Pakistan Geographical Review, Vol.74, No2, December. 2019, PP 90-103

EVALUATING AND DETECTING THE AREA OF DATE PALM CANOPIES USING QUICKBIRD DATA IN ASSESSING THE NDVI AND CATALOGING THE LAND COVER MONITORING IN SUKKUR, KHAIRPUR DISTRICTS OF SINDH

Naila Parveen Abbasi*, Aiman ShahaniSamar Ali Ghanghro**
Ghazala Parveen Abbasi*, Ali Murad Soomro*****
*Department of Geography, Shah Abdul Latif University Khairpur
**Department of Geography, University of Karachi
***Department of Education, SMBBGC, Larkana, Sindh.

ABSTRACT

Date palm crop growing is economically significant in the district of Khairpur and sukkur in Sindh, with important monetary investment approaching from mutually the government and private entities. In direction to acquire this fact, a method intended for palm trees finding expending high resolution satellite imageries planned. Given technique mark its potential headed for assessing canopy area of date palm trees in said districts.

Another target is to develop a comparison set to calculate the density of date palm throughout the season in both districts assessing the NDVI and cataloging the land cover of study area.

Designed for this analysis, high resolution satellite data help to identifying the truths close to this review, additional data was composed by means of informal talk with resident people and from secondary bases. The area of date palm has been observed greater in district Khairpur, about 79.3% as compared to the other district sukkur about 20.6% area has been detected. And diversity in landcover of this region have been perceived. Absolutely founded of consequences for this research, it will be useful in communal and cultivating devotion around the monitoring the date palm density and land cover pattern in both districts of Sindh.

KEYWORDS: Area, Date palm tree, detection, Land cover, high resolution imageries.

INTRODUCTION

Date fruit is well thought out as one of the earliest fruits found on earth discover in primeval time. Alphonse Pyrame de Candolle (1806-1893), a renowned French-Swiss botanist notified in the time of pre-historic eras the date palm trees planting extended begin near Senegal at West of Africa crossed as basin of Indus into Southern Asia. At a distance from our home region, dates remained growing in Senegal, Mauritania, Mali, Nigeria, Algeria, Tunisia, Morocco, Libya, Egypt, Sudan, Chad, Iraq, Saudi Arabia, Yemen, UAE, Oman plus Iran since the ancient time period. Arabs ranged dates in Spain during their ruling time in part of Southern European nation since the 12th up to 15th eras. Dates remained familiarized more in western zone to the American region via Spaniards in the time of 18th

century (SBI, 2010). The date palm (Phoenix dactylifera L.) probably the mostly primeval cultured trees worldwide (Zaid, 2002). Date palm remains solitary of the mostly significant tree in dry and semi-arid zones worldwide also has turn out to be a share of the traditional life of the societies in those regions. As the tree is able to offer a wide-ranging of products plus services, also it is expressed like naturally sustainable source. For instance, fruit of (dates) remain wealthy full with vitamins in addition to carbohydrates. Date tree is also seasonal monocot plant using a lengthy generation time nearly 25 an age. This is a mainly grower in hot parts of Southeastern Asia, Africa. (Palm Oil). Exact records plus seeing of date palm is hard for farm managing as well as plant extent growth. Remote sensing is one of the greatest effective assessment ways for exact spotting in excess of great expanses (Tan, 2013). Though the intention of date tree exposure is for detect or mark date palm tree shown on map, airborne images or digital imageries. As these facts are the basic element for date palm farm managing and perceiving for each cultivated zone. Expressive the expanse of date palm tree in every cultivated zone be able to assist the crop estimate. The modest approach to identify date palm is to physically spot the date trees on imageries or else in survey by utility of Global Positioning System to gather the locations of palm trees as well as show their positions on the images. Though, there is a number of date palm cultivated spaces, those can be located huge also comprise over than 1000 date palm trees, physical finding as well as survey is a time-consuming practice also costly. In this situation remote sensing method is more significant to assess and identifying the cultivated area of date palm through high resolution satellite imageries (Wulder, 2008). The outcomes of this task drive to moderate the time limitation for perceiving then support to evaluating the areas for cultivation. It is significant for design to form an assimilated data arrangement in directive to approach the precise and current records which utility in the events of exploration comprising the design, managing, monitoring and similarly in overwhelming uncertain circumstances. This revision drive to support for growers in the plantation of further date palm cultivation. Moreover, the huge extent of date palm cultivation reflectors has various measures also carrying out in direction to acquire the great output of crop or fruitlet clusters. Such as to get the most output effectiveness of supervision into the date palm cultivation, geospatially exploration been applied. Due to the reason that, the valuable data by remote sensing can remain useful to assimilated in cultivation particularly in date palm. Farm administrator can acquire facts plus particular yields collected along the soils in excess of the huge extent for support the choice for final production. If the cultivation is proper in accord with the correct choice plus instruction by the farmer, it will mark

the production progress of date palm fruit. The measures of necessity elements reflected such as the land choosing, cropping material, technical authority, planting and environmental conditions. Though whole the standards in the date palm cultivation if manageable and unified with each other, the productivity of fruit can be increased. Thus, the outcome of study remains utilized to sustain the maintainable exploration on this ground (Marzukhi, 2016). As Date palm trees are expanse over 98,000 hectares entire Pakistan make it the 5th leading date producer worldwide at 0.7million metric tonnes, with majority of plantations found in Sindh and Balochistan. (Dawn, 2011).

STUDY AREA

As Khairpur and Sukkur are the leading date generating zones in Sindh, the important yield would make certain constant accessibility of the item for consumption also accordingly produce dates giving out necessities. So, a tree in the study area can be very valuable for cultivators also growers as well. A minor transport charge can be acquired for carrying the item at the place because of the nearness. That would be beneficial for time saving and can be subsidize to a great pace commercial activity in the area. (SBI, 2010).

District Sukkur is located in Sindh province, which is site on the bank of western side of river Indus. This is most populous city of Pakistan with 12th ranked among the cities of country along 3rd largest city in the province of Sindh. As the city remained originated throughout the British colonial law on the head work for the larger barrage Sukkur was useful for directing flow of water over the huge irrigational work in the side of upper Sindh. Climate of district Sukkur is considered as actually hazy and hot summertime by cool winter and dry. All over the yearly time period the low speed of wind with abundant sunlight as the district shows a desert type environment. In summer the temperature raises up to 50 °C a very hot weather in summer. Dry hotness is started from April to earlier of the June till the monsoon period start towards land. In the city of Sukkur, the monsoons remain not exactly humid, however exceedingly great dewdrops increase with high hotness which make the temperature exceedingly unbearable. Dewdrops in excess of 30 °C (86 °F) plus hotness indicator in greater of 65 °C (149 °F) remain noted on a few of some days, that are some of maximum heat indicant worldwide recorded. Monsoon decrease in September; however, it is not up to delayed until October which is the small existed in autumn period is practiced (Bullo, 2011).

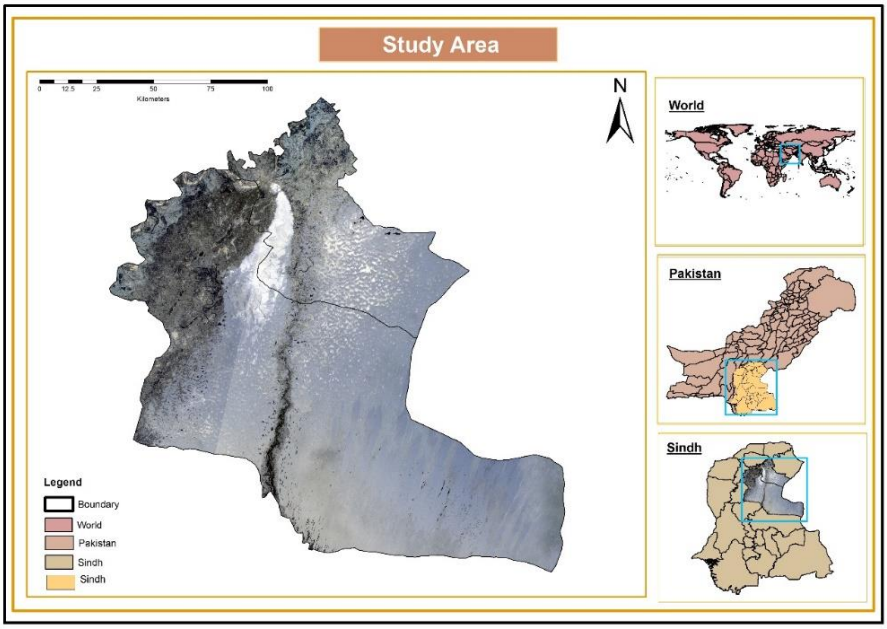


Figure 1: Location of District Sukkur and Khairpur (Source: Authors)

Khairpur district is sited in northerly side of the Sindh. As the climate of Khairpur is subsist with hot and cold fine-distinct season around the district.

Economy of the district is mainly farming, with cultivation accounts for around 80 percent population of the district related to this activity. District Khairpur is specifically healthy-known for growing exporting quality dates (all over about 85% through whole province dates remain processed and produced alone district Khairpur). District has the intense climatic environments, thru extreme temperature about 42° C through summer season, then a least of 7° C in winter (Bullo, 2011).

Climate for Date Palm Growthness

Date Palm be able to grow in dry climatic condition in extreme hotness and a smaller amount of humidity. As the date palm tree is adapt boldly face the hazards of water logging and salinity. In order to the technical reading date tree be able to mature on very sound on 43 Celsius. Though, this one consumes slighter capability to tolerate monsoon rains with mature fruit. Also, sandy and silt grownup lands, the tree can be grown in a barren region.

Some Popular Varieties

It is observed that there are more than 200 kinds of dates in whole the region particularly in district Khairpur that are famous with different tags few are discussed as further down:

Dedhi, Aseel, Asul, Kurrh, Nakul, Gajar, Patasho, Pathri, Noori, Dhakki, Narro, Eidan Shah Jo Kuprro, Began, Otakin, Khori Wari, Thothar, Toto, Khurmo, Sawrro, Mithrri, Kasho Wari, Luhar Wari, Achi Gajar, Surmit, Halwaen, Kotaen, Sakhanin, Dahota, Barmo, Ahmed Wari, Piper Wari, Allahen, Ghuri Wari, Taar Wari, Khurmit, Indrri, Badamen, Boobak, Ashrafi, Allah Bakhsh Wari, Sanhi Chapar, Koonj, Dodi, Golrri, Phoopher, Gharrhi Ashrafi, Shabihan, Warangi, Shah Wari, Bahar Wari, Jammu, Mohani Wari, Poong, Sobhari, Kazen, Khahnyanin, Jalebi, Gorrho Misri, Haji Wari, Thorrhi, Hakim Wari, etc. (Bullo, 2011).

OBJECTIVES

For assessing at entirely methods of analysis few plans of aims are very essential also for the leads of this review the core objectives are:

- Determine date palm canopy area analysis by high resolution satellite imagery.
- Develop a comparison set to calculate the density of date palm in both districts.
- Identify the land cover cataloging through classification in study area.

METHODOLOGY

For specific completion the two types of basic data gathering were used in this study. Foremost substantial route is prime facts i.e. the figures that captured by Satellites. Secondary base of records combined by print source. In this study to assess the performance of projected palm recognition process, QuickBird picturing of both localities were applied. Given areas remained by tradition is enough cultivated within date palm trees. As the image takes ground sampler expanse nearly 61 cm for every pixel and 3 band groups included blue, green, red. By the help of imageries, a selection of the date tree planted area also clear their margins. Furthermore, Landsat imagery of district Sukkur and Khairpur was also used to demonstrate the land cover cataloging and NDVI performance of the proposed way. The given revision, in which a scheme of spotting date palm areas via greater resolution multi-spectral imageries, mainly in planted expanses have been planned. The imageries used in given method were rectified also can be in RGB or RGB with near infrared. Afterward the edge of the planted range which is clear noticeable, and area calculate approach is applied.

Wherever near infrared remains the near infrared spectral bands. The (NDVI) is defined as below (Rouse, 2014).

$$NDVI = \frac{(NIR - Red)}{(NIR + Red)}$$

This one is the greatest frequently customized vegetative key. The figures differ in the middle of−1 and 1. In common, the radiant conversion must be done earlier calculating plant indices in command to attain exact vegetative indices. Though, the vegetation indices in this work have been not approached for detecting the accurate etymology of date palm trees, they actually in fact utilized for separating date palm tree plus background.

The feature select method was choice an appropriate index from whole the indices that remained calculated from the images. The input files for the projected technique was not bounded near simply multi-spectral and digital imageries. Though remained, RGB imagery have been utilized. Besides, the feature assortment has been suggested extra strong when the radiometric substances remain slanted or transmuted, i.e., the example of pan-refined imageries. Used many catalogs in the dissection of agronomic imageries. Fewer indices included Excess Green (ExG), Excess Red (ExR), and Excess Blue (ExB) also Excess Green minus excess Red (ExGR). Specified an image in RGB tone space, the calculation of discussed catalogs start commencing the normalization of spectral red (R), green (G) and blue (B) elements by an assured pixel (Guijarro, 2011).

$$r = \frac{R}{R+G+B}, g = \frac{\mathrm{G}}{R+G+B}, \qquad b = \frac{\mathrm{B}}{R+G+B}$$

As the common customized key, e.g., NDVI is an appropriate solitary is for the classification. While the NDVI of vegetative indices has been processed with the help of ArcGIS 10.1 software. With the spectral reflectance, the bottle green flora of date palms been identified.

Calculating Area of Date Palm

The compute geometry tools for contact the geometrical sorts in the layer. While the tool be able to evaluate the coordinate value, length, plus extents, liable to geometry of given layers. Simply calculating the areas, lengths, or edge of feature so, condition is the coordinate arrangement being customized been proposed. This one commended that an equal-area projection be utilized where the area calculate is required. For calculating the date palm area get on to the righted-on layer then opened the attributed table. Through geometric calculation on attribute tables. After

that opened the fields headline, to sort the calculations also command the calculating geometrical ways. Different properties are available depending on the type of layer which have been utilized, than used the coordinating systems of the data route or the coordinated systems of the data set. The divisions of the productive calculation have been applied as units selected in acers for the final output of the date palm area calculation.

The accessible search work from varied linked articles utilized to clip the way for this evaluation. Usually the techniques for the variation contact can be shared into binary core groups over classification order year wise, by the help of imaging giving out which stands the significant phase in remote sensing method. Though the process of Quick bird and Landsat-8 imageries is ended by convinced tools in ArcGIS 10.1 and Obia software's have been utilized for this intention. The encouraged commonly on the disparities in the changes in zone wise and land cover category in both districts (Herold, 2002). Un-supervised classification and Obia classification is well-defined easily as the method been used. The method comprises projection, subsets, plus vegetative indexes of NDVI, plus the giving out remains ended meant for the purpose of getting, understanding plus examining the outcomes.Sound onward than improved the imageries, then raster imageries were covering, than to drop the geometric errors through reading strategy and assessment, taken (GCP) to increase the image accuracy. The analysis images for the year of 2017 were hold the spot around the date palm area detection, vegetation, which shown in (Figs 2,3 and 4) accordingly in study area.

RESULTS AND DISCUSSION

The constraint is fixed to covers enough zone of date palm trees because the approximate area of district sukkur is 5,165 km² out of that the date palm canopy is about 20.6%, and 15,910 km² area of district Khairpur accounts the date palm canopy about 79.3%. The source to talk, that the, analyzing of spatial variations inside the areas of both districts the Khairpur district covered more area of date palm trees. As the area naturally set apart along such a suitable climatic favor for harvest. And due to the reason of silt growing land-living, date Palm be able to grow in a dry region. It partakes a capability of stand up into salinity also in water logging pressure soundly, that is the basic reason for density in palm cultivation in this region. Figure 2 illustrate a sample of the picture use in the contemporary valuation of the date palm canopy contrast between both districts of Sindh.

Though the uncovering of planted part's margin line has been shown. The spotted date trees through given scheme also clear within green reflectance on map.

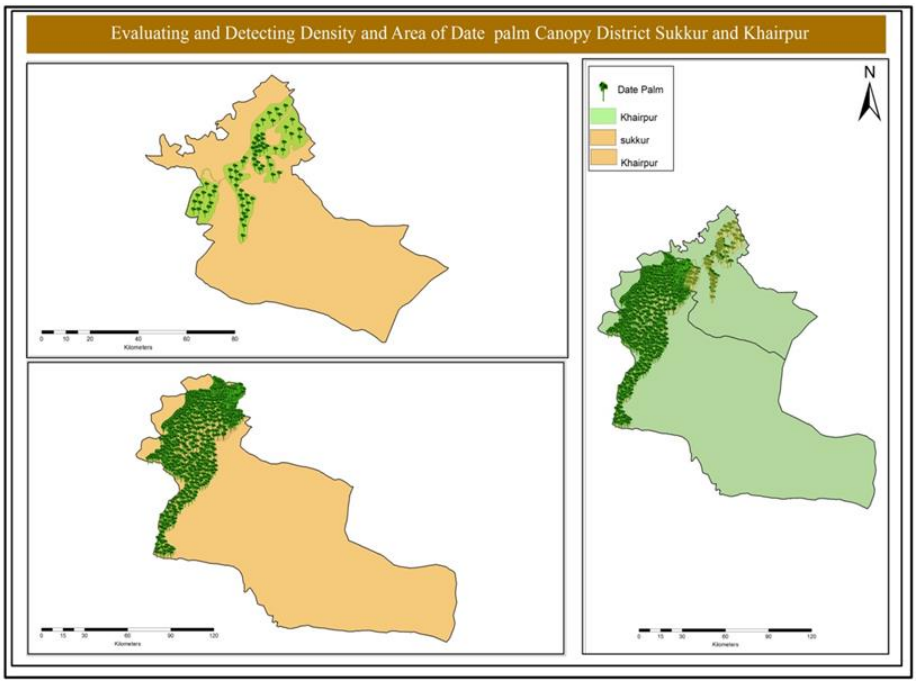
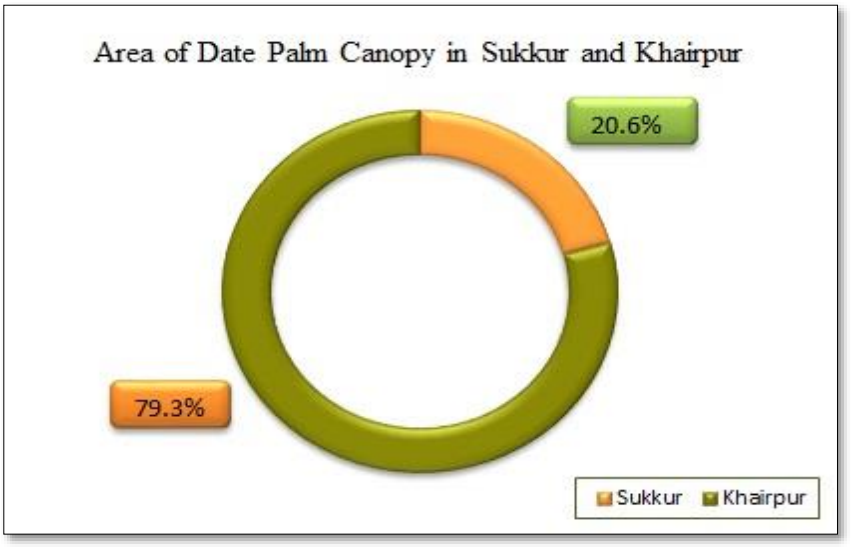


Figure 2: Density and Area of Date Palm (Source: Authors)



Graph 1: Area of Date Palm Canopy (Source: Authors)

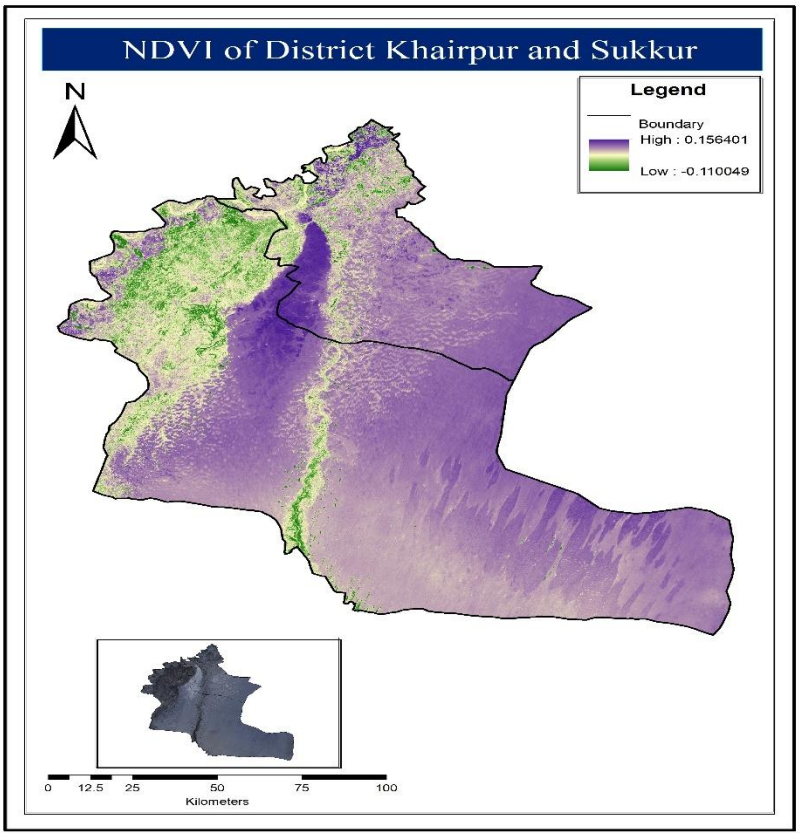


Figure 3: NDVI of District Sukkur and Khairpur (Source: Authors)

As figure 3 has shown vegetative indexes for detected the greenery of the trees. Imagery of Landsat-8 have been workout all through in given plan. It's due to the Landsat imageries have best combination for detecting the areas where the dense and sparse vegetation found in any area. In addition, Landsat possess dual spectral bands which is weighty in NDVI analysis process that the Band 3 plus Band 4. Band 3 is red and band 4 is near infrared NIR (Wright, 1999). Revealed indices are exactly valuable for fragmenting flora on an image particularly only in red, green and blue spectral groups are accessible. Though mostly the RS provides imageries in RGB-NIR range. Specified an imagery within advanced spectral resolutions, the NIR range be able to use into accounts with defined vegetative catalogs.

NDVI value of the both regions where date palm area have been observed. The positive value shows different groupings like waterbody, constructed areas plus unfertile lands, where near negative value show vegetation

types including date palm and other vegetation. Based on this project, the lowest of NDVI values shown 0.11 as where is simply date palm planted spots. As values of NDVI ranges through 0.15 to 0.11. (Desmond, 2013). This kind of diversified exploration shows the cataloging of the high plus low vegetation along date palm tree in this region. The dense tree has dark green reflectance and low vegetation has light green reflected tone. So, the values of NDVI remains analyzed as per greater. On the base of given reading the areas where dark green reflectance has been shown (Shashikant, 2012), It was predicted because of the observation on the bases of high-resolution data sets of both region for most of the date palm trees found in Khairpur as compare to sukkur.

Figures 4 shows the presentation of the planned date tree detective method, two imageries of Quickbird and landsat-8 have been utilized for date palm planted zones be present for conducted experimentation. The multi-spectral satellite imagery shown the different land cover catalog in study area. It is perceived that the given areas are not uniform, it contains objects that stands not only date palm trees, i.e., buildings, extra trees, and barren land are also perceived in the study area.

The three types of image classification have been shown as obia classification of landsat image and then Quickbird a big difference in all imageries of 2017 because the year is same but the diversity in land cover vegetation is different due to the diversity monthly imageries. In obia classification, the whole study area has been classified while, in landsat and Quickbird only the area has been classified, where the date palm canopy is covered in this region. That is why the diversity in landcover percentages have been observed in all images.

As in obia there are five landcover classes have been shown as district sukkur and Khairpur is mostly the rugged topography due to Nara desert in district Khairpur. The desert area account about 44.6% in both regions. While, vegetation accounts 24.1% for obia and 24.7% for landsat similarly, 32.8% in obia there is whole image has been classified while, in next two images only those areas have been classified where date palm is covered.

The vegetation cover is greater in Quickbird image due to the variation in month as the peak season of date palm in this region from May to August. Water covered area is shown 4.8% for obia similarly, 5.8% in landsat and Quaickbird image accounts about 38.6% for this class. No built-up class has been cataloged in obia due to other major landcover in this region but in landsat about 17.1% built up area has been covered while, only 2% built up land has been observed in the region. Barren land has been has shown in Landsat about 26.5% and in Quickbird there is around 20.3% have been

perceived. The open space for obia there is 23.7% similarly, 22.6% for Landsat and 3.4% area for open spaces have been displayed in this region.

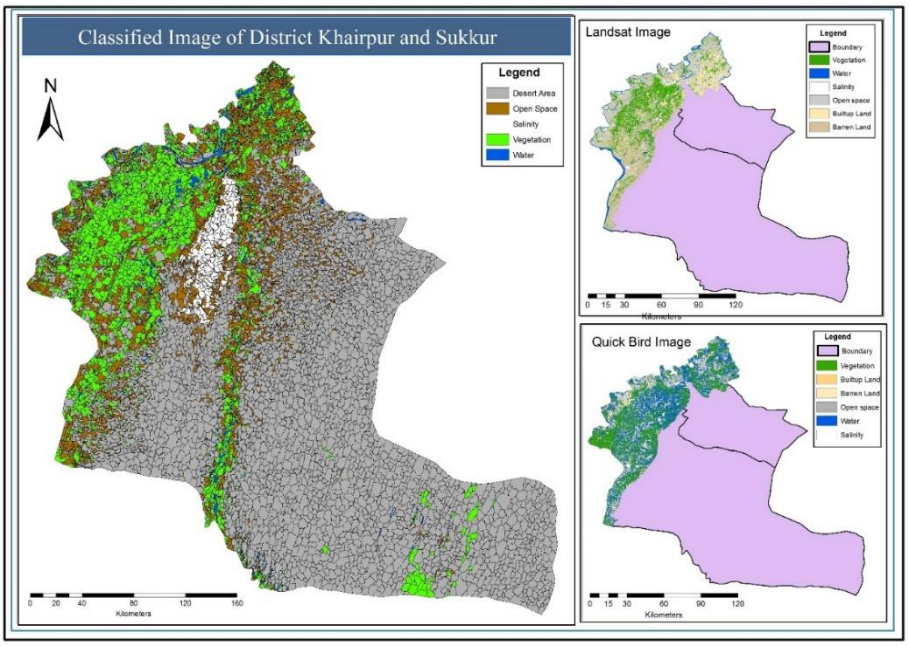
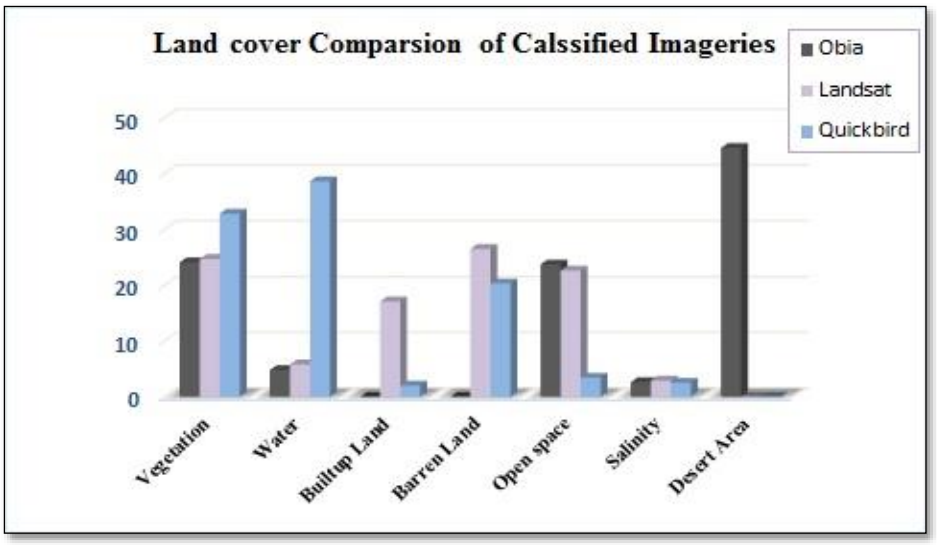


Figure 4: Classified Imageries of Study Area (Source: Authors)

Salinity is also observed on some areas of the region as 2.6% salinity has been observed through obia classification while, 2.9% with the help of Landsat image and 2.5% salinity accounts for Quickbird image in both districts.

As graph 2 is showing the landcover contrast in all landcover classes there are three classes of landcover has been shown in greater such as desert, water and vegetation in the area of this region. Because the mostly part of district Khairpur is covered on Nara desert due to this big part of the desert the share of rugged area is greater. The water contribution especially in



Graph 2: Land cover comparison of classified images (Source: Authors)

Quickbird image it is due to the standing water in fields and the Nara canal is flowing from river Indus for irrigation purposes in the area of district Khairpur. Vegetation is rich due to the density of date palm cultivated area in both districts and other vegetation have been observed along the agricultural lands. Many crops and fruits growing in this region such as Banana, mango, guava, falsa, orange and lemon are most grown fruits in this area. While patotas, onions, lady fingers, and peas are the most commonly grown vegetables. The main cash crops in Khairpur include wheat and grams in Rabi season, and cotton, oil seeds and sugar cane in Kharif season.

CONCLUSION

Dates remained a favored nutrition and fruit of the parts worldwide wherever it is manufactured or planted. The historical background of the date crop is trust to be as older as the human and it back to 6000 BC. This study is based on two districts of Sindh province. The purpose of the present study is to evaluation of and detection of date palm canopy and landcover cataloging in the district of Sukkur and Khairpur on based of high-resolution satellite imageries. The date palm detection and assessing is an important task in date palm plantation area. It has been seen at various places of this region that the date palm growers placed are not homogenous because the date palm trees are seen unevenly scattered in this region. Khairpur and Sukkur region constitutes a lush green Date Palm zone consisting very organized orchards spreading over 10,000 and

thousands of acres with lacs of Date Palm trees. Particularly the lengthy dateline along the shoulders of the main National Highway from Tando Masti to Babarloe adds scenic beauty of the district and by and large maintains echo system. The density of date palm canopy is greater in Khairpur then Sukkur due to the suitable climate and soil condition for date palm in this region. The peak season start from the month of June to mid of August. The key success components and the contribution of the proposed algorithm are canopy selection process, in contrast to other methods which directly use NDVI as the feature for detection date palm canopy. The process fully automatic, the detection of date palm plantation area and its boundary method has been developed in this region. As almost 80% to 85% dates are produced in these two districts. That is why this market demand come across by the import and export of dates to Pakistan and around the world.

REFERENCES

Dawn.comJuly 26, 2011 https://www.dawn.com/news/647053

Desmond Ofosu Anim, Amos Tiereyangn Kabo-bah, Philip Nti Nkrumah, Raphinos Tackmore Murava. (2013). Evaluation of NDVI Using SPOT-5 Satellite Data for Northern Ghana. Environmental Management and Sustainable Development, 167-182.

Faradina Marzukhi, Aina Liyana Elahami, Sharifah Norashikin Bohari Universiti Teknologi MARA, Detecting nutrients deficiencies of oil palm trees using remotely sensed data. Perlis, Malaysia . (IGRSM 2016) IOP Publishing pg. 1-11

Guijarro, M.; Pajares, G.; Riomoros, I.; Herrera, P.; Burgos-Artizzu, X.; Ribeiro, A. Automatic segmentation of relevant textures in agricultural images. Comput. Electron. Agric. 2011, 75, 75–83.

Herold, M., J. Scepan, and K. Clarke, (2002). The Use of Remote Sensing and Landscape Metrics to describe Structures and Changes in Urban Land use. Environment and Planning, 34, 1443-1458.

http://www.cresda.com/n16/n92006/n92066/n98627/index.html.

Palm Oil Facts and Figures. Available online:http://http://www.simedarby.com/upload/Palm_Oil_Facts_and_Figures.pdf (accessed on 6 June 2014).

Rehman. Ziaur, Khanum. Farheen, Kazmi. Jamil. Hasan Evaluation of Land Cover Changes at the Coast of Sindh through Successive Landsat Imageries. Volume 7, Issue 1.

Rouse, J.W.; Haas, R.H.; Schekk, J.A.; Deering, D.W. Monitoring vegetation systems in the great plains with ERTS. Available online: http://www.researchgate.net/publication/ (accessed on 16 September 2014).

Sim Wright. (1999). Retrieved from Normalized Difference Vegetation Index analysis on forestry and crop management.

Tan,K.P.; Kanniah,K.D.; Cracknell, A.P. Use of UK-DMC2 and ALOS PALSAR for studying the age of oil palm trees in southern peninsular Malaysia. Int. J. Remote Sens. 2013, 34, 7424–7446.

Timothy, K. Broschat. (2005). Nutrient Deficiencies of Landscape and Field-Grown Palms in Florida. Environmental Horticulture Department University of Florida, 110.

Veena Shashikant, Abdul Rashid Mohamed Shariff, Laili Nordin, Biswajeet Pradhan. (2012). NDVI of oil palm trees by LANDSAT-5 Imagery. The 3rd Asian Conference on Remote Sensing, (pp. 1-4). Selangor.

Wulder, M.A.; White, J.C.; Coops, N.C.; Butson, C.R. Multi-temporal analysis of high spatial resolution imagery for disturbance monitoring. Remote Sens. Environ. 2008, 112, 2729–2740.

Zaid, A and P.F. de Wet. 2002. Origin, geographical distribution and nutritional values of date palm. Date Production Support Programme. FAO.