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Change Monitoring In Agriculture of Dhule And Sakri Tehsil Using Geospatial Technology

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Abstract

The monitoring of particular land according with specific factor Land use/ Land cover is the most suitable method to implementing the policies and conclude the ill impacts on the surroundings. The study here aims at analysing the changes that occurred in LULC over a time span from 1999 to 2019 using multi date data of a part of Dhule district. Thedigital data consisted of two sets of Landsat Thematic Mapper (TM) data and Sentinel-2. The classification is carried out in QGIS using Semi-Automatic tool the six class is taken like dense agriculture, moderate agriculture, sparse agriculture, fallow agriculture and other class the present study focused on the agriculture change in 20 year of time period. Further statistical analysis is done between five- and ten-year time period. It has found that the low agricultural land is converting into the dense and moderate agriculture also the water body area is increasedwhich is shows the development of the Dhule and Sakri tehsil.

Keywords: Land use/ Land Cover, Agriculture change, Satellite Image processing, Agriculture classification.

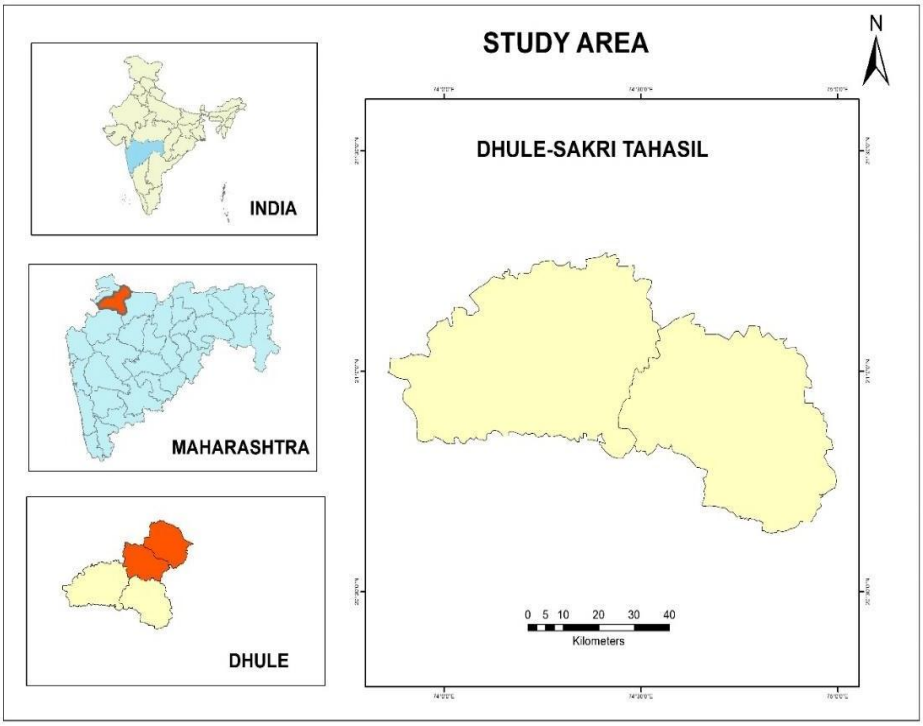
Introduction:

Geospatial technology is highly progressive branch of geography which enhance the research work very effective and accurate with sustainable approach. Land use/ Land cover is one of the effective methods to analyse the changes on the earth surface with interested study research field also very useful to implement the various policies and to analyse those policies after the decade also. Agriculture is the main economic source of India it is very important to develop our agriculture by innovative approaches so in the present research agriculture changes have monitored and analyse the changes from 1999 to 2020 of Dhule and Sakri tehsil. Land use pattern shows the clear view of changes in agriculture pattern as present study classified the agriculture in four classes except water body. Akkalpada dam is the main source of water behind the positive changes in agriculture. For the economic growth in the agricultural sector water resource management is the main factor to optimize the economic growth also land use land cover suggests the sustainable development and also more helpful for the future agricultural growth

Study Area

Dhule district is the district of Maharashtra located in the Northern part of Maharashtra and Sakri is the tehsil of the Dhule district. Dhule is the administrative headquarters of Dhule district. Dhule located at 20^0 54' 11" N latitude to 74^0 46' 29 E longitude and Sakri tehsil located at 20^0 59' 35" N Latitude to 74^0 18' 52" E Longitude. Dhule district covers area of of 8063.11 sq. km., which is 2.62% of the geographical area of the state. Particular Dhule tehsil covers a area of 8063 Sq.km and Sakri tehsil covers an area of Dhule district comprise of four tehsil and they are Sakri, Shirpur, Shindkheda and Dhule so in the present research researcher selected Sakri and Dhule district as a Study area. Sakri includes largest number of villages as compare to other three tehsils.

Map No.1.1



Source- QGIS And Census

Objectives:

To analyze the decadal changes inagriculture of Dhule and Sakri tehsil
To identify the agriculture, change because of Akkalpada dam in Dhule and Sakri tehsil.
To find the impact of water resource management on agriculture of Dhule and Sakri tehsil.

Database and Methodology:

Secondary Data

The administrative boundary has been obtained from the "bhaskaracharya institute of space application centre". "Google earth" has been used to check the past and present situation of the study area. SENTTINEL AND LANDSAT 4-5 data of 1999, 2010, 2015 and 2020 has been downloadedfrom the USGIS website which is the main part of the study area.

Delineation of Study Area

The boundary of the dam and canal has been delineated from the Google Earth also Google earth helps to found out the past and present situation of the agriculture which helps to comes to the result of the present study.

Satellite Image Processing

Sentinel image of 25 Jan 2015, 12 Jan 2020, and LANDSAT 4-5 images of 20 Jan 2010, 15 Jan 1999 has been processed in the QGIS. the layer stacking operation has been carried out separately for the SENTINEL and LANDSAT image for sentinel data blue, green, red, an NIR band has been merge and for Landsat data blue, green, red, NIR, short wave-wave infrared has been merge. Further the standard FCC images has been generated of four different years' data. The area successfully clips to the boundary which is in shape file format.

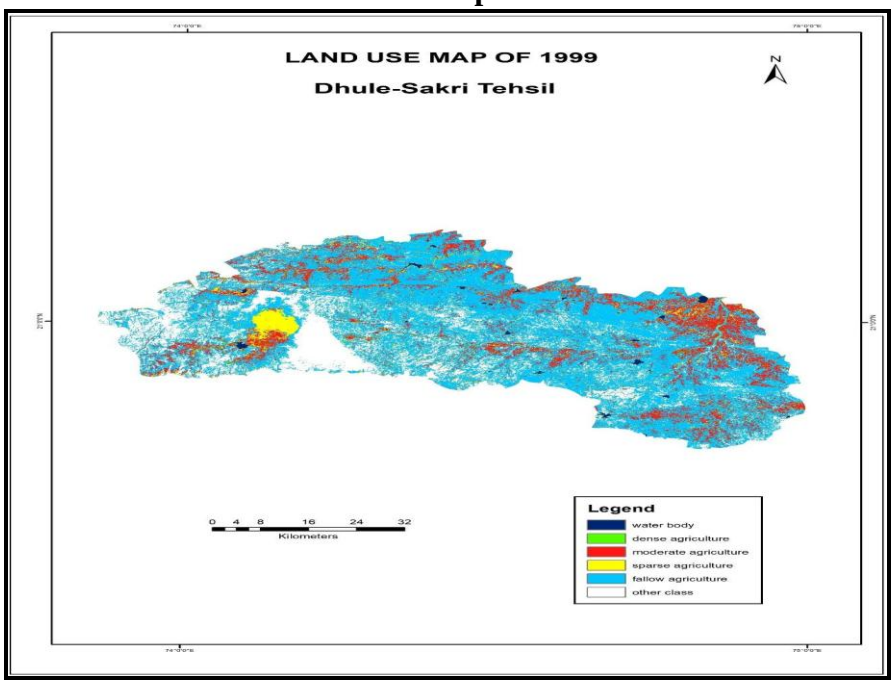
Land Use Map

The digital data set of Landsat TM 4-5 and Sentinel data is merge and clip with the respected study area after that using the semi-automatic tool in QGIS the four image of different years is classified with class dense, moderate, sparse, fallow agriculture and other class.

Result And Discussion:

The study proposing the agricultural change in different years of data, canal is the main reason of change in the agricultural so here land use map and FCC image shows the situation of agriculture that every taken year.by comparing the land sue map we can assess the change and conclude the present scenario of the agriculture which can be helpful for the farmers and also water management suggest the industrial development suggestions for future.

Map No. 1.2

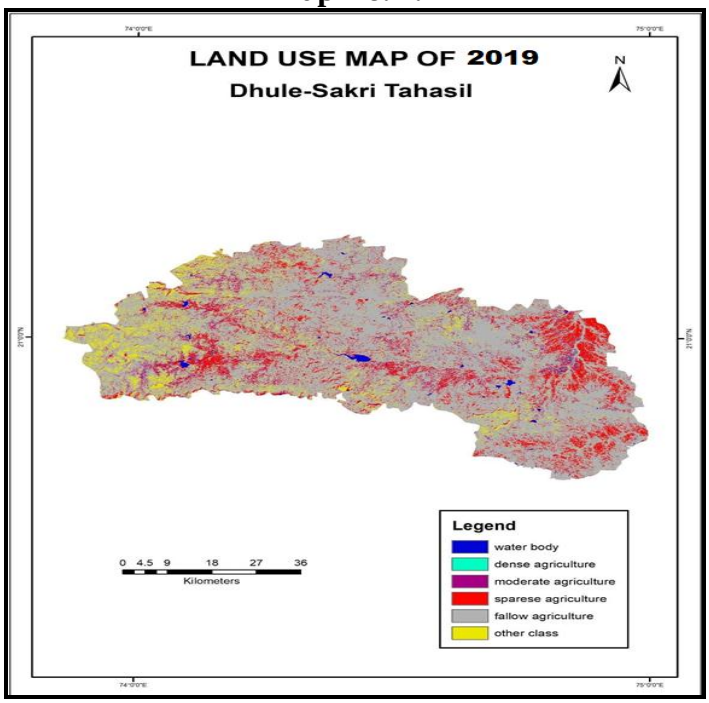


Source- Qgis And Census

The above two map shows the standard FCC image and Land use map of Jan 1999 the study Mostly focus on the agriculture so the classification is based on the vegetation which clearly

shows the change. Table no 1 shows the area of each class in hectors and classification include the classes like water body, dense agriculture, moderate agriculture, low agriculture, fallow agricultural land and other class.in the 1999 there was no dam present in the area so the agricultural production is low as compare to the present situation if water resource is not much more effective and present in thelarge proportion then it indirectly affect the all environmental activities and also affect the livelihood. As per table water conservation facilities is very rare so it affects the agricultural production also there is no storage of water so surface runoff is also high. in 1999 area of fallow land is so high means it clearly shows the low ratio of agriculture.

Map No. 1.2



Source- QGIS and Census

The present situation of the agriculture which shows the positive result on the agricultural change as we compare this with the previous data waterbody is increased up to 83321 hectare which is the main objective of the present study. according to the waterbody dense, moderate agricultural land area also increases up to 97447 and 49551 respectively also sparse agricultural land slowly coverts into moderate agriculture and moderate agriculture converted in to dense agricultural land. This is related to all the human activities like employment, economic growth also other class activities are also in growth ration because according to the industrial development and long-term time span several changes and development where occurs respectively in the study area settlement increases also the rehabilitation takes place so the towns were shifted to the new places also the transportation work is going on so built-up area is also increases. Minor irrigation is the major thrust area. the total area under irrigation is only 19% of the area under cultivation. the ultimate irrigation potential for the district is 4.86 lakh ha. There is need to increasing investments in various activities such as drip/ sprinkler irrigation which is more important for agricultural production.

Table No.1.3, Monitoring Change Between 2019 And 1999

CLASS		AREA (Hectare)			CHANGE (%)
	1999	%	2019	%	
Water Body	45020	10.31	83321	19.10	45.96
Dense	75043	17.19	97447	22.34	22.99

Agriculture					
Moderate Agriculture	85012	19.48	49551	11.36	-71.56
Sparse Agriculture	59011	13.52	55443	12.71	-6.43
Fallow Agriculture	102000	23.37	67211	15.41	-51.76
Other Classes	70218	16.09	83111	19.05	15.51
TOTAL	**436304**		**436084**		

Source- QGIS and Census

Table No. 1.3 shows the change detection between two decades that is from 1999 to 2019 so according to research and image processing there is positive changes in some classes. Here the agriculture is classified in to four classes except water bodies. The water bodies, Dense agriculture, Moderate agriculture, Spares agriculture and other two classes show increase in area of particular class. In 1999 water bodies shows area of 45020 and in 2020 it increases up to 83321 which is a positive change because of construction of akkalpada dam and proper management of water resources it shows 45.96% change. Moderate, sparse agriculture and fallow agriculture shows the negative change i.e., -71.56, -6.43 and -51.76 respectively because there were no more facilities to improve the agricultural production. Other classes are also showing positive changes that means other agricultural classes get transform in to a good agriculture.

Conclusions

Satellite remote sensing can be used as an effective tool for generating the necessary dynamic information for surveying and monitoring LULC in a region. Agriculture is the important factorin human life and maintain the socio-economic condition. This study carried out in the Dhule and Sakri tehsil combine in the Maharashtra state. To assess the agriculture change using satellite images is the main purpose of this study. The methodology of present study is Satellite data has been used to generate the LULC map also the boundary has been demarcated using the QGIS software. Sentinel and Landsat TM data taken year wiseafter the data has been merge using the band and clipping process with the respected study areais done using QGIS software, further classification has been done in QGIS. Six class has beentaken for detecting the agricultural change after that the study calculate the area of each class to assess the agricultural change in five-year gap.

The result of present study shows the growth of the agriculture area in 2019. Also, the water body area is growing and development of agriculture is going on continuously also the sparse agriculture and fallow agricultural is decreasing. Before 1999 there was no proper irrigation facilities in the study area Panzara river is the main source for water before construction of Lowe Panzara dam after the completion of dam in 2006-2009 there is biggest change in the agriculture sector of Dhule and Sakri tehsil. So according to the present study the spares agriculture and moderate agriculture which is 13.52% and 19.48% respectively get reduces and transform in to the dense agriculture which is a good sign. after statistical analysis the present study concluded that positive change in 1999-2019 thereason behind this ratio is increase in waterbody area which is the main source of agriculture also there is many government policies were implemented for the agriculture sector and in 1999 the water body area is low so dense agriculture, moderate agriculture is very low and fallow agriculture is high this conditioned is changed in 20 years which shown inthe present study.

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