



Changing general land-use pattern in Command area of Krishna-Koyana Lift irrigation Project in Sangli District of Maharashtra

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Abstract:

The term Land use / land cover change (LULC) is generally used for the human modification of Earth's terrestrial surface. From thousands of years humans have been modifying land to obtain food and other essentials. At present extents and intensities of LULC are far greater after the introduction of irrigation projects. It is most importance to assess the land use/ land cover changes with respect to the development activity like irrigation. The region selected for the present study is the Command area of Krishna-Koyana Lift irrigation Project in Sangli District of Maharashtra. It is located between 73° 42' East longitudes to 74° 40' East longitudes and 16° 45' North latitudes to 17° 33' North latitudes. occupying total irrigated area of 106020 hectares.

Landsat-5 TM (Thematic Mapper) and Landsat-8 satellite images acquired from Land viewer website and USGS Earth Explorer Geo-portal for the year 2000 and 2015 respectively which provide 30 meters spatial resolution with eight spectral bands including near infrared and a panchromatic band with 15 meters spatial resolution For efficient analysis of changes during the period of investigation. The analysis reveals that 2.16 per cent of additional land has been brought under irrigation.

Introduction:

Agriculture is the backbone of the Indian economy. Agriculture sector provides the highest employment in the country until other developments take place. Water is a prime source for sustainable agriculture. Agriculture production gets affected most of the time due to erratic monsoon conditions. Irrigation is a vital factor for development of agriculture, especially in India, where the natural source of water, that is, monsoon rainfall which is highly variable in amount and distribution. Subsequently

there is no adequate water source for irrigation. So by considering the important role of irrigation in bringing social and agriculture transformation, the present study tries to understand the impact of irrigation project on agriculture. In India, about 33 per cent of net sown area is under irrigation and rest is dependent on rain (Census of India, 2011).

Irrigation is one of the basic infrastructures of agriculture activities. Water supply naturally or artificially is the principal requirement for the development of sustainable agriculture. Insufficient

rainfall of monsoon and persistent drought condition hindered the development of agriculture. Regular monitoring of LULCC is needed to improve water management. can be performed to study the land cover and vegetation vigour transformation (Singh, 1989; Fung, 1990). The main objective of the present study is assessment of the irrigation development in the the Command area of Krishna-Koyana Lift irrigation Project in Sangli District of Maharashtra through land use/land cover analysis.

Study Area:

Command area of Krishna-Koyana Lift Irrigation Project includes eight tehsils

of Sangli district, out of total ten tehsils. Yerala, Krishna, Warana, Agrani, Man are the major rivers of the district. 78 per cent people of this district living in rural areas. It shows very clear that the district is agriculture in character. Physical settings of the study area has shown contrast immense dimension due to players of the relief, vegetation and climate. The study area lies in the Sangli district, Maharashtra and mainly covers a draught prone tahsils of the district. It lies between between $73^{\circ} 42'$ East longitudes to $74^{\circ} 40'$ East longitudes and $16^{\circ} 45'$ North latitudes to $17^{\circ} 33'$ North latitudes.

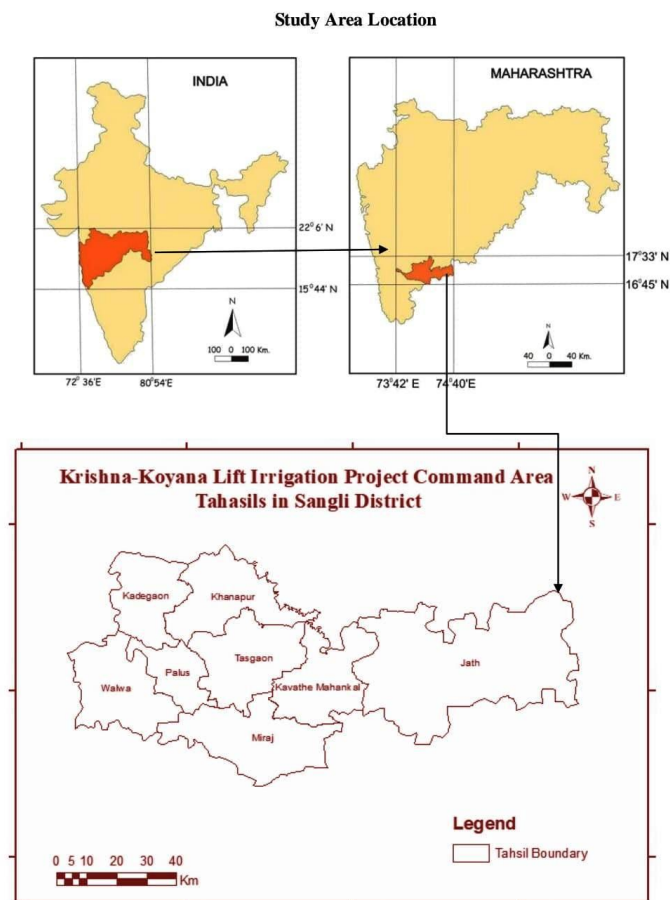


Fig.1: Location map of study region

Methodology:

To assess the irrigation development in the Command area of Krishna-Koyana Lift irrigation Project in Sangli District through land use/ land cover the recent techniques like remote sensing and GIS have been applied.

Landsat-5 TM (Thematic Mapper) and Landsat-8 satellite images acquired from Land viewer website and USGS Earth Explorer Geo-portal for the year 2000 and 2015 respectively which provide 30 meters spatial resolution with eight spectral bands including near infrared and a panchromatic band with 15 meters spatial resolution. These downloaded multispectral satellite data prepared to proper remote sensing analysis applying various image pre-processing techniques in Erdas 2015 such as radiometric correction, geometric correction, noise correction etc.

Supervised classification method used to generate Land use and Land Cover map. Richards (1993), defined the supervised classification is a method for identifying spectrally similar areas on an image by identifying 'training' sites of known targets and then extrapolating those spectral signatures to other areas of unknown targets. Also he discussed that supervised classification is the procedure used mostly for quantitative analysis of remote sensing data. It makes use of suitable algorithms to label the pixels in a given image as a representative of specific land cover types or classes. The supervised classification relies on the prior knowledge

of the location and identify of land cover types that are in the image. To assess the changes in land use / land cover that have changed over a period of 15 years. The digital data was preprocessed and geo-referenced to remove systematic and nonsystematic errors. At last, the images were classified into six different land use/land cover categories.

Irrigation Development:

During the period under investigation (2000-2015), two major projects have been completed in Study area. These projects are basically planned to enhance lift irrigation facilities for 109127 hectares of land for agriculture development. The total cost incurred to complete these projects is around INR 4959.91 crores.

Results And Discussion :**Land Use /Land Cover Change (LULCC) Analysis:**

The land use/land cover pattern of a region is an outcome of natural and socio-economic factors and their utilisation by man in time and space. Land is becoming a scarce resource due to immense agricultural and demographic pressure. Hence, information on land use / land cover and possibilities for their optimal use is essential for the selection, planning and implementation of land use schemes to meet the increasing demands for basic human needs and welfare. Land use and land cover change has become a central component in current strategies for

managing natural resources and monitoring environmental changes. According to supervised classified images

(figure 2 and 3), six classes were identified and the changes in land use /land cover are represented in Table 1.

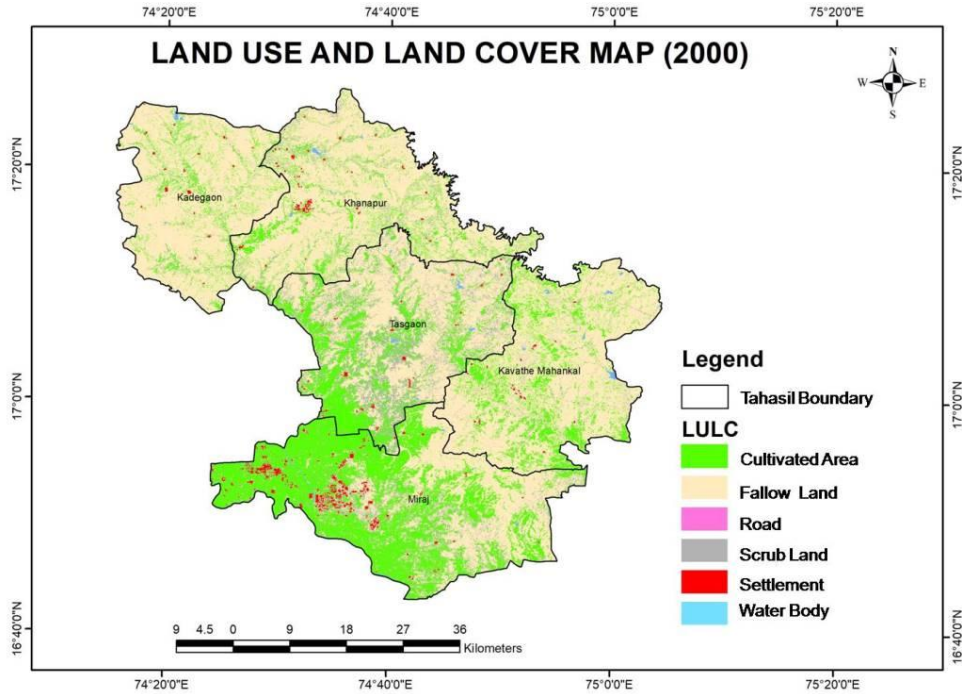


Fig-2: Supervised classified image Landsat-5 TM (Pre-treatment)

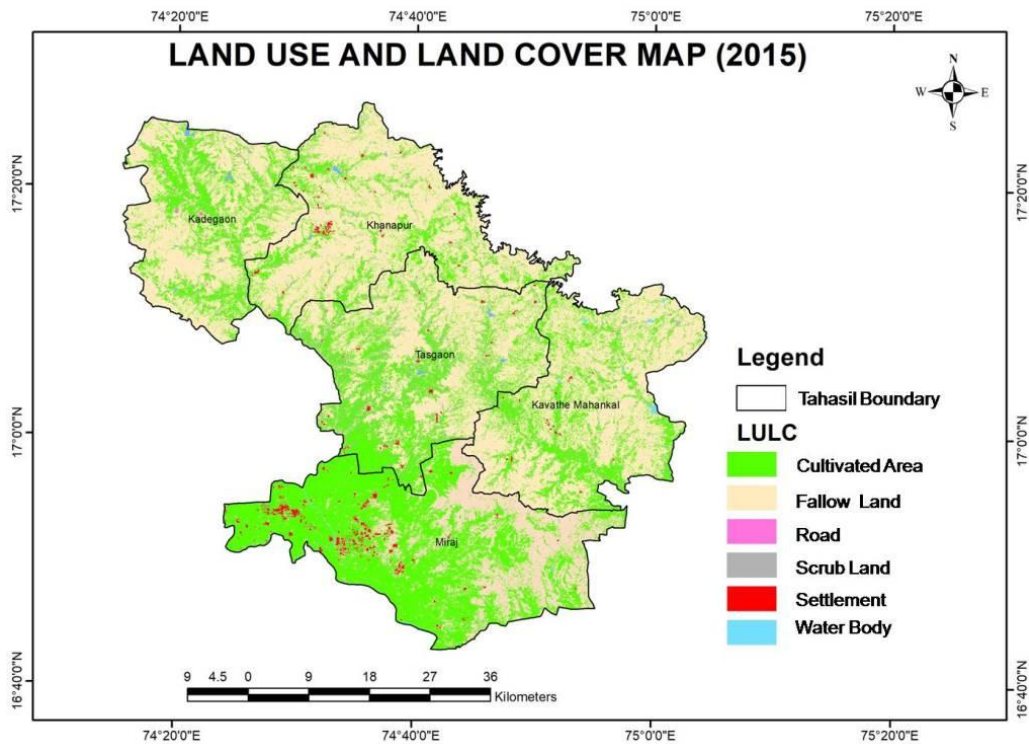


Fig-3: Supervised Classified image of Landsat-8 (Post-treatment)

In the LULC map entire study area classified into six classes i.e. Fallow Land, Cultivated Land, Scrubland, Built-Up, Water Body and Road. In the study area the largest land area is covered by fallow land i.e. 58.43% and 47.11% fallow land area shows in the year 2000 and 2015 respectively. Second largest area covered by cultivated land i.e. 37.26% and 46.70% area shows in the year 2000 and 2015 respectively.

In the year 2000 approximately 58.43 per cent land area covered by fallow land which largely found on undulated and hilly area with high to medium ground slope and it decrease up to 54.32% in the year 2015 because most of fallow land converting into agriculture. In the study area fallow land is remarkably converted into agricultural land at the western side of Miraj tehsil along the Krishna river basin, southern side of the Kavathe Mahankal along the Agrani river basin, western and central side of the Tasgaon and Kadegaon tehsil and central to eastern side of the Khanapur tehsil along the Yerala river basin and its tributaries. As parallel to decreasing the fallow land increase the cultivated area from the year 2000 to 2015 i.e. in the year 2000 about 37.26% area

covered by agriculture and it increase up to 39.42 per cent in the year 2015. In the context to agricultural area this temporal change detection shows that agricultural area is increase by 2.15 per cent within the fifteen year time period from the year 2000 to 2015.

Some drastic temporal changes are found in the class of water body. According to table 5.4, there is 0.35 per cent land area covered by water body in the year 2000 and its area grown up to 0.09 per cent and captured 0.44 per cent land area out of whole study area in the year 2015. This up growing trend of the water body affecting on other Land Use and Land Cover classes such as Scrub, Fallow Land and agriculture etc. In the study area Scrub Land is generally found along the drainage lines and adjoining to the agriculture and fallow land area. About 3.18 per cent scrubs are found in the year 2000 and it grows by 1.49 per cent in the year 2015 and covered 4.67 per cent area. In the area of Road and Built also grow by 0.03 per cent and 0.26 per cent from the year 2000 to 2015 respectively. During the period of investigation, the this project has observed a substantial LULCC.

Table 1: Land Use/ Land Cover Change (2000-2015)

| Sr. No. | Land Use Class | 2000 | | 2015 | | Change in % |
|--------------|--------------------|-----------------|------------|-----------------|------------|-------------|
| | | Area in Hectare | % | Area in Hectare | % | |
| 1 | Cultivated Land | 145842.60 | 37.26 | 154282.37 | 39.42 | 2.16 |
| 2 | Scrub Land | 12435.86 | 3.18 | 18815.39 | 4.81 | 1.63 |
| 3 | Agriculture Fallow | 228689.48 | 58.43 | 212609.65 | 54.32 | -4.11 |
| 4 | Settlement | 2502.59 | 0.64 | 3195.17 | 0.82 | 0.18 |
| 5 | Road | 585.68 | 0.15 | 696.57 | 0.18 | 0.03 |
| 6 | Waterbody | 1351.47 | 0.35 | 1809.01 | 0.46 | 0.12 |
| Total | | 391407 | 100 | 391408 | 100 | |

Source: Compiled by researcher.

Here the study reveals that the results are not up to the desired level like other large-scale irrigation development project of India (GOI 2002). As the main LULCC analysis reveals that 2.16 per cent of additional land has been brought under irrigation.

Conclusion:

During the period of analysis, the substantial LULCC has been observed in the Command area of Krishna-Koyana Lift irrigation Project. The net sown area has been increased by 2.16 per cent. However, the per centage of agricultural follow land has decreased by 4.11 per cent. This change is a result of improved irrigation facility through completed irrigation projects. The change is specifically confined along the projects command area. The satellite images of study region acquired during 2000-2015 periods have

offered a rich source of information about changes in land use /land cover in the watershed over a period of 15 years.

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