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Analysis of variation in cropping pattern in the Region between Narmada & Kim River

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ABSTRACT

In order to provide necessary watering according to available resources for agricultural requirement and for the optimizing the crop production the sustainable cropping pattern is playing significant roll. For optimizing the agricultural production from past data and comparing with available data irrigated land and decision-making evaluation for command area development, The high resolution satellite data can give spatial information about various crops grown and crop yield, will access existing adopted cropping pattern by farmers. This analysis includes identification of crop types, crop acreage, Using Index map and relevant satellite images for the region between Narmada and Kim River .The existing cropping pattern for the rabi season between two rivers area accessed over the period of time between the year of 1998 and 2014.The study reviles the significant changes in cropping pattern which includes reduction in Juvar and Sugarcane due to unlined canal irrigation system. The cash crop adopted by farmers and looking to water requirement of actual cropping pattern is excess which means the irrigation capacity need to be increased by various management strategies between the study area.

I. INTRODUCTION

The region between Narmada and Kim river has the unique feature of diverse agro-climatic situations which enable it to cultivate many types of crops. Agricultural land cultivation was according to the agronomic conditions of land and food crops occupied a major part of cultivated land. The gap between the requirement and production of various crops in this region is indicating an increasing trend in the past. Changes in land use pattern and cropping pattern in the study area indicate that the available irrigation resources and ground water resources need the considerable development. The increment of crop area can be possible in the case of over all prosperity and enhancement of farmer's education and scientific methods of crop growth.

II. STUDY AREA AND DATA USED

The study area covers 21º43' North latitude to 21º21' North latitude and 72º39' East longitude to 73º7' East longitude which covers Region between Narmada & Kim River. It covers 61,375 ha area of lies between Narmada River and Kim River.

The Satellite data of IRS-1C with LISS-III and IRS-1C with PAN+LISS-III merged images of different for 1998 and 2013 have been extracted.

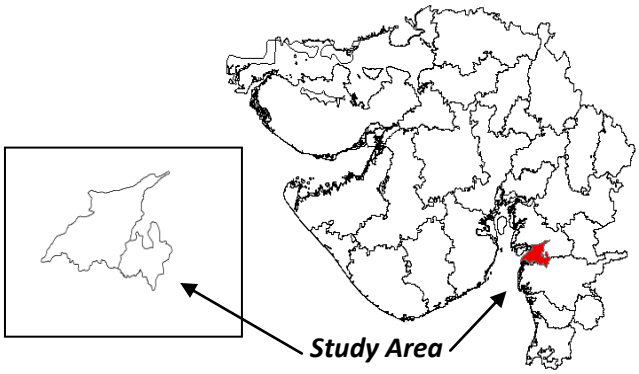

Fig 1: Study area index map showing the region between Narmada and Kim Rivers, Gujarat

Study area is spread over six images of 1:50,000 scale Satellite Remote Sensing Data namely 46C10, 46C11, 46C14, 46C15, 46G02, 46G03. These six toposheets are covering study area selected for multiyear land use land cover mapping study.

The topographical maps have been used for the extraction of features viz. canal/drainage network, road network and villages, including other land features. Administrative boundary Map which includes Command of study area. Other data like settlement, water body, and road network using the base maps. The Agricultural data of Study area for Rabi season has been collected from the Krushi Bhavan, Gandhinagar and compared with the result achieved. During pre-interpretation field visit the information have been collected about land use & land cover classes, extent of salinity and water-logging and utilized for the Crop inventory study.

I. METHODOLOGY

High yield producing crops demand more input of resources. Changes in cropping patterns can be a strong indicator for water delivery, price and land degradation in the choice of crops. Hence, it is necessary to identify the crop types that are cultivated.

Ground truth data have been collected using image prints of same date which cover 25 sqkm area between Narmada and Kim River. Using ground truth data and ENVI 4.0 software the ROI of 14 different regions in the command have been digitized. The image has been classified using maximum likelihood classifier with the help of the ROI that have been digitized. Each crop of land use pattern have a particular DN value and which has been introduced with reference to the ground truth data in terms of ROI to the ENVI 4.0 software so that the software has identified the particular class of crop in the image of study area.

Based on the ROI, the Confusion matrix prepared for crop classification. The ENVI 4.0 package can now be able to identify the different types of crops in the satellite images. With the help of software package, the total no of pixel in the command images for each crop type having different DN value is

to be multiplied by one pixel size(24mx24m) in meter so that the crop acreage can be directly work out. Crop condition has been monitored remotely sensed data of IRS 1C LISS III sensor for two year duration.

Normalized Difference Vegetation Index (NDVI) values of different crop pixels for two different year's e.g.1 Jan2013 and 11 Jan2014 of same period have been used for crop condition assessment. Normalized Difference Vegetation Index (NDVI) image will be generated for each date data of respective crop and other vegetation. Following formula of NDVI values applied, for an analysis of the data

NDVI= (NIR-R)/(NIR+R), (Where NIR= Near Infra Red & R= Red)

The higher NDVI image value will show the crop condition in Rabi season in same year which may be better than that year of lower NDVI value. The crop growth have assessed with the monthly images of Rabi season of 1998-1999 e.g.Nov98, Dec98 and Jan99, Rabi season of 2013-2014 e.g.Nov13, Dec13 and Jan14 Each month of Rabi seasons image will show the crop condition (growth) in Rabi season in same year.

TABLE-1 Acreage estimation of different crops in Rabi season

Sr. No.	CROP REGIONS	For 1989		For 2013	
		Area (Ha)	Area (%)	Area (Ha)	Area (%)
1	WHEAT	1278.6624	3.98%	2348	6%
2	JUWAR	5260.0896	16.39%	3174	9%
3	PULSE	299.52	0.93%	1029	3%
4	TUR	3199.2768	9.97%	4486	12%
5	SUGARCANE	13169.952	41.03%	11831	33%
6	COTTON	4599.1872	14.33%	7654	21%
7	BANANA	877.9392	2.74%	2771	8%
8	VEGETABLES & OTHER	3413.0304	10.63%	3107	9%
TOTAL AREA OF RABI CROP		32097.66	100%	36400	100%

Such phenomenal change in cropping practiced in this area has left some significant impact on water release and irrigation management. Fig-1 and Fig-2 Shows variation in cropping pattern for year 1998 and 2013.

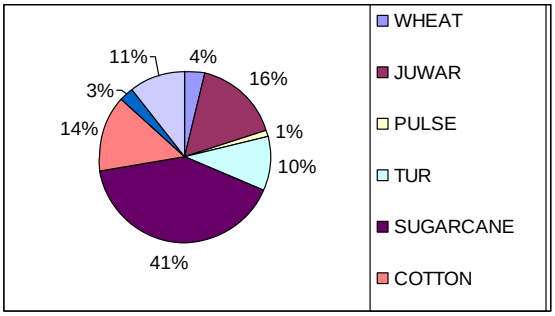

Fig.1 Acreage estimation of different crops in Rabi season (1998)

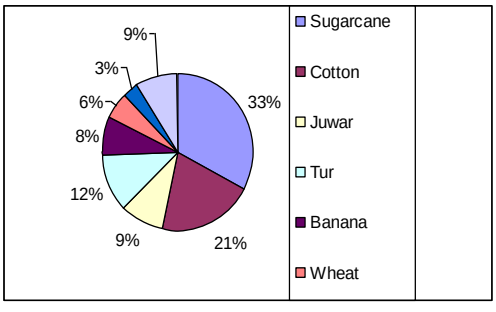

Fig.2 Acreage estimation of different crops in Rabi season (2013)

II. CONCLUSION

The crop inventory study for 1989 and 2013 which identify different crop types, crop acreage; condition assessment based on satellite remote sensing data in GIS for Region between Narmada & Kim River. The outcome about various crops grown and acreages for the 1998 and 2013 shows the variation in cropping pattern

The analysis reviles that due to unlined canal irrigation system, the 14 month sugarcane acreage decrease from 14% to 13%. With available canal capacity cotton crop has been sustained and increased from 14.33% to 21%. As the Juwar crop required more water from optimal production, it has decreased from 16.39% to 9% which shows that existing cropping pattern in the year of 2014 is need to be modified. Also the irrigation by making it line canal, So that few crash-crop may be included in required cropping pattern.

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