ACREAGE ESTIMATION OF SUGARCANE CROP IN SITAPUR DISTRICT, UTTAR PRADESH USING OPTICAL REMOTE SENSING DATA

Prashant Kumar [1], Shri. Narendra Kumar [2], Dr. Sudhakar Shukla[3]

[1]M.Tech Scholar, School of Geo-Informatics, Remote Sensing Applications Centre, Uttar Pradesh, India
[2] Scientist-SE, Remote Sensing Applications Centre, Uttar Pradesh, India
[3]Scientist-SE and Head of School of Geo-Informatics, Remote Sensing Applications Centre, Uttar Pradesh, India

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Abstract - *The use of optical remote sensing technologies made it simpler to distinguish between numerous crop varieties in a given region. It's challenging to categorize a study region with numerous crops and the same planting and harvesting times using a single data type. Multiple crops, on the other hand, maybe easily distinguished using time series optical data. As a result, temporal data is employed for crop mapping and crop acreage estimate in the current research time series. The most widely utilized optical satellite data for sugarcane crop mapping is Sentinel-2B. Sugarcane (Saccharum spp.) is India's most valuable cash crop. India has the world's largest sugarcane production area and is the world's second-largest sugarcane producer after Brazil. Uttar Pradesh is India's biggest sugarcane producer, followed by Maharashtra, Karnataka, and Tamil Nadu. The crop acreage of Sitapur District has been calculated. This study was carried out to analyze the acreage of sugarcane in Sitapur District for the year 2021-22. Unsupervised classification with the help of the iso- data method by defining 100 classes was used for the classification of the sugarcane crop. The acreage was calculated by using ArcGIS 10.8 and Erdas Imagine software. The total area calculated under sugarcane cultivation in Sitapur District is 1.65 lakh Hectares.*

Key Words: Optical Remote Sensing, crop, acreage estimation, unsupervised classification, iso- data

1. INTRODUCTION

Sugarcane is a critical coins crop grown all around the world. It belongs to the grass family Poaceae. In 2012 FAO estimate it become cultivated on approximately 26.00 million hectare land, in extra than ninety countries, with a worldwide harvest
1.83 billion tonnes. India is the biggest manufacturer of sugarcane in the global. The subsequent five predominant producers in amount manufacturing are Brazil, China, Thailand, Pakistan and Mexico. Sugarcane is a tropical, perennial grass that bureaucracy lateral shoots at the base to produce more than one stems, typically 3 to 4 meter peak and approximately 5 centimetres in diameter. Sugarcane is a cash crop, but it is also used as farm animal fodder. Sugarcane is a moderately non-sunny weather-loving

plant grown in pleasant weather areas; the tropical and subtropical. The total area under sugarcane in India is 5.06 million hectares with 356.56 million tonnes of production in 2020-21, out of which 70% lies in the subtropical region and the remaining 30% in the tropical belt. Major sugarcane growing states in India are U.P, Maharashtra, Karnataka, Tamil Nadu, Andhra Pradesh, Punjab, etc., but northern India has a subtropical climate. The important sugarcane growing states of the northern region are U.P, Haryana, Punjab, Bihar, and Jharkhand. Uttar Pradesh is the highest sugarcane-producing State. This study was conducted in the Sitapur district (U.P.) with the help of arc GIS. In the Sitapur district, during 2021-22 the sugarcane had an area of 1.65 Lakh hectares.

1.1. CLIMATIC AND SOIL REQUIREMENTS:

- Sugarcane requires a warm weather year to reach maturity.
- The areas which are having temperatures of 20 degrees Celsius to 26 degrees Celsius and an average of a minimum of 60 cm of annual moisture.
- A well-drained loamy soil with neutral soil reaction
- (pH 6.5 to 7.5)
- The soil should be loose and friable with a minimum depth of 45 cm without any harmful salts and nutrient deficiency.
- Sugarcane grows well in alluvium and Light clay soil.

Objective

The principal objective of this study is:
- Acreage Estimation of Sugarcane crop in Sitapur District.

2. STUDY AREA

The district of Sitapur is located in Uttar Pradesh's Upper Gangetic Mid-Plains and is bordered on the north by four sides by the districts of Lakhimpur Kheri,

Bahraich, Barabanki, and Hardoi. There are 19 blocks and nearly 2,000 settlements in the district. The district covers a total size of 5743 square kilometres. Sitapur district is located in the Indian state of Uttar Pradesh, with Sitapur town serving as the district seat. The city is located on the river bank of the 'Sarayan'. Sitapur, Biswan, Mishrikh, Laharpur, Mahmoodabad, and Sidhauli are the six tehsils that make up the district. The district is divided into 19 blocks, with two parliamentary constituencies (SC) in Sitapur and Mishrikh and nine assembly constituencies (SC) in Sewta, Biswan, Mahmoodabad, and Sidhauli. The district's total population is 28.57 lacs. At 27.57°N 80.68°E, Sitapur is located. 138 metres above sea level is the average elevation (452 feet). It's in the Gangetic Plain, with heights varying from 150 metres above sea level in the north to 100 metres in the south. Numerous streams and ravines divide it, with many shallow ponds and natural reservoirs. Gomti, Kathana, Pirai, Sarayan, Ghaghra, and Sharda are the five rivers that go through Sitapur's district. The average annual rainfall is around 975 mm, with the rainy season lasting from July to October. The balance year is mostly dry.
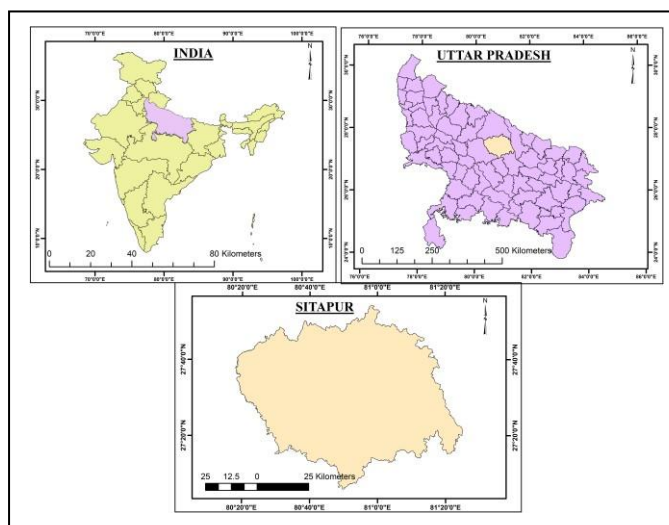

FIGURE -1: STUDY AREA MAP OF SITAPUR DISTRICT

3. DATA USED

DATA	DATE	TILE NUMBER
SENTINEL-2B	23 MAY, 2021	T44RMR, T44RNR
SENTINEL-2B	30 OCTOBER,2021	T44RMR, T44RNR
SENTINEL-2B	29 NOVEMBER,2021	T44RMR, T44RNR

TABLE-1: DATE WISE SENTINEL DATA USED FOR THE STUDY
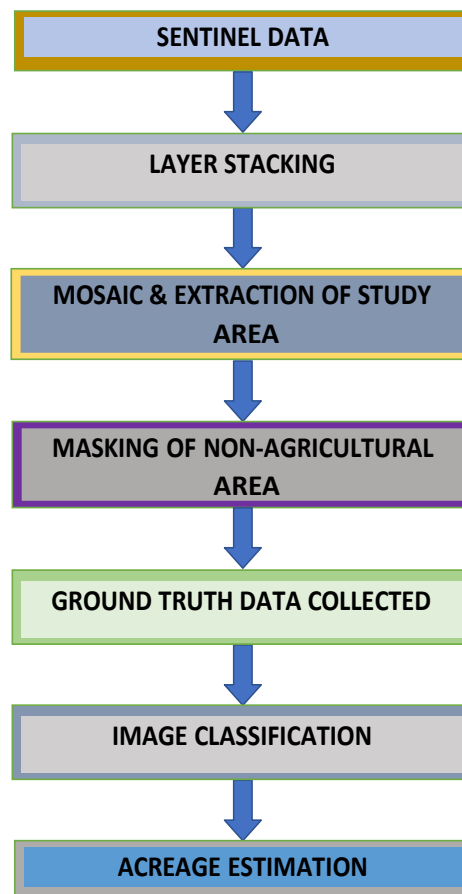
4. METHODOLOGY

FIGURE -2: FLOW DIAGRAM OF METHODOLOGY USED

Acreage estimation of Sugarcane Crop in Sitapur District has been calculated using various steps. Initially, Sentinel 2 images of 23 May, 29 November, and 30 October with a cloud cover of less than 10% were downloaded. False-colour composite (FCC) is generated using band -2 (Blue), band -3 (green), band 4 (red), and band 8 (Visible and near-infrared). After layer stacking, mosaicking of the generated false- coloration composite has been achieved. After this process subset has been created to generate the area of interest (Sitapur) using the boundary of the district. As I have to calculate the acreage estimation masking of non-agricultureland has been done. Unsupervised classification

has been done with the help of ground truth data to calculate the area under Sugarcane cultivation by assigning 100 classes during Un-supervised classification.
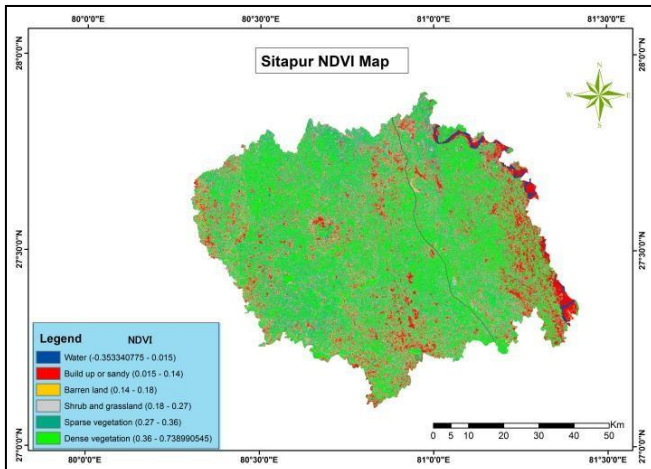
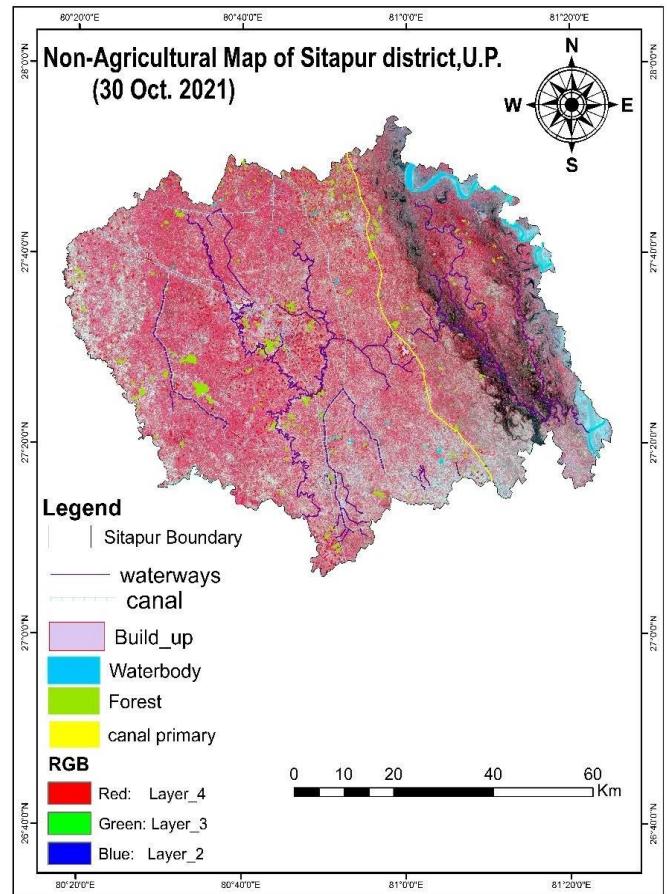**FIG-3: NDVI MAP OF SITAPUR DISTRICT, UTTARPRADESH**

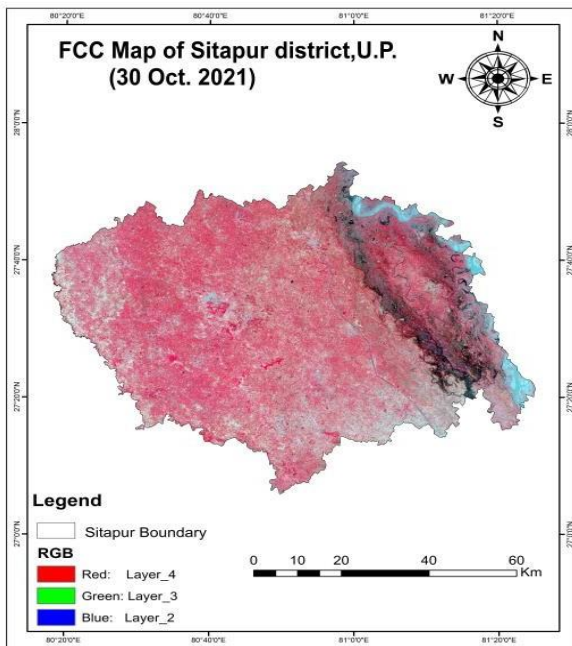**FIG-5: NON-AGRICULTURE MASKED MAP OF SITAPUR DISTRICT, UTTAR PRADESH**

5. RESULTS

Sugarcane crop is identified on the basis of image interpretation by the help of ground truth data where red color shows the area is under sugarcane cultivation. To assign a same value for sugarcane crop thematic recoding has been performed. The ground truth data collected was used for accuracy assessment.

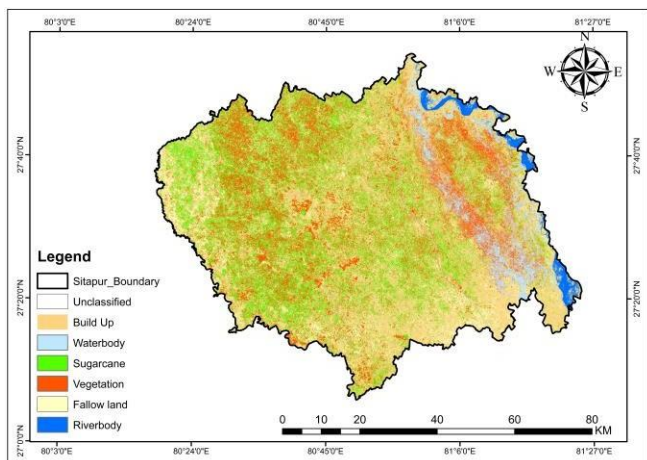*Area calculated under sugarcane cultivation=1,64,726.60hectare.*

FIG-4: FCC MAP OF SITAPUR DISTRICT, UTTAR PRADESH

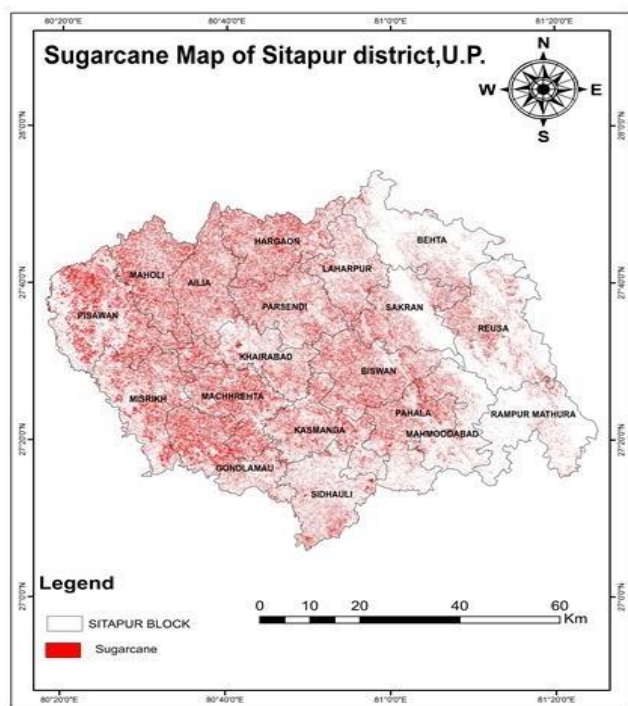**FIG-6: CLASSIFIED MAP OF SITAPUR DISTRICT, UTTAR PRADESH**

FIG-7: SUGARCANE DISTRIBUTION OF SITAPUR DISTRICT, UTTAR PRADESH

6. CONCLUSIONS

On the basis of Ground Truth Data, it is observed that the sugarcane crop is mainly surrounded by fields of Wheat and vegetation cover. Sugarcane crop is identified on the basis of image interpretation.

7. REFERENCES

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