

ACREAGE ESTIMATION OF TOMATO IN GHORAWAL BLOCK OF SONBHADRA DISTRICT USING REMOTE SENSING AND GIS TECHNOLOGY

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Abstract - Tomato is an important crop in Uttar Pradesh. The crop is grown in around 12.10 Thousand hectares. The area under Tomato cultivation in Ghorawal block of Sonbhadra district is calculated using Remote sensing techniques which provide a methodology to map the area of tomato field with the help of Sentinel 2b satellite data and Geographical Information System database. ArcGIS 10.4 and Erdas Imagine software is used to calculate the acreage. Data of the month October, November and December, 2021 have been used. The total area calculated under tomato cultivation in Ghorawal block is 3637.7 acre.

Key Words: Acreage, Sentinel, GIS, Remote Sensing, Classification, Tomato.

1. INTRODUCTION

Tomato comes under the family of Solanaceae and its scientific name is Solanum lycopersium. Potato, tobacco, and peppers are some example that comes under this family. Andhra Pradesh is the leading producer of tomatoes in India. It is estimated that 852 thousand hectares of land are under tomato cultivation in India. In Uttar Pradesh total area estimated under tomato, cultivation is 12.10 thousand hectares.

Tomato is one of the main horticulture crops in India. Tomato is one of the generally significant "Defensive food varieties" in view of its nutritive worth. The tomato crop is developed from nearly MSL to an elevation of 1500m in the tropical and sub-tropical region, with a yearly rainfall of 60-150 cm. extremely high precipitation during its development is unsafe. Whenever it has become under hot atmospheric conditions, it is developed as an irrigated crop. In the colder time of year, crop is planted from August to September. The winter crop is great for natural cultivating of tomatoes. The best reasonable land for developing tomato is very much depleted sandy topsoil soil with high organic content, the soil with high acidity isn't reasonable for developing tomato.

1.1. Objective

The principal objective of this study is-

- Acreage Estimation of Tomato in Ghorawal Block.

2. STUDY AREA

2.1 Location and Area

Sonbhadra or Sonebhadra is the second largest district by area of Uttar Pradesh after Lakhimpur Kheri. It is the only district in India that borders four states, namely Madhya Pradesh to the west, Chhattisgarh to the south, Jharkhand in the south-east, and Bihar to the north-east. The district has an area of 6,788 km.

2.2 Geography and Physical Features

Sonbhadra District lies between 24.6850 N latitude and 83.0684' E longitude.

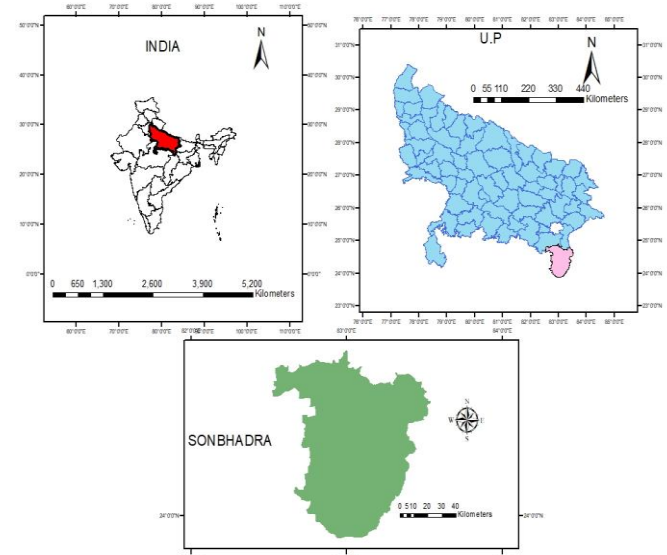


Fig -1: Study area of Sonbhadra district, Uttar Pradesh

3. DATA USED

Table -1: Date wise Sentinel data used for the study

DATA	DATE	TILE NUMBER
Sentinel 2b	11 DEC,2021	T44RPN,T44QPN,T44QQ M,T44RQM
Sentinel 2b	12 NOV,2021	T44RPN,T44QPN,T44QQ M,T44RQM
Sentinel	20	T44RPN,T44QPN,T44QQ

2b	OCT,2021	M,T44RQM
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4. METHODOLOGY

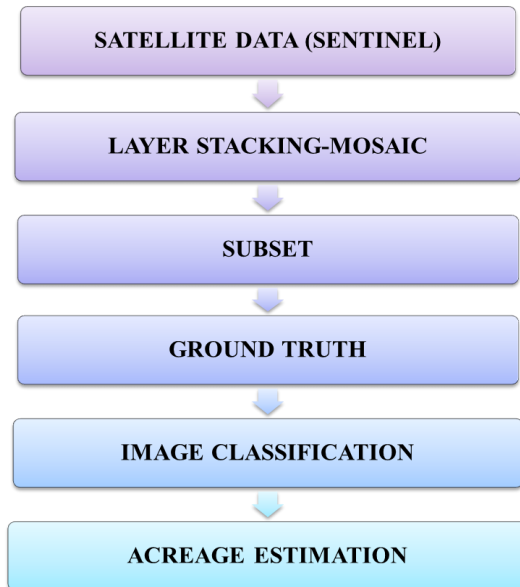


Fig -2: Methodology adopted for Acreage estimation

Acreage estimation of tomato farming in Ghorawal block has been calculated using several steps. First of all, I have downloaded the Sentinel 2b images of 11 December, 12 November, and 20 October (Rabi Season) with a cloud cover of less than 10%. False-color composite 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-color composite has been done. After this process subset has been done to generate the area of interest (Sonbhadra) using the boundary of the district. As I have to calculate the acreage estimation masking of non-agriculture land has been done. Unsupervised classification has been done with the help of ground truth data to calculate the area under tomato cultivation by assigning 150 classes during Un-supervised classification.

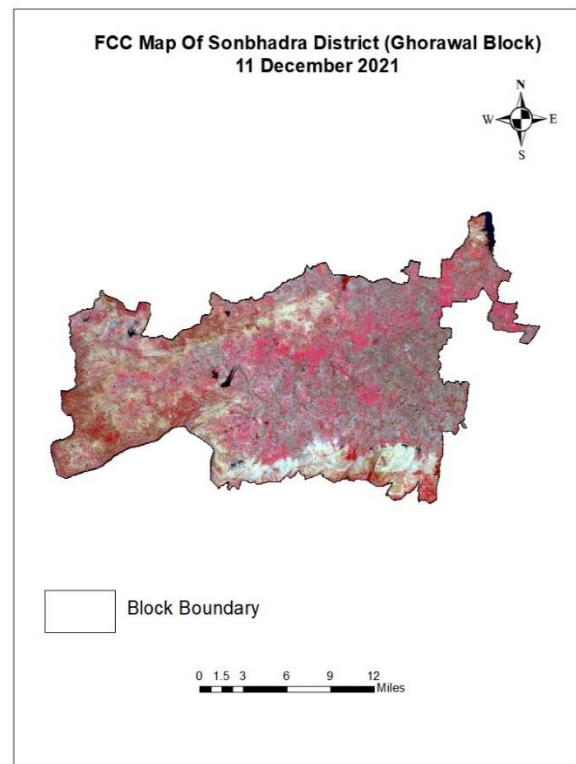


Fig -3: Fcc map of Ghorwal block sonbhadra district, Uttar Pradesh

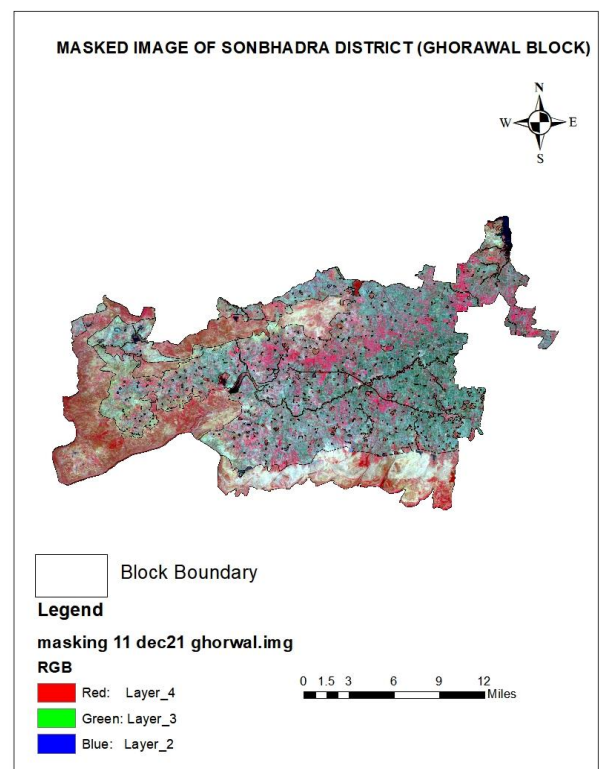


Fig -4: Masked map of Ghorwal block sonbhadra district, Uttar Pradesh

5. RESULTS

Tomato crop is identified on the basis of image interpretation by the help of ground truth data where green color show that area is under tomato cultivation. Thematic recoding has been performed to assign a same value for tomato crop. The ground truth data is used for accuracy assessment.

Area Calculated Under Tomato Cultivation =3637.7 Acre.

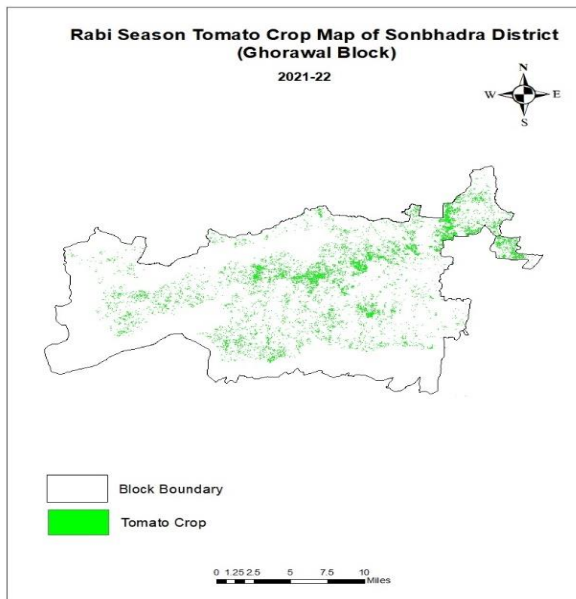


Fig -5: Classified map of Ghorwal block sonbhadra district, Uttar Pradesh

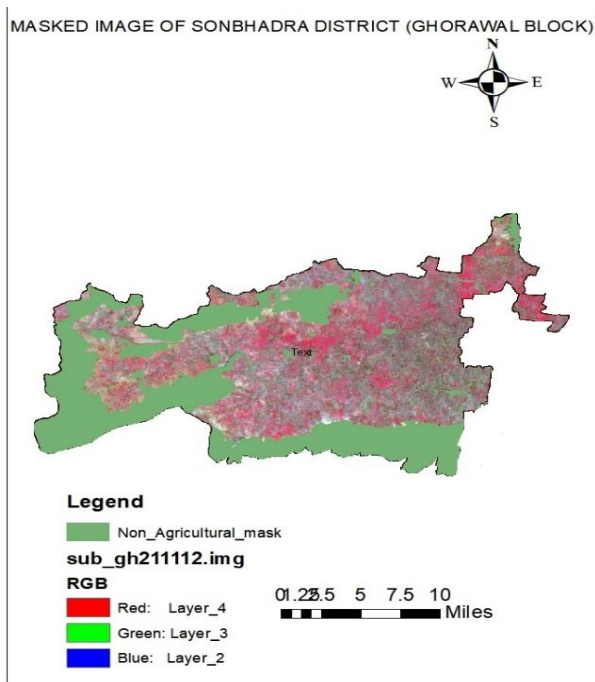


Fig -6: Masked map of Ghorwal block sonbhadra district, Uttar Pradesh

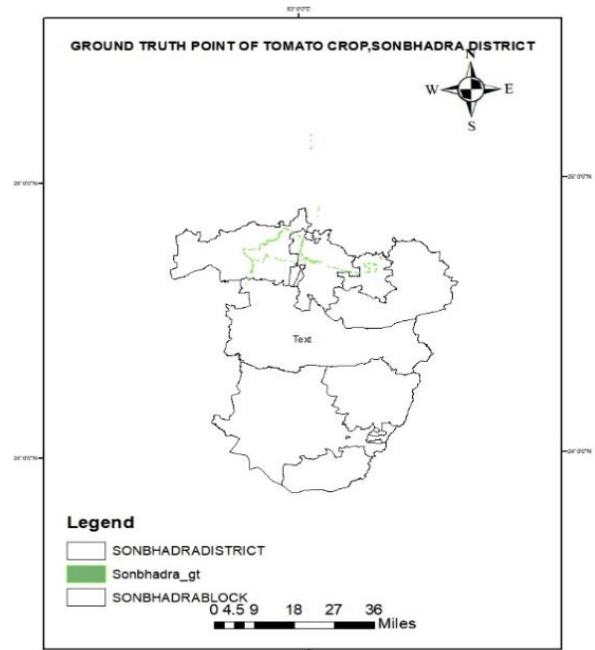


Fig -7: Ground Truth map for Ghorwal block sonbhadra district, Uttar Pradesh

6. CONCLUSION

On the basis of ground truth data it is observed that tomato crop is mainly surrounded by field of paddy, chilli and red gram. Tomato crop is identified by the basic image interpretation.

REFERENCES

- [1] R.S. DeFries, M.C. Hansen, J.R.G. Townshend, and R.S. Sohlberg, Global land cover classifications at 8 km spatial resolution: the use of training data derived from Land sat imagery in decision tree classifiers, International Journal of Remote Sensing, 19, 3141–3168, 1998.
- [2] M.A. Friedl and C.E. Brodley, Decision tree classification of land cover from remotely sensed data, Remote Sensing of Environment, 61, 3, 399–409, 1997.
- [3] R. Lawrence, A. Bunn, S. Powell, and M. Zambon, Classification of remotely sensed imagery using stochastic gradient boosting as a refinement of classification tree analysis, Remote Sensing of Environment, 90, 331–336, 2004.
- [4] R.S. DeFries and J.R.G. Townshend, NDVI-derived land cover classification at a global scale, International Journal of Remote Sensing, 15, 3567–3586, 1994.

- [5] P. Jonsson and L. Eklundh, TIMESAT--A program for analyzing time series of satellite sensor data, *Computer & Geosciences*, 30, 833- 845, 2004.
- [6] L.G. Ferraira, and A.R. Huete, Assessing the seasonal dynamics of the Brazilian Cerrado vegetation through the use of spectral vegetation indices, *International Journal of Remote Sensing*, 2510, 1837-1860, 2004.
- [7] Al-Bakri JT, Taylor JC. (2003) Application of NOAA AVHRR for monitoring vegetation conditions and biomass in Jordan, *J Arid Environ*, vol. 54 (pg. 579-93).
- [8] Amit Kumar Verma, P.K Garg, K.S Hari Prasad, V.K Dadhwal (2016) Classification of LISS IV Imagery using Decision Tree Methods. *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, Volume XLI-B8, pg. 1061-1066.