

Identification of Saline Land in Daund Tahsil of Pune District, Maharashtra, Using Remote Sensing and GIS

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Abstract

Soil salinization problem is one of the burning issues in present day context particularly for arid and semi-arid regions. Anthropogenic activities like excess irrigation, improper irrigation, chemical fertilizers, mono-cropping pattern of water intensive cash crops, etc. lead to the development of soil salinity. Salinity in the study area is observed in continuous patches particularly over northwestern part. Salt encrustation is observable during dry season of the year leading to fallow lands. It has also been observed that the crop growth is not to the expected limit or stunted crop growth is been observed. Mostly highly saline soils are kept fallow due to uneconomical rectification measures. For proper management of soil salinity problem, the extent of saline soils needs to be demarcated. The objective of this study is delineation of saline areas. Various combination of reflectance of bands along with reflectance of individual bands was used to calculate soil salinity. Soil Adjusted Vegetation Index (SAVI) was estimated using the Satellite data collected.

KEYWORDS: Remote Sensing, Land 8, Salinity indices, SAVI.

Introduction

Soil salinization is a process through which salt content in the soil increases leading to threat to agriculture. It is quite natural process but due to over irrigation problem its intensities is increasing day by day. Over, irrigated land soil salinization has become a threat to crops resulting in reduction of value of crop and productivity of land. Mainly ground water is being used for irrigation purpose which contains soluble salts at large amount this is the major source of salinity. Saline lands are major form of land degradation for agricultural area. It has been observed in most part of the country that irrigation facilities have increase the production of crop to a considerable extent but it has bought land salinization problem along it too which inversely affecting fertility of soil and thereby reducing crop production.

Salinization hazard varies from place to place and region to region and its intensity increases in arid and semi-arid areas. Considering issues of salinization problem, the present study is been conducted to find out saline land over Daund Tahsil, which is sugarcane dominant region. Sugarcane over this region is mainly grown with the help of irrigation facility.

Study Area

The study site is located on western part of Pune district in Maharashtra (Fig 1). It extends from $18^{\circ} 17'47''$ N to $18^{\circ} 40'11''$ N and from $74^{\circ} 8'47''$ E to $74^{\circ} 50'38''$ E. Daund experience semi-arid climate with hottest month May and June. Highest temperature reaches up to 40° C. Temperature decreases as low as 12° C in month of December and January. Sugarcane is predominant cash crop in this region followed by other crops like Jawar, Bajara, Wheat, etc. The area is drained by Bhima and Mula rivers. Bhima borders the region to the northern part and Mula drains western part of the region. Besides these rivers there are many water bodies in this region like Victoria *talav*, Matoba *talav* and Khamgaon *talav*, which provides water to cannel irrigation. It has been observed that over irrigation and unplanned irrigation has lead to soil salinization problem in the area. Land covered with salt has been observed during field visits.

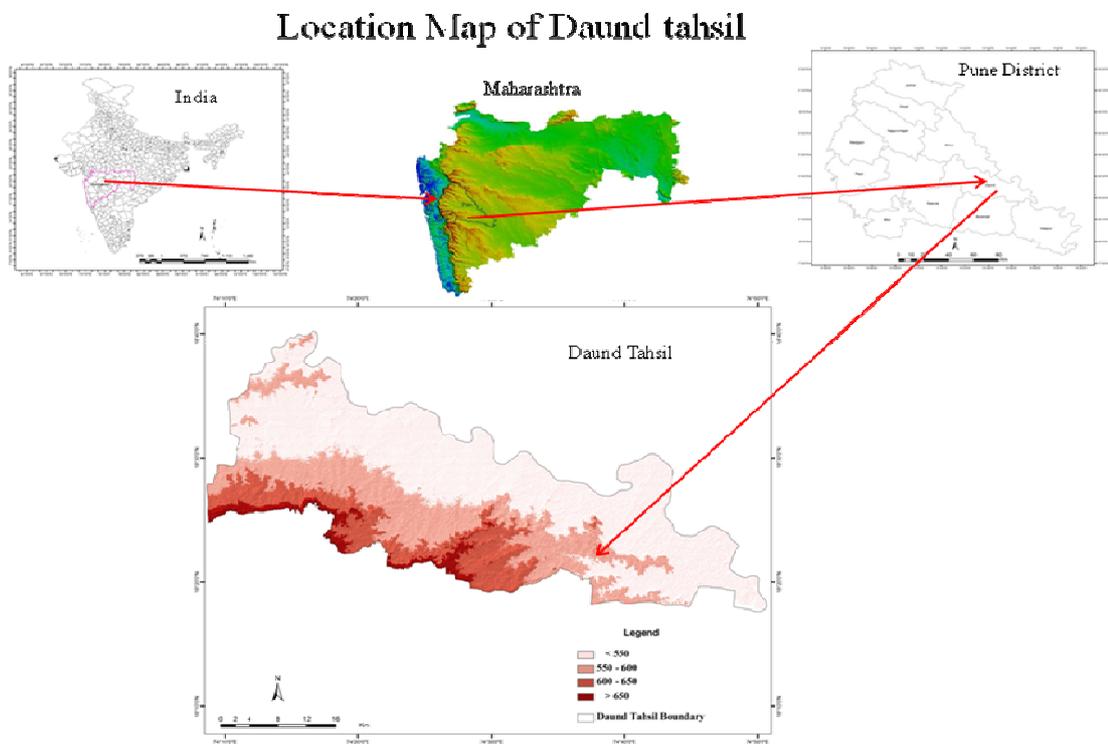


Figure 1: Location map.

Methodology

Multispectral data with temporal coverage is continuously been provided by Landsat mission and most recently Landsat 8 satellite is providing real time data. Landsat 8 data contains eleven bands. Landsat 8 image acquired on 28th March 2017 is been used in the present study. This particular data is being selected keeping in mind, least cloud cover and salt accumulation over surface is maximum during this month. Landsat 8 image has been downloaded from U.S. Geological Survey (U.S.G.S) site. With the meta data

provided with the image, the data was pre-processed to convert digital numbers to top of atmosphere reflectance (USGS, 2015). After pre-processing SAVI (Soil Adjusted Vegetation Index) is been calculated with help of band combination.

$$SAVI = ((NIR - R)/(NIR + R + L)) * (1 + L),$$

where, NIR is near infrared band (0.845 - 0.885 μ m)

R is red band (0.630 - 0.680 μ m)

L is canopy background adjusted factor.

With the ground truth data SAVI image is then categorized into highly saline (>0.10), moderately saline (0.08 – 0.10), slightly saline (0.05 – 0.08) and non saline land (<0.05).

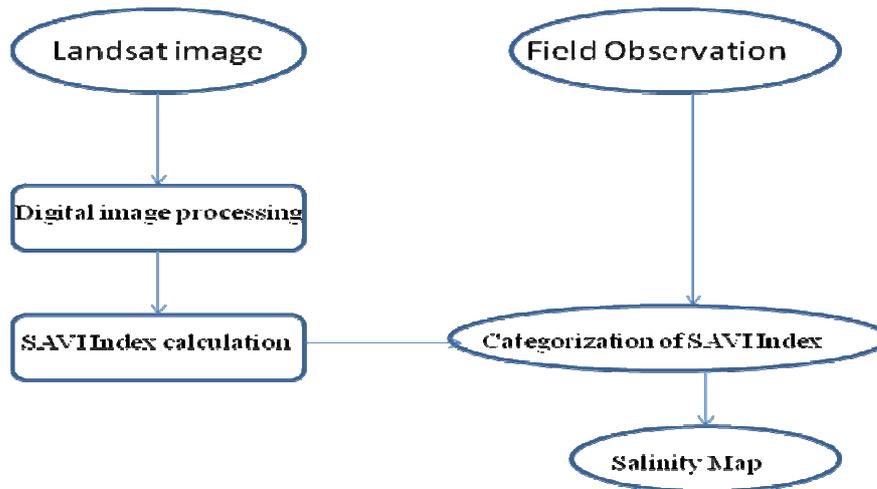


Figure 2: Methodology

Result and Discussion

SAVI index shows high and moderate salinity over northern and eastern part of the tahsil where as southern part is under non saline land mostly and few parts has started with salinity problem specifically valley regions. It is also observed that comparatively, northwestern part of Daund Tahsil is much more affected than that of the other parts (Fig 3). From the SAVI index it has been calculated that there is 24% of land under high threat of salinity, 15% of land under moderately saline, 28% under slightly saline and 26 % of land is under non saline land (Table 1). Percentage of Slightly saline lands is high because salinity is increasing mostly in valley region over southern part of the region. Along the canal there is highly saline land. Agricultural fields around the lake which provide water to the canal is also highly affected by soil salinization.

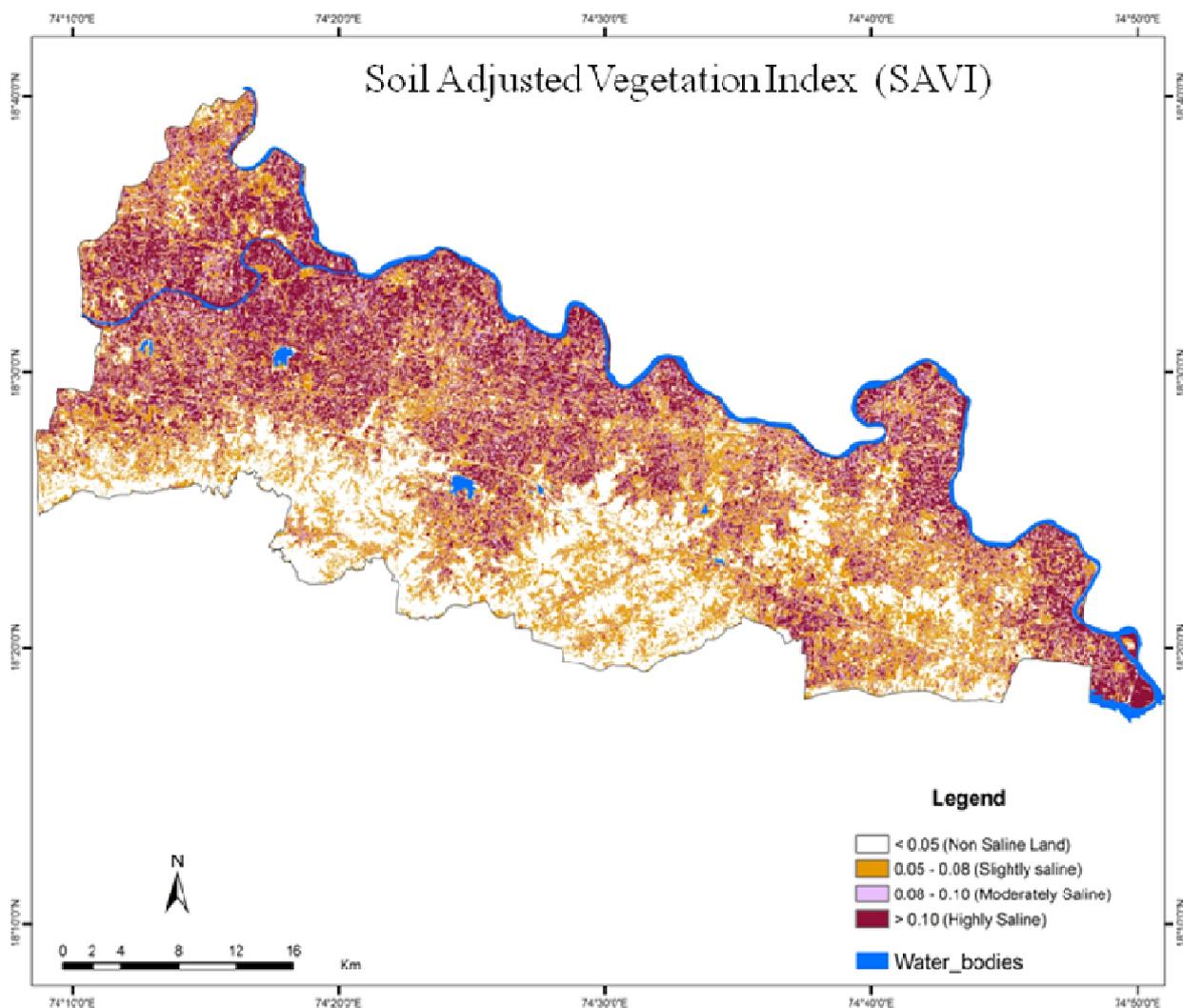


Figure 3: SAVI index map.

Table 1: Showing Salinity Classes		
Salinity Classes	Sq Km	Area in %
Highly Saline	330.12	24.27
Moderately saline	207.75	15.27
Slightly saline	388.08	28.53
Non saline land	357.80	26.30
Water bodies	76.65	5.63
Total	1360.39	100.00

Conclusion

Soil salinity issue has become serious issue mainly over arid and semi-arid regions. In the present study area over irrigation and reluctant nature of the farmers in increasing the issues of salinity. The irrigation water is generally given for longer duration of time and no care is taken to put off the water supply as a result of which excess water is been given to the fields. This stagnant water when evaporated leaves salt over the surface of the soil. Even there were outlets for the stagnant water to drain out but it has been closed up to increase the land holdings which again boost up salinization problem. While supplying water to the fields care is not taken about necessity water to the fields as a result of which excess water is been given to the fields.

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