



Mapping of waterlogged and salt affected area in north western Haryana using Geospatial Technology

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Abstract:

Over the last four decades, the water level in canal irrigated areas has increased at a rate of 10 to 30 cm per year, with about 473,400 ha of land coming within 3 m of the ground surface in June 1996, resulting in land loss due to waterlogging and secondary salinization. Fatehabad and Sirsa is gravely hit by waterlogging and soil salinity. 62.06 sq. km region of the study area is under various classifications of badlands that was 2.45 percent of the complete geographical zone of the district. Geo spatial technology gives arising instruments to mapping, monitoring and the board of waterlogged and salt influenced zone. Presented study is based on the mapping of waterlogging and salt affected area in north western Haryana.

Key word: Waterlogging, Soil salinity, Satellite data and Geo-spatial technology

Introduction

Soil salinity is a significant hindrance in accomplishing expanded harvest yields by both methodologies. Since 1966, after beginning of Haryana, the Government agreed the most elevated need to agriculture as the state was inadequate in food creation. The very much arranged and solid endeavors brought about a stupendous advancement which has made Haryana an apothegm for improvement in limited capacity to focus fifty years of its reality. Soil salinity is a significant worldwide issue because of its unfriendly effect on the climate, agro-environments, agricultural efficiency and supportability. Salinity sabotages the asset base by diminishing soil quality. Powerful soil asset use and the board require logical based comprehension of soil salinization.



About Study Area

North western Haryana includes Sirsa and Fatehabad districts. Sirsa district came into existence on September 1st, 1975 while Fatehabad was imprinted out of Hisar district on 15th July 1997. Haryana's northwestern region is located in the state's far western corner. It is bordered on the north and north-east by the Punjab (Faridkot and Bhatinda districts), on the west and south by the Rajasthan districts of Ganganagar and Hanumangarh and on the east by the Haryana districts of Hisar and Jind. The study area's climate is marked by aridity, temperature extremes and a lack of rainfall. It is classified into four types: subtropical, semi-arid, continental and monsoon. The district's monthly rainfall is 186.3 millimeters. The months of July to September produce more than 60% of the annual rainfall. The hottest months are March to June, when temperatures tend to climb. The average daily high temperature ranges from 41 to 46 degrees Celsius, while the average daily minimum temperature is around 27 degrees Celsius. Maximum temperatures can exceed 48 degrees Celsius.

Database & Methodology

The waterlogged and salt-affected areas were interpreted using IRS-IC/ID LISS-III, LISS-IV and Sentinel digital data from various years. WGS 84 and UTM were used as the satellite data's datum and prediction method, respectively. The data was received from Haryana Space Applications Centre (HARSAC), Department of Science & Technology and Government of Haryana and Sentinel data were downloaded from Sentinel Open Access Hub. The analysis of satellite data was done with the aid of an on-screen interpreter.

On the source of satellite data characteristics like tone, texture-shape, colour, associationsetc; the different waterlogged and salt affected areas were delineated. The available geological maps, information were also consulted in elevating the geomorphological information. For numerous Salt-affected and waterlogged areas, "keys" for understanding were created. These interpretation "keys" served as the basis for deciphering satellite data. Satellite data are grouped into three salinity and two waterlogged groups based on their frequency in the research area using these interpretation keys. Low-lying zones, impervious substratum, and canal/river banks are the most common sites for these classes.



Results and Discussion

Salt Affected Area

Excess soluble salts (saline soil), high exchangeable sodium (sodic soil), or both soluble salts and exchangeable sodium (saline sodic) soil all have negative effects on the development of most plants. Total area under salt affected is 6.31 sq. km. from which sodic soil covers 1.48 sq. km. area i.e. 23.45% of total salt affected area. Other class like saline covers 1.34 sq. km area which is 21.24% and saline -sodic soil covers 3.49 sq. km area i.e. 55.31% of total salt affected area. It was experiential that mostly saline areas are found along the canals or drains. Major areas of sodic soil are located near village Lohgarh, SaktaKhera, Taruana, Rohan and Kungrawali. The *saline sodic* soils are distributed near the village Surtia, NathusariChopta, Darba Kalan, Dhabi Kalan and GudiaKhera. Class wise arial extent of these soils is shown in Table 1 and the class wise salt affected area map is shown in Figure 1.

Table 1 Areal extent of different soil salinity classes

Salinity classes	Area in Sq. km.	Percent of total salt affected area	Percent of total geographical area
Saline	1.34	21.24	0.020
Saline Sodic	3.49	55.31	0.052
Sodic	1.48	23.45	0.022
Total Area	6.31	100.00	0.094

Waterlogged Area

Mostly the waterlogged patches in the study area are found moreover in the confined depressions or parallel the canals. Throughout the raining period, water collects in the depressions, causing flooding. The region of the research area that is seasonal waterlogged is 12.20 sq km, or 0.18 percent of the total geographical area, and the area that is permanently waterlogged is 8.10 sq km, or 0.12 percent of the total geographical area. Mostly seasonal waterlogged area is distributed in the western and southern side of the study area. Area under seasonal & permanent waterlogged is given in Table 2. The Map of waterlogged area is displayed in Figure 2.

Table 2 Areal extent of waterlogged areas

Waterlogged classes	Area in Sq. km.	Percent of total waterlogged area	Percent of total geographical area
Seasonal waterlogged	12.20	60.10	0.18
Permanent waterlogged	8.10	39.90	0.12
Total Area	20.30	100.00	0.30

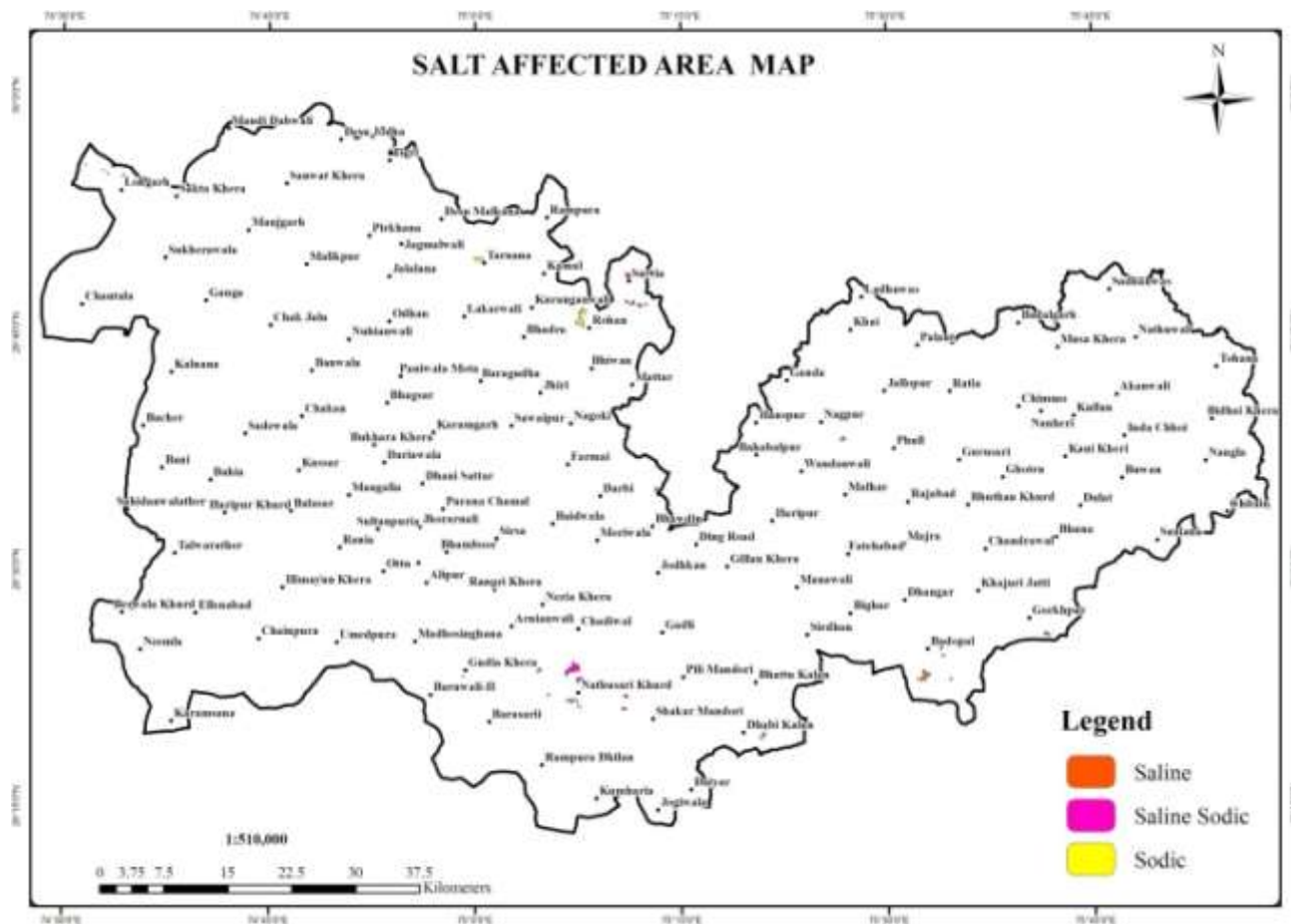


Figure 1

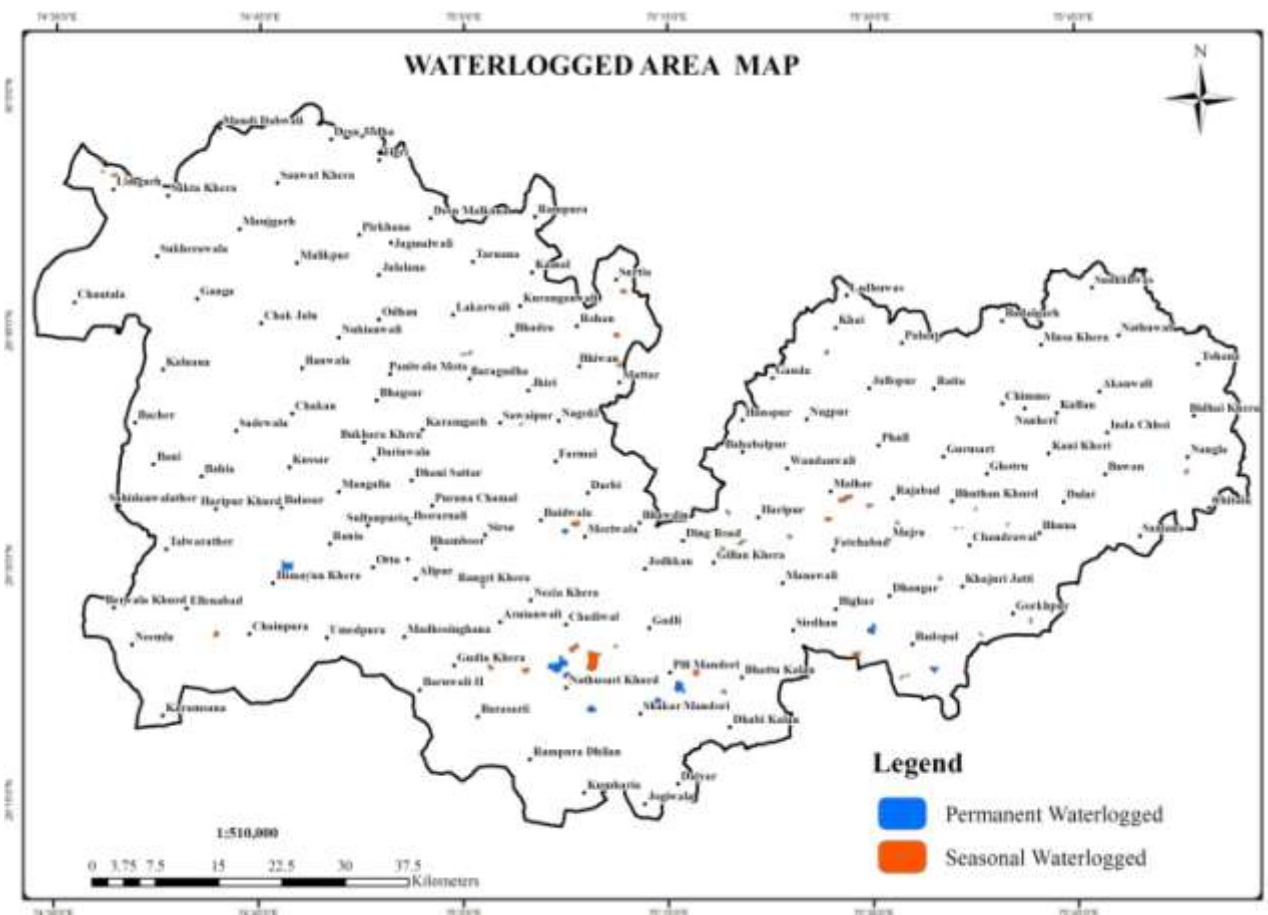


Figure 2

Conclusions

- The study area is in troubles of waterlogged and soil salinity, over exploitation of land and water resources, their degradation and problems related to their management. Major problems of waterlogged and salt affected are in adjacent area of canal and river. In these patches of waterlogged and salt affected also facing the problems of low soil fertility, light texture, low carbonic & organic matter, soil erosion and poor quality of underground water.



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