

Identification of Water Logged Areas and Saline Land

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ABSTRACT: The paper looks at some problems such as **Water Logging** and **Salinity** that occurs frequently in irrigation systems, and are focused to avoid them in future. The Paper work is to provide support to irrigation extension of person in their efforts to improve the exploitation of minor irrigation schemes or small sub-units within large schemes. The methods which are used for the Identification of water logging & salinity of land can be made fit for irrigation. Using these methods, Water logging and salinity can be minimized. More land will be made available for irrigation purpose. The reduction in the Water logging areas and salinity of lands by using simplified methods can lead to high crop yield and also improve Economic growth. It will be beneficial for the farmers.

I. INTRODUCTION

Irrigation history has shown that drainage problems in agricultural lands have always followed after irrigation; & state of Maharashtra is not exception to it. In 1888, Nira canals were commissioned for the first time for large-scale irrigation & the land damage problems due to water logging & soil salinity started cropping up. In June 1916, the special irrigation Division was opened at Pune to investigate the causes and remedies to these land damage problems. Mr. C.C. Inglis, Mr. W.A. Evershed, and Mr. V.K. Gokhale carried out fundamental research on different aspects and factors pertaining to land drainage and have laid down guiding principles describing the methodologies for water logging & salinity in irrigated lands. When the agricultural land losses its productivity and becomes less favorable for economical cultivation, it is classified as damage land by common cultivator. The particular moisture of a soil which is best for plant growth is the "Optimum moisture content". It varies for soils of different texture and to small degree for different types of crops. With moisture content in soil at roots of crops exceeding this optimum moisture, the poor spaces become partially failed with water and aeration becomes deficient. Such conditions are unfavorable for plant growth. The result of such conditions is commonly known as waterlogging & termed as damaged land or affected area. Water logging is generally coupled with soil salinity. These are two irrigation hazards which are responsible for damage to the agricultural lands in the command areas. The manual's goal object is to provide support to irrigation extension officers in their efforts to improve the exploitation of minor irrigation schemes or small sub-units within large schemes using the simplified methods. In the present study, various methods are applied to identify the water-logged areas and salinity of soil in the command areas of Nira Right Bank Canal.

II. LITERATURE SURVEY

Patil S. K. and Nagarajan R presented a Research paper on "Identification of salinity affected black soil areas and their assessment in semi-arid region" and concluded that,

Soil salinization is one of the problems that affect the crop production from arid and semi-arid regions. Anthropogenic activities such as excess irrigation, mono-cropping pattern of water intensive cash crops and chemical fertilizers lead to the development of soil salinity. Black soil in Peninsular India is not known for salinity potential. However, 10 to 20 years of irrigated cultivation has resulted in the soil degradation. The salinity in black soils is observed in discontinuous patches having salt encrustation observable only after harvest or in fallow lands.

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During the crop growth, stunted growth is observed. Salt tolerant sugarcane species are grown in moderately saline agriculture land. For proper management of salinity, the extent of saline soils needs to be demarcated. The objective of this study is identification of saline areas and the assessment of methods with reference to ground conditions. Vegetation indices such as Normalized Difference Salinity Index (NDSI), Brightness Index (BI), and Soil Adjusted Vegetation Index (SAVI) were estimated using the Satellite data collected during the crop growth period. Various combination of reflectance of bands along with reflectance of individual bands were correlated with field observed soil salinity.

B. P. Godase presented research paper on “A case study of quality distribution of soil chemical in Nira Right Bank Canal area in selected villages of Phaltan district Pune” and concluded that

Soil pH, Electric Conductivity, Organic Carbon, NPK, Potassium, Sodium, Lime, are the essential nutrients, present in soil and helpful to growth of crops. Distribution of nutrients is unequal. In this paper, an attempt has been made to find out the level of nutrients and their distribution. It covers an area 75025 of hectares of agricultural land where 1 87, 937 population reside. Area covers 46, 683.87 sq. hectors (34%) out of 138248.8 hectares of Phaltan tehsil, where 76 % population are concentrated. Average village wise nutrient level of 400 soil samples from NLBC area of Phaltan is calculated and presented graphically. It shows that NLBC area soil is Alkaline and indicates 11 % area are of high saline. Organic Carbon is high but there is not enough Nitrogen. Phosphorus and Potassium are in good condition. Villages Nimbut, Bajrangwadi and Late are in an excessive alkaline condition of ph. Use of organic fertilizers, reducing excessive use of chemical fertilizers, green compost and wherever needed reclamation is recommended to maintain soil health.

Walaa Y. El-Nashar presented research paper on „The Combined Effect of Water-logging and Salinity on Crops Yield“ and concluded that

Water-logging and salinization continue to cause economic losses in many areas of the world, though farmers and scientists have been aware of these problems and potential technical solutions for thousands of years. Water-logging and salinity problems often require some form of drainage to allow sustainable agriculture production. However, poor irrigation and agronomic practices have led salinity and water logging. In this research, a model is suggested to study the effect of water-logging on the net profit from the crops farm yield. The duration of water-logging according to different irrigation systems, crop type and soil type by calculating water consumptive use for each crop using Blaney-Cradle method and calculating the amount of deep percolation that causes water table rising, the effect of salinity on crops yield only, the combined effect of water-logging and salinity on crops yield.

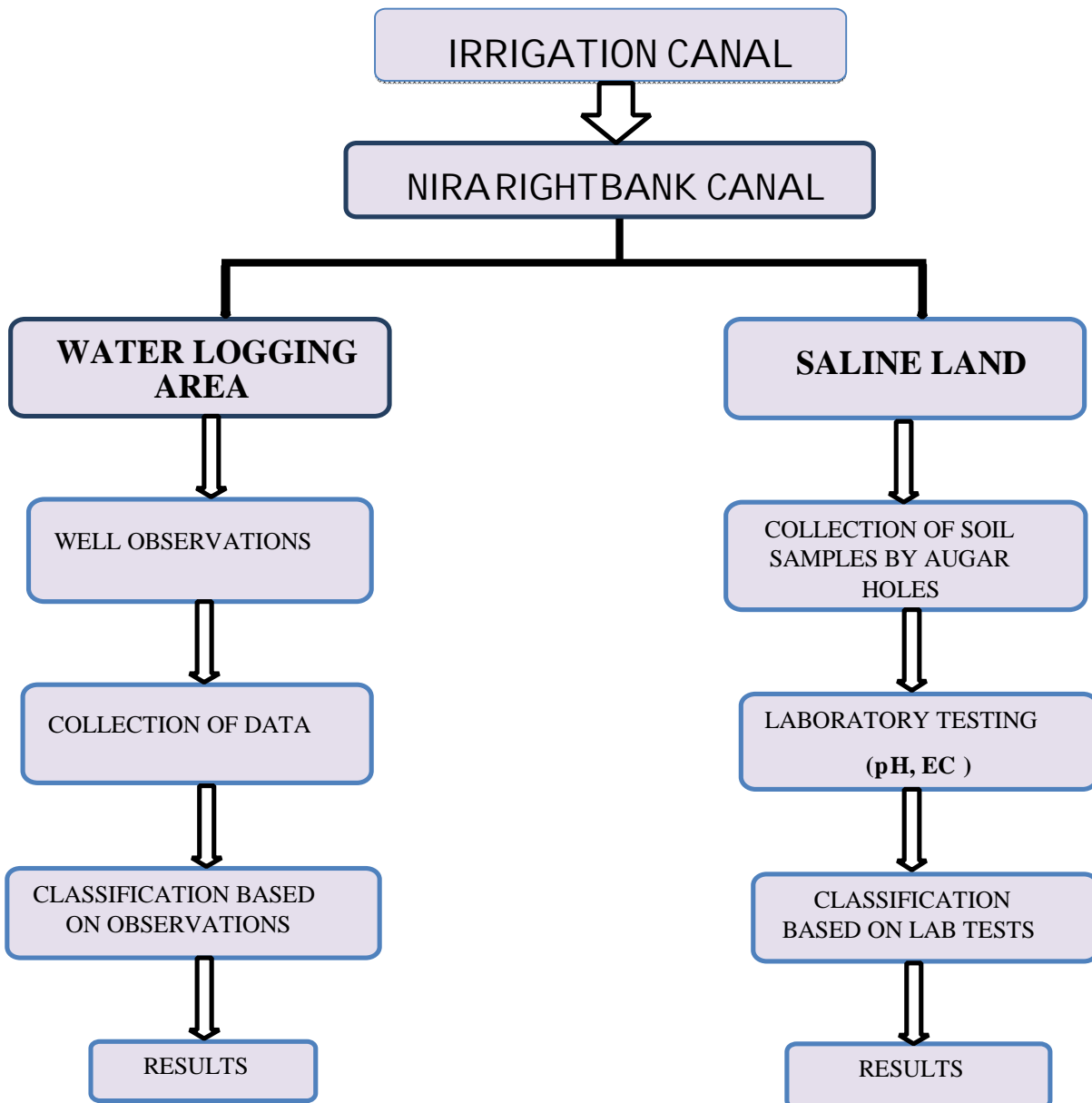
III. METHODOLOGY

Irrigation is the key factor that boosts agricultural production. Our aim is to increase agricultural production per unit volume of water, per unit area of cropped land. First, we carried out entire visual survey of canal then divided the particular most critical path of approximately 3 kms.to carry the detailed investigation and survey work for identification of the water-logged areas and saline lands.

We propose the following methods:

Sr. No	For Water Logged Areas	For Saline Areas
1.	Observation of water level in nearby wells.	Visual Observation.
2.	Provision of augur holes.	Collection of Samples a) pH test. b) Electrical Conductivity Test. c) Augur Holes.

FLOW CHART:



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IV. SURVEY.

Detail Survey of Water Logged Areas:

	Village	Pit no.	Fully Waterlogged	Partially Waterlogged	D	M	Total
1	Phaltan Bk.	29	-	8.314	8	21	29
2	Kambleshwar	3	-	1.00	1	2	3
3	Nimbhore	2	-	0.40	0	2	2
4	Surwadi	2	-	0.60	0	2	2
5	Jinti	1	-	0.20	1	0	1
6	Tadawale	1	-	0.30	0	1	1
7	Rawadi Bk.	1	-	0.50	0	1	1
8	Vadgaon	1	-	0.25	0	1	1
		40		11.564	10	30	40

RESULTS OF SOIL SAMPLES COLLECTED BY AUGAR HOLES

Lab No	Village	Survey No.	Pit No.	Depth in Cm.	pH	Conductivity in mm/hod/c/cm	Remark
569	Phaltan Bk.	307	143	0-20	8.46	1.58	SS
570				20-40	9.07	1.6	
571				40-80	9.11	2.36	

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572				80-120	9.16	1.43	
573		308	144	0-20	9.03	1.93	SS
574				20-40	8.95	2.57	
575				40-80	8.9	2.83	
576				80-120	9.01	3	
577		309	145	0-20	9.15	1.41	NS
578				20-40	9.24	0.51	
579				40-80	9.24	0.52	
580				80-120	9.34	0.42	
582		310	146	0-20	9.16	0.88	SS
583				20-40	9.2	1.9	
584				40-80	8.97	2.92	
585				80-120	8.98	2.17	
586		311	147	0-20	8.82	1.61	SS
587				20-40	8.55	1.42	
588				40-80	8.29	1.65	
589				80-120	8.54	1.59	
590		312	148	0-20	8.64	2.78	FS
591				20-40	9.41	3.76	
592				40-80	9.97	5.02	
593				80-120	9.98	3.17	

Lab No.	Village	Survey No.	Pit No.	Depth in Cm.	pH	Conductivity in mm/hod/c/cm	Remark
737	NIMBHORE	134	185	0-20	9.36	0.57	SS
738				20-40	9.8	4.29	
739				40-80	9.98	1.27	
740				80-120	9.32	1.77	
741		135	186	0-20	8.85	1.71	SS
742				20-40	8.41	1.35	
743				40-80	8.98	3.39	
744				80-120	9.19	1.31	
745		136	187	0-20	9.09	1.89	SS

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746			20-40	9.03	2.66		
747			40-80	8.96	3.79		
748			80-120	9.88	3.54		
749		137	188	0-20	9.77	3.46	FS
750				20-40	9.88	5.58	
751				40-80	9.8	7.3	
752				80-120	9.6	7.6	
753		140	189	0-20	9.9	3.12	SS
754				20-40	9.2	1.56	
755				40-80	8.76	1.78	
756				80-120	8.54	0.87	
757		155	190	0-20	9.17	0.84	NS
758				20-40	9.21	0.8	
759				40-80	9.18	0.57	
760				80-120	9.16	0.5	

LABORATORY TESTS:

➤ pH value: -

The pH value of soil sample was determined by taking 20gms of soil sample which was mixed in 40ml of distilled water and by stirring well, an aqueous soil suspension was formed. The pH value was then measured with the help of digital pH meter

Sr.No.	Soil pH Value	Interpretation
1	Less than 3.5	Acid caliphate soils (Kerala Coastal Belt)
2	3.5-6.5	Acid soils from warm to humid & high rainfall areas.
3	6.5-7.5	Neutral for practical purposes, max. availability of all essential plant nutrients.

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4	7.5-8.5	Calcareous or saline soils.
5	8.5 and above	Alkali or sodic soils.

Table: Soil pH value and its interpretation

➤ **Electrical Conductivity (EC) Value: -**

- The soil sample was collected and tested in the lab with the conductivity meter and expressed in Deci siemens/m. Higher value of EC indicates higher degree of salinity
- For an average soil, an EC value of 1 Deci siemens/m corresponds to a salt content of about 0.2 percent by weight.
- The effect of soil salinity on crop growth is negligible when EC value is less than 1.0 Deci siemens/m.
- Many of the common field crops are affected when EC value is in the range of 3 to 8 Deci siemens/m

V. RESULTS

In the present study, it was found that the Water Logging and Salinity are major problems in the study area. This is all due to the rising of water table. This excess water is made available to the soil through canals. As a result, there is a continuous accumulation of underground water year after year. A large number of factors are responsible for Water Logging and Salinity. Water Logging gives birth to Salinity. These includes seepage from unlined earthen canal system, inadequate provision of surface water drainage, poor water management practices, over-irrigation and use of poor quality (highly saline) ground water for irrigation. Subsurface Drainage or Subsoil Drainage is used to reduce watering logging, the water table and soil salivation. With this Subsurface Drainage, the water table will stay at the desired level to prevent water logging and soil salivation and promote vegetation growth.

From the survey, we found that the command areas of NRBC are Partially Water-Logged i.e. the depth of the Water-Table is within 2.0 m.

From our study area, village Phaltan Bk. found highest pH percent in weakly Alkaline (7.4 to 7.8 pH value) category i.e. 23.96% which concludes that the nature of soil is SS (Slightly Saline). After Electrical Conductivity (EC) test it was found that, most of the soil is NS (Non-Saline) i.e. its EC value is up to 1 ds/m

Remedial Measures

- Optimum use of irrigation water at appropriate time with proper dose of organic fertilizers can reduce the outbreak of waterlogging and soil salinity.
- Proper crop rotation techniques should be practiced.
- Seepage is the main cause of Water Logging, so we should first minimize the seepage losses through canals.
- Farmer's participation in drain maintenance is very important. Avoid over-irrigation by Implementing Micro Irrigation systems.
- Excessive use of Chemical fertilizers should be avoided.
- Salty water from the dug wells should not be used for irrigation purposes.
- Sub-surface drainage systems should be used to reduce water logging and salinity of the soil.
- Land should be levelled properly so that uniform application of water is possible and it will help in preventing water logging.
- Selection of proper crops is necessary to avoid salinity of soils due to the crop nutrients.
- Conjunctive use of surface and ground water need to be encouraged.

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VI. CONCLUSION

Most of the area of Phaltan village is Slightly Saline whose EC value is between 1 to 3 Deci siemens/m. The command areas of NRBC are partially Water Logged. These areas cannot be used for irrigation purposes. There is a high cultivation of Sugarcane crops which leads to soil salinity. In some areas, fully saline lands are also observed. Water logging is directly related to salinity. Evaporation of water in summers can result in accumulation of salts on the surface and root zone. Thus, multiple approaches are needed to tackle the problem.

After analyzing the data and discussing with the irrigation officers of the Phaltan section it was observed that this problem has the capacity to expand at a greater scale in the near future and will also affect the agricultural production. Hence, a solution in the form of Sub Surface Drainage has been implemented in these areas to avoid water logging and salinity conditions.

Sub Surface Drainage has helped the farmers massively. We were told that many barren patches were turned into useful agricultural patches through this process. So, it is a very useful and efficient way to tackle the problem of water logging and salinity on agricultural fields.

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