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Impact of Water Logging and Salinity on Agriculture and Socio-Economic status in Rohtak and Jhajjar District

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Abstract - Water logging and Salinity have become serious problems in canal irrigated areas of arid and semi-arid regions. This study examined impact of water logging and salinity impact on agriculture and urbanization. For this purpose IRS LISS III data of different dates will be used. The analysis to purpose to be carried out on ERDAS IMAGINE software. Besides using remote sensing data, LISS III 2002 and LISS III 2010 images used for this purpose, Survey of India Topo sheets and ground water depth data were also used. With the help of Geo-informatics find salinity and water logged affected area in the Haryana State of India where about 500 000 ha area are waterlogged and unproductive, and the size of the waterlogged area is increasing, causing a threat to agricultural sustainability. Groundwater depth during the study period (October 2012) is about 20 Feet which is the main reason of water logging and salinity. An annual groundwater table rise of 0.198m was estimated for the study area. Since the groundwater table had been rising continuously. There is salt in many parts of the study area. Salinity can develop naturally, but where human

intervention has disturbed natural ecosystems and changed the hydrology of the landscape, the movement of salts into rivers and onto land has been affected the production. This is beginning to dramatically affect our natural environment, reduce the viability of our agricultural sector and damage private and public infrastructure. Controlling on the water logging and salinity is the main purpose of the present study.

Key words - Water logging, salinity, groundwater, water management, semi-arid regions, sustainable agriculture; socio-economic issues.

I. INTRODUCTION

Today we face many environment problems such as air pollution, water pollution, soil pollution etc. Presently, waters logging and salinity are probably the most important environmental problems. These problems occur worldwide by natural and artificial sources such as rainfall and fertilizers in agriculture. Flooding and salinity decreases growth and survival of plants. Poor drainage and hot, dry weather also contribute to the build-up of salt in the soil. Sodium

chloride (NaCl) is the most common salt, but others such as calcium chloride ($CaCl_2$) and magnesium sulphate ($MgSO_4$) are also present. We can see the impact of water logging and salinity on agriculture and others socio-economic factors. It is a worldwide crop production problem. Every water bodies have dissolved mineral salts, but the concentration and composition of the dissolved salts depend upon the source of water. For example, snow melt water contain very small amount of salt whereas groundwater and wastewater has high level of salt. If soil has high salinity content, the plants growing there will not be as vigorous as they would be in normal soils. Seeds will germinate poorly, if at all, and the plants will grow slowly or become stunted. Salinity can develop naturally, but, where human intervention has disturbed natural ecosystems and changed the hydrology of the landscape, the movement of salts into rivers and onto land has been accelerated. This is beginning to dramatically affect

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our natural environment, reduce the viability of our agricultural sector and damage private and public infrastructure.

In our country, 8.4 mha (million hectares) areas are affected by soil salinity and alkalinity, of which about 5.5 mha is waterlogged. This is occurs by poor canal management and more uses of fertilizers in agriculture. During the present survey time, it was found that many area of agricultural land are affected by water logging and salinity because in these fields farmers use more fertilizers. Due to the 'Green Revolution' in India during 1970s, there was a continuous expansion of salinity and water logging area. The groundwater table started rising and caused water logging in the western and central parts of Haryana State mainly in Rohtak and Jhajjar districts where groundwater is of poor quality. An estimated 500000 ha area of Haryana state is waterlogged.

II. IMPORTANCE OF THE STUDY

The study has devoted particular attention to the control of water logging and salinity impact. Water logging and salinity are major issue in present time. Water pollution and salinity impact on urban areas and agricultural areas is the main purpose of this study we discuss about a small area of Rohtak and Jhajjar districts (Haryana, India). In this area founded many water logged and salinity affected area because the farmer uses more and more chemical fertilizers in agriculture fertilizers. This study provides us an idea to improve our environment condition which provides scientific data for planning and regulatory agencies to address environmental problems in this area.

III. OBJECTIVES

- To map salinity and water logging in the study area.
- To map land use and land cover of the study area.
- To study impacts of water logging and salinity on urbanization and agriculture.
- To map the affected area by this problem.

IV. SCOPE AND LIMITATIONS

Present study is based on remote sensing, GIS and field data. IRS LISS III data of different date and toposheets have been used for mapping of water logging and salinity with base information. The present study provides information on impacts of salinity and water logging on urban area and agricultural area. The study can be used as reference for detailed study on water logging and salinity in the area as well as may be replicated for other areas. For detailed study, monitoring the impacts of water logging and salinity on urbanization and agriculture, various scientific parameters will be required which will take time, money and trained man power.

V. STUDY AREA

The study area lies in the central part of Haryana state having geographical coordinates 28º30'N to 28º54'N latitude and 76º27'E to 76º54'E longitude and covers an area of about 92,000 ha. This area lies within the districts of Rohtak (25 000 ha) and Jhajjar (67 000 ha) is bounded by Diversion Drain No. 8 flowing from North to South which continues as the Najafgarh Drain in a southeastern direction and Dulehera Distributary bounding the area in an eastern direction. It is bounded by Rohtak district on the north, Jhajjar district on the south and Hisar and Bhiwani districts on the west side.

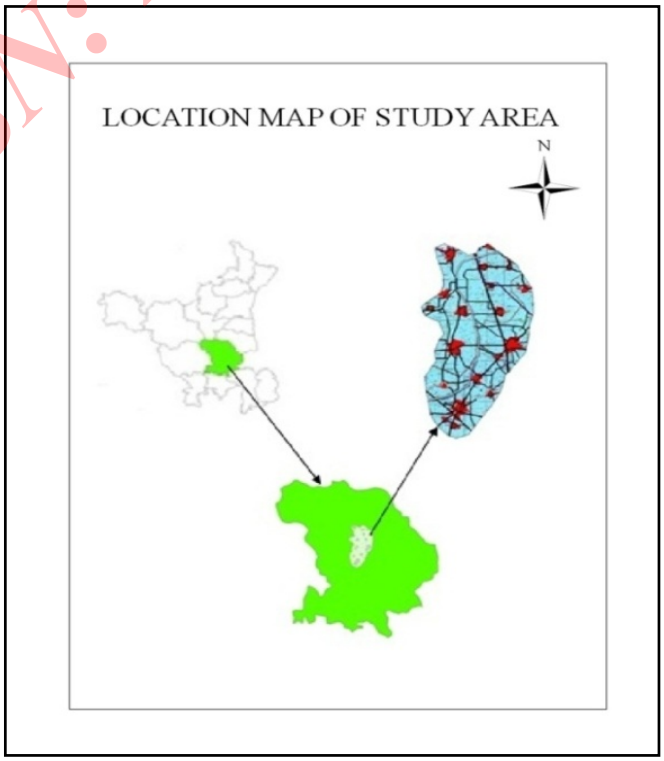


Fig.1. Location Map

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VI. METHODOLOGY

Data source and methodology is a central part of any research work which gives us help in scientific description and explanation of reality. The present study is based on primary and secondary data sources and uses GIS and Remote Sensing techniques to reach to conclusion. The present study focuses on the increasing problem of water logging and salinity in Rohtak Jhajjar districts part. For this purpose, LISS-III (2002) and LISS-III (2010) satellite data Survey of India (SOI) Topo-sheets of the same area has been used. Toposheets used in this study have been Geo-coded by converting them into Polyconic (Everest 1965, India/Nepal) projection with the help of ERDAS image 9.0. Using of supervised classification method identified the problem. Finally the maps are generated in Arc GIS 9.3, and interpretation and analysis have been made.

VII. MAJOR SOURCE OF EXCESS WATER LOGGING AND SALINITY

Poor drainage pattern and poor policies of government are cause of water logging and salinity. Major sources of excess water logging and salinity are floods and groundwater table depth rising. Uses of more fertilisers in agriculture are a major cause of water logging and salinity. In the rice cultivation many farmers uses wrote metre which cause of water logging. Many others fertilisers and insecticides which directly cause of water logging and salinity. Physical structure (Soil, Geology, Vegetation and Climate) of agricultutural land is also a cause of water logging and salinity.

VIII. ANALYSIS AND MAPPING OF STUDY AREA

As is evident from previous discussion, water logging and salinity are major issue today. It has been spreading fast in India also. Northern part of India has been reaping the benefits of green revolution since 1960s. However the negative side of green revolution has also surfaced in many ways. Water logging and salinity in many parts of north Indian plains is a live evidence of such environmental problems we are facing today. Present study discusses the spread of water logging and salinity in village agricultural land in Haryana. To study the impact of water logging and salinity in Haryana villages and urban areas, geospatial technology has been used. Time series data (LISS – III) has been used to study the aerial extent of water logging and salinity affected area and problems of water logging and salinity thereof in the villages of Rohtak and Jhajjar districts part. For this purpose, LISS – III image has been used with 2.3 meters resolution and also used toposheets, google earth maps of study area to define the problem.

IX. AERIAL EXTENT OF WATER LOGGING AND SALINITY AFFECTED AREA IN STUDY AREA IN 2002

There are 22 villages (Wazeerpur, Baghpur, Beri khas, Seria, Bisan, Gochchhi, Lakariya, Dhandhlan, Dighal, Qabulpur, Ritauli, Baland, Karauntha, Kakrana, Garnauthi, Shimali, Bhambewa, Mayna, Pahrawar, Sunaria Khurd, Sunaria kalan and Kanheli) in study area. All villages of study area are affected by water logging and salinity. The agriculture plays a very important role in the rural economy. It is base of all country but by water logging and salinity affected it in very bed condition. In the study area almost part affected by this problems. Out of 378 km² area in the study area, 110 km² areas come under water logging and 42 km² areas comes under salinity (Table I, Fig. 2.).

TABLE I
AREA UNDER WATER LOGGING AND SALINITY IN KM² (2002)

Sr. No.	Total Area	Water Logging area	Salinity affected area
1.	378	110	42

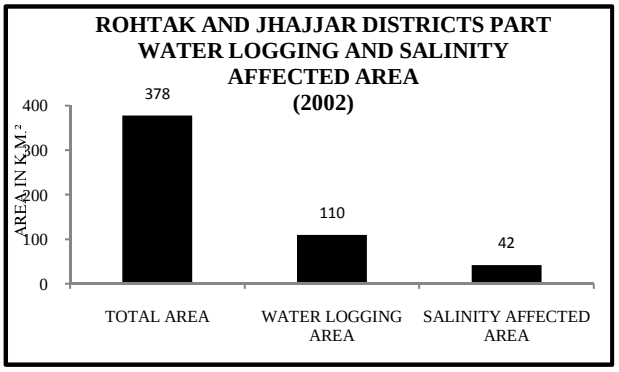


Fig. 2.

X. AERIAL EXTENT OF WATER LOGGING AND SALINITY AFFECTED AREA IN STUDY AREA IN 2010

There are 22 villages (Wazeerpur, Baghpur, Beri khas, Seria, Bisan, Gochchhi, Lakariya, Dhandhlan, Dighal, Qabulpur, Ritauli, Baland, Karauntha, Kakrana, Garnauthi, Shimali, Bhambewa, Mayna, Pahrawar, Sunaria Khurd, Sunaria kalan

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and Kanheli) in study area. All villages of study area are affected by water logging and salinity. The agriculture plays a very important role in the rural economy. It is base of all country but by water logging and salinity affected it in very bed condition. In the study area almost part affected by this problems. According to 2010 satellite image data Out of 378 km² area in the study area, 215 km² areas come under water logging and 125 km² areas comes under salinity (Table II, Fig. 3.).

TABLE II
AREA UNDER WATER LOGGING AND SALINITY IN KM² (2010)

Sr. No.	Total Area	Water Logging area	Salinity affected area
1.	378	215	125

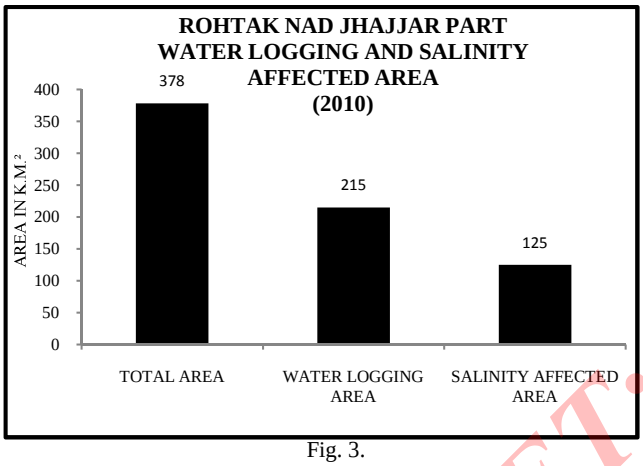


Fig. 3.

XI. IMPACTS OF WATER LOGGING AND SALINITY

When salinity has affected a landscape, warning signs appear. These include sick or dying trees and declining vegetation. As salinity impacts on any remaining native vegetation and the wildlife that depends on it for survival, the loss of biodiversity escalate. Salinity also reduces the productivity of crops and the sustainability of agriculture. It affects the health of infrastructure, they can be damaged by saline soil and water. Foundations can crumble, and roads degrade, increasing the risks of accidents and causing large expenditure on repair. The economy status of people to downward to this problem and they move or migrated to urban areas. Remaining peoples of study area to spent a poor life and there socio-economy status back down by this problem. They have no sufficient living things like houses, clothes and foods and their children not take good education they work rivers and streams, in extreme cases the water may be too salty for animals and humans to drink. Where there are buildings, fences, roads and other infield. They have no hopes to life. Most of people of study area move to urban areas almost migrated people of study area living in Rohtak and Jhajjar districts. By this migration of people the population of both urban areas is increasing continuously. Many environmental and manual problems are occurs in urban areas by the migration of people, drinking water problem, health facilities problems, educational problems, settlement related problems etc.



Photo No. 1. Affected Wall by Salinity

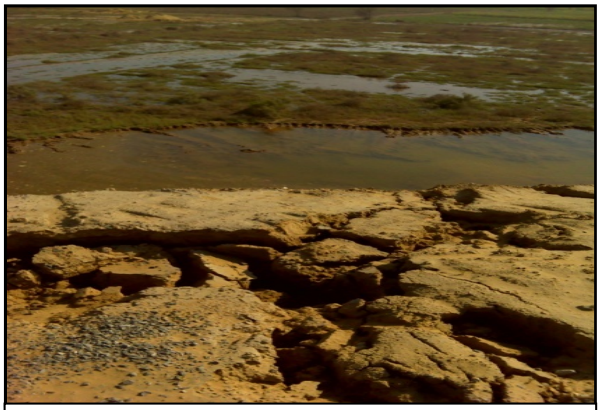


Photo No. 2. Affected Field by water logging

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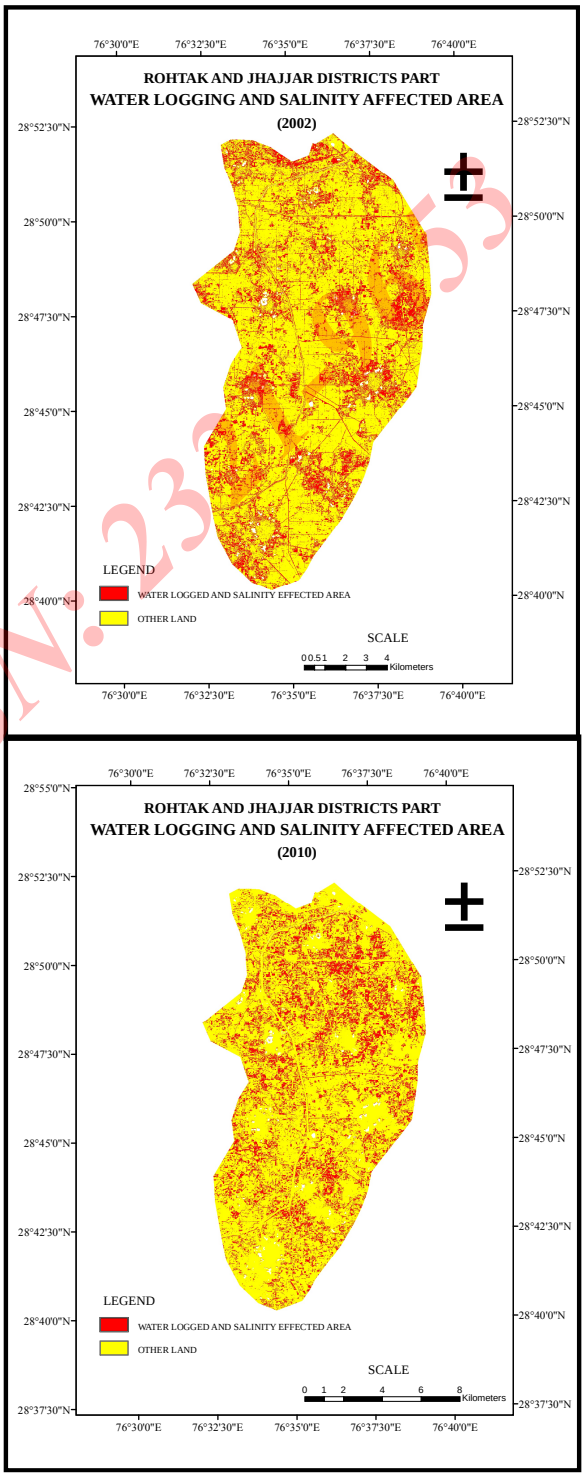
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Photo No. 3. Affected Field by Salinity and water logging



Photo No. 4. Affected Field by flood



XII. RESULTS AND DISCUSSION

As is evident from previous discussion, water logging and salinity are major issue today. Here are many area are affected by water logging and salinity almost part of study area is affected to this problem. It is continuous increase after 1995 in study area. In 2002 water logging area about 152 km² and in 2010 it is increased water logging area about 340 km²(Fig. 4.) farmers take suicide when destroyed their agricultural land crops.In 2013 (During study time) it is increasing at high level and affected the agricultural and others use lands. Many people of this area to migrated in urban areas for searching jobs because they have no source of living and they cannot achieve their fundamentals needs. Drinking water also affected this problem so people face many health problems. They die to increasing this problem.

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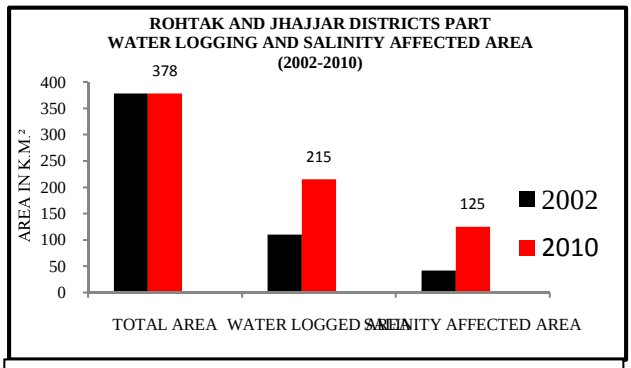


Fig. 4. Result Diagram

XIII. CONCLUSION AND SUGGESTIONS

Conclusion

The population of study area is continuously decreased because agricultural area has more affected

by this problem and no others sources of income so peoples of this area to migrated urban area. It directly as well as indirectly affected socio economy status. Poor management of drainage pattern and others poor floods controlling plans are major cause of water logging and salinity. Due to increasing uses of fertilisers in agriculture also cause of water logging and salinity. Supervised classification technique has been

successful to study the changes in water logging and salinity affected area. This technique has help to identified water logging and salinity affected area in study area. A database generated from Remote Sensing imageries in Erdas software and thematic maps prepared using Arc GIS which could be helpful for sustainable planning.

Suggestions

To manage the problem of water logging and salinity in Rohtak and Jhajjar districts part, it is suggested that the use of Remote Sensing and GIS in combination with geospatial data is of vital importance. Therefore, there is need for the use of water logging and salinity information database that can be generated using Remote Sensing GIS techniques. Programmers on water logging and salinity is massaged and manipulated into regionally relevant criteria. Indeed, by introducing the concept of impairment of human water uses and public perceptions, there would appear to be a danger that water logging and salinity assessment and control could drift completely from its scientific and technical roots. This can be successfully when both government and local people participate at a great level. The government, private and local agencies should be involved in to controlling water related problem.



Photo No.5. Photograph showing dewatering water logged field by engine pump at Baland village



Photo No.6. Photograph showing water logging control by lane pattern at Baghpur village

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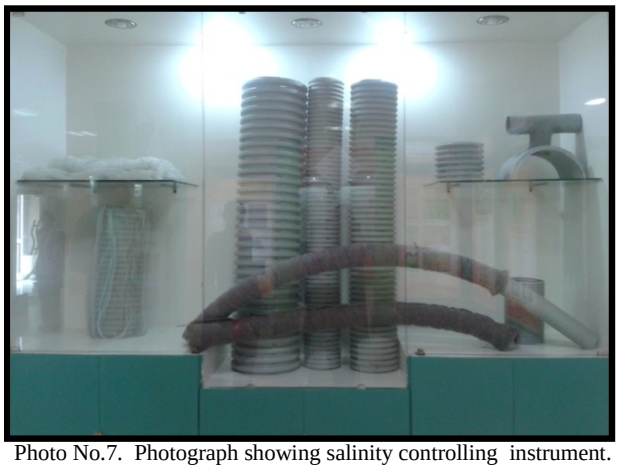
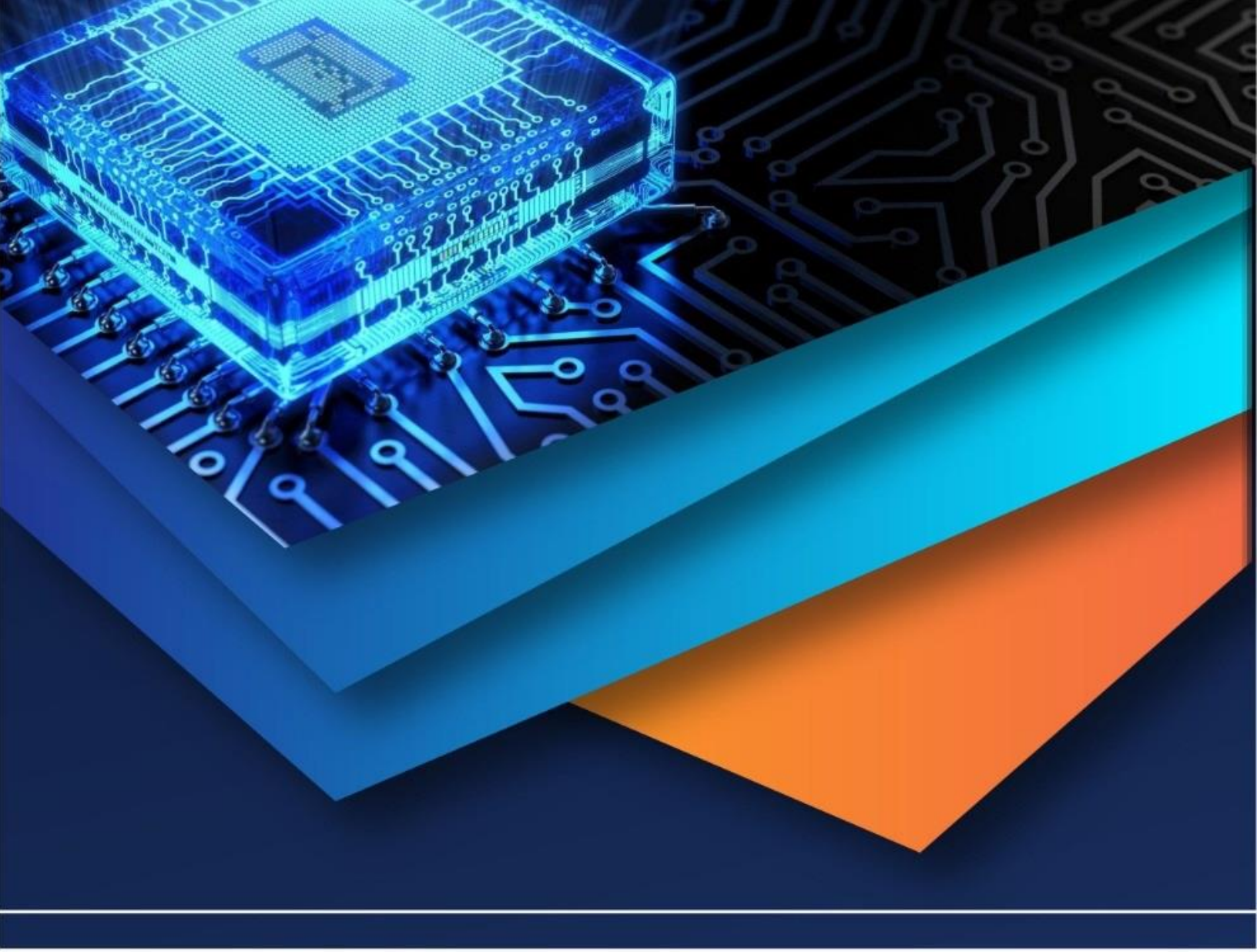


Photo No.7. Photograph showing salinity controlling instrument.

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