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Need of Proper Ground Water Level for Crop Production

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ABSTRACT

Ground water level is so important for the production of crop. It is considered that if the soil has higher ground water level then it is appropriate for crop production. On the other hand, it is very difficult to produce crop from the soil having low ground water level. For example, for the crop of rice, it is necessary that soil must have high ground water level as rice needs a lot of water to grow. The level of ground water may differ from place to place. The current paper describes the need of proper ground water level for crop production.

Keywords : Crop, Production, Ground water

I. INTRODUCTION

It is observed that the ground water level tends to be at lower side in Rajasthan as compared to that of in Haryana or Utter Pradesh. So there cannot be same ground water level at different places. The range can be varied according to the atmospheric conditions of the region.

It is also observed that the places where a lot of rain is found, their ground water level will be high as compared to that of with lower amount of annual raining.

Deforestation also affects the ground water level as forests help in maintaining good rate of ground water in the soil making the soil healthy for the irrigation. The quality of the soil and level of ground water goes on decreasing as a result of deforestation.

Appropriate amount of water needed to be provided to the soil in order to maintain the healthy ground water level. Rainy water is supposed to be the best option to get high rate of ground water. This ground water level is the basic need for any type of crop production as no crop can be yielded without the aid of water.

The importance of ground water is equivalent to that of surface water. The quality of the crop also improves depending upon the level of ground water. It is found that the soil with good rate of ground water, yields good crop production as compared to that is obtained from the soil with lower ground water.

Groundwater is characterized as subsurface water and the water-table is the upper surface of the groundwater. Water-table also marks the boundary between the saturated and unsaturated zones. A saturated zone is the zone below the ground where the pore space and cracks in sediments and rocks are completely filled with groundwater, whereas, the unsaturated zone is above the saturated zone, where the pore space is filled with air, water, plant material and soil organisms. Not to be confused with the term aquifers, in this publication the term groundwater is used only in reference to the zone of soil or sediments saturated with water closest to the soil surface.

Good quality groundwater can be an excellent source of water for crops if the water-table is at an optimal depth of about 3 feet and there are drier topsoil conditions. The quality of groundwater not only affects soil health but poor quality groundwater can severely limit crop yields. Poor quality groundwater is usually the result of high salts or sodium in the water. In addition, water-table at too shallow a depth leads to the depletion of oxygen around plant roots and poses even greater risk of soluble salts and sodium near the soil surface.

When groundwater moves towards the soil surface, through capillary action or shallower water-table depth due to the higher than historically normal rainfall/precipitation, it also brings excessive salts with it. As the water approaches the soil surface, the water evaporates, leaving behind the salts.

II. RESEARCH STUDY

There are different methods to test the groundwater quality for different purposes. For crops, soil electrical conductivity is used to estimate the quantity of salts in the water. To test for excessive sodium, ratios of sodium to calcium and magnesium soil ions are analyzed and the ratios are calculated using the formula for exchangeable sodium percentage (ESP) or sodium adsorption ratio (SAR).

The soil pH is also a good measurement to check east of the Missouri River to confirm potential sodium problems. Be advised that in the far west of the state, pH of 5.00 or below can be associated with soils high in sodium.

Maintaining water-table levels at an optimum depth to provide the best combination of crop water supply and aeration within the plant root zone, as well as limiting salt accumulation near the soil surface should be a goal of any crop production strategy. By maintaining an optimum water-table depth soils will function optimally and produce economically sustainable yields.

The competition for existing freshwater supplies will require a paradigmatic shift from maximizing productivity per unit of land area to maximizing productivity per unit of water consumed. This shift will, in turn, demand broad systems approaches that physically and biologically optimize irrigation relative to water delivery and application schemes, rainfall, critical growth stages, soil fertility, location, and weather. Water can be conserved at a watershed or regional level for other uses only if evaporation, transpiration, or both are reduced and unrecoverable losses to unusable sinks are minimized (e.g., salty groundwater or oceans).

Agriculturalists will need to exercise flexibility in managing the rate, frequency, and duration of water supplies to successfully allocate limited water and other inputs to crops. The most effective means to conserve water appears to be through carefully managed deficit irrigation strategies that are supported by advanced irrigation system and flexible, state-of-the-art water delivery systems. Nonagricultural water users will need to exercise patience as tools reflecting the paradigmatic shift are actualized.

Water's uneven geographical distribution has made its acquisition a matter of great contention. The picture is further complicated by the fact that the productivity of the currently irrigated land base around the world is actually declining because of soil salination, water logging, and soil erosion. As the water resource-hungry competition swells in the form of increasing population, urbanization, environmental consciousness, recreation and tourism, and related concerns, agriculture's access to a critical resource is no longer guaranteed. This scarcity is especially evident in the prime agricultural areas of the arid and semiarid areas, but it is also being felt in the humid regions of the world.

III. DISCUSSION

An optimum water-table depth should begin the season at a deep enough depth to allow early seed germination and minimal surface salt accumulation.

During the growing season, the groundwater depth should ideally recede to allow the maximum possible rooting depth for the crops.

To manage moderately shallow water-table depth, deep-rooted late-maturing and high water-using crops, like alfalfa, sunflower and in some cases sugarbeets, are likely rotational choices. If there is time during the growing season either before planting or after harvest, cover crops may be useful in depleting the excessive subsoil water and lowering the water-table to an optimum depth. Selection of crops that have some tolerance to salinity in already affected fields is also important. In the example of growing soybeans, if soil electrical conductivity range from 2.00 to 5.00 dS/m in a field it will result in not only very poor soybean yield, but very low water use, resulting in a greater salinity challenge the following year and a likely increase in the acreage affected by salinity in the field.

In order to get the maximum output out of the drainage system, soils should be thoroughly checked for their sodium and soluble salts content. Tiles installed below or within the sodic or saline-sodic sub-soils may function properly initially, but may loose efficiency due to the leaching of calcium and magnesium based salts and the dominance of sodium causing soil dispersion. This results in the sealing of the soil layers above or around the tiles. Considering the important relationship between gradual drops in the water-table depth during the growing season and high crop yields, a tile drainage system combined with a control drainage structure may be a very good investment as it provides the flexibility of controlling the water-table depth during wet and drier seasons.

To prevent the capillary rise of poor quality groundwater in drier weather, use systems that preserve the surface soil moisture as long as possible. This can be achieved by planting cover crops, mulching of surface soil with plant residues or manure and by not exposing the surface soil to direct sunlight such as conditions achieved under no-till or strip-till. If any of these systems are not possible or unacceptable to the grower, then shallow tillage is at least helpful. Deep tillage or ripping should be avoided to preserve any soil moisture present and to prevent physical movement of salty soil to the surface.

Genetic approaches to raising water use efficiencies focus on the selection of varieties with growth characteristics and tolerances (i.e., heat, cold, salinity, pests, drought, shorter growing seasons, earlier flowering, and more efficient nutrient use) matched to relatively location-specific conditions. Crop breeding will have greatest impact on increasing water use efficiency by selecting for optimal growing season lengths and harvest dates that take maximum advantage of rainfall timing at critical growth stages for each region.

IV. CONCLUSION

There are several approaches for improving the crop productivity (yields) of water including replacing high water consuming crops with lower-consuming ones and adopting management and systems improvements to increase productivity per unit of water consumed.

Reallocation of water from low-value crops to higher-value crops can increase the economic productivity of water; however this conserves water only if the high-value crop has a shorter growing season, and the land is not recropped the same year. Thus, the most significant sources of “new” water will be through improvements in productivity per unit of water with the adoption of appropriate management and water application systems. Each basin and watershed may have different solutions depending on specific socioeconomic, soils, water supply and climatic characteristics.

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