Evaluation and Demonstration of Soil Moisture based on Demand Irrigation

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***Abstract*: Irrigation is the artificial applications of water to the land or soil. Soil moisture levels should determine by timing of irrigation. Soil moisture can be determined by feel and appearance of the soil. It is mainly depend on texture of soil and size of soil such as fine type soil content available moisture greater than course type soil. Determine the amount of water needs to refill the root zone based on the percent soil moisture deficiency. For example, silt clay loam soil holds4.0 inches of available moisture/ foot of depth. If the feel test indicates that the moisture is 70 % depleted in the upper foot, it requires 70 % of 4 inches, or 2.8 inches, to refill the top foot. Add estimates for each foot of the root zone to calculate the total amount of water required to refill the root zone. If we do not know what the soil moisture content of the soil is we may excessive water amount and loose soil water by depth percolation (leaching below the root zone) Sometimes it may be done deliberately to flush salts and other soluble from the root zone.**

Keywords: Percolation, Retention, Germination

1. INTRODUCTION

Apply irrigation water at the right time and the right in amount for consistently high yields. In excessive amount of water application to reduced yields by carrying nitrate below depth of root penetration, and by remove soil air for too long, causing a lack of oxygen to the roots. Less water also reduces yields and check soil moisture to determine when to irrigate, and also how much water to apply to land [1].

Irrigation is the artificially applications of water to the land or soil. Soil moisture level should determine timing of irrigation. Soil moisture can be determined by feel and appearance of the soil. It is mainly depend on texture of soil such as fine type soil content available moisture greater than course type soil. For example, silt clay loam soil holds 4.0 inches of available moisture per foot of depth. If the feel test indicate that the soil moisture is 70% depleted in the upper foot, it requires 70% of 4 inches, or 2.8 inches, to refill the top foot[2]. Add estimates for each foot of the root zone to determine the total amount of water needed to refill the root zone. In Jagatpura region there are many types of crops grown per annum. We have selected two different sites in Jagatpura to conduct this project and water requirement of same particular crop is different at site. So the water requirement (duty) is depend on soil texture moisture content and there water holding capacity etc. From this project we found out how much water required irrigating a particular crop. So there are many test carried out which performed to find out water requirement which include – Soil texture, Moisture content for water holding capacity, Field density or bulk density and dry density,Permeability,pH of water and soil.

Factor affecting soil moisture is texture, temperature and moisture. In the soil is finer the texture more is the pore space and also surface area, greater is the retention of water. Structure: In this Well-aggregated porous structure is better porosity, which in turn increases water retention. If higher the organic matter more the water retention in the soil. If the density of the soil high, low is the moisture content. If the temperature is cooled, higher is the moisture retention. Salt content: If the salt present in the soil is much the water available to the plant is low. If more the depth of soil the available to the plant of water is more. Moisture is essential for seeds germination. Soil moisture and temperature are the most important factors that control germination, the start of roots growth and emergence. Soil moisture is critical as it affects how quickly water penetrates the seed. Irrigation seed has to use a high percentage of its weight in water before germination begins [3]. Cold temperatures and variable soil water availability in spring limit germination and subsequent growth of plant. In addition to cool temperatures in the spring, most soils are also exposed to rapid drying on the surface when disturbed by any form of cultivation. Irrigation is sown very shallow and germinates in the portion of soil that is subjected to the greatest drying effect. Germination and emergence of irrigation is progressively delay and reduced as soil water availability is decreases.

As the soil dry it becomes very difficult for the seed to obtain water from the soil particles. This is semi-dry seedbeds suddenly result in slow, uneven germinations and very abnormal seedlings. Coarse textured soils may dry or drain rapidly resulting in reduced root growth. Sprinkler irrigation or heavy rain during flowering may cause flower damage, reduce the yield. However, most irrigation and dry land growers have not reported this to be a serious problem. In general, produces more flowers than its photosynthetic can sustains and when a portion of the flowers are affected by heavy rain or irrigation, later formed flowers can compensate. Since flowering can extended up to 30 days, it is almost impossible to avoid irrigation during this period, if adequate soil moisture levels are to be balanced. With use of water around 7 mm (0.28") per day, the crop would required 210 mm (8") of water during flowering. However, the soil moisture storage capacity of most soils is well below this level. Irrigating during the flowering stages are particularly

important since a water deficiency of water will result in reduced dry matter production, fewer pods, early leaf loss and reduced yields[4]

2. STUDY AREA

In Jagatpura region there are many types of crops grown per annum. We have select two different sites in jagatpura to conduct this project and water requirement of same particular crop is different at site. So the water requirement (duty) is depend on soil texture moisture content and there water holding capacity etc.

3. METHODOLOGY

Soil moisture limits forage production the most in semiarid regions. Estimated water use efficiency of irrigated and dry-land crop production systems is 50 percent, and available soil water has a large impact on management decisions producers make throughout the year. Soil moisture is available for growth of plant makes about 0.01% of the world's stored water. There are many test carried out which performed to find out water requirement which include determination of Soil texture, determination of saturation, moisture content for water holding capacity, determination of bulk density and dry density, determination of permeability of soil, determination of pH of water and soil.

Soil texture of the relative proportions of sand, silt and clay present in a soil is known as the soil texture. The test is done by sieve analysis method and the soil is mixed (sandy, clay, silt) type found. Color of sample soil first is Brown and color of sample soil second is Dark grey

In this process of determining the individual separate size of soil below 2 mm in diameter i.e. sand, silt and clay called particle size analysis. Particle size distribution has very important effect on permeability or intake rate water, water storage capacity of aggregate, crushing of the soil. The value of land, land use capability and soil management practices are largely determined by the texture.

Table 1. Moisture Content of Soil

Region	Moisture content
Sample 1	26.67%
Sample 2	15.78%

Water content or moisture content is the quantity of water contained in a soil sample called **soil** moisture. This test is done by Oven dried method.

This is done by pH meter. The range of pH is –.

Table 2 pH of Water Sample

Sample	pH range
Water sample	6.45
Soil sample first	6.25
Soil sample second	6.28

The above table indicates the values of the pH of the various water samples.

Permeability is a movement of water and air through the soil, which affects the supply of root-zone air, moisture, and nutrients available for plant. Soil permeability is determined by the relative soil moisture rate and the air movement through the most prohibited layer within the upper 100cm of the effective root zone.

This is done by Falling head method. In this method, drop in water level in a narrow tube is measure instead of flow. This method is better adopted for slowly permeable soils.

Bulk density is the weight of dry soil per unit of volume typically expressed in g/cc3. It is an indicator of soil compaction and soil health. It affects infiltration rate, rooting depth or restrictions, available water capacity, soil porosity, plant nutrients availability, and soil microorganism activities, which influence the soil processes and productivity.

Table 3 Analysis of Bulk and Dry Density of Soil

S NO.		Determination No.	Sample 1			Sample 2		
1.		Weight of core cutter + wet soil, in Kg	2.780			2.904		
2.		Weight of core cutter(Wc) in Kg	0.910			0.910		
3.		Weight of wet soil (Ws-Wc) in Kg	1.870			1.994		
4.		Volume of core cutter (Vc) in cm^3	1021			1021		
5.		Bulk density =(Ws-Wc)/Vc in cc	1.8315			1.9529		
6	S no.	Container no.	18	20	26	21	22	23
	a.	Weight of container (W1) in gm.	10	12	14	8	10	10
	b.	Weight of container + wet soil (W2) in gm.	40	38	44	46	44	40
	c.	Weight of container + dry soil (W3) in gm.	34	32	38	40	40	36
	d.	Water content (W) in % W=(W2-W3)100/(W3-W1)	25	30	25	18.7	13.3	15.30
7.		Dry density=(bulk density*100)/(100+W) in g/cc	1.80	1.83	1.9	1.96	1.95	1.949
8.		Average water content in %	26.67			15.78		

The bulk density of soil change indirectly with total pore space present in the soil and gives a good estimate of porosity of soil. Bulk density is more importance than particle density that understands the physical conditions of soil.

4. RESULT AND CONCLUSION

The evaluation of soil moisture is very important for determining of properties of soil for maintaining
Of irrigation and the values of different type of test for same crop is found different. The values is given below table –

Table Density Data

Sample No.	Bulk density	Dry density	Water content
1.	1.8315 g/cc	1.818 g/cc	26.67%
2.	1.9529 g/cc	1.949 g/cc	15.78%

Table pH Data

Sample	pH range
Water sample	6.45
Soil sample first	6.25
Soil sample second	6.28

In the study of soil moisture based on demand irrigation be done by various types of test carried on soil sample and the water sample of sites where is to be conduct and in this project two is considered of same crop and find their physical characteristic by tested on it. And these characteristic of soil sample is approx. same (such as densities) but there water content is different.

By the inter relation of these test to know there physical characteristic and can be reclamation of soil according to their requirement and also to be estimate minimum water requirement to growth of crop. So this project is very well and interesting also help in higher studies of soil engineering and is gives a good future scope and also to increase the economy of the country.

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