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Rainwater Harvesting, Water Logging Problem, And Economic Losses

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Abstract

As a result of the increase in population density, the request for land resources such as food, fuel and shelter is increasing. It is necessary to use land that is less convenient for agriculture or land in less favorable climates. Exploring arid and semi-arid regions can be a way to reduce land scarcity. Arid and semi-arid regions are characterized by intermittent low precipitation of up to 700 mm per year. The plurality of people in arid and semi-arid regions depend on agriculture and grazing for survival. These action face many limitations due to the prevalence of irregular rain patterns, heavy rains that are lost mainly due to runoff, high evaporation rate and reduced yields; Weeds grow more strongly than crops planted and compete for rare moisture reserves, low organic matter and varying levels. High responses to fertilizers. There is a need to capture and use more efficiently the scarce water resources in arid and semi-arid regions. Improving rainfall management, by collecting water in integrated and sustainable production systems, can improve smallholder livelihoods by developing rain-fed agricultural production.

Waterlogging is a state of land in which the soil form is saturated with water either temporarily or permanently. Water registration and soil salinity are two critical environmental problems in many countries around the world, especially in arid and semi-arid regions. These problems have a major impact on soil fertility, which in turn has a major impact on soil productivity. Drowning and salting are a source of economic losses in many regions of the world, although farmers and scientists have known these problems and possibility technical solutions for thousands of years. In this article, the spotlight is on a review of techniques for maximum utilization of water under different conditions of irrigation methods and solutions to the problem of waterlogging and salinity of water.

Keywords: *Logging; Soil Salinity; Sustainable Economic Losses; Water harvesting*

Introduction

Rainwater harvesting is broadly defined as the collection and concentration of running water for productive purposes, such as the production of crops, fodder, pasture, trees, livestock and domestic water supply in arid and semi-arid regions. For agricultural purposes, it is defined as the method of creating, collecting, storing and preserving local runoff in arid and semi-arid regions (Levenstein, et al. 1989.). It is an ancient exercise and remains an integral part of many agricultural framework around the world. The first use of these technologies is confirmed to have originated in Iraq over 5,000 years ago, in the Fertile Crescent, where agriculture began around 8,000 BC.

Rainwater gathering systems have the following properties: They are proficient in arid and semi-arid regions, where surface runoff is often intermittent and this requires the runoff production area and the runoff receiving area. Water stockpiling is an integral part of the system and can be carried out directly in the soil or in surface tanks or small groundwater tanks. This should be an integral part of investing in the irrigation system. However, poor irrigation and cultivation practices have resulted in the recording of salinity and water, and thus, there is a lot of research in this area, such as (Kapoor, 2001). It qualified a method for creating controlled flood events in this region. (Wichelns, 1986) examined agricultural and output models at the plan level to define politicking that would support farmers to consider opportunity costs and the effects of irrigation and combat at the depth of provincial groundwater.

In general, when the soil is totally appeased with water, a water log is usually indicated. In this case, the groundwater level is so high that it does not allow for adequate agricultural efficiency, and the conditions of water cutting greatly change the properties of the soil, and these changes in the soil negatively affect the ability of the plant to survive in these states. Constant flooding provides positive availability of water and nutrients in anaerobic conditions. However, the tory system consumes an enormous amount of water. Plants growing in underwater conditions are affected by many stresses, such as limitations of gas deficiency in mineral nutrients and microscopic toxicity. Many anatomical and morphological changes accumulate in the root system. Decreased root respiration rate has been reported in either species tolerant or intolerant of logging. Roots under oxidative conditions are also mineral nutrient inhibitors for imaging systems and also for themselves. Closing changes in stomata and non-stomata are responsible for the decreased integrity of the CO 2 layers. In regulating the maintenance of physiological adaptability, plant hormones are more involved. The roots of any plant, due to cutting off the water, are subject to hypoxia or hypoxia. In plants that can withstand flooding, the development of spores and transverse roots in the area around mineral nodules is a sign of adaptive properties.

However, the conservative system consumes an enormous amount of water. Temporary; the registration of transit water can also have major impacts on the growth and output of dry land. The severity of the water records depends on the stage of development of the plant. Drowning and salting continue to cause economic losses in many regions of the world, even though farmers and scientists have been aware of these problems and possible technical solutions for thousands of years. Flooding and salinity problems generally demand some form of drainage to allow sustainable agricultural production.

Rain Water Harvesting

General Approach

The purpose of rainwater harvesting is to alleviate the effects of the lack of rain to cover the needs of the family, as well as for productive use and progress agricultural production and health care, thus contributing to poverty alleviation, resisting environmental degradation through reforestation, improving agricultural practices, and helping to recharge groundwater. Empowering women to manage water and other natural resources, and deal with floods and droughts by storing excess water (CRITCHLEY, & SIEGERT, 1991.).

In agricultural production systems, rainwater harvesting consists of a surface runoff production area commonly called a catchment area and a runoff utilization area generally called an agriculture reservoir. The main divisions are classified according to the distance between the catchment area and the cultivated basins as follows: rainwater catchments in the site, rainwater catchments in (small) internal hydrographic basins and rainwater catchments in external basins.

According to (Pacey and Cullis, 1986), the physical, chemical and biological properties of the soil influence with crop's response to the collected rainwater. Precipitation characteristics, such as frequency, duration and intensity, are more suitable for obtaining better results for water harvesting techniques than the total amount of precipitation. Especially in semi-arid regions, fluctuations or variations in precipitation within and between years are very high. It is very difficult to define the minimum requirements for the frequent distribution of showers and it also depends a lot on other factors, such as the duration of drought periods between showers. It is extremely important to collect water during the period and intensity of rainfall, because runoff occurs only when certain limits are exceeded, either the intensity of precipitation exceeds the rate of seepage, or the intensity and duration of precipitation exceeds the storage capacity of the soil. The minimum amount of rain needed for water to flow on slopes in arid regions is a little low, for example 3-5 mm on rocky soil in the Negev. In medium-shallow soils in Johdpur (India), the limit is 3-5 mm in wet soil and 7-9 mm in dry soil (ITABARI, WAMUONGO, 2003).

Vegetation cover severely affects watershed systems in the processes of seepage, runoff, and erosion. Vegetation decreases the amount of rain that reaches the soil. On the other hand, its presence breaks down the raindrop’s effect on land agglomerations, thus reducing soil erosion. Sawdust, roots, litter and other crop residues reduce the flow rate; As a result, there is a large difference in seepage rates between bare soil and soils covered with any type of vegetation (Falkenmark, et al., 2001).

Other important requirements that must be taken into consideration when implementing water repapering systems for crop production are the slope of the area and operating costs. These technologies are not recommended for use in areas with slopes of more than 5%, due to the uneven distribution of runoff and large amounts of earthwork required which are not considered economical. The cost of building and maintaining water harvesting systems is the most important factor to consider, which determines whether the technology will be widely adopted at the individual farm level. Many farmers in arid and semi-arid regions do not have the labor force available to move the large tracts of land needed in some large water harvesting systems.

In-Situ Rainwater Harvesting

Introduction

It involves harvesting rainwater on-site using methods that increase the amount of water stored in the soil profile by storing rain or keeping it where it falls. In this application there is no separation between the collection area and the storage area, the water is collected and stored where it will be used.

On-site rainwater harvesting include small movements of rainwater such as surface runoff, in order to concentrate the water at the location where it is most needed. Essentially; it prevents net runoff from a particular crop area by retaining rainwater and prolonging infiltration time. This system works best when the soil water retention capacity is large enough and precipitation is equal to one or more crop water requirements, but the amount of moisture in the soil is limited by the amount of infiltration and deep filtration (MATTHEW and BAINBRIDGE, 2000.).

Rainwater harvesting has been widely used and can be used to increase water supply for crops, livestock and domestic use, and is recommended for areas with low terrain, with little and variable amount of precipitation. The technology has the following advantages: minimal additional work, implementation flexibility, rainwater harvesting according to best agricultural management practices, and additional flexibility in land use as a means of artificially recharging aquifers. The best way to collect rainwater on-site for agricultural production is through the following methods: conservative tillage, conservative tillage, and conventional tillage. When these measures cannot be fully implemented to conserve biological soil, boundary beams, terraces and hills are constructed.

General Design Principles

According to (Barrett, 2003.), the ratio between watershed and cultivated area is calculated by Equation 1:

$$\frac{catchmentarea}{cultivatedarea} = \frac{cropwaterrequiremnt * designra\inf all}{designra\inf all * runoffcoefficient * efficiency\ factor} \quad (1)$$

The following is the computation of crop water requirements as follows in Equation 2:

$$ET_{Crop} = kc * ET_0 \qquad (2)$$

Where: ET harvest is the need for water for a specific crop in millimeters per unit time. Kc is the yield factor, which is given in the tables for each stage of the crop growth, such as the initial stage (little water is used by the crop), the stage of crop development (water consumption is increased), the mid-season stage (water consumption reaches selection) and the stage Afternoon (again, less water is needed). ETo is a reference culture of fumigation in millimeters per unit time, which is defined as the rate of evaporation of a large area covered with green grass that actively grows and completely shakes the soil with no lack of water. The rate of water evaporation depends on the climate and can be estimated in a number of ways, such as the mass evaporation method and the Blaney-criddle method.

Projected precipitation is defined as the total amount of rain during the harvest, as the catchment area or above will provide enough runoff to meet the harvest's water needs. Precipitation cannot be estimated in a sub-project or overestimated. If the present precipitation in the crop is less than the planned precipitation, then there will be moisture pressure on the plants; if the actual rainfall exceeds the rainfall in the project, there will be excess runoff that can damage the structures. Its value is determined by analyzing the statistical probability, according to Equation 3:

$$P(\%) = \frac{m - 0.375}{N + 0.25} * 100 \qquad (3)$$

An analysis of more than 15 years of observations (N) is used to obtain annual rainfall totals for the growing season. These values are from the top rating overall (m = 1) to the minimum (m = o) are calculated the probability of P (%) for each of the organization notes from the equation above.

The runoff coefficient is the fraction of the rain that flows along the soil, such as the runoff. This depends, among other factors, on the degree of slope, type of soil vegetation cover, previous soil moisture, intensity and duration of rainfall. The parameter generally ranges from 0.1 to 0.5. To determine the percentage of extraction for the cultivated area, it is necessary to evaluate the annual rate (for perennial crops) or the seasonal flow coefficient (K). This is defined as the total runoff observed in a year (or season) divided by the total precipitation in that same year (or season) as follows in Equation 4:

$$K = \frac{yearly(seasonal)totalrunoff[mm]}{yearly(seasonal)totalra\inf all[mm]} \qquad (4)$$

The runoff plots 3-4 m wide and 10-12 m wide are used for runoff measurement under controlled conditions. Metal or wooden panels around earthen embankments are inserted into the soil at a height of 15 cm above the ground to cut off the flow of water from outside to the ground and vice versa. The rain gauge should be installed near and at the bottom end of each plot. A column should be placed to direct the runoff water to a 0.20m3 barrel. Plots of land should be built directly in the project area and their physical characteristics, such as soil type, slope and vegetation cover, should be representative of the places where water harvesting plans are planned. It is desirable to construct several plots in series in the project area, so that a comparison of the measured surface runoff volumes can be made and judged on the representative character of the locations of the batches (TWDB, 2006).

Various forms of industrial cladding materials have been used to increase the flow in the collection area. Plastic membranes, such as polyethylene and vinyl, are very effective, and asphalt, concrete, and other hard surfaces can also be used to direct water to the planted area (BOTHA, et al., 2007).The efficiency factor takes into account the inefficiency of the uneven distribution of water within the field as well as the losses due to evaporation and deep percolation. The planted area is smooth and the efficiency is higher. Micro-receiving systems are more efficient because the water is usually less deep. Usually the factor is between 0.5 and 0.75.

Runoff System

The main factors that determine the volume of runoff in a watershed area include precipitation characteristics (among the intensity and duration of rain), soil characteristics (surface consistency, surface roughness due to vegetation and forts) and terrain. This is expressed in the efficiency of runoff, that is, the ratio of the volume of runoff to the volume of precipitation that was calculated on average over a year to the fluctuations of the opponent due to the size of the storm. Surface run-off specialization increases with increasing rain concentration, soil texture purity and slope, but decreases with catchment size.

Assuming other runoff factors that characterize the region's constant, total surface runoff production increases with the size of the catchment area, although the rate of runoff efficiency decreases. The droplet of water dredging is determined in the area of implementation, and thus, the depth of infiltration is jointly determined by ***the ratio of runoff to runoff area (RRAR):*** an increase in RRAR mostly leads to deeper infiltration. The RRAR required depends on the water storage capacity of the soil sector in the storage area, which is dependent on the depth of the soil and the texture of the soil (HARDAN, 1975), and thus surface runoff systems can be classified according to the size of their catchment area, where an appropriate distinction is made here between small watersheds (<5 ha) and total catchment systems (> 5 ha) and related RRAR systems.

Micro-Catchments

Small watersheds respond to rain, resulting in small amounts of runoff, which generally does not cause erosion problems. As a result, the soil can be considerably moistened during the rainy season with limited amounts of water. Typical examples of small watershed systems, such as shallow pits and contour strips (FENTAW, et al., 2002) exist, where soil conditions are moderately moist, especially in loose earth. This means that a large ratio of surface runoff can be lost, especially during light summer rains (FENTAW, et al., 2002However, the low runoff yields are inherently convenient to low runoff efficiency (i.e. high leakage losses during low intensity precipitation), and this may require a relatively high runoff rate. Reducing RRAR, especially in modern soil runoff systems, is also essential to reduce the time to maintain water stagnation in the area, and thus the risk of flooding.

Consequently, the highest transpiration rates are likely per unit operating unit, with no extra dry matter production, which may negate the effect of improving the water supply due to the high runoff competence of the relatively small watershed. In addition to the water taken directly from the small runoff area, it appears that a large amount of water was lost due to the evaporation of the soil around that area, as a result of the surface lateral flow of the runoff water stored in the soil. Sometimes it is the salt deposited on the surface of the soil. To some extent, the accumulation of salt can also occur with its detrimental effect on the growth of the culture within the running area, due to insufficient filtration due to the limitation of the runoff head, caused by the decrease of RRAR or decrease in the efficiency of runoff (OLALEYE, et al. 2006.).

Macro-Catchments

Due to the lower efficiency of latent flow in larger areas of river basins, total river basins produce less frequent flow than smaller basins, although in greater quantities with an additional risk of corrosion. The production of large quantities of runoff requires large catchment systems with a high RRAR content; preferably in soils with a fine texture, to ensure adequate storage of runoff in the operating area, especially during dry years (PRIENZ & SINGH, 2001).

Hence, it is better to use smaller operating areas, to expanding control of water distribution. However, when heavy rains occur, the volumes of runoff, which are magnified by the large catchment area, will easily exceed the storage capacity of the operating areat .Then, drainage passages should be created to safely control the overflow, and maintain a water height between 0.2 - 0.5 m, as sufficient water is reserved for the production of biomass, without creating water saturation problems dispersed in the loose soil. In terraced systems with a series of defined fields, excess runoff flows along drainage corridors from the upper fields to the lower fields, fulfilling in an even distribution of water in fields with a large operating area.

The large amount of water settled in the total collection systems backing high plant densities. As long as the running areas are large enough, such as terraced fields, the associated improved microclimate, which has a low air-drying capacity, can reduce excess perspiration, as proposed for plantations in small, large-scale tanks. Although filtration, as a result of repeated high-volume runoff volumes, reduces the risk of salinization in the running area, essential nutrients can be lost in the process. Runoff systems designs generally focus on collecting water rather than harvesting. The decrease in runoff and overflow, in relation to the needs of the crop, is reflected in the lower efficiency of water use. Cutoff volumes and runoff hesitancy should be adjusted according to general water requirements and crop transpiration rate over time and location and vice versa (SCTD, 2001). The following steps are suggested in planning continuous agricultural systems to increase water use efficiency:

First, based on soil and climatic factors, the maximum volume of watersheds and related runoff quantities should not exceed the maximum drainage rates generated during runoff events acceptable tolerances in relation to erosion pond sizes due to reduced work and maintenance requirements.

Second, based on average annual yield, RRAR is evaluated taking into account soil capacity to store water minimum water requirement and maximum crop root depth required. The limiting range should be adjusted to obtain the expected amount of water and the generated flow frequency.

Finally, it provides crop management tools to adapt to inconstancy in average annual runoff revenue and time throughout the year, and to adapt plant intensity and selective use of crops, while creating more quantitative relationships between the factors debated in the above steps, specialized systems can be advanced to increase agricultural output And improve its resilience, and increase the efficiency of water use in running agriculture.

Water Logging

Water logging is a condition where the top layers of the soil become completely saturated with water and deprive the plant's roots of oxygen to breathe. Recording of water is not always due to high groundwater level, it may be due to poor drainage capacity in the soil root zone. Soil and water management is essential to a sustainable agricultural ecosystem. There are many ways to manage the state of the water registry.One cost-effective forestry is forestry, which appears to be the answer to each of these issues. Forestry is the process of planting trees alongside crops, either in chains or by growing. It serves many purposes. On the one hand, it aims to obtain crop production in the short term and obtain forest products in the long term. Besides the economic benefits, there are many environmental benefits associated with agroforestry.

Over the past few years, cities and suburbs have become larger and densely populated. The covered area of plants that are now replaced by infrastructure is used as buildings, streets and side blocks. The absence of this natural surface greatly disrupts the natural water cycle. The excessive use of unfilled coverage left a chain with the challenges of increasing surface runoff, floods from back erosion, and reducing water poverty. Today, these problems pose a major threat to the sustainable development of cities and suburbs. The important thing of that day requires immediate attention and a solution available. The porous concrete is a special type of concrete with high porosity to apply flat concrete that allows water from precipitation and other resources to pass through it, thus reducing surface runoff from the site and recharging groundwater levels. Runway permeability offers a practical, cost-effective, long-term and sustainable solution that reduces the risks of surface water flooding and improves water quality.

Penetration can play a fundamental role in most sustainable sewage system designs in urban areas, providing a long-term, practical response to surface water floods that can be implemented quickly and cost-effectively. A few new, quick-drying concrete paving solutions, it quickly directs excess water away from the streets, parking deck, driving and walking routes. Unlike traditional concrete, it has a high vacuum rate ranging from 20-35%. This allows surface water to drain to the sublayers and dissipate it naturally, reducing the risk of surface water flooding and waterway contamination. Permeable concrete is a concrete paving solution with improved permeability properties compared to permeable concrete. It offers porosity of up to 30% with an average flow rate of 36,000 mm / h / m 2 with a compressive strength of 10-20 N / mm2 and 1.5-3 N / mm2, respectively. The hackable solution offers great benefits compared to traditional solutions. Combining a system of smuggling surface and drainage into one component creates benefits in the construction process and in construction and environmental costs.

Nature Of Water Logging

Water logging is a major problem worldwide in the 21st century (Ram J. 2011). It has become a growing problem in recent years for several reasons: natural changes in the flow of rivers, increased sediments in riverbeds, and failure to operate and maintain flood gates. In recent years, farmers will face risks, as water cuts cause a serious humanitarian crisis that creates challenges in living conditions, livelihoods, health, food, security, employment, education and communications.

On the other hand, there are many developmental structures, such as dams, bridges, bridges, canals and roads, which lead to the dissipation of drainage. Additionally, the unplanned and liberal process of urbanization makes water congestion a deadly trap for city dwellers. As most farmland is flooded, people have to be forced into unemployment. Coastal piers, shrimp farming and climate change make this area a kind of shortage, because no more new canals are dug and existing canals are narrowed or taken over by the influential population. The landfill area is the most affected area that occurs every year, causing massive damage and damage to living conditions and the entire ecosystem. People often see a disaster as a natural phenomenon. Many roads, market kitchens, shopping malls, homes and schools have been exposed to ankle-to-knee deep water during the current rain wave in recent days. Residents blamed the unplanned construction on the swamps, the illegal invasion of the lowlands and the lack of systematic cleaning of the condition's sewers.

Causes Of Water Logging

The dual problems of recording water and salinity in the world are generally attributed to the location of the depression in the region. together with the lack of an adequate drainage system, deficient filtration due to cooling clay layers and continuous leakage of the irrigation bypass in the area of the channel. In addition, the intensity of irrigation and leveling of the soil leads to a great blurring of the natural land and drainage, together with the main changes in farming patterns and practices, which appear to have exacerbated the double problem of water cut and salinity (Su -qin, et al. 2006).

Capillary water works very actively in the loamy soil area, which clearly leads to salinization of the soil and reduce the hydraulic drainage of the soil. Several studies have documented the negative effects of saturated soils on soil structure and crop growth. (Toky. 2011) provided a comprehensive review of the literature related to the depth of the fixed (unstable) saline groundwater of crop yields and included additional results from their own studies.The incidence of problematic soils in the Rift Valley regions in Ethiopia becomes particularly high, as groundwater is found near the surface of the soil with melted salts rising and irrigation without attention due to sight.

Rain Water Harvesting And Water Logging Problem

Problem of Water Logging

However, the water recording process begins even when the water table is directly below the surface. The area recorded in this study can be considered when the water level above the ground surface is too high and does not allow for the expected activity, such as agriculture. It occurs when the rate of water accumulation by sedimentation or other means exceeds the rates collected of water discharge, percolation and evaporation in watersheds or when flood waters inundate the area. The water log can differ from the flood in such a way that the water flow is virtually non-existent in an earlier case, since the water body is preserved by the boundaries.

Soil water record has long been identified as a major biological stress. It can greatly reduce seed germination and seedling creation. Thus, soil water logging is an important factor affecting the growth and survival of many plant species, not only in natural ecosystems, but also in agricultural and horticultural systems (Toky. 2011).

A rapid change in soil properties occurs in the recording of the following soil water. When water saturates the pores of the soil, the gases dissolve, a decrease in the diffusion of gas occurs and the toxic plant compounds accumulate with the spread of the anaerobic state. All of these changes greatly affect the ability of corn growth to survive such a state. In responses, stomatal resistance increases photosynthesis and decreases the hydraulic conductivity of the root, and reduces the transfer of photo absorption materials.

Effect Of Water Logging On The Crop Yield

The effect of water cutting on the plant depends on the ratio of the affected root zone, root elongation, the rate of oxygen depletion, and the effect on nutrient availability, intake and accumulation (Wala and Nashar 2013).The rate of oxygen depletion and the degree of damage from lack of water depend on various factors of temperature, availability of organic matter, salinity, acidity, and stage of plant growth. According to Kapoor (2001), there are three basic requirements for water logging in the plant's root zone:

Sufficient water supply to produce soil saturation in the root zone.

The mechanisms and physical properties by which water is supplied and maintained within the root zone.

The roots of the plants are quenched to produce anaerobic conditions and associated changes in biological and chemical activity, which is detrimental to the health of the plants.

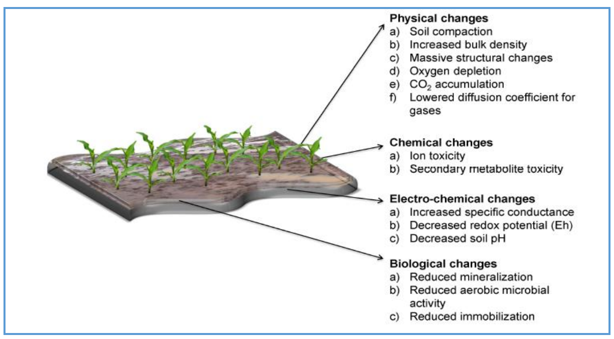
Salt Affected Soil

Soil salinity results from excessive use of salt water and the accumulation of salts and usually appears on the soil surface. Salt can be transported to the soil surface by capillary action from ground salty water, where it builds up as a result of evaporation at the surface. It can also be concentrated in the soil due to human practices, such as excessive and ineffective use of pesticides and adding salts to irrigation water. As soil increases salinity, the effects of salt can degrade the soil's ability to maintain growth.

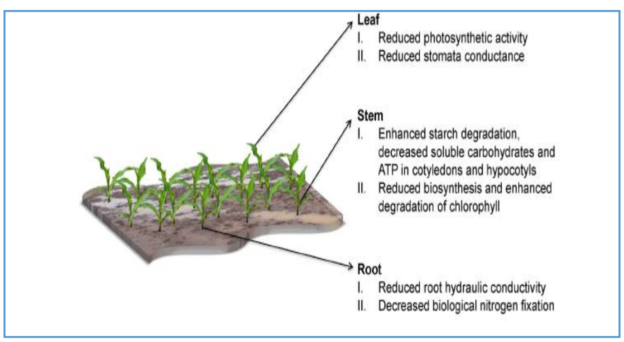
Due to mineral wear, salts are also deposited by dust and before precipitation. In dry areas, salts can accumulate and cause naturally salty soil. Proper irrigation management can prevent salt buildup by providing adequate drainage to filter added salts from the affected soil root layer.

Disabling the drainage patterns that provide filtration can also lead to salt buildup. An example of this occurred in Egypt in 1970, when the High Dam was built in Aswan. The resulting change in groundwater level has eroded the soil, resulting in high concentrations of salts in groundwater. After construction, the continuous increase in the water table led to the salinisation of arable land. Salinity can occur in arid lands when the depth of groundwater is between 2 and 3 m. Salts are removed from groundwater by capillaries on the soil surface. It can also occur when groundwater is salty (a common condition) and land-use practices allow more water to enter the aquifer than it can absorb. For example, deforestation for agriculture can lead to the salinisation of arid lands in some areas where deep root systems of trees are replaced by shallow root systems for annual crops, resulting in low water extraction and a high level of salt water. (Su-qin, et al. 2006.).

Salinity is an important and growing source of soil degradation worldwide. It can be reduced by filtering the dissolved salts in the soil with excess irrigation water. Controlling soil salinity involves controlling the water level and washing it with tile drainage or some other form of underground drainage. High levels of soil salinity can be tolerated if salinity tolerant plants grow. Even sensitive crops lose their activity even in slightly salty soils. Most crops are negatively affected by salty soils (moderately) and only a small number of food crops can be grown, or even tolerate very salty soils. Rain or irrigation, if not filtered, can bring salts to the surface through capillaries Irrigation salinity can occur over time wherever irrigation occurs; because most of the water contains some dissolved salts. Since the salinity of the soil makes it difficult for plants to absorb moisture from the soil, which has detrimental effects on the growth and production of corn, these salts must be removed from the root zone of the plant by applying additional water. This water in excess of the plant's needs is called the filtration part (LF). In addition, the salinity percentage due to the use of irrigation water is greatly increased due to poor drainage and the use of saline water to irrigate agricultural crops.



Effects of waterlogging on soil properties.



Effects of waterlogging on plant growth.

Combined Effect of Water Saturation and Salinity on Crop Yields

Soil salinity is caused by the excessive use of salt water accumulated in salt, which can be seen physically on the soil surface. Salt can be transported to the soil surface by capillary property of saline groundwater, where it accumulates due to evaporation at the surface. Recording water and salinity has become a problem threatening development in developing countries. Flat water levels and associated salinity problems have become common features of agricultural land areas around the world. When implementing an irrigation project plan, it must include an environmental impact assessment.

Particularly in developing countries, research-based recommendations on the impact of cutting off water and salt water on crops and management practices are urgently needed. Develop and implement specific water log management strategies, such as the use of gypsum or a salt tolerant plant to restore saline soils and soft drinks. To stop productivity loss and soil being affected by salt accumulation, it is essential to use appropriate soil and water management practices (Ram, 2011).

Economic Losses

The economy of farmers and the country depends on agriculture. For sustainable agriculture, water and soil resources must be properly managed. Over the past few years, the crop pattern has been shifted from traditional crops in favor of agriculture. This, along with some other causes, has led to the problem of water registration and soil salinity. As a result of salinity and water logging, yields are adversely affected. This has also led to other social and economic impacts. The current study examines the causes, effects, and treatments of these two major problems. The results of the current survey will surely help farmers adopt a suitable model in a cost-effective, affordable and scientific manner to deal with these two evils that are detrimental to valuable water and soil resources (Wichelns, 1986).

Strategies for Waterlogged Soils In Agriculture

By surveying the whole world it was found that submerged and submerged soils covered about 5 to 7% of the Earth's surface. Globally submerged soils are approximately 700 to 1,000 million hectares. Globally, tropical swamps, paddy fields and floodplains represent approximately 14, 12 and 10% of the total area covered by water. Water-saturated soils for a long time give distinctive prospects for oxidation-reduction processes. The submerged soil profile contains (a) free surface water, (b) a partially oxidized layer with the ability to reduce oxidation 400 MV or more, and (c) a permanently reduced layer with bluish green drip (MATI, 2005).

Management Strategies

Raising high farms:

Since water saturation creates the roots of anaerobic plants in the anaerobic environment it cannot survive in these conditions, but in high bed farming practices an artificial air condition is caused by cultural practices. Since the physical processing of the soil and the formation of the raised layer create favorable conditions for increased hydraulic conductivity, and reduce the density of loose soil that leads to greater root penetration and good drainage.

Drainage:

Surface drainage: Surface drainage is an integral part of agriculture in wet and sub-humid areas. In seasonal climatic conditions, they are required mainly even in arid and semi-arid regions.Traditional surface drainage consisting of main or branch tubes or assemblies. These drains must be supplemented with a type of surface drainage system, which is subject to the direct control and supervision of farmers. Innovative surface drainage technology such as on-farm ponds; Land composition modifications should be made as alternative options for surface drainage.

Underground drainage: Underground drainage is practiced mainly in areas with a high floor table. Underground drainage reduces the water table or water fall and ensures an adequate environment in the root area where flooding occurs. These drainage systems consist of open drains and pipes with spaced depth and discharge distance. The systems are most effective in areas where the subsoil is sufficiently stable and hostile subsoil properties, such as refrigerant, are not shown. Typically, the type of drainage to be installed depends on the terrain, the characteristics of the soil and the required drainage rate. Managing water saturation using horizontal tile drainage systems (using a drainage system combined with tubular wells in addition to horizontal drainage systems) is most useful for keeping the water level within the desired depths.

Bio-drainage: Bio-drainage can be defined as "pumping excess soil water by plants with deep roots using their bioenergy. "The biological drainage system consists of (1) fast growing tree species, (2) a larger canopy area, and (3) plants with a higher water consumption and higher transpiration rate. For example, Syzygium cumini, Pongamia pinnata, Terminalia arjuna is considered Casurina glauca Eucalyptus tereticornis is one of the most effective and used plants for biological drainage, and remedial measures (for areas submerged in water) and preventive (for areas likely to be submerged in water) are the most beneficial method.

Factors Controlling Effective Bio-Drainage

There are four factors that can be manipulated when designing forestry systems to control the salinity of drylands and waterlogging. Here they are:

Cultivated area: The area of the farm is positively linked to the potential for bio-drainage.

Arrangement of trees: The trees should be planted with a distance that enhances the overall canopy coverage, which enhances the total amount of water that is expelled through the leaves.

Its location within the watersheds: The cultivation of the biological drainage plant surrounding the submerged areas gives better results instead of the submerged areas.

Selected Tree Types: Tree types with a rapid growth rate, deep root penetration, greater canopy coverage, and a high transpiration rate for bio-drainage should be selected.

Crop Management

Crop management options for increasing crop water use and reducing the occurrence of water saturation include early sowing and higher sowing rates. Early sowing of wheat varieties performed better due to reduced risk of water saturation damage by removing soil watering and avoiding water saturation in weak early growth stages. Wheat, barley and rapeseed plants were less affected by early water saturation (vegetative stages) than late (reproductive stages). Early sowing can also avoid waterlogging events at the end of the season. The strength of the early crop can be another important feature of carrying water saturation in the field. Tillage and reproductive stages are crucial for tolerance of water saturation in crops such as wheat and barley. One of the main effects of water stress in crops is low nitrogen absorption. Early activity may be associated with increased nitrogen uptake. However, under normal conditions growth rates of seedlings can vary with genotype differences (MATI, 2005).

Nutrient Management

One of the main effects of water saturation on plants is lack of nutrients, which leads to reduced photosynthesis and net carbon fixation which ultimately leads to a decrease in growth and hence the yield. The application of essential nutrients will help alleviate the negative effects of abiotic pressures such as water saturation which leads to increased productivity. The use of highly efficient fortified fertilizers such as Slow Release or Controlled Fertilizers (SR / CR) plays an important role in improving plant growth and development under underwater conditions. Potassium fertilizer has also been reported to improve the harmful effects of water saturation in many crops including cane, rapeseed and cotton. The external application of various sources of phosphorous (P) such as cow manure (DCM) and meat and bone meal (MBM) are effective in producing ideal yields under conditions of P deficiency in the wet growing season. The use of farm fertilizers also resulted in a significant increase in the concentration of grains in iron, zinc and copper under submerged conditions. Likewise, the use of leaf boron increases the overall growth of the plant and reduces the harmful effect of water saturation of the corn. Consideration should be given to appropriate application methods, nutrient types, timing and rate to avoid the negative impact of tissue toxicity (such as manganese) and nutrient deficiencies on the soil environment. The application of nitrogen fertilizer during or immediately after water saturation was less effective than pre-saturation due to the inefficiency of nutrient ions absorbing weak roots, and high leaching hazards in moist soil and in the late growth stage, the applied additional fertilizer could cause excessive plant growth and harvest plant problems. Therefore, this strategy has wide limitations as the harmful effects of water saturation can only be partially mitigated by adding fertilizers due to the reduced ability of the roots to absorb nutrients (MATI, 2005).

In general, water saturation can be efficiently regulated by adjusting land shapes, mechanical drainage as well as bio-drainage, and controlled irrigation procedures. Tolerant or resistant varieties and proper nutrient management will be more effective in order to better sustain agricultural crops in flooded soil. To improve mitigation strategies, more research should focus on the following aspects:

Comparing cost / benefit analyzes of different exchange strategies;

Understanding the mechanisms of nutrient loss during water saturation and identifying the benefits of nutrient application;

Increasing soil removal from soil through soil improvement and agricultural strategies; And

Increasing the specificity of the interaction between different management practices and the environment (soil types, water saturation intensity, etc.) as well as between management practices.

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