

Role of Water Management in Field Crops: The Conserve Approaches

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Field agricultural success depends on efficient water management, which includes timing irrigation, gathering water, improving soil health, and guaranteeing optimal plant health and yields while encouraging sustainable farming methods. Only 3% of the water on Earth is fresh, and two thirds of that is frozen and unusable. Freshwater has been diminishing at a rate of six times since 1900. billion people thus lack access to water. Agriculture is the primary usage of almost 70% of the freshwater on Earth. Water needs to be used wisely and precisely as the world demands. Water is regarded as a key component of soil fertility and improves crop yield as well as the efficiency with which resources, such as nutrients received in solution form, are used. A change in technology or practices that aim to conserve soil moisture and advance rainfall or weather prediction technology that accurately reaches farmers with minimal error is necessary to manage water in a way that lowers the water requirement without compromising soil sustainability and yield. Land leveling, reduced or no tillage, raised bed planting with furrows incorporated, soil cover, and crop variety are some techniques that help manage water while meeting crop water needs by preserving moisture or lowering evaporation. A shortage of water for agriculture and an impact on global food security result from rivers, notably the Great Amazon River, drying up or losing water due to rising temperatures. This makes water management more important globally in preserving the downward trend of water availability and resources.

Keywords: irrigation fresh water, food security, productivity, crop diversification and soil moisture

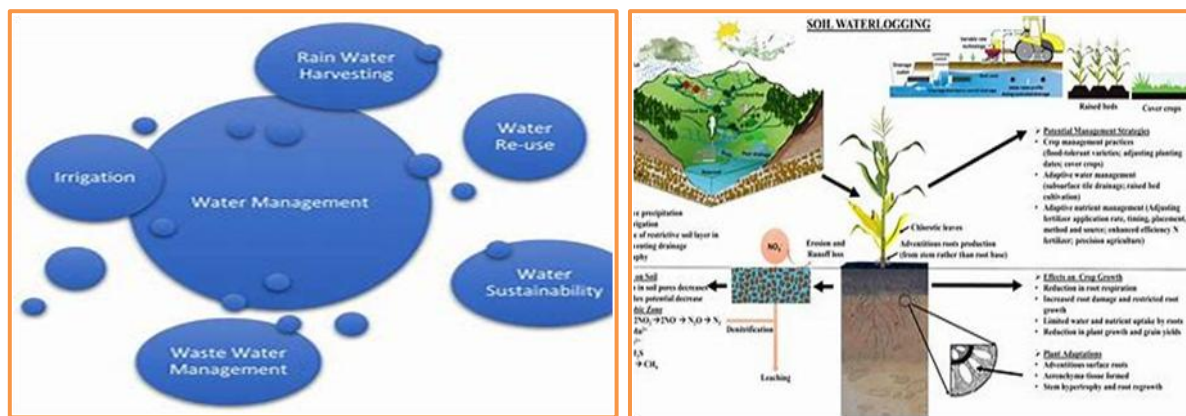
Introduction

Water management systems in agriculture can help improve soil health, conserve moisture, and protect water quality. This blog explores the pivotal role of water management in agriculture, examining various strategies and technologies that contribute to sustainability. UNESCO states that water resources should be developed, distributed, and used in a way that aligns with pre-established goals and takes into account the amount and quality of the resources. The process of organizing, creating, allocating, and overseeing the most effective use of water resources is known as water management. Because many thought that more water meant more yield, there was excessive or unsustainable resource exploitation during the green revolution to increase the maximum production. However,

Efficient Water Management

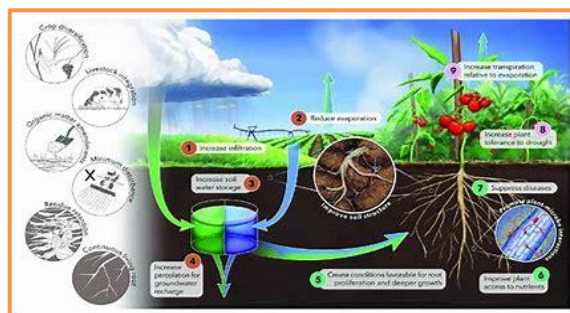


agriculture science asserts that water is necessary for plants to carry out their life cycle, including photosynthesis, nutrient uptake, temperature regulation, turgor pressure, seed germination, nutrient and organic compound transport, soil health, and so forth. This does not imply that we use too much water; this has drawbacks as well, such as waterlogging, nutrient leaching, soil erosion, salinization, increased pressure from pests and diseases, water waste, environmental effects, and expensive irrigation costs. In agricultural field crops, appropriate water management is necessary to maintain optimal yield and soil health for long-term crop production in order to prevent these issues. Both agriculture and the dwindling water resources brought on by climate change benefit from water management strategies and practices. It contributes to the global reduction of water poverty. This article's discussion of the function of water management in field crops follows.



Water management is essential for plant life; both an excess of water and a shortage of it have negative impacts on the crop and the farmers. Scientific water management plays the following roles:

- Optimum growth and yield:** To achieve optimum crop growth and yield through water management, focus on efficient irrigation techniques like drip irrigation, soil water conservation with mulches, and understanding crop-specific water requirements, while also considering factors like soil type and climate. Water is the main source for plants to perform their functions efficiently such as temperature regulation, transpiration, transportation of nutrients etc. which assures the optimum growth of plants. The proper growth of plants can be necessary for obtaining optimum or expected yield. Excess water supply can cause anaerobic conditions in soil, which can kill the aerobic microorganisms such as azotobacter beneficial for plant growth and yield whereas shortage of water can cause difficulty in dissolving nutrients in solution (the available form of nutrients for plants). Adequate water supply can avoid these problems as well as maintain temperature and turgor pressure of plants.
- Soil health:** Soil health refers to the soil's capacity to support plant and animal life, maintain environmental sustainability, and improve human health, influenced by factors like land management and cropping practices. Water management is crucial for maintaining soil fertility and health. Mismanagement of excess water can cause soil compaction, destroy soil structure, soil erosion, nutrient leaching, waterlogged conditions, soil salinization, and killing of various beneficial aerobic microorganisms. While with the scarcity of water, the nutrient remains in unavailable forms. This overall impact of these causes can lead to degradation of soil. Proper management of irrigation and efficient drainage facilities should be necessary for maintaining soil fertility and health.



3. **Plant protection:** Plant protection encompasses strategies and products to safeguard crops from pests, diseases, and weeds, aiming to maximize yields and minimize losses. Over irrigation can provide favourable conditions for pathogens such as bacteria, fungi, virus attacks. By avoiding the overirrigation, the diseases infestations such as powdery mildew, blights, and root rot can be decreased. Proper water management can improve crops health and provide withstand ability during pests attacks. Efficient irrigation techniques such as drip irrigation can reduce the weed germination by providing water directly to the crop root zones. It also provides stress resistant ability to the crops against hot weather, heat stress as well as overcoming water stress.
4. **Resource conservation:** In order to preserve natural water resources, effective use, rainwater collection, sustainable agriculture, and the preservation of ecosystems that control water cycles should be prioritized. Renewable energy sources and a reduction in water-intensive activities should also be taken into account. Water resources such as rivers, canal, lakes, groundwater are abruptly exploited for a very long time. Proper water management such as conservation of soil moisture, reduced irrigation can diminish the pressure on the water resources and helps in revival of various resources. Advanced irrigation technology such as drip irrigation can increase the water use efficiency and reduce the wastage of water from the agricultural fields. The energy required while over irrigation can also be reduced which ultimately saves water, energy and cost as well. Rainwater harvesting method and proper management for water infiltration helps in ground water recharge and also become the alternative source of irrigation.
5. **Environmental protection:** water treatment plants improve the quality of irrigation water which reduces the contamination problems of soil. Efficient use of water reduces the water exploitation which conserves the natural habitat and natural reservoirs such as rivers, lakes etc. soil erosion, the other and major problem of poor water management, can also be cured and reduce the soil degradation and fertility. Flood risks are also reduced through proper management infrastructures for irrigation such as barrages, dams, canals etc. it also leads to afforestation and reforestation and improves biodiversity and contributes to the agroforestry system.
6. **Climate change adaptability:** Climate change has the potential to become a common occurrence, which causes significant fluctuations in rainfall patterns, which might result in droughts or floods. The efficient water management facility gives us a place to address both of the negative circumstances. These management techniques increase the water storage capacity, make use of it in unfavourable weather circumstances, and serve as backup irrigation supplies when conditions are stressful. One important piece of climate-resilient infrastructure is the construction of water treatment facilities and distribution networks, which enhance water quality and give people access to clean water.
7. **Economic role:** It increases productivity, which maximizes the yield. By using water precisely, it lowers input costs, which directly helps the farmer. In addition to the direct advantages, it also indirectly boosts farmers' incomes by improving crops' resilience to climate change, enhancing soil health by lowering soil erosion and extending its sustainability, encouraging crop diversification, enabling farmers to cultivate high-value and water-intensive crops, and so forth. Farmers who use water management techniques are also eligible for a number of government incentives and programs, including the Pradhan Mantri Krishi Shinchayee Yojana (PMKSY).



Conclusion

Field agricultural yield and sustainability are greatly impacted by efficient water management, particularly in light of growing water constraint and climate variability. Farmers can optimize water use and maintain the long-term viability of agricultural ecosystems by implementing water conservation measures. Techniques such as drip irrigation, rainwater harvesting, soil moisture monitoring, and the use of drought-resistant crop varieties can significantly enhance water use efficiency and reduce wastage. Using sustainable water management techniques enhances soil quality, increases crop yields, and lessens the adverse consequences of water stress. Additionally, it promotes the preservation of natural water supplies, guaranteeing the long-term viability of agriculture. Therefore, in order to achieve food security, sustain rural livelihoods, and address the global issues of water shortages and environmental degradation, it is imperative to integrate conservation-based water management systems.