Ecology-friendly irrigation towards a sustained environment

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Effective, correct irrigation is generally linked with WUE (Water Use Efficiency).It entails optimal water management with the aim of boosting agricultural productivity and improving food quality.

High economic return on a water unit is generally the main parameter for commercial evaluation. The efficient use of water is the prime challenge in worldwide farming practices where problems of water shortages or collection and delivery of water are widespread. It is an accepted fact that industry and sometimes, agricultural practices, play a significant role in environmental pollution.

The resulting damage is evident in a wide range of locations as well as in the visible impact on a broad variety of processes. A significantly detrimental effect of agricultural practices on the environment can be attributed to the irrational application of irrigation and inefficient use of fertilizers, pesticides or other chemicals. Agriculture is presently undergoing significant changes in innovative irrigation, fertilizer technology and agronomic expertise. These elements constitute a vital platform for agricultural success and for preventing ecological impairment. The following review presents several processes and their link with environmental irrigation, balancing environmental protection with improved agricultural production. The environmental irrigation platform is based on the uniform application to the active root system zone of precise amounts of water and fertilizers, combined with rational agricultural knowledge of the plant's water needs.

1. Environmental Irrigation is directly linked with the reduction of pesticide application

The widespread use of chemicals for disease, pest and weed control is an inherent factor in agriculture. A major principle in reducing this overuse is limiting use without damaging crop quality or the farmer's profits. Leaf disease development and weed growth are promoted by free accumulation of water on the leaf surface, air humidity and soil moisture. Reduction of leaf wetness by applying water under the foliage, and control of soil moisture to a limited area will suppress leaf disease and prevent weed infestation. Drip irrigation governed by the right timing and required amounts around the plant will impede leaf diseases and weed growth. It will therefore minimize dependence on pesticides. Drip irrigation

teamed with the rational application of pesticides –using monitoring and models for predicting disease development –is a substantial factor in minimizing environmental damage.

2. Optimizing nutrigation and meeting environmental needs

The tendency to increase agricultural production and make it more efficient is directly associated with the widespread application of a variety of fertilizers. Many countries are sensitive to both the predictable damage resulting from overuse of fertilizers and their accumulation in the soil and in groundwater. This applies equally to greenhouses and open field agriculture. Furthermore, in certain crops, such as lettuce, nitrate levels in the leaves are restricted by food agencies due to public health concerns. This constraint applies to nearly all fertilizers and in particular to nitrogenous fertilizers. Various forms of nitrogen (nitrate, ammonia, urea and organic nitrogen) are easily leached and may reach fresh water sources. Here too, the prevention of environmental pollution requires integration of drip irrigation and agronomic expertise. Correct forecasting of nitrate requirements, accurate application of nitrogen in the irrigation system and its precise application around the root systems is essential towards preventing the pollution caused by excess use of fertilizers in general and nitrogen in particular. Monitoring water quantities and nitrogen levels at root level and beneath it will enable the control and balance of fertilizer and water dosage.

3. Inhibiting erosion, surface and underground run-off

Soil erosion and destruction of the natural environment are widespread phenomena resulting from precipitation along with uncontrolled and high water application flow rates. This applies to all topography and soil types but is particularly relevant to acute slopes. Here, the most effective solution is low volume and low flow drip irrigation to supply water that suits the soil’s penetration abilities and prevents excessive run-off.

4. Saving water and preventing dissipation of water resources

Environmental irrigation is also applicable in cases where there is improper use of surplus water for irrigation. Drip irrigation is extremely economical because it integrates low evaporation on the soil surface, delivery of exact quantities of water to the active root zone and uniform water distribution. The high uniformity of water distribution achieved by drip irrigation can prevent water loss of up to 30-40% compared with flood irrigation and 10-20% compared

with overhead irrigation. The benefit of uniform water supply and, consequently, fertilizer supply will undoubtedly contribute to an increase in production and quality.

5. Cutting down on energy requirements

Irrigating with a heavy surplus of water entails excessive use of energy (for pumping and water transportation). Drip irrigation has low energy requirements compared with the majority of other irrigation methods. High energy requirements are directly associated with environmental pollution due to gaseous emissions into the atmosphere.

6. Rational use of waste/recycled water by surface and sub-surface (below surface drippers) drip irrigation

Another aspect of irrigation and environmental protection is evident in the rational use of low quality water– in particular brackish or recycled water. Certainly, a drip system that enables low-quality water to be used successfully for agriculture eliminates the need for costly purification, a process with high energy requirements. Drip irrigation also enables extensive use of waste and recycled water in compliance with local authority standards. Controlled distribution of wastewater prevents pollution of the soil and water sources. Its use has increased following the development of a relatively new system of drip irrigation that is installed under the soil surface (subsurface drip irrigation). This agro-technical system could be an optimal solution, particularly for wastewater. Already in wide and successful application, it utilizes wastewater for crops and allows municipalities to irrigate large landscape areas. This topic will undoubtedly assume major importance in the future with the increased awareness of environmental issues.

Conclusion

Environmental irrigation integrates agricultural and ecological concerns at their optimized levels. In today’s modern farming systems, growers can rely on advanced tools and know-how to optimize the application of water. The choice of an effective, correct irrigation system in conjunction with agronomic expertise is a crucial component for achieving high yields and preventing environmental pollution.