Drip Irrigation Technology: A Resource Management Tool for Farmers

By John C. Roberts, in collaboration with Stuart W. Strong

Drip irrigation technology offers many advantages over traditional methods. It is especially useful in arid areas where water resources are limited. Drip irrigation systems are becoming more popular due to their efficiency and economic benefits. As a result, farmers and industries are increasingly adopting this technology. This article provides an overview of drip irrigation systems and their benefits.

The use of drip irrigation technology has increased significantly in recent years. This is due to its ability to deliver water and nutrients directly to the root zone, thereby improving crop yields and reducing water and fertilizer use. Drip irrigation systems are also more efficient than traditional methods, as they deliver water directly to the plant roots, reducing water loss through evaporation.

Drip irrigation systems work by delivering water through small tubes or hoses that are connected to a network of pipes. These tubes are fitted with small emitters that release water at a controlled rate, allowing for precise water delivery. Drip irrigation systems are adaptable to a variety of conditions and can be used in a wide range of crops and landscapes.

Drip irrigation technology is especially useful in arid regions where water resources are limited. It allows farmers to conserve water and soil, which is crucial in sustaining agricultural production. Drip irrigation systems can also improve crop yields, reduce water use, and minimize soil erosion.

In conclusion, drip irrigation technology offers numerous benefits for farmers and industries. It is an effective tool for conserving water and soil, improving crop yields, and reducing water and fertilizer use. By adopting drip irrigation technology, farmers can increase their productivity and contribute to a more sustainable future.
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The strain on the world's water resources continues to intensify, select the environment including the urgent needs and producing higher quality crops, while at the same time increasing the amount of polyethylene plastics in the departure from traditional flood and sprinkler systems and increasing the use of water while in lower quality handfuls. This means that the crop alternates between having too much and too little water and nutrients available. Drip irrigation scheduling allows water and nutrients to be delivered exactly when and where the crop needs them resulting in larger, higher quality harvests.

**PATTES & LAYOUT OF A DRIIP TAPE SYSTEM**

Drip irrigation systems can be placed on the soil surface as shown in the diagram above, or they can be buried at depth, ranging from 4 to 30 centimeters. Buried drip systems are less susceptible to mechanical and pest damage.

**Benefits of Drip Irrigation**

Water conservation was originally thought to be the primary benefit of drip irrigation. Experience has shown that a well-designed, needed and managed drip irrigation system offers other equally important agronomic and economic benefits. As a result farmers worldwide are installing drip technology:

- Improved Crop Quality and increased yields — Using traditional irrigation methods, water and fertilizer cannot practically be applied in small amounts on a frequent basis. This means that the crops alternates between having too much and too little water and nutrients available. Drip irrigation scheduling allows water and nutrients to be delivered exactly when and where the crop needs them resulting in larger, higher quality harvests.
- Water Conservation — Drip systems allow a farmer to apply only the precise amount of water a plant can beneficially use. Additionally, drip systems do not wet the entire field surface. As a result, water loss to evaporation, deep percolation and runoff are minimized. This not only conserve water, but also minimizes ground-water contamination.
- More Flexible Field Operations — Cultivation, spraying and harvesting can continue even when irrigating.
- Lower Input Costs — Drip tape enables the uniform delivery of water, chemicals and fertilizers on an as needed basis. This minimizes the over application of costly resources, thereby reducing input costs. Cost savings on chemicals of 25 to 50% are not uncommon with drip systems.
- Energy Conservation — The low operating pressure (0.5 bar) required for drip systems reduces pumping requirements, thereby conserving less energy than sprinkler systems.
- Reduced Disease — Less disease can occur because foliage is not wetted and soil moisture is controlled.
- Less Weed Growth — Only the crop is irrigated, minimizing the weed growth between plant rows.
- Problem Soils Can Be Farmed More Effectively — Drip systems are ideal for heavy soils with low infiltration rates, since the water can be applied at a slow enough rate for the soil to absorb it, minimizing or eliminating surface run-off. Sandy soils, which are incapable of storing large amounts of water, also can be farmed with drip systems using very high frequency irrigation.

![Figure 1: Wettmg pattern of an above g round drip installation.](http://www.igationjournal.com)

**Figure 1:** Wettmg pattern of an above ground drip installation.

**Introduction to Drip**

Although drip irrigation was pioneered in England in the 1940s, it was not until the advent of polyethylene plastics in the 1960s that drip irrigation was developed as a commercially viable technology in the United States and Israel. Initially, many farmers did not consider drip irrigation practical because it was such a significant departure from traditional flood and sprinkler methods. However, years of cooperative research among farmers, universities and government agencies have demonstrated the many advantages of drip irrigation. Today, as a result of the proven agronomic, conservation and economic benefits, drip irrigation has gained global acceptance and is being implemented at a rapid pace by competitive growers worldwide on vegetables, fruits, flowers, cotton, sugar cane, vineyards and many other crops.

**Drip vs. Traditional Methods**

Traditional irrigation methods such as flood and sprinkler apply water at high rates to a large area with limited ability to distribute the water to exactly where it is needed and promote consistent growth. This is accomplished through high frequency irrigation cycles, and by applying water directly through the drip irrigation system as often as required by the crop.

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**Drip Irrigation Technology**

The most important drip irrigation systems for the future are drip tape and in-line emitters. The primary factors which determine the most appropriate product type are application, cost, field conditions, and management practices.

Drip tape is a thin plastic hose with emitters molded into the wall of the tube. Drip tape is available in various sizes, ranging from 0.12 mm to 0.40 mm with emitter spacing from 10 cm to 60 cm. A variety of flow rates are available to meet the needs of specific crops and growing conditions.

Drip tape is generally the most cost-effective technology and is widely used in single-sensor and long-term crop-specific emitter products. An injector molded emitter placed on the inside of the pipe during the extension process. This type of hose is available in wall thickness ranging from 0.20 mm to 1.25 mm, with emitter spacing from 40 cm to 120 cm. In-line emitters are most commonly used in long-term vineyard and orchard applications.

**Figure 1:** Wettmg pattern of an above ground drip installation.

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Conponents of Drip Irrigation

Along with its many benefits, drip irrigation systems also have some potential cost and operational disadvantages. Most of these can be overcome through good system design, proper installation, and ongoing maintenance and management.

- The initial cost of a drip irrigation system per hectare is typically higher than other irrigation systems. Filters, pumps, regulators, valves, and mainlines must be purchased as start-up items for the system. These costs, though substantial, are one-time costs. Drip tape is the only significant recurring cost, but it represents only approximately 20% of the initial system cost.
- Drip systems require more intensive management than flood or sprinkler systems. In order to realize the many benefits discussed above, the farmer must constantly be monitoring the growing environment and scheduling irrigation to meet the plant’s needs. Frequent inspections of drip systems are recommended and the timely correction of problems is critical to not risking a crop.
- Fitting and saving drip tape typically requires a change in cultivation, planting, and harvesting practices. Educating personnel on these changes is required during the first season drip is used, but these practices quickly become a standard part of the farming operation.
- The small opening in drip emitters may be plugged by dirty water. Therefore, water quality should always be analyzed to identify possible problems, and a well-designed filtration system must be installed.
- Some crops do not germinate well with drip irrigation. In these cases, portable sprinklers are often used for germination. Once started, the crop can be irrigated with a drip system to optimize plant growth. A drip tape system will not make a farming operation good. On the contrary, one needs to start with a good farming operation and then adapt drip tape irrigation and adjust farming practices around the new method to ensure success.

**The Choice**

Drip irrigation is a proven and rapidly growing technology. It is compatible with global water conservation and environmental protection goals. Drip systems can yield substantial economic benefits if properly designed, installed, and maintained. Today, less than two percent of the world’s irrigated

**The IA Educational Offers Three New Courses**

The Irrigation Association has expanded its list of sanctioned educational courses to help landscape and irrigation companies train their crews. The new half-day courses are:

- Sprinkler System Scheduling
- Field Hydraulics
- Design Hydraulics

IA staff will help local sponsors arrange arrangements and provide materials for these and other courses.

**Nashville Expo Exhibit Hall Will Be Filled to Capacity**

Both for the 1997 International Irrigation Exposition in Nashville, Tennessee, which is scheduled for June 17, 18 and 19, and at the Irrigation Training and Research Center in California Polytechnic State University, San Luis Obispo, CA 93407.

**John C. Roberts, Robins Irrigation Products Inc., San Marino, California**

**IA Board Eyes Charlotte for Future Expo Site**

The Summer Board Meeting was held in Charlotte, North Carolina, last month so officers and board members could evaluate Charlotte as the site for the future International Irrigation Exposition and Technical Conference. Three days of intensive meetings each summer help the association set and achieve its goals.

**Luis (Loth) Sotth set the agenda for the meeting. "North Carolina has become a major distribution point for West Coast Irrigation manufacturers who want to serve the East Coast," Toth remarked. "Irrigation is growing both nationally and internationally. The IA is growing with it."**