

Ebb & flow from an engineers viewpoint

John W. Bartok, Jr.

Extension Agricultural Engineering Specialist

The concept of ebb and flow irrigation has been around for many years. Originally used with hydroponic systems in the Far East, it is now becoming the way to produce pot crops efficiently. New technology and materials make this a very attractive system for the wholesale grower concentrating on a few crops.

The system can be used with benches or on the floor. Watertight aluminum or plastic benches are flooded with up to an inch of nutrient solution as needed to keep the rootzone of the plants moist. This may be once or twice a week to several times a day depending on weather conditions and the size of the crop. Once flooded, the solution is allowed to drain back to a storage tank located below the benches or underground. The tank has to be large enough to store all the solution--about 1/2 gallon per square foot. Submersible pumps are used to move the nutrient solution from the tank to the benches. Gravity brings it back, usually through the same pipe system.

Most benches are designed with grooves to allow the surface to dry rapidly once the solution is removed. This prevents pools from forming if the bench is not perfectly level and also reduces algae growth.

Flooded floors are becoming more popular in some areas especially in Florida. The advantage is the lower cost of not having to install benches. Typically a floor system will cost \$2-\$3/sq. ft. vs. \$5-\$6/sq. ft. for a bench system installed.

In the floor system, there are no aisles, and all the area can be used for plants. The key to a good system is a level floor. A laser transit has worked well for setting the screed boards for the three-inch-thick concrete. Grooves leading to drain tiles that return the nutrient solution to the tanks are cut later.

What are some of the benefits of these systems?

Less labor. The time needed to setup and operate the watering system is just about eliminated.

Uniform plants. Every plant gets the same amount of water.

Nutrient solution is recirculated, eliminating the potential for groundwater pollution. Growers who are using the system change the solution every few months to once every few years. Water is added as

needed. Nutrient concentrations, pH and salt levels can be monitored and adjusted continuously with a controller. Less water is needed to grow a crop.

Less fertilizer used as none is leached. There is a potential for higher salt concentrations, especially in long-term crops. Because the nutrient solution is applied to the bottom of the pot, the highest salt concentration frequently occurs near the surface of the soil.

Flexibility. With most bench or floor systems, you can use any pot between 3 in. and 3 gal.. Spacing can be varied as needed. You are limited to using only one size pot per bench and in controlling the water level and time for each size container.

Adaptability. Ebb and flow can be used in most existing greenhouses and works well with fixed or movable benches.

Lower humidity, because the leaves remain dry. The dry bench surface also lowers humidity and increases the temperature in the crop area.

Less diseases. Although there is the potential for spread of disease, growers who are using the system have not had any major problems. In research that was conducted at the University of Connecticut on lettuce during the 1970s, no disease problems were observed. Cleaning benches with an algicide between crops and keeping tanks covered will reduce algae problems.

To date the ebb and flow system has worked successfully with many crops including poinsettias, kalanchoes, mini roses, Christmas cactus and chrysanthemums. Research on the production methods for other crops is being conducted at several universities.

