Water and Resource Efficient Plant Propagation

John Kabashima
Environmental Horticulture Advisor, University of California Cooperative Extension, South Coast Research and Extension Center, Irvine, California

Cooperative extension is part of the University of California's (UC) Division of Agriculture and Natural Resources (DANR). DANR is the only statewide division within the UC system. DANR was started in the late 1800s to help farmers use science-based data to improve their farming practices. As urban areas developed in the state, environmental horticulturists have joined farm advisors to work with the horticulture and landscape industry.

Cooperative Extension (CE) acts as a conduit for information from DANR to their clientele and from the clientele to the DANR. CE advisors often try to interest basic researchers in DANR to conduct research which would be applicable to the industry. CE advisors also take basic research results and try to apply that information and seek adoption of new information and techniques by industry to improve their professionalism and their productivity. An analogy would be to look at DANR as a big old tree. We have all this information stored in our roots and trunks. CE is like the fruit of that tree or the harvest of the information in that big vast knowledge base. CE then takes the seed of the fruit and plants it in growers operations to improve their growing practices.

California has been experiencing a severe drought. Because of this, several researchers have been conducting research to reduce plant water use by applying irrigation more efficiently using specialized tensiometers and computers to water the plants extremely accurately. The need for such research by scientists such as Drs. Dave Burger and Heiner Lieth at U.C. Davis was timely because many growers are still convinced that hand watering is the most efficient method of irrigation. However, it has been proven beyond a doubt that this is not only the most inefficient method of watering, but also leads to increased chances of disease. We also face regulatory problems with runoff from nurseries. Several nurseries in Orange County are under permit restrictions that limit the pounds of nitrate in runoff water per month allowed from their operations. Two of the nurseries have opted to comply by partially recapturing their runoff and using drip irrigation whenever possible. One nursery elected to comply by using computer-controlled irrigation to minimize runoff by more accurately controlling their irrigation run times and using drip, pulsed, and subirrigation. Research conducted by various advisors throughout the state to demonstrate this new technology was at the insistence of Burger and Lieth, who wanted their new technology made available to growers to help them deal with these problems.

Improperly spaced sprinklers and system design are a major problem in the nursery industry. Five CE offices (Los Angeles, Riverside, San Bernardino, Orange, and San Diego) with funding from the Metropolitan Water District developed educational materials to train irrigators to audit and schedule their irrigation more efficiently and to use crop coefficients and reference evapotranspiration to determine the actual water needs of their particular crop and then apply that water uniformly. The information to develop these training materials came from U.C. DANR basic research such as how plants use water, and ways of

measuring plant water use with evaporation pans, atmometers, CIMIS (California Irrigation Management and Information System) reference evapotranspiration, and direct measurement of soil media moisture using specialized tensiometers connected to computers.

Some of the topics covered in this training include knowing the size of the soil reservoir, the precipitation rate (PR) of the irrigation system, the distribution uniformity (DU) of the system, the crop coefficient, and water-conserving methods such as drip, subirrigation, ebb and flood, and computer-controlled tensiometer irrigation.

U.C. DANR, like the industry it serves, has gone through the recession and severe budget cutbacks and has had to modify how they conduct business to make up for these cuts. The renovation of an existing old greenhouse structure into a state-of-the-art computer-controlled greenhouse is an example of how I have tried to deal with these budget cutbacks. In April of 1994, volunteers from University of California Cooperative Extension, the nursery industry, Orange Coast College, and the greenhouse manufacturing and supply industry helped remodel an existing greenhouse at the South Coast Research and Extension Center. This greenhouse is now a state-of-the-art research and demonstration greenhouse being used to conduct research on ornamental plant production and propagation, and as a permanent demonstration greenhouse featuring various technologies. Examples are: positive pressure cooling, rolling benches, Biotherm starfin heating system using a high-efficiency low-mass boiler, high-tech soil tensiometers to measure the soil moisture tension and turn irrigation on and off, state-of-the-art sensors (temperature, light, and humidity), motorized vent and curtain systems, high and low-pressure fog systems. All of this is controlled by QCOM's Gem III environmental control software and/or stand-alone zone controllers.

This has been a dynamic process with donations constantly being added and growers visiting and asking questions such as, "how long should I turn on my fog or mist system, what is the difference between a high-pressure fog system and a low-pressure compressed-air fog system", giving us ideas on what type of research is needed.

This state-of-the-art research and demonstration greenhouse was possible in spite of the recession and severe budget cutbacks because of donations from companies such as QCOM, Agratech, Biotherm, MicroCool, Spraying Systems, Cravo Inc., Bacchus Industries, Arthur Enterprises, PTI Gravel, El Modeno Gardens, and volunteers from the university, nursery industry, and Orange Coast College.