Introduction to Drip Irrigation of Vegetable Crops and the Short Course

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The American Society for Plasticulture (ASP) was pleased to sponsor the short course "Drip Irrigation of Vegetable Crops." It is appropriate for ASP to undertake such sponsorship, because many of its members were instrumental in the development, manufacture, and application of drip irrigation to vegetable crops in the United States.

Drip irrigation as a concept or idea originated in Germany during the 1860s when a type of drip irrigation was developed for subsurface irrigation Perforated pipe was introduced later in 1920, but it was not until the development of polyethylene during and after World War II that drip irrigation became commercially and economically feasible on a large scale.

R. Chapin in the United States, V. Hansen in Denmark, and S. Blass in Israel all were responsible for the early developmental work with drip irrigation. In the 1960s Chapin was an early manufacturer and user of drip irrigation in the production of greenhousecrops. He promoted this watering method because of its water conservation, labor savings, and improved quality of crop production. He then expanded his research efforts and developed the lay-flat twin-wall drip line for use with row crops (Chapin, 1969). The first successful commercial use of drip irrigation on vegetables in the United States was conducted in 1963 by N. Smith, a county extension agent on Long Island, N. Y. Smith used Chapin's twin-wall linear drip line on tomatoes and melons.

In 1971, Chapin and Chapin reported that interest in drip irrigation technology had increased dramatically. Small experimental plots had been replaced by numerous test plots around the country, and large commercial acreages of vegetable crops, such as tomatoes, melons, peppers, and eggplants, were being drip irrigated. At this time, other researchers/extension specialists were working on drip irrigation of vegetablecrops; e.g., with staked fresh-market tomatoes in California (Hall, 1971) and with lettuce in Arizona (Oebker and Kuykendall, 1971).

Throughout the 1970s new types of drip tubing, such as DuPont's Viaflo, a porous, plastic irrigation tubing (Bergman et al., 1973) were developed and tested; new filtering systems (screen and free-flow sand filters) were developed by A. Morrisand K. Phillips, engineers with the Yardney Co.; and research continued to expand the number of vegetable crops being drip irrigated. Water management of drip irrigation systems and drip irrigation used in conjunction with plastic mulches also received increased attention (Liss and Pollack, 1975). During this decade, drip irrigation began to be viewed as not just an efficient vehicle for delivering water, but as a means of delivering nutrients to the plant root zone. One of the early researchers on injection of fertilizers (fertigation) and chemicals (chemigation) was H. Bryan, Univ. of Florida (Bryan and Duggins, 1977). Refinement of techniques for simultaneously applying plastic mulch, drip irrigation tubing, and fumigating also was researched in Florida (Canninghton et al., 1975). In 1975, R. Grove, speaking at the 12th National Agricultural Plastics Conference, stated, "drip irrigation is going to revolutionize the very life and existence of many growers in the world in the coming years."

The latter part of the 1970s saw research that considered the physical, chemical, and biological qualities of water used in drip irrigation in light of their potential to cause clogging of the drip tube. This led to work on the use of chlorine and acid treatments (Davis et al., 1977) of the drip irrigation system as a means of preventing clogging. For example, research was conducted on the control of certain types of slime clogging in drip systems (Ford, 1977) Stall et al. (1977) reported continued increases in the use of drip irrigation in conjunction with plastic mulches on vegetables in Florida. They also reported increased fertilization via the drip irrigation system to help eliminate potential salt problems and as a means of supplying nutrients when double-cropping was conducted with plastic mulch, Also in Florida, Overman (1977) began investigating the application of nematicides via the drip system.

In the 1980s research began on injection of systemic fungicides through the drip line to control diseases (Johnston and Smith, 1980). Considerable numbers of research and extension demonstrationscontinued refining thescheduling of drip irrigation (Bucks et al., 1980) fertigation programs for both monocropping and double-cropping situations, and evaluation of new products and technology. Fertigation research work such as that of Paterson on eggplants (1981) and tomatoes (1983) continued to encompass a greater number of vegetables. Much research concerned the beneficial effects of using different plastic mulches and drip irrigation for specific vegetable crops, such as tomatoes (Bhella, 1986a) and watermelons (Bhella, 1986b). In addition to horticultural research, information concerning the economics of drip irrigation usage also was being assembled (Dhillon, 1981; Sanders et al., 1986). Research on the continuous use of polyethylene mulch beds with drip irrigation (Clough et al., 1987) is indicative of the kind of applied research programs continuing at present in many locations around the United States.

Thus, we arrived at the short course with an extensive body of knowledge on the use of drip irrigation for vegetable crops. The objective of our speakers at this short course was to impart to participants some of this knowledge in thespecific areas of design, installation, operation, maintenance, fertigation, and water management, and also methods of extension of this technology to growers.

A final thought: as competition for limited water resources increases, drip irrigation will be used on more vegetable acreages in the United States, When used in conjunction with plastic mulch, it creates a closed system with an ideal environment for maximum vegetable crop growth/ yields and, if used effectively, minimal chemical leaching. Continued interaction and cooperation among researchers, extension professionals, vegetable growers, and industry representatives will expand the usage of drip irrigation into the next century and make Grove's prediction of 16 years ago a reality.

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