# Training Future Horticulturists; and an Example for a Leading National Program on Efficient and Modern Apple Production in the US

**Esmaeil "Essie" Fallahi***

Professor of Horticulture, Director of Pomology and Viticulture Program, Parma Research and Extension Center, University of Idaho, Parma, Idaho 83660, USA

*Corresponding author: efallahi@uidaho.edu

## Abstract

The importance of "horticulture" has arisen way above just being a "branch of agriculture". Horticulture by definition encompasses the science and art of growing edible and ornamental crops at an intensive scale. Economically, horticultural plants are grown in less acreage but have more cash values than agronomical crops. From the stand point of human health, horticultural crops are the main sources of vitamins, minerals, enzymes, fiber, and other nutritional values required in the human daily diet. Thus, it is not surprising that horticultural crops may rank second in the list of national income, next to petroleum, in many oil-producing countries, including Iran. Therefore, training future horticulturists, able to fulfill needs of future generations, is an extremely important task of educational institutions. Training merely for the sake of increasing the number of graduates in horticulture is not a wisely-designed goal for any institution. Future horticulturists should be trained to face major challenges such as drought, scarce usable land, disappearing-valuable germplasm, and environmental and human safety. To achieve this critical goal, it is essential that all natural resources, including land and water, are used most efficiently and molecular and genomic technologies are employed to increase and induce resistance of horticultural crops to pests and diseases, while always keeping human health and the environmental safety in the forefront of every task. As example, successful and long term projects in irrigation and high density systems of apples, conducted at the University of Idaho, Pomology and Viticulture Program in the United States during the past 27 years will be discussed. In a long-term study, use of crop evapotranspiration (ETc), when a precise crop coefficient (Kc), ground shading, and canopy maturity were used, a reliable tool for determination of water requirement for 'Fuji' and 'Gala' apples was achieved. Each tree during a growing season received 5617 L to 6461 L in full sprinkler (FS) and 2921 L to 3996 L in full Drip (FD) systems. Using a partial root zone-drying regime through a micro sprinkler system (PRS) reduced fruit size but improved fruit color. In general, fruits from trees with a deficit drip at 65% of FD were smaller but had better color with an acceptable level of production. Fruits from trees with 50% of FS or FD systems were too small and had poor quality for market. When the 65% of FD rate was applied to only one of the alternating sides of the tree every other week (PRD), fruit size was larger than those with deficit drip applied to both sides of the tree every week. Trees with a FS system had slightly lower sugar. 'Fuji' apple quality was optimum

when leaf nitrogen levels were 2 to 2.3% (dwt) and soil application was about 40 g N/tree. Water-deficient trees had lower leaf and fruit K. Root distribution was affected by the irrigation treatment. 'Gala' tree on B.9 was more precocious and fruits matured earlier than those on other rootstocks. A well calculated ETc-based FD system is recommended over other treatments for production of apple fruit with high quality. The best results from our long-term irrigation were applied in a serious of high density and ultra-high density apple orchards with various architectural designs and new generation of rootstocks. The outcome of this project has increased production of high quality apples so that growers in several States of the United States, including Idaho, New York, Washington, Utah, and Colorado are producing and selling their crop at the highest prices in the world market. A pilot plan of this long-term study is being experimented at the Arzhang Kooh Research Center, Fashandak, Taleghan, Iran. Despite difficulties, this research center is becoming one of the most advanced centers for educating horticultural graduate students and faculty who are interested in production with maximum efficiency in Iran.