Alternative intensive production systems for stonefruit and citrus crops

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Research and development of alternative approaches to crop management for citrus and canning peaches grown in the Murrumbidgee Irrigation Areas (M.I.A.) N.S.W., has shown greater productivity through improved cropping efficiency. This has been achieved through manipulation of planting density, tree shape, structure and total canopy architecture to achieve high early productivity and satisfactory performance in the longer term.

Canning Peaches

An experiment comparing three new methods of intensive peach production was planted in 1977 using self-rooted cuttings of Yanco Queen peach. The achievement of optimum production efficiency and the compatibility of uniform planar fruit canopies to mechanized management were the main objectives of the trial (McKenzie *et* al, 1976). At four years of age, the canopy development in each of the respective systems "Thin-Wall Oblique Palmette Hedgerow" (Hedgerow), "Tatura Y-trellis Canopy" (Tatura) and the "Self-supporting double-row opposed planar A-canopies" (MIA) was complete and three crops have been harvested from them.

The M.I.A. system has consistently outyielded Hedgerow and Tatura in all crop years, with second crop yields exceeding average district yields from conventional plantings of mature bearing age. It produced stronger tree growth, superior fruit size and quality, and presented the crop uniformly over the entire canopy surface. Its ability to achieve higher productivity and better canning yields was related to the doubling of tree numbers per canopy unit compared with Tatura. This provided a proportionate increase in root volume per canopy. Under stress conditions, higher leaf water potentials were recorded for M.I.A. than for Tatura despite the fact that irrigation frequency, rate of water application and soil moisture conditions were similar. These preliminary measurements indicated that the M.I.A.'s increased root/leaf volume gave it a greater capacity to tolerate high levels of evaporative demand. It can also be more simply mechanized for all management practices and either mechanical harvesting or mechanically-aided hand picking is possible.

High Density Dwarf Orange Trees

From an experiment investigating the effect of planting densities on productivity, very high early yields have been achieved using plant populations in excess of 3000 trees/ha. Although fruit production/tree has stabilized at such high densities after 7 years, this is more than offset by the greater number of trees per hectare, producing a cumulative yield of 260 t/ha compared to 100 t/ha achieved from spacings of 1042 trees/ha. Cumulative yield response is closely related to tree numbers for any particular row and within-row spacing, and planting density has produced little effect on fruit quality. This has allowed the development of cumulative yield and cropping efficiency response models with planting density. From these, yield optima for various within-row spacings at fixed row spacings have been developed and are being used to determine the optimum tree spacings for management, harvesting, tree-size control and crop protection consistent with early economic production and continued high productivity of dwarf orange trees.

1. McKenzie, D.W., J.S. Dunn, M. Stolp and R.J. Hutton. 1976. Horizontal canopy orchards for mechanical harvesting. Acta Horticulturae,No. 65. Symposium on High Density Planting.