

Developing Intensive Apple Orchards in the Batlow District of Australia

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Batlow district is situated in the southern highlands of New South Wales (NSW) in the southeastern part of Australia at 36°S latitude. After its early beginnings in the 1850s as a gold prospecting area, miners turned to farming pursuits when the alluvial gold ran out. The first commercial orchards were planted in the 1890s and the industry developed to the point where, in 1922, local orchardists started a cooperative coolstore. Batlow was the first apple growing district in NSW to construct coolstores and still has the biggest coolstore and packing complex in Australia. The combination of fertile basalt soils, high annual rainfall of 1320 mm (52 inches) and a clean alpine environment has helped to produce fruit with flavor and excellent keeping qualities. Orchards in the region range from 500 m to 1000 m (1600 to 3300 ft) above sea level.

The area is famous for premium apple production and represents approximately 10% of the national crop and 45% of the NSW apple crop. Total apple production is estimated at 45,000 metric tonnes. Stone fruit production is estimated at 2,500 metric tonnes and pear production is estimated at 500 metric tonnes. Today there are over 65 apple growing businesses in Batlow and close to 2000 ha (5000 acres) of orchards.

While Batlow is famous for its quality Red Delicious apples and is the proud home of the Bonza variety, more recently apples such as Gala, Fuji, Braeburn, Pink Lady and Jonagold have become popular additions to the industry's portfolio. Changes in orchard design have seen a move toward more intensive plantings. Trellising and changes in pruning

techniques have resulted in earlier production from the orchard. Extensive use of hailnet to reduce the risk of hail damage also has occurred in the district.

Vanzella Bros., Wilgro Orchard and Mouats Farm have accepted the challenge to move into the newer varieties and more intensive orchard management systems. We operate family orchards, mostly north of the township of Batlow. In general, the uptake of dwarfing rootstocks has been slow in Australia with the semi-dwarf rootstocks having greater acceptance. We believe that the Batlow district is well suited to intensive orcharding using dwarfing rootstocks. We are in a state of constant change (and poverty!) and believe the advantages of dwarfing rootstocks will eventually provide greater economic rewards.

Ralph Wilson and wife Judy own Wilgro Orchard, which they purchased 15 years ago. There are 12 ha (30 acres) of apples and 1.75 ha (6 acres) of sweet cherries. All trees are under 12 years old with 77% on dwarfing rootstock and 16% on semi-dwarfing rootstock. Major apple varieties are Gala, Jonagold, Braeburn, Pink Lady, Fuji and Red Delicious.

Greg Mouat and his wife Kristin run an orchard consisting of 9.2 ha (23 acres) of apples and 0.8 ha (2 acres) of cherries. During the past 4 years he has undertaken overseas study tours to major pome fruit growing areas in Washington State, USA; New Zealand and Europe. Subsequently he has begun planting an intensive orchard system using M.9 and M.26 rootstock, so far totaling 2.4 ha (6 acres).

Adrian Vanzella, along with brothers Gene and Tony, carried on from their father who commenced orcharding in the 1930s. They have 76 ha (188 acres) of

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orchard of which 24 ha (59 acres) are on dwarfing rootstock. Adrian's role in this partnership is in planning and developing new orchards, which now are totally on dwarfing rootstock.

SITE SELECTION PREPARATION

Site selection is an important element in developing a successful orchard. Generally because of the lack of large expanses of ideal orchard land, we have had to modify existing land rather than having the luxury of selecting the best site. Aspect (preferably a northeastern exposure; the sun is in the northern sky) and slope are important but are expensive to modify, whereas drainage can be modified before planting. Subsurface rubble drains and piping have been used to improve drainage before planting. Frost is a consideration but it is not a large risk factor in Batlow generally and especially in our part of Batlow. On those sites that are frost prone, overhead sprinklers

have been used and less frost affected varieties planted. New orchard land is still available, but on some orchards replanting is the only option.

The better soils in Batlow are red basalt soils but often, especially in our area, shallow granite soils predominate. Soils generally are acidic with some replant sites at <4.5 pH. Generally lime is applied before planting to bring pH up to the optimum of 6.5-7.0 pH. Soil tests are carried out and nutrient levels adjusted. Phosphorous is generally low and poor growth has been observed when phosphorous levels have not been lifted. Nitrogen levels are quite good. Organic matter is needed in most soils and can be lifted with the addition of manures. Generally this is an area where more effort can repay with increased tree growth in the vital first 3 years.

Irrigation is a very important component in site selection. Trees are mostly irrigated using one self-compensating dripper per tree delivering 4 liter/hr. Recently there has been a move to more than one dripper per tree so that there is a better wetting pattern. Pulsed short duration irrigation is proving more efficient than long deep irrigations on dwarf trees.

The availability of irrigation water and access to that water are increasingly becoming issues.

PLANNING THE ORCHARD

We all agree that it is in the area of planning that the success of the orchard can be most influenced. It is very hard and expensive to correct poor planning at a later stage in the orchard development. We have all wished that we had planned a block better rather than rushed the development of the new block. Knowing what to plant and how occupies a great deal of our time when sitting on the tractor. Observing what other people are doing around us, in the rest of Australia and overseas is the most effective way to develop ideas about how we will develop our next orchard. We are always asking ourselves and anyone else who may have the magical answers what to plant and what system to use. The market does have a large influence on what variety and that is why our orchards are constantly changing. The growing market acceptance of the newer varieties and the poor market returns for the "commodity" varieties means that we are constantly looking to upgrade our orchards.

Rootstock and Variety Combination

Once the site has been selected then the preferred variety has to be selected. We

would all like to know what "the next big variety is" but ultimately have to draw upon our own expertise in selecting the variety to plant. Often this decision is not totally market driven, as the market may not have given clear signals about a new variety. This is where reading, talking, observing and asking questions from a variety of information sources is the only way to decide which variety to plant. There has been a big switch to the newer varieties Gala, Pink Lady, Braeburn, Fuji, Jonagold and Sundowner. Usually blocks are planted with 4 rows of the main variety and 2 rows of a pollinating variety. There is a trend toward solid blocks of a variety with crabapple pollinizers or inter-row pollinizers of a different variety.

Rootstock selection is influenced by many factors such as availability, scion variety, soil type, virgin or replant soil, machinery, etc. Because of the problems with availability, we have developed layer beds so that our rootstocks of choice can be used. The dwarfing rootstocks M.9 and M.26 have been hard to source in the early 1990s but, with increased supply (that we have grown ourselves), this problem has not been an impediment. With both M.9 and M.26 we have the EMLA clones and standard non-indexed clones available. Some of the better clones used in Europe and the United States have not been available in Australia. Hopefully these, as well as some of the newer dwarfing clones, will be available in the near future.

Many Australian orchardists have steered away from the dwarfing rootstocks because of the perceived problems with lack of tree growth, fruit sunburn and woolly apple aphid (WAA). Also some growers believe that dwarf trees mean low yields. Initially tree growth was a problem with us but, with more information and experience, we are finding that excess tree growth also can be a problem on close-planted blocks. Sunburn indeed can be a problem but mainly on weak trees. Healthy dwarf trees that receive adequate irrigation do not suffer much more than vigorous trees. Woolly apple aphid has provided some problems and a solid chemical program has been required in many orchards. We have also found that an integrated approach has enabled some of us to control WAA without any chemical intervention. We do not think that WAA should be a deterrent to using dwarfing rootstocks.

There is no doubt that dwarfing rootstocks require a different approach to the more traditional rootstocks. We have to ensure that the dwarf tree gets away to a very good start and that the fruiting

canopy is developed before significant cropping takes place.

Tree Quality

The need to improve tree quality is probably the greatest single advance our industry could make in getting intensive orchards accepted. Too often we start with a weak rod or whip, which means that we have to grow a tree in the first year. This in turn puts back early production and breakeven time scales. Tree quality from nurseries in Australia does need to improve if the advantages that intensive orcharding could provide are to be realized. Too many times we have planted standard trees because they were the only ones available. Well-feathered and well-rooted trees that are free of defined virus are as rare as "hens' teeth," in our opinion. Not that the nurseries are the only ones to blame, growers have not been united in their requests for the ideal planting tree.

It is important to get well-feathered, virus-tested trees from the nursery. The added cost of intensive orchards can be repaid only if returns are forthcoming early in the life of the orchard. We have also found that, with constant varietal change, the ability to capitalize on early production using intensive orcharding practices has produced good economic returns.

Tree Density and Arrangement

Many factors influence tree density and arrangement. Each of us has developed different intensive orchards because of different influences at the time. Planting distances have been dictated to some extent by existing equipment, hailnet, slope and existing orchard configurations. Row widths vary from 3.5 m to 4.5 m (11.5 to 14.8 ft) with the majority at 4 m (13.1 ft). This distance allows hailnet to be erected and existing machinery to be used. Inter-row spacings of between 1 m and 1.75 m (3.2 to 5.7 ft) have been used, with most plantings around 1.25 m (4 ft). Tree densities on dwarfing rootstocks of between 1250 trees/ha through to 2850 trees/ha (505 to 1150 trees/acre) have been used by us. There is little planting at the higher densities associated with super spindle.

Single north-south rows are preferred. A small 3-row bed has been planted but the problem with weeds and excess tree growth means that the higher labor input is barely recoverable compared to single-row planting.

Tree densities of between 2500 and 3000/ha (1000 and 1200 trees/acre), which are arranged in single rows, are preferred

at this stage for non-hailnetted blocks. Where hailnet is used, tree densities of between 1400 and 2500 (565 and 1000 trees/acre) are preferred.

Tree Support

Tree support is very important. Some of our earlier attempts have been improved. Nearly all our dwarf trees are supported by a 3-wire trellis using treated pine posts. Initially we thought that we would grow low pedestrian orchards like those we had seen in Europe. This idea changed when we realized that to get the production we required we would have to use the "free space" and grow our trees taller. Today we are growing dwarf trees to about 3 to 3.5 m (10 to 11.5 ft) tall. This change meant that our trellis system would need to be quite robust in order to support the trees. Generally we use 3 m treated posts that are rammed into the ground 0.6 m (2 ft). End posts are usually 150 mm (6 inches) round with inter-row posts 100 mm (4 inches) round. Posts are placed 15 m (50 ft) apart and high tensile wire is placed at 0.6 m (2 ft) with 1.3 m (4.3 ft) and 2.4 m (8 ft) above the ground. End assemblies are usually 2.4 m long and

150 mm round posts rammed 1.4 m (4.5 ft) into the ground at a 30° angle.

Where hailnet is going to be used over the orchard, we have tried using hailnet posts as the trellis posts and erecting the hailnet 3 or 4 years after planting. This saves on the expense of trellis posts when hailnet posts will have to be used at a later date.

The 3-row bed block has been planted with 2.4 m treated round posts beside each tree. Trees in this block are only 2 m (6.5 ft) tall.

TREE TRAINING AND PRUNING

As orchardists who have changed from older extensive orchards, we have had to come to grips with the high level of initial tree training required in an intensive orchard. Intensive orchards demand much more attention to detail and repay the increased effort applied in the early years.

We have experimented with many tree-training techniques to control vigor and position limbs. Initially we were tying down the central leader to maintain a pedestrian orchard but have now gone away from that idea, as we want a taller tree. String, rubberbands, toothpicks, limb

spreaders and weights have been used to position limbs with varying degrees of success. Generally string is used to tie down larger limbs to between horizontal and 30° above horizontal. We are also using limb spreaders. We have found that these techniques are useful but expensive. Many different tree fasteners have been used to tie the tree to the wires. Of late, we are using a plastic hollow tube 5 mm thick to tie up the trees. Our aim of recent years is to develop a "tame" tree with no strong upright limbs, no large limbs and a weak top. Trees are generally not trained with multiple tiers of permanent structural wood; instead we are looking to develop many light limbs that can be replaced or renewed when required. Most of our trees are trained to a central axis/slender pyramid style. Growth in our strong soils can be excessive, so we try to crop the tree to reduce vigor as well as normal summer and winter pruning.

The move to intensive orchards using dwarf rootstocks has been slow in our area, but we see the benefits of such a move. It will be interesting to see the developments in orcharding practices in the next few years.