

# A Leap Forward in Orchard Density—Spindle to Super Spindle, the British Columbia Experience

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JAMIE KIDSTON

We grow apples in the Okanagan Valley of British Columbia, near the west coast of Canada. Apples are also grown in the Canadian provinces of Ontario, Quebec, New Brunswick and Nova Scotia. It is interesting to note that these growing areas are in fact all south of the 49th parallel of latitude which defines most of the border between Canada and the USA. The Okanagan Valley extends north from the 49th parallel to about latitude 50° 30' north.

I live in the soggy north end of the valley, where annual precipitation is approximately 385 mm (15 inches). Bruce Currie farms in the middle of the valley, while Rob Dawson is in the hotter, more arid south near the USA border. Annual precipitation in the south is approximately 255 mm (10 inches). There is a considerable difference between apples grown in the north and south ends of the valley.

I farm 16 ha (40 acres) of orchard. This was first planted by my grandfather almost 100 years ago. My father farmed the orchard for 50 years and I have done so for the past 23 years.

Tree fruits have been grown in the Okanagan Valley for more than 100 years. Early plantings were on seedling rootstocks at wide spacing. By the early 1980s most apple trees were being grown on size-controlling rootstocks, mainly M.2, M.4, M.7, and some M.26. Spacings typically were 5 x 5 m (16 x 16 ft).

Dwarf plantings had been established earlier by a few pioneers, but this practice was not popular because of limited avail-

ability of M.9 rootstock and, more importantly, a scarcity of relevant horticultural knowledge.

In the mid-1980s interest in dwarf plantings was rekindled through grower trips to other areas. The first IDFTA conference I attended was in Rochester, New York. I stepped off the bus at the first tour stop and found that the whole orchard was below my eye level. That was a revelation, and I vowed that I would work toward throwing away my ladders.

In 1988 I planted my first M.9 trees, spaced 1.5 x 3.5 m (5 x 12 ft). I was at the low end of the learning curve, as was everyone in the valley, and I made many mistakes in pruning, feeding and cropping. Although this planting was not very successful, it did show me that M.9 is a precocious and productive rootstock. However, under my soil and growing conditions the rootstock did not have sufficient vigor to grow a strong lower platform of branches and then continue up to adequate height. Another drawback was the necessity to tie branches down to promote cropping and then a year or two later to tie them up under crop load.

In 1990 I again planted M.9 trees at 1.5 x 3.5 m (5 x 12 ft). It happened that I had a dozen or so trees left over, so I planted these at 30 cm (12 inch) spacing between the permanent trees and planned to use them as spares. I did not head the spare trees and, in fact, treated them with benign neglect. The next year the permanent trees, which had been headed after planting, had grown moderately well but had no crop, while the spare trees had no strong

*Be persistent and keep replanting . . . do not try to keep the trees too short.*

branches but lots of fruit. This was the genesis of my super spindle experience.

In 1992 a few brave (or foolhardy) growers in the valley decided to plant super spindle more extensively. The three of us on this panel were in that fraternity. Approximately 10 ha (25 acres) in total were planted.

In the fall of 1992 the super spindle growers traveled to Europe to study similar plantings. We visited southern Germany and the South Tyrol area of Italy where the oldest super spindle plantings had been in the ground about 6 years. Our one season of experience with the plantings made our trip more meaningful than if we had gone before planting. The super spindle plantings we saw were very interesting and reinforced our idea that we were on the right track.

Super spindle plantings are now common in the Okanagan Valley, and almost all growers who have tried this system are continuing to use it.

A word on the definition of spindle vs super spindle is in order. In British

Columbia, tree densities for spindle and super spindle plantings range between 1,400 to 2,500 and 4,000 to 8,000 trees/ha (560 to 1,000 and 1,600 to 3,200 trees/acre), respectively. Although tree densities are often used to compare spindle vs super spindle, the most important differences between the plantings are that super spindle trees are not headed at any time until they reach their full height and that all strong branches are removed.

My standard super spindle tree spacing is now 60 cm x 3 m giving 5,500 trees/ha (2 x 10 ft giving 2,180 trees/acre). The support system is a 4-wire trellis with the top wire at 2.2 m (7 ft). The trees quickly reach their full height, and a block can be in full production in about 3 years (depending on variety).

I have two super spindle plantings of Spartan. Spartan is a variety that was bred many years ago at the Agriculture Canada Research Station at Summerland, BC. It suits our climate very well, especially in the cooler northern end of the valley. Like all varieties, it has its specific problems. It is not a precocious variety and has a tendency to produce lots of blind wood and few weak branches and dards.

My super spindle plantings of Spartan have taken longer to produce significant crops than similar plantings of Gala or Golden Delicious, but they are coming along.

My training procedure with the super spindle trees is to remove strong branches as they appear—the 50% rule is sacrosanct. The strong branches are removed at any time of the year but mainly in the summer as they show up. The weaker branches I allow to grow out for a year, then if they are too long I head them back into 2-year-old wood after blossom. The leader is not touched until the tree is at full height. No branches are tied up or down. The tops of the trees are allowed to grow well above the top wire and are then headed back to a weak side branch, again after blossom time. When the tops of the trees become stronger with age I treat the topping cuts with NAA to reduce vigor.

A super spindle planting in full production is a wonder to behold—a wall of apples of uniform size and color. It is a sight that gladdens the hearts of growers... and pickers as well.

#### BRUCE CURRIE

My father-in-law and I have been farming 20 ha (50 acres) of apples for the last 25 years at Peachland, British Columbia. We are located midway between

Pentiction and Kelowna at about 490 m (1600 ft) above sea level.

Over the past 10 years we have changed the orchard from 120 to 10,000 trees/ha (48 to 4,000 trees/acre). To do this, we moved from seedling rootstocks to M.9 and B.9 rootstocks. The soils in our valley are generally very light and our growing season is limited by latitude, which makes the control of these dwarfing rootstocks very manageable. In fact, with the dwarf trees we must push for early, vigorous growth in order to fill the allocated space. We are all replanting into old orchard soils and apple replant disorder has been a problem. I have used several methods to combat this disorder, from importing virgin soil, to fumigating, to mixing in compost. For the past few years I have been working compost into the planting trench in areas that have a lot of sand and gravel or where there previously had been poor tree growth. The growth response to this treatment has been improving each year as I increase the amount of compost added.

One of my earliest plantings using dwarf trees was a slender spindle planting at 0.9 x 3.3 m (3 x 11 ft) with an anticipated tree height of 1.8 m (6 ft). This was to be a pedestrian orchard where all work was to be done without ladders. The yields from this planting were inadequate and what I had to do was put in new posts and install more wires to train the trees to 3 m (10 ft) height.

A later planting, at considerably higher density, was Fuji on M.9 at 0.3 x 3.3 m giving 9,900 trees/ha (12 inches x 11 ft giving 3,960 trees/acre). The trees were trained in a V, with alternate trees in a row leaned in opposite directions. This planting was quite manageable, but I found that the Fuji should have been kept as a single vertical row and been planted at about 0.5 m (18 inches) instead of 0.3 m (12 inches) apart. Lack of sufficient sunlight caused some problems. Today I am planting at 0.5 m x 2.7 m = 8,070 trees/ha (1.5 x 9 ft = 3,230 trees/acre) using unfeathered whips on B.9 rootstock.

Royal Gala has been the main variety planted over the past 5 to 8 years both in my orchard and in the Okanagan Valley in general. Many growers, myself included, are looking for the next new variety. I have planted Honeycrisp, which matures just after Gala, and Silken, a recent introduction from the breeding program at Agriculture Canada Research Center, Summerland, which matures slightly ahead of Gala. Of major interest in our valley is a chance apple seedling discovered in the south end

of our valley about 15 years ago that has been named Ambrosia. This precocious and productive variety is ideal for our super spindle planting systems with its very upright and spurry growth. Ambrosia fruit has passed all our postharvest tests without any negative findings. For British Columbia growers, this looks like a winner.

Now for those of you who might be thinking about planting at 3,750 to 7,500 trees/ha (1,500 to 3,000 trees/acre), here are some lessons I have learned and errors I hope not to repeat. It seems that when you do something right when replanting an orchard the “rightness” is sometimes difficult to recognize, but when you make a mistake it is often very visible and costly to correct.

One of my favorite mistakes was to try to save on support posts by putting them too far apart. My earlier post and wire support systems tended to lean, and it soon became evident that more support was needed. The lesson was that the greater the tree density, the closer the posts have to be. Today my line posts are 7 to 10 cm (3 to 4 inches) diameter, driven 1 m (3 ft) into the ground and 7.5 m (25 ft) apart when tree spacing is 0.5 m (18 inches).

Another lesson learned the hard way was not to crop the tops of the super spindle trees until they had been trained vertically above the top wire and were strong enough to carry a load without flopping over and breaking.

Lastly, do not try to keep the trees too short. As mentioned before, my pedestrian planting just did not have enough production. This illustrates the wider lesson that sometimes good ideas are not as good as they initially appear to be or, to put it another way, what you gain on one end you find yourself losing on the other end.

Over the years, I have tried many training systems and planted at many densities. Today I believe that planting at around 7,500 trees/ha (3,000 trees/acre) in my location works best for me. Yields of 50 tonnes/ha (50 bins/acre) keep me working happily and keep my wife from wanting to sell.

#### ROBERT DAWSON

We own and operate 40 ha (100 acres) of apple orchards in the Similkameen Valley just north of the Canada-USA border. Our primary variety is Royal Gala and its sports, followed by Fuji, Granny Smith and a number of test varieties. In the early 1980s we became interested in trellised plantings, preferably using the M.9 rootstock. This interest led to a decision to plant Granny Smith and Royal Gala using

the central axis system. The varieties were a good decision. Unfortunately, we chose M.26 as the rootstock since M.9 with those scions was unavailable.

During the period from 1983 to 1991 we planted at higher densities beginning at 1250 trees/ha (500 trees/acre). As our confidence increased so did the density of our plantings. By 1991 we were planting 2250 trees/ha (900 trees/acre). During this period we switched from the central axis to the spindle bush system. We also switched to the M.9 rootstock. The first was a poor decision, the second a good one.

The productivity of our M.9 plantings was excellent. It also became obvious that these plantings could be successfully managed at much higher densities. Although we were increasing our planting densities each year, whatever the optimum was, it was at higher densities still. In 1991 we left several rows of a home nursery in place and developed these to a super spindle planting. The production of 20 and 40 tonnes/ha (20 and 40 bins/acre) in years 2 and 3 was very encouraging as was the quality of the fruit. We embraced the system and replanted 35% of our acreage, fine tuning the densities as we learned more.

We refer to our system as “super spindle,” but it is probably more accurately described as very high density planting using super spindle training techniques. Our tree spacing is generally 0.5 to 0.6 m x 3 m (20 to 24 inches x 10 ft) giving 5555 trees/ha (2250 trees/acre). Super spindle in Europe usually refers to plantings of 10,000 trees/ha (4,000 trees/acre) or higher. We do know

that our system works very successfully on our site and in our climate. Orchard development is always a work in progress so we have tried to distill some lessons that may be of value to others.

1. Plant trees on M.9 rootstock. When your nurseryman offers a great new rootstock that just may be the best one yet, ask if you can call him back. Go for a coffee or preferably something stronger. You are obviously suffering from stress to be considering the offer. Go for a walk through your Ottawa 3, P.22 or Mark blocks. Better yet, walk through your M.26 blocks. Call your nurseryman back as soon as possible while the impressions of the walk are still fresh in your mind. There are selections of M.9 suitable for almost all of your sites. The result will be higher yields, better-sized fruit, better grades and manageable trees.
2. Whenever there are two or more similarly effective systems, choose the simplest of these. If you do this often enough, you will in time have a simple and effective system. At the very least you will be able to explain to your employees what it is that you are trying to do.
3. If your orchards evolve to higher density plantings, always plant at a density at least 20% higher than you otherwise would believe is prudent.
4. Do not let the price of nursery trees frighten you. If returns for a new variety are high, pay the price. If returns are moderate, purchase less

expensive trees. Do not pay for branches you should cut off anyway. If necessary, grow your own trees (a last resort). Do not lower your densities just to save money on trees.

5. Renew between 5% and 10% of your orchard annually. Less than 5% means that the problems are only postponed and will be even greater in the future. More than 10% may result in cash flow problems in years 3 to 4.
6. Be persistent and keep replanting. Soon you will have an efficient and profitable orchard. You can now assure your neighbors, who thought you were crazy but are now trying to catch up, that it is really quite easy and that it will not take them long at all.
7. Select the variety that grows best for your site, provided the market returns for it are high.
8. It does not matter why the price for that new variety is high or why they pay more for the redder ones. The language of the market is price, listen to it.
9. Do not go cheap with your support system. Your pickers may prefer low trees but not that low.
10. Travel as much as possible and learn from other growers. You will learn best in warm climates during a Canadian winter. You will learn even more if the trip can be made tax deductible.