

# HIGH DENSITY TALL SPINDLE ORCHARDS IN VERMONT

Intensively-planted orchard plantings have been studied since the 1960's with the Slender Spindle system developed in Holland, and Vertical Axe developed in France in the 1980's. All of these systems are modifications of the basic central leader system, with primary changes in trellis design, tree spacing, and shoot manipulation being the main differences.

The development of smaller equipment, including narrow orchard tractors and taller tower sprayers, has further pushed the implementation of intensive orchard systems. Growers began to realize that a tree's photosynthetic energy could produce either wood or fruit, and that trellises could replace much of the structural function of large, strong trunks. Closely-planted trees with no large limbs, consisting almost entirely of very productive 2-3 year-old fruiting wood borne on the central leader could yield significant quantities of high-quality fruit with excellent light penetration into the canopy.

[Extensive multi-year research in New York](#), including work in Champlain Valley orchards, has shown the potential of intensive, high density (1000-1200 trees per acre) plantings in Vermont. Costs associated with establishing these plantings, including trellises, is around \$15,000 per acre, but early returns of a few hundred bushels per acre in year two and up to 1000 bushels per acre by year five quickly pay off the high investment required. Highly intensive systems such as these may not be for every grower now, but they will be a major component of the orchard industry in years to come.

In 2011, a model high density, tall spindle apple orchard was planted at the University of Vermont [Horticulture Research Center](#) with funding from the [Vermont Tree Fruit Growers Association](#) and USDA Specialty Crops Block Grant Program.

## Cornell Orchard System Training Fact Sheets:

- [Tall Spindle System: Planting, Pruning, and Training](#)
- [Vertical Axis System: Planting, Pruning, and Training](#)
- [Slender Pyramid System: Planting, Pruning, and Training](#)
- [Slender Axis System: Planting, Pruning, and Training](#)
- [Tall Spindle Orchard Information from the University of Massachusetts and Cornell University](#)

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