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A Double Row Alley-cropping System for Establishing Nut Orchards

One of the greatest deterrents to establishing a new nut orchard is the long period of time it takes from tree planting to first commercial nut harvest. At the Pecan Experiment Field, a pecan or walnut must grow ten seasons or more and maybe a little less for Chinese chestnuts before the trees produces enough nuts to warrant mechanical harvesting.

A decade is a long time to wait for a crop to return a profit. This delay in cash flow has led several growers to experiment with planting intercrops between trees during the establishment years. Many agronomic crops have been used as intercrops between young pecan and walnut trees including soybeans, wheat, corn and milo. Hay crops have also been used including several clover/grass mixes. One of the first problems growers face in planning a new orchard/intercrop system is deciding on the spacing for the trees. A spacing of 35' by 35' is frequently recommended when trees are the only consideration in orchard planning. Adding an intercrop into the mix makes things a little bit more complicated. Growers planning to farm between tree rows need to think about the width of their farm equipment and will it be possible to get a combine down between the trees rows. Row crop farmers often end up spacing their trees 50' by 50'. Wide spacing makes intercropping easier but seriously delays the onset for economically viable pecan yields.

Intercropping has one drawback often not considered when designing a planting plan. Planting a crop on both sides of a tree row makes it nearly impossible to access the trees for critical summertime tasks such as tree training, grafting, weed control, insect control, and watering. Lack of care during the early years of tree

growth can delay the onset of commercial nut production.

For establishment of new blocks of nut trees at the Pecan Experiment Field, a double tree row alley-cropping system was designed that is a compromise between trees and crops (Fig. 1). Objectives for this design were to:

1. plant enough trees/acre to ensure a commercial harvest by year ten,
2. provide adequate room for equipment to harvest the intercrop, and
3. provide year-round access to the trees.

To lay out a planting, start by marking tree rows 80' apart in a north-south direction. Within each of these primary rows we spaced the trees 40' apart. To make the double rows, layout a second row of trees only 23' to the east of each primary row. The trees in the companion row are also spaced 40' apart but offset in a triangular pattern in such a way that no trees within a double row is closer than

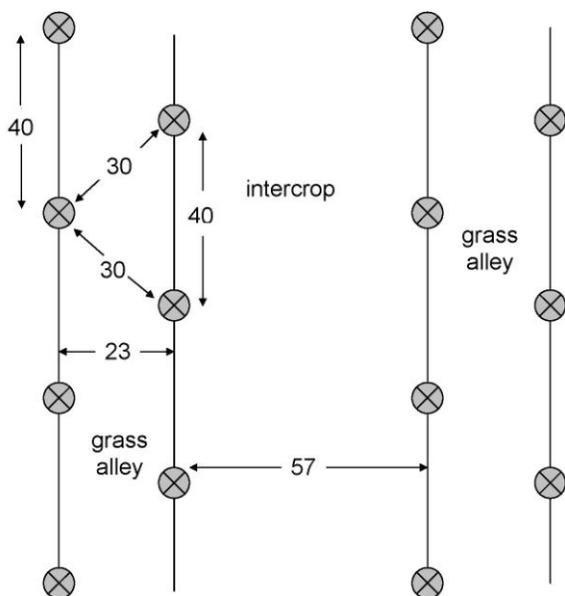


Figure 1. A double row alley-cropping plan for a nut orchard. Distances are in feet. Trees locations are marked by circles.

30' apart (Fig. 1). A north-south direction provides maximum sunlight exposure to the trees and crops.

Before planting the trees, the site needs to be prepared to develop a 'root-friendly'

soil, starting with site preparation no later than the summer before the trees are planted. Site preparation on heavy clay soils should begin with deep ripping down the tree rows. On better aerated soils, deep ripping should include chisel plowing to kill any perennial weeds, reduce compaction, and prepare a seedbed for planting a green manure crop such as hairy vetch, winter wheat, or cereal rye. Just before fall- or spring-planting of the trees, incorporate the cover crop and create 8" high raised beds down the tree rows using a levee plow. Fill the ditches, especially along the 23' alley, with a spring tooth harrow to level the soil between the raised beds.

We recommend using raised beds so seedlings are planted into a soil environment with loose soil where water does not pool around the root ball during heavy rains or spring floods to allow for more rapid regeneration of the tap root and lateral roots.

You will use 27 trees per acre with the double row alley-cropping design. It is best to purchase large, container-grown planting stock that is already grafted to improved cultivars or grown from seed of an improved cultivar known to be a vigorous rootstock such as 'Colby' seedlings for pecan. Advantages of container-grown seedlings are that they can be fall planted and new root growth can occur in loose soil during the fall and spring when it is still too wet to spring plant (fall planted bare-root seedlings will likely frost heave during the dormant season).

One of the disadvantages of container-grown planting stock is that the root system may have had roots circling inside the pot, especially around the bottom. If seedlings with circling roots are planted, these roots can grow to girdle and eventually kill the tree. To prevent this type of girdling, the first step in planting is to prune the root system. If circling roots are visible, they need to be pulled away from the root ball and cut off at the point where the roots

begin to circle. By pruning these main roots, including the tap root, you will stimulate the growth of 2 or 3 new roots to replace the roots you removed. Alternatively, you can pull the tap root free, cut it, and then make three or four vertical slices along the root ball with a utility knife leaving the root ball intact.

Planting trees in a newly formed raised bed makes it easy to hand dig a hole for the tree. Dig the hole slightly wider and 2 to 3 inches deeper than the height of the root ball. When you set the tree in the hole, make sure there are no air pockets under the root ball, pack loose soil around the roots, and finish by covering root ball with 2 to 3 inches of soil. Firm the soil around the tree with your feet. After several heavy rains and the ground settles, the tree will be 2 to 3 inches above the surrounding area with only a slight but perceivable berm remaining.

Fall-planted seedlings need to be irrigated to ensure the root ball does not dry out. The Pecan Research Station uses a 'poor boy's' trickle irrigation system to water newly planted trees (Fig.2). This system is composed of a 5-gallon bucket with a 3/16" hole drilled in the bottom. The bucket is held in place with a steel post. The buckets are filled 2 or 3 times per week. The water soaks into the soil slowly, wetting the root zone, and helping foster new root growth. Keep the irrigation going until the first good winter rain that soaks the entire field. Leave the buckets in place so they can be used again the following summer. The steel post can also be used to support tree shelters and new growth of scions after field grafting.

After all the trees were planted, establish a bluegrass/ perennial rye alley within the double row to form a sod that



Figure 2. Five-gallon buckets used for trickle irrigation during tree establishment.

allows year-around access to the trees. Along each tree row, use herbicides to keep a weed free strip about 6' wide. Between each set of double rows, establish 51' of intercrop. Annual intercrops are used to minimize competition with the trees along with winter cover crops to boost the organic matter content of the soil. Planting glyphosate or dicamba-ready intercrops can be problematic because it is difficult to spray the intercrop without getting drift on the tree saplings. A 6' weed-free strip is maintained with tillage within 3' of the trees for the intercrops. If intercrops are fertilized, we apply fertilizers after the first growing season to the weed free strip as well as the crop.

The double row system met all of the original design objectives as most trees produce successful grafts that have excellent growth, there is adequate space for the intercrop, and trees are accessible year-around. It does, however, sacrifice more land to trees than most traditional intercropping schemes. In our scheme, about 40% of the land area is devoted to trees and the grass alleyway, while 60% of the land area can be intercropped (Fig. 3).

Watch for the Spring 2018 issue of the MNGA newsletter for tips and tricks for successfully grafting nut trees.



Figure 3. Successful dual row alley-cropping planting of grafted improved pecans and oats.

This article was compiled by Jerry Van Sambeek from his research and two articles originally published by William Reid in the Kansas Nut Growers Newsletter.

Upcoming Meetings

September 14, 2017. Fall Field Day. Forrest Keeling Nursery, 88 Forrest Keeling Lane, Elsberry, MO. For more information call 800-356-2401 or visit: ForrestKeeling.com/FallFieldDay.

September 22, 2017. Fall Pecan Day. Knight Creek Farms, near Sapulpa, OK. 2:00 p.m. Details posted on the “Events” page of the Oklahoma Pecan Growers website: <http://www.okpecangrowers.com/home>

September 30, 2017. MNGA Pre-harvest meeting at Kevin McGraw property near St. Charles, Mo. Details in the article on the first page of this newsletter.

October 14, 2017. Missouri Pesticide Collection Event. 8:00 a.m. to Noon at S & H Farm Supply, Lockwood. Details and other

dates and locations at www.mo.gov/env/hwp/pesticide