UK COOPERATIVE EXTENSION SERVICE
UNIVERSITY OF KENTUCKY — COLLEGE OF AGRICULTURE

KENTUCKY CHRISTMAS TREE PRODUCTION WORKBOOK

PLANTATION LAYOUT

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GROWN IN | KENTUCKY

Once a person has made the decision to grow Christmas trees and has determined where and how to do it, he or she must plan the physical layout of the plantation. One thing that a Christmas tree grower becomes aware of very quickly is that it will take several years (typically five to seven) before the Christmas trees will be ready to harvest. Even if a grower decides to capitalize on the tabletop tree market, it will still take at least three to four years to grow trees large enough for that specialized market.

Christmas trees have traditionally been grown in plantations, much like any other agricultural crop, in straight lines and solid blocks of trees on each acre. Because it takes so long to grow Christmas trees to a harvestable size and because all the finances are outgoing rather than incoming during that time, Christmas tree growers might want to consider alternative options for growing their trees.

Alternative Options

The first option is an agroforestry technique called "alley cropping" (Figure 1). Agroforestry is a developing science used in many parts of the world where growing agricultural crops or livestock crops on the same land area as tree crops is a matter of necessity. In alley cropping, one to three rows of trees are planted, leaving a wide space, or "alley," between each series of tree rows. The alley can then be used to grow an annual crop, whether it's hay, grain, alfalfa, or row crops. The land is then used to provide an annual cash flow while the Christmas trees are growing to maturity. Concerns include the use and timing of chemicals. If chemicals are being used, they **must be compatible** with both crops.

When using alley cropping, the width of the alley will depend on the crop being planted between the trees and the size of the equipment used to harvest the alternative crop effectively. Spacing between the tree rows also needs to be wide enough to accommodate the grower's mowing equipment. The usual spacing is 6 feet between the trees within the rows and 6 feet between the rows. If, however, the grower has a mower with a 6-foot cutting blade, for example, the spacing between the rows should be at least 8 feet so the tree trunks will not be cut by the mower. If the grower plans to cross-mow, the trees would also need to be 8 feet apart in the rows.

A second option, also an agroforestry technique, is known as "silvopasture" (Figure 2). In this technique, grazing livestock are pastured in open areas between grouped rows of trees. With silvopasture, the grower might want to plant the trees in single rows instead of in grouped rows

Figure 1. Alley cropping can accommodate an annual crop between the trees until the tree crop matures.

Figure 2. The silvopasture technique lets grazing livestock be pastured between rows of trees.

and to leave wider spaces between tree rows to accommodate the animals. It is critical to use electric fencing to protect the trees in their first three years, until they get some height on them. This can be accomplished by using one or two strands of live wire to deter the animals from browsing or rubbing on the young trees. Typical pasture grasses would be grown between the tree rows, and the livestock should be rotated frequently so they are not in the tree area long enough to cause problems with the trees. In about the fourth or fifth year, the fencing may no longer be necessary. This depends, in part, on the type of livestock being pastured with the trees; some are more destructive than others. Cattle and sheep are probably the least destructive to the trees. Horses will often chew or rub trees out of boredom. Goats will eat anything but can be trained to electric fencing. Deer like to rub older trees and chew new foliage on younger trees. One grower has successfully deterred deer with two or three strands of heavyweight fishing line. The deer can't see it, and it spooks them. Use of electric fencing should control all problems with grazing animals.

A third option is to intercrop Christmas trees with other kinds of trees or shrubs. People have successfully grown black walnut (*Juglans nigra*) (Figure 3) and black locust (*Robinia pseudoacacia*) (Figure 4) between certain conifers grown as Christmas trees. Other species that could be intercropped include American holly (*Ilex opaca*) (Figure 5), which can grow into a large tree, and deciduous holly (*Ilex* spp.) (Figure 6), which is a shrub. Intercropping can include planting a mixture of trees within the rows or row by row, with a row of hardwood trees alternating with a row of Christmas trees. If growers decide to use this technique, they could plant a three-row grouping with one row of hardwood trees as the middle row. Spacing

Figure 3. Black walnut and white pine.

Figure 4. Black locust and pines.

Figure 5. American holly.

Figure 6. Deciduous holly.

between the rows would be expanded (probably to 10 or 12 feet between hardwood and conifer rows). Spacing **in the row**, if the two species are mixed in the row, would also be expanded so that the canopies of the hardwood trees would not overshadow the growing conifers.

Mixing hardwood and conifer tree species will ultimately give the grower one or two crops of Christmas trees before the hardwoods yield an interim product (e.g., fence posts or fuel wood from black locust, seasonal greens or berries from hollies) or a timber product. If the intercropping is also done as alley cropping, then there will be several crops off the same land at different times, ranging from annual to long-term harvests (decades for something like black walnut). An additional benefit of intercropping with a species such as black locust is that, because it is a nitrogen-fixing species, the soil will be enriched for all species growing there. Another advantage of an open, diverse plantation is a likely reduction in insect and disease problems for all of the species involved.

A traditional plantation layout is indicated in Figure 7.

Layout Requirements

1. Water will be a critical factor in the success of a Christmas tree plantation, whatever form it takes. Site trees near a water source if possible, or consider installing drip irrigation. Planting trees along the contours of sloping land and digging a shallow ditch or *swale* just above the grouped or single rows can provide more water to the trees by slowing runoff from rainfall.
2. Following slope contours will probably **not** result in straight rows. It *is* important to keep the spacing consistent between rows so that mowing equipment can still be effectively used. In a traditional plantation (Figure 7), trees can be planted in blocks of eight rows of 16 to 32 trees.
3. Access lanes between blocks are very important during regular management and particularly important at times of harvest and sales. As is true with the spacing of trees in rows and between rows, access rows should be wide enough to accommodate harvesting equipment (tractors, wagons, trucks).
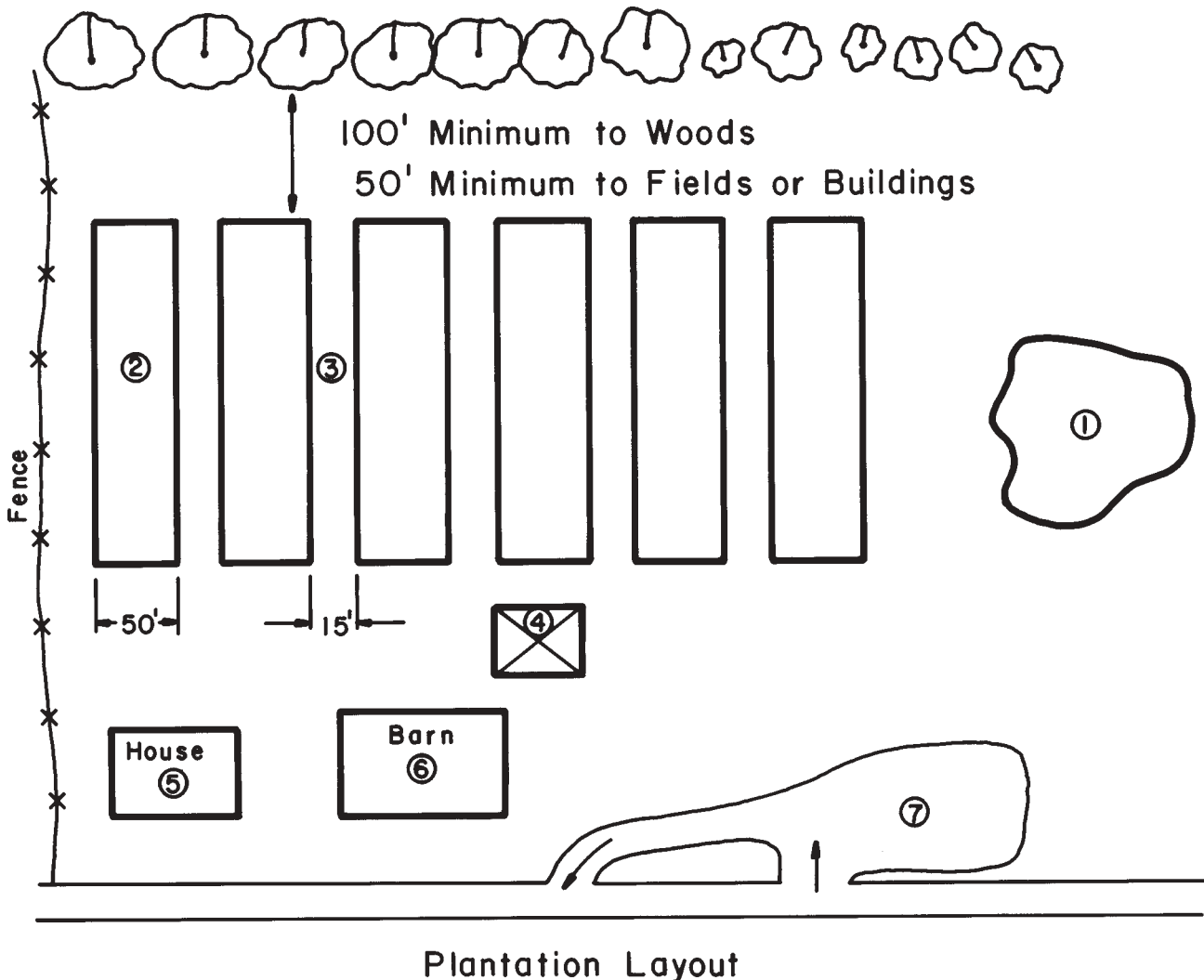

Plantation Layout

Figure 7. Suggestions for a plantation layout: 1) water source, 2) consistent spacing, 3) access lanes, 4) shelter building, 5) house, 6) sales barn, 7) parking areas. (Adapted from a plan by John Nutter, Red Pine Farm, Topsfield, Massachusetts 01983)

4. A shelter building is a good investment, both for relief of work crews during hot summer hours and during harvesting in November and December. A shelter can also be a focal point for sales.

5. If the grower plans to grow Christmas trees on a homesite, the trees should be visible from the house. This may offer some protection against vandalism and/or tree theft. If the plantation is in a more remote site, develop good relations with neighbors and local authorities to keep an eye on your place.

6. It is important to have a barn or shed for sales. For a very small "choose-and-cut" operation (250 trees or less per year), the shelter (see No. 4) may also serve as a sales center.

7. If trees are to be sold to the public on site (not sold wholesale), plan to have an area where clients can park, ideally with a separate entrance and exit so traffic flows easily. An area that can accommodate five to 10 cars at once is ideal.

Layout Tips

• Avoid planting on steep slopes for choose-and-cut operations because the slopes can be slippery with ice, snow, and/or mud at sales time.

• Keep roads and access lanes open around and through your plantations at all times to facilitate movement of spray equipment, fire trucks, etc.

• Avoid planting in "frost pockets" or low, marshy areas where the cold air drainage and/or cold, damp soils will slow the growth of trees and damage new, tender shoots.

How to Find and Follow Contour Lines

If money is no object, a grower can always hire a surveyor to find and follow contour lines on his or her land. However, if this is not an option, there are a couple of very simple tools that can be used to do this. The first is an *A-frame* (Figure 8).

• An A-frame has two "legs" of equal length, with a rigid crossbar (close to if not equal to the same length as the legs) like the crossbar of a capital letter "A."

• To use, mark the center of the crossbar with paint, or score it so that it is clearly visible.

• Make a plumb line with cord and a weight. Attach the plumb line to the top "point" of the A-frame.

• Place one of the legs where the tree row is to start.

• Move the other leg along the line of planting until the plumb line crosses the midpoint of the crossbar.

• Mark the locations of the legs with flags.

• Keeping the second leg in place, swing the first leg around in the line of planting.

• Adjust the leg just moved until the plumb line crosses the midpoint of the crossbar again.

• Mark the new location with a flag.

• Continue the process, swinging the leg closest to the starting point to a new location each time.

• The line of flags will indicate where the seedlings should be planted.

Figure 8. Using an A-frame with plumb line to find and follow contour lines.

A second simple tool is a *water level* (Figure 9). This is a 6- to 8-foot-length of clear plastic tubing, preferably about an inch in diameter.

• Attach a yardstick to each end of the plastic tubing with twist ties or rubber bands, with the 1-inch end of the yardsticks at the top.

• Select your proposed site for planting, and place the two ends far enough apart that the slack is *almost* tight.

• Carefully pour enough water into one end to be able to measure it on both yardsticks.

• Gently move the end farthest from the starting point uphill or downhill until the water is at the same measuring point on both yardsticks.

• Mark the two points with flags in the ground.

• Swing the beginning end of the water level past the other end in the line of the proposed planting.

• Repeat the leveling process, marking each new point with a flag as it is determined.

Figure 9. A water level with yardsticks on each end and the unused plastic tubing wrapped around one end.

How to Lay Out a Planting Block

If the decision is to lay out a traditional plantation of blocks of trees, the following is a suggestion for getting the blocks squared. The most accurate way is again to use surveyor's tools, but few people want to go to that trouble themselves or to hire the work done. The next best thing is to prepare a cord or rope (other than nylon because nylon has too much "give") with markers at the spacing you want for your trees. Colored plastic tape works well for this (Figure 10).

- Lay off the long outside row.
- Mark with flags where the tree seedlings are to be planted, using the colored markers for a guideline.
- Lay off the short row at right angles to the row just completed.
    - Take a 60-foot tape, and join the 60-foot and the 0-foot marks, forming a loop.
    - Secure that point with a stake or pole.
    - Measure off the first 20 feet (0-20).
    - Drive a strong stake or pole at this point.
    - Pull the tape around the outside of the stake, and pull both sides tight at the 45-foot mark.
- This is a 3-4-5 triangle (15 feet x 20 feet x 25 feet) which always has a 90° angle at its base (Figure 10).
- As additional long rows are measured, this process can be continually repeated to check for accuracy.
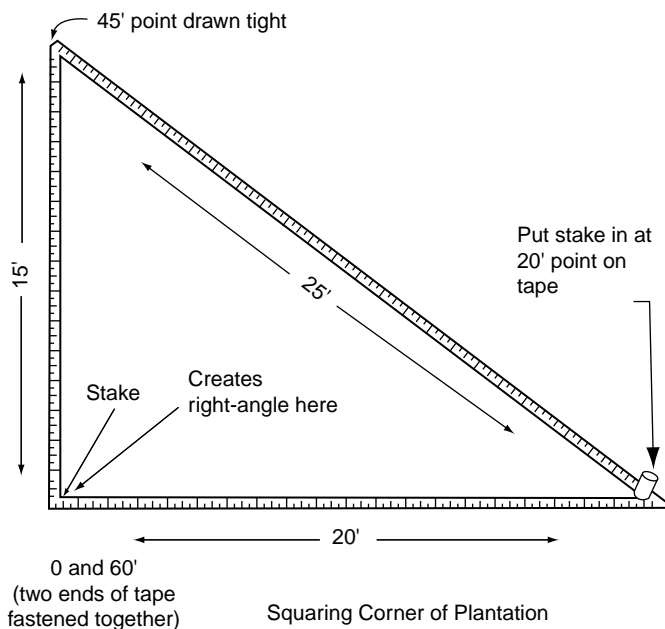

Figure 10. Laying out a planting block.

Having evenly spaced rows and evenly spaced trees within rows makes it easier to cross-mow the plantation. A traditional block plantation with trees on 6-foot centers (6 feet between trees within rows and 6 feet between rows) and including several access lanes should have about 1,000 trees per acre (see chart at Figure 11). This is a smaller amount than indicated on the chart for a 6 by 6 spacing, but the chart does not take access lanes into consideration. If growers choose one of the agroforestry options, the number of trees is more likely to be about 250 per acre. However, that means that the majority of the land is producing a yearly crop to assist with the annual farm economy and cash flow situation—much more so than the traditional plantation.

Seedlings look very small and lost out in that big area when they are first planted, but they will grow, and when they are all 6 feet or taller, they will need every inch of space that has been allowed.

		Feet between Rows						
		5	6	7	8	10	12	14
Feet between Trees in Row	5	1742	1452	1245	1089	871	726	622
	6		1210	1037	908	726	605	519
	7			889	778	622	519	444
	8				680	544	454	389
	10					435	363	311
	12						302	259
	14							222

Figure 11. Number of trees required to plant one acre at various spacings.