quantities to other markets reported in short supply.

A fully stocked timber stand may mature less than 100 trees an acre, all that are left of an original stand of 5,000 to 10,000 seedlings established by nature. These surplus seedlings are desirable to provide competition for the final crop trees. Such competition is nature's way of pruning side limbs and ultimately growing high-quality lumber, for knots in lumber are caused by limbs. A reasonably well-stocked stand of young Christmas trees established by nature can produce, under management, at least 50 trees an acre annually. Many young forest stands are so thick that thinnings are necessary to assure satisfactory growth of timber. Thinnings release the final crop of trees so they can make their best growth. Actually a properly supervised harvest of Christmas trees proves beneficial to the remaining stand.

Evergreens on the poorer forest soils grow more slowly. This slow growth usually produces good-quality Christmas trees—trees that are denser and more symmetrical. On many forested areas, the Christmas-tree crop is the only practicable one. On some such areas the trees grow satisfactorily for 15 to 25 years, then stagnate and, if they are not cut for Christmas trees, they likely will not be utilized at all. On certain State lands in Minnesota, up to 750,000 trees are cut annually under such a management plan.

Even though some trees grow larger than the usual Christmas-tree sizes, the utilization can be complete. For example, this is how a Michigan Christmas-tree grower markets trees a foot or more in diameter. The tops provide a well-shaped Christmas tree, often with a good cluster of cones, and such trees command a premium on the market. The main stem or trunk of the tree is made into a building log or timber, with the smaller cuts suitable for building rafters. The green foliage of the side limbs is tied into bundles and provides material for wreaths. Thus, usually the entire tree is utilized. On some operations the main stem may go into pulpwood.

THE FARMER AND CHRISTMAS TREES

ARTHUR M. SOWDER

Many farmers are finding that Christmas trees are a profitable crop. A Christmas-tree plantation fits in well with good land utilization and aids in the conservation of soil and moisture—a good way to salvage an eroded hillside or gully or to make use of rocky land or an idle corner. Some plantations are only part of an acre in size.

Most of the Christmas trees used in the United States are cut from areas where the trees have grown naturally. However, the number of trees harvested from plantations is increasing annually. About 100,000 acres of plantations are now devoted to growing Christmas trees in this country. Two-thirds of the acreage is owned by farmers. Pennsylvania has nearly 40,000 acres in Christmas-tree production.

Each plantation-grown tree can be given plenty of space to grow into a symmetrical tree, in contrast to uncared for wild trees in crowded or dense stands. However, merely planting the tree and expecting to return in a few years and reap a harvest cannot be depended upon. A well-shaped tree, grown under adequate spacing conditions, with uniform distance between whorls or branches and fully shaped, will command the best price. Christmas trees respond to intensive management. Returns can normally be expected in 8 to 10 years after planting.

Things to consider in selecting a Christmas-tree planting site are value of the land, soil and climate, location

of site with respect to market centers, accessibility, and the existing vegetative cover.

A PROSPECTIVE GROWER of Christmas trees should give careful consideration to the selection of species. While most evergreens are used for Christmas trees, yet some command better market prices than others. There appears to be no best all-around Christmas tree. Desirable characteristics are:

1. Retention of needles between the time of cutting and through the Christmas holidays.
2. Full, symmetrical shape.
3. Limb strength adequate to support ornaments and electric lights.
4. Sufficient nonprickly foliage with a healthy green color.
5. Fragrant odor.
6. Pliable branches that are not too brittle so they can be tied compactly for shipment, yet regain their shape when released.

Desirable species to be considered for farm plantings are: Norway spruce (*Picea excelsa*), Douglas-fir (*Pseudotsuga taxifolia*), Scotch pine (*Pinus sylvestris*), the balsam fir (*Abies balsamea*), white spruce (*Picea glauca*), red pine (*Pinus resinosa*), eastern redcedar (*Juniperus virginiana*), the Colorado blue spruce (*Picea pungens*), grand fir (*Abies concolor*), and Fraser fir (*Abies fraseri*).

First consideration should be given, however, to matching the species with the local climate and planting site—that is, soil, moisture, slope, and exposure. In the selection of species, a good guide is to observe what evergreens are growing satisfactorily in the vicinity of the proposed planting. Low ground could well be a frost pocket and may prove detrimental to new growth. Well-drained and relatively poor soils are satisfactory, provided they are not too thin. The soil should not be the best nor yet the poorest. Good soil may make the trees grow tall and spindly. Evergreens generally are not adapted to alkali soils. Avoid wet, heavy clays, coarse sands, and gravel. Christmas trees can be a profitable poor-field crop. If soil preparation is necessary, it should be done well in advance of planting.

THE PLANTING STOCK can usually be obtained from public and private nurseries, and names and addresses can be had from the Forest Service, United States Department of Agriculture, Washington 25, D. C.

Only good, healthy, graded seedlings and transplants are worth planting. Transplants may cost more but should reach marketable size a year or so earlier. The growing of planting stock from seed is not an easy undertaking and means a year or two of waiting. Some farmers obtain seedlings and line them out in transplant rows near the planting site for a year or two. Where wild evergreen seedlings, such as balsam fir, are available, they can often be used for planting stock.

Many Christmas-tree growers prefer a 4- by 4-foot spacing—that is, 4 feet between trees in the row and 4 feet between rows. It is practicable to plant evergreens with a 3- by 3-foot spacing with the expectation of removing every other one as the trees develop.

The tree sizes most in demand by the Christmas trade are those 6 to 8 feet high; that size is best grown when the trees have been thinned to about a 6-foot spacing.

Spacing in feet	*Number of trees required per acre*
3 by 3	4,840
4 by 4	2,720
5 by 5	1,740
6 by 6	1,210
7 by 7	890
8 by 8	680

If the growing of Christmas trees is to be tied in with the production of wood products such as fence posts, pulpwood, or sawlogs, then wider spacing is necessary as the trees develop.

PLANTING MAY BE DONE in the spring or fall when the trees are dormant. Spring planting is usually more successful—just as soon as the frost is

out of the ground and before growth starts.

In handling the small trees, the roots should never be allowed to dry out. The package of trees should be soaked with water as soon as received and the trees planted as soon as possible. If the trees are not planted promptly, they may be stored for a day or two in a cool, damp place with the package well soaked with water. If it is necessary to delay planting as much as 10 days, the small trees should be heeled-in by lining them out in a cool, moist, shady place; one should make sure the roots are thoroughly watered.

Two-man crews (or a man and a strong boy) are satisfactory for planting Christmas trees—one man digs the hole, preferably with a mattock or grub hoe, and fills in the soil, while the other carries the planting stock in a bucket of water and inserts the tree. It pays to use extra care in planting to insure a good stand and thus avoid replanting.

If some woody vegetation—such as brush—covers the planting site, it is imperative that it be removed before planting. The small trees should be set the same depth as they grew in the nursery with the roots well spread out in the planting holes. The roots should never be allowed to dry out, hence moist soil should be firmly packed about the roots at the time of planting. Air pockets about the roots should be avoided and firming the soil with the heel will prevent this.

An 80-percent survival is considered satisfactory. It may be necessary to replace any small trees that do not survive the first year or two. Where different species are planted on an area, it is not desirable to alternate rows by species; it is better to plant each species in a group or block.

Weeds, grass, and brush should not be allowed to handicap the small trees. In areas of limited rainfall during the growing season, two or three cultivations each summer may be necessary to eliminate competition of weeds and grasses. Weed growth around the trees may keep the lower branches from developing. Later on, weed removal by mowing is usually adequate and will not disturb the lateral tree roots near the surface.

Pruning Christmas trees to shape them is usually time well spent. It enhances the value of the trees and reduces the number of cull trees. Some growers plan to prune each tree several times before it is harvested. One man can prune about 50 trees an hour. A few pruning suggestions are:

1. Keep terminal growth to about a foot per year.
2. Keep the lower and the lateral branches pruned so that the tree will grow to a conical and uniform shape.
3. Begin pruning a tree just as soon as the leader develops a length out of proportion to the laterals, which may be when it is 2 or 3 years old.
4. For pines, pruning must be done in early summer. For short-needled evergreens, such as spruces and firs, pruning may be done at any time.
5. Sharp pruning shears do the best job.
6. Pruning usually should not be done the year that the tree is to be harvested.

A grower of Christmas trees is confronted with many hazards. Probably the greatest is fire—and most fires are due to carelessness. Other handicaps are tree and insect diseases; rodents and rabbits; brush and hardwood seedlings; adverse weather, such as drought, unseasonable frosts, hail, heavy snow, and wind; animals (both domestic and wild—by browsing, trampling, and occasionally rubbing); and thievery.

AMONG THE MANY RECORDS of successful Christmas-tree enterprises is one from a grower in Ohio who planted 12,000 trees on 4 acres in 1927. Nine years later he began harvesting the crop. At the end of another 9 years he had cut 2,000 trees and received $1,200 for the stumpage, thus averaging 60 cents a tree, or $300 an acre. He reported that the Christmas trees alone yielded slightly more than 7-per-

cent compound interest net, and that he has left a good stand of potential saw timber.

An annual average harvest of 600 trees from a 15-acre tract in New York State over a 15-year period has grossed the owner a total of $7,000 on a combination retail and wholesale basis. This grower estimates it costs him 30 cents per tree to plant, prune, harvest, and market, or a total of $2,700, leaving a net return of $4,300.

Evergreen trees are often planted primarily for soil protection, the returns from Christmas trees being incidental. In Ottawa County, Mich., for example, the sandy soil supported a fine stand of virgin pine timber in the 1880's. Logging operations and subsequent fires denuded the soil, and the sand started blowing to adjacent croplands. The county agricultural agent encouraged the farmers to plant trees to keep the sandy soil in place. Scotch pine, white spruce, and Norway spruce seedlings were supplied to farm cooperators at low cost and were planted at the rate of about 1,200 trees to the acre. In 4 to 8 years the trees found a ready market as Christmas trees. In one year, the farmers realized more than $50,000 from the sale of 70,000 evergreens. The next year more than 200,000 trees were removed, and the farmers received more than $100,000 for them. The 1948 returns totaled nearly $300,000. A dense growth of trees was left to prevent soil blowing, and more Christmas trees are in prospect. Later, as the trees grow larger, a pulpwood harvest will be made, the treetops to be sold for Christmas decorations. Still later as the remaining trees reach pulpwood and sawlog size, they will be converted into lumber.

A FAIRLY NEW PRACTICE in Christmas-tree farming, especially with the well-managed plantations, is stump culture. In general, this method is practicable before the stems get too large (up to 6 inches stump diameter) or trees become too old (up to 15 or 50 years). When Christmas trees are severed above live-branch whorls, the uppermost remaining limbs, or newly developed adventitious buds, form new leaders. Eliminating all but one, two, or possibly three such leaders, after at least one year's growth, may cause those left to grow into satisfactory Christmas trees called turn-ups. The root system of such a stump tree is usually adequate to produce suitable trees in a shorter period than the original crop tree. However, when trees are growing too close together, the understory trees may undergo severe root and crown competition from these stump trees, which then become wolf trees. Usually four or five individual trees can be grown in the space occupied by one such stump or wolf tree. Stump culture is best adapted for trees growing in openings. Careful pruning attention must be given to the trees produced through this rather exacting practice.

The appearance of a Christmas tree on the market is important. Best prices are paid for well-shaped, freshly cut trees. When cut, the butt should be trimmed off neatly. Many people like to obtain a freshly cut tree and like to make their own selection from among growing trees. This is an advantage for Christmas-tree plantations established close to market centers.

A curved pruning saw has been found to be an efficient tool for cutting Christmas trees. Trees not harvested one year can be held over to the next or left to grow into larger trees for forest products. A grower should not harvest large quantities of Christmas trees unless a market is assured; even better, the trees should be sold under written contract. Cooperative harvesting and marketing offers good possibilities. Branches trimmed to shape up harvested trees as well as those from culled trees usually find a ready market as wreaths or table and mantle decorations.

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