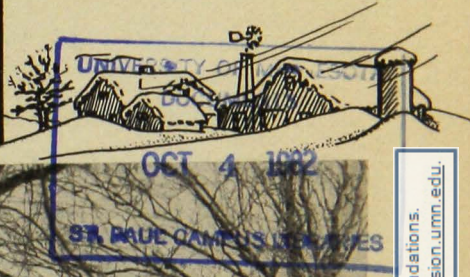


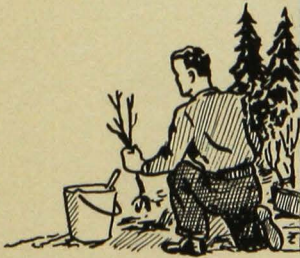
# Planting

## THE FARMSTEAD SHELTER BELT

MN 2000 EB-196  
(Rev. 1948)



PARKER  
ANDERSON



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UNIVERSITY OF MINNESOTA  
*Agricultural Extension Service*  
U. S. DEPARTMENT OF AGRICULTURE

## *A Good Shelter Belt...*

Adds to home comfort by reducing piercing storm winds and by saving fuel.

Prevents snow from drifting around buildings and walks.

Protects livestock feed yards.

Prevents garden and orchard drainage.

Supplies fuel wood, fence posts, and repair material.

Enhances farm appearance and increases home values.

## *Be Sure to Have...*

Correct location for year-round protection and appearance.

Tree species that are hardy, best suited to protection needs, and adapted to climate and soil factors.

Mainly long-lived trees with mixtures of fast-growing trees for early results.

Conifers mixed with hardwoods for year-round protection.



# Planting the *Farmstead Shelter Belt*

Parker Anderson

**T**HE VALUE of a farmstead shelter belt cannot be computed in dollars and cents. Beside affording practical protection against wind and snowstorms, a well-planned shelter belt beautifies the farmstead. In addition to cutting fuel costs, a shelter belt adds immeasurably to the comfort of the farm family, as well as that of livestock.

While snowstorms rage at 30 miles an hour, the family living inside a well-established shelter belt is exposed to only a five- or six-mile-an-hour wind. Walks, drives, and the farmyard are well protected from snow. Fruit trees, flowers, shrubs, and ornamental trees, frequently broken by wind, snow, or sleet, are protected throughout the winter.

Farm production is maintained at a higher level and with less handicaps than would be possible without the protection of a shelter belt. Snow near such a planting melts more slowly in spring and has a better chance to soak into the ground, thus conserving moisture that is later needed for garden crops. Livestock in protected feed lots make better use of their feed; less of the feed consumed is needed to maintain required body temperature and more goes into milk and meat production.

In spite of these many advantages, however, many farmers today are not enjoying the fullest possible benefits from their shelter belts. Many have only a few rows of quick-growing, short-lived trees which have a scrawny appearance and offer little protection in winter. Old plantings are often too near the main farm buildings, so that snowdrifts pile in the yard around buildings.

The shelter-belt plan presented in this bulletin has been used since 1926 and is the standard plan for Minnesota.

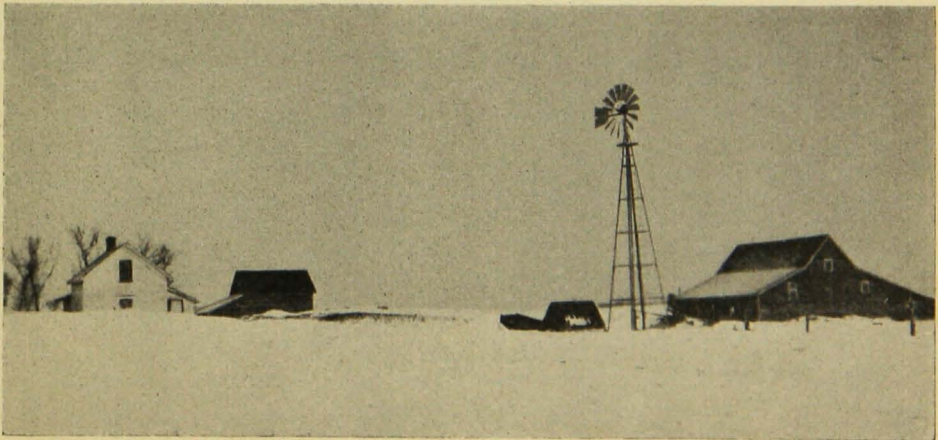


FIG. 1. A farm is a dreary place without a shelter belt

## FARM PLANS BEFORE BUILDING

Wisely planned farmstead arrangements influence future comfortable family living conditions and basic home developments. In establishing new farm buildings or removing or rearranging old structures, take time to plan such improvements.

Direction of prevailing winds, exposures, air circulation, drainage, relation to other buildings, and economic working arrangement of fields, pastures, and feed lots are important.

Plant trees and establish shelter belts even before starting to build. Trees take time to grow, while buildings can be constructed in a much shorter period. Buildings that are poorly arranged, too close to highways or roads, or improperly placed will only handicap or reduce effective protection.

## SHELTER-BELT LOCATION

To provide the greatest protection against prevailing storm winds of Minnesota, the shelter belt should be on the north and west sides of the farmstead proper. For the average farm in Minnesota, such a protective planting *should extend at least 400 feet on the north side and 400 feet on the west and should not be closer than 100 feet to main buildings.* Where the southwest wind is a problem, the planting on the west may be extended 100 feet or more to protect the farmstead against the dry southwest winds or snowstorms coming from that direction. It is almost never necessary to provide protection on more than two sides of a farmstead if you have a good solid grove.

The main grove should be at least 80 feet wide. Outside of this should be an open space of 40 to 60 feet which serves as an important snow trap. Beyond the snow trap should be a secondary planting of two or three rows of low-growing trees or shrubs, called the snow catch.

The shelter belt should be set back at least 100 feet from the main buildings to prevent snow from piling up in the yard and to allow room for an orchard and garden between the shelter belt and the house. This distance will also provide room for a small barnyard feed lot for winter cattle feeding.

If highways or other obstructions on the west or north sides of the farmstead do not allow adoption of the entire plan, adjustments can be made. The number of rows of trees can be reduced, or the snow trap may have to be omitted. The object is to give the best protection possible under the circumstances.

## PREPARATION OF LAND

Before any tree planting is done, the land should be in some cultivated crop, such as corn or potatoes, for at least one year. This will provide for the proper pulverizing of the soil and the killing of competing grasses and weeds, and will help conserve the moisture so necessary to successful tree growth. New or soddy ground should be broken two years in advance of planting. For land that has not recently been in a cultivated crop, the following procedure is recommended.

Two years before the trees are to be planted, plow the ground (except in very sandy soil) deep in the fall or spring. Then disk and harrow it during the summer and keep it free from grass and weeds. This amounts to clean summer fallow. This practice has been found the best means of conserving soil moisture so essential for young trees the first few years.

One year before the trees are to be planted, plow the ground deep again in the fall and allow it to remain rough over winter. This aids in catching winter snows, which provide needed moisture in the spring for successful planting.



In the spring the land should be disked and harrowed thoroughly and worked until the soil is mellow. The ground is then in a most favorable condition to receive the trees and assure successful growth.

### WHAT TO PLANT

Choose trees that have proved hardy in your locality and that are most desirable for protection. The species given in this bulletin have been found the most practical and successful and are recommended for the standard Minnesota shelter belt.

Figure 3 shows the snow catch and the snow trap outside the main shelter belt. A snow catch consists of two rows of low trees or tall shrubs whose purpose it is to catch or retard the snow, causing it to pile up in the snow-trap area between it and the main shelter belt. Without a snow catch and snow trap, snow will pile up in the main grove, break limbs of taller trees, and break down or smother young growing trees.

**Snow catch**—Rows 1 and 2 of the snow catch should be planted to low shrub-like trees such as Caragana, buffalo berry, Russian olive, diamond willow, golden willow, or low-growing native hardy willows. Wild fruit trees may also be used successfully. Tatarian honeysuckle and common lilac are especially hardy and desirable, as they are not too tall but are dense from the ground up. If tall willows are

used, they should be trimmed back to a lower height, a foot or so above the ground every two years, so that they will continue to grow as dense as possible. The trees in the snow catch should be planted from 4 to 6 feet apart in the rows, and the rows should be 10 feet apart. *They may even be spaced farther apart to allow cultivation with farm power equipment.*

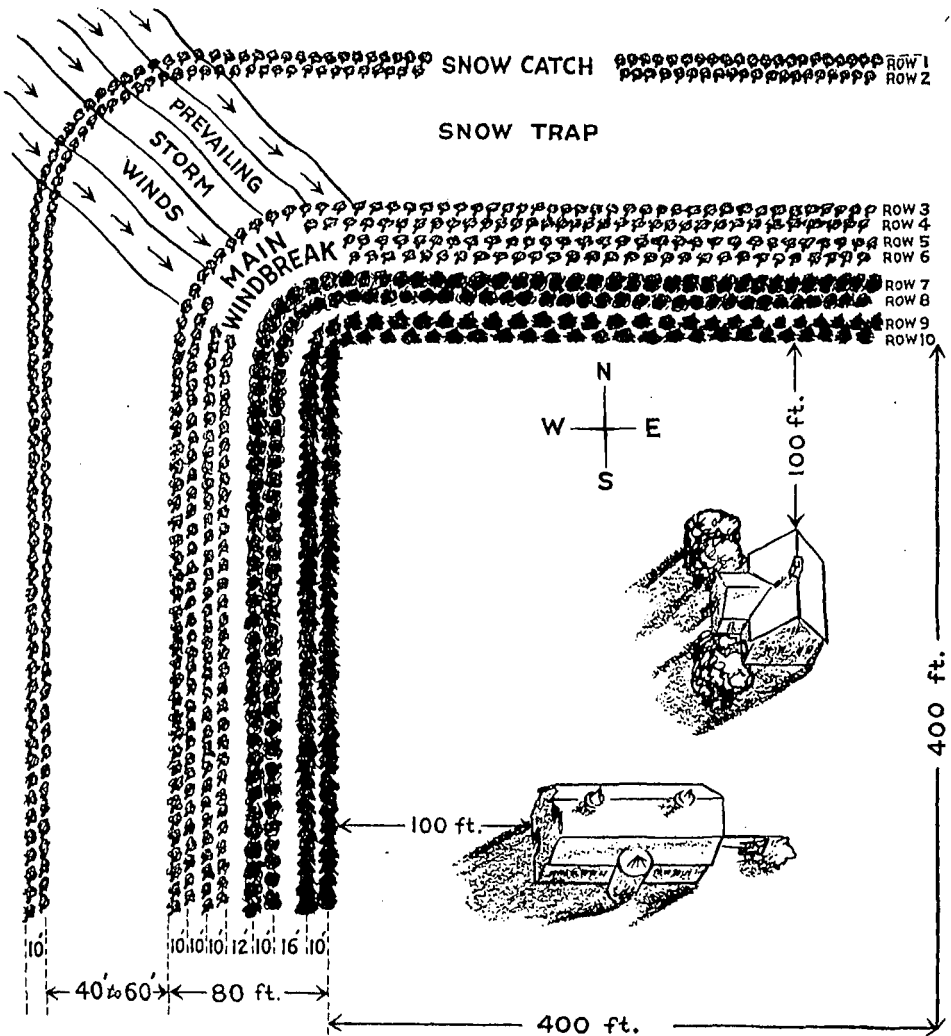
**Snow trap**—Snow piles back and drifts in direct proportion to the height and density of the trees in the snow catch, varying from 5 to 15 times the height, depending upon the density of the planting, species used, and storm conditions. For the snow-catch trees recommended, a 60-foot snow trap will give the best results. In summer the open snow-trap area may be used for calf pasture, alfalfa, sweet clover, potatoes, corn, or a long farm garden. With present power equipment long gardens are easily cultivated.

**Main shelter belt**—The main shelter belt should be 80 feet wide and should consist of eight rows of trees. There should be two rows of fast-growing, short-lived, broad-leaved trees, two rows of long-lived, broad-leaved trees, and four rows of hardy conifers. Such a combination insures the best year-round protection. The fast-growing trees not only give early protection but also serve as a nurse crop for the longer-lived, more permanent trees.

Rows 3 and 5 should consist of such fast-growing trees as box elder, cotton-



FIG. 2. Note how the row of snow-catch trees at extreme right held the drifts



Rows 1 and 2. Caragana, Russian olive, buffalo berry, low willows, wild plum, chokecherry, pincherry, common lilac, or Tatarian honeysuckle

Rows 3 and 5. Cottonwood, Canadian poplar, Norway poplar, willow, box elder

Rows 4 and 6. Green ash, elm, hackberry, maple (locust, walnut, butternut, and black cherry in southeastern and south central Minnesota)

Rows 7 and 8. Western yellow pine, jack pine, Norway pine, Scotch pine, white pine

Rows 9 and 10. Colorado blue spruce, Black Hills spruce, white spruce, Norway spruce

FIG. 3. Planting plan

Note: For tractor cultivation, tree rows may be spaced 10-12 feet apart, whichever distance is most convenient for use of farm power equipment.

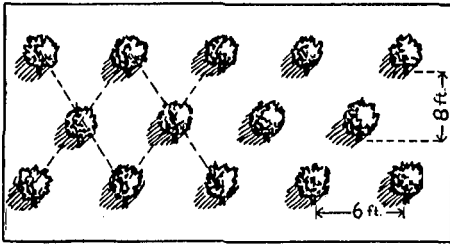


FIG. 4. Proper alignment of trees

wood, Norway poplar, northwest poplar, Canadian poplar, or hardy willows. These trees should all be planted 6 feet apart in the rows, and the rows spaced 10 to 12 feet apart. All trees planted in the grove should be alternated or staggered to check the wind (see figure 4).

Rows 4 and 6 should consist of the more hardy, more permanent, long-lived trees, such as ash, elm, hackberry, and soft maple. In south central and southeastern Minnesota, walnut, butternut, and black cherry may also be used. These longer-lived species not only will make a more permanent shelter belt, but also will provide repair materials, fence posts, fuel, and even lumber for home use and market (see figure 5). These trees should also be spaced 6 feet apart in the rows, and the rows 10 to 12 feet apart.

When Rows 4 and 6 begin to get crowded and are able to furnish the protection required, Rows 3 and 5 may be cut out and used for fuel or posts. This will then leave 20 to 24 feet between Rows 4 and 6.

Leave a space of 12 feet between the last row of hardwood trees of Row 6 and the first row of pine, Row 7. When hardwoods grow too close to pines, they are apt to sideshade them and hinder development. This often results in deforming the pines or leaving open spots in the rows.

Rows 7 and 8 should consist of more hardy pines, such as western yellow pine, jack pine, Norway pine, or Scotch pine, depending upon the soil and climatic conditions. The species have been named in the order of preference. The pine trees should also be planted 6 feet apart in the rows, and the rows 10 to 12 feet apart. These trees should also be alternated or staggered, as in figure 4.

A space of 16 feet should be left between the last row of pine and the first row of spruce. Spruce is quite tolerant of shade; the trees tend to grow dense and spread out. If too close to pine trees, the pine are likely to be damaged or deformed by sideshading. The spruce, Rows 9 and 10 (consisting of Colorado, Black Hills, or white spruce), should be planted 6 feet apart in the rows, and the rows 10 to 12 feet apart. Such spacing assures as impenetrable a wind and snow barrier as possible in the shortest time.

Spruce has dense foliage maintaining its limbs from the ground up, 12 months of the year. This growth characteristic prevents dust and snow storms from filtering through the belt. Spruce are therefore the best species

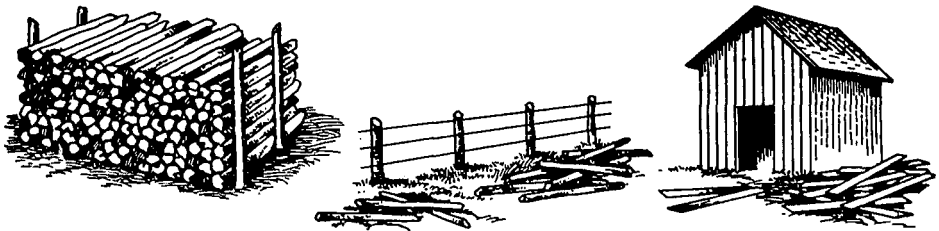


FIG. 5. Use home-made timber for fuel wood, fence posts, and timber



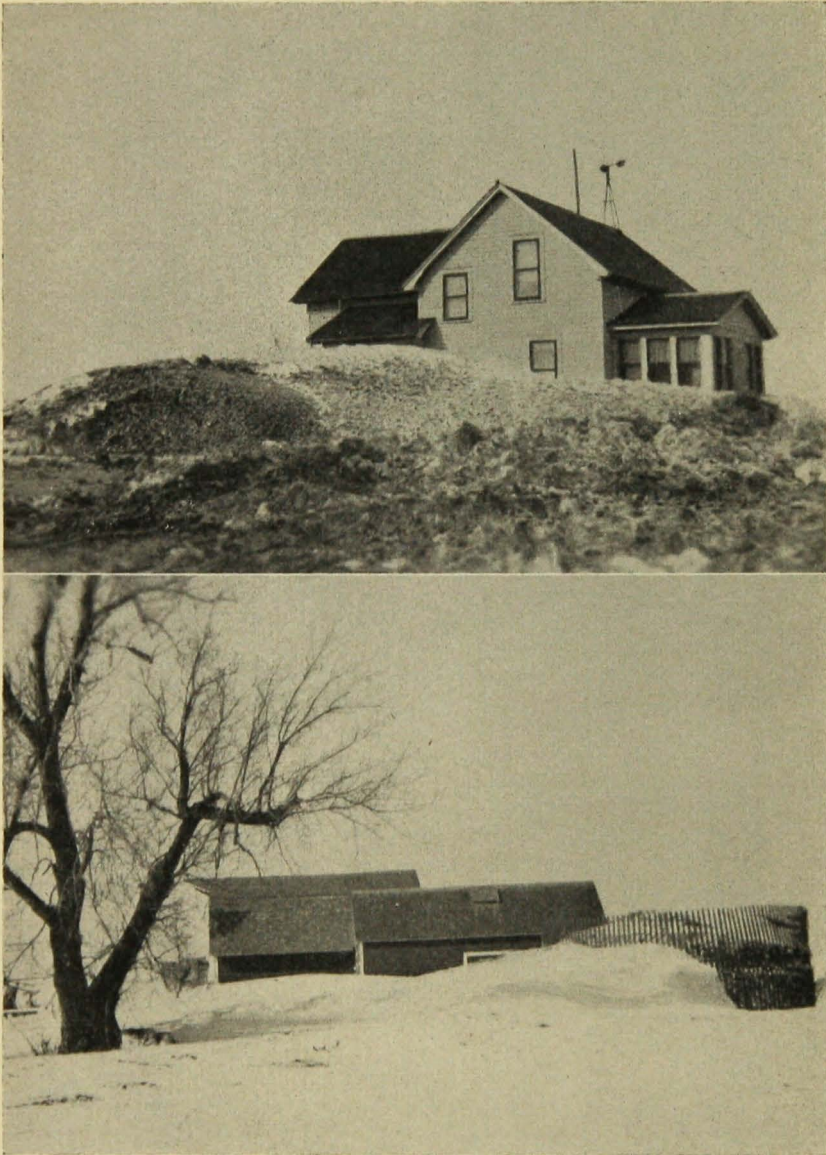


FIG. 6. "It Never Snows but It Drifts" when Shelter-Belt Protection Is Lacking

This house and barn are both on the same Minnesota prairie farm. Drifts were higher, believe it or not, but the snow had already settled about one third before the pictures were taken.



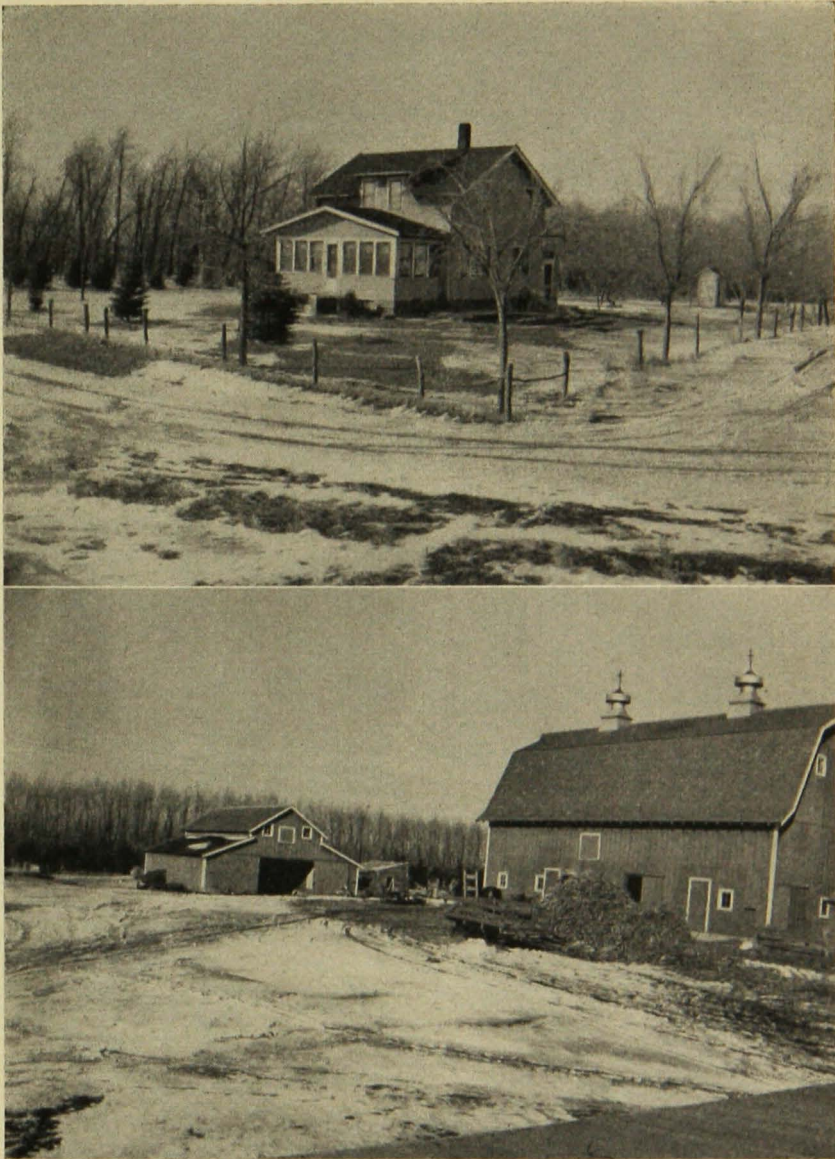


FIG. 7. "It's More Like a Home when It's Planted," as Shown by These Pictures of a Well-Protected Minnesota Farmstead

Note absence of drifts around buildings and on walks and driveways, as well as the more cheerful, attractive appearance trees give the farm.

for the inside row. Locating the spruce on the inside where it can be seen by the family is the first step in home beautification. Spruce and pine have foliage all the year round, and therefore provide the greatest winter protection and summer beauty.

Close spacing of all trees, as in this plan, forces them to grow taller faster and, consequently, shade the ground more quickly, thus killing off competing weeds and vegetation. Close spacing gives better year-round protection against winds. Because of this dense spacing, too, the annual leaf litter forms a mulch which helps retain soil moisture and discourages grass and other undergrowth from coming up. Space the rows more widely if this makes cultivation by power equipment easier.

## SOURCES OF PLANTING MATERIAL

### Transplants May Be Used

One- to three-year-old seedling hardwood trees that have reseeded naturally on or near your own farm can be transplanted successfully with a little care. The only expense is the labor of digging and transportation. In transplanting, select only hardy trees that have well-formed crowns and vigorous, well-developed root systems. Beware of "tree peddlers" who are selling wild stock dug in northern timber areas.

### Raise Trees from Seed

Seed from selected native hardwood trees may be gathered during normal seeding periods. The source of seed is very important. Minnesota climate is quite severe, so only seed from the better-established, well-formed, hardy trees should be chosen. Trees, like other plants, have a strong tendency to carry on qualities and peculiarities that

they have developed through years of exposure to climatic and soil conditions.

Seed so gathered may be sown in drills in a prepared farm garden nursery. Properly cultivated and protected for a year or two, these home-raised small hardwoods may be transplanted to their permanent locations. A large number of farm-home nurseries and 4-H nurseries have been established to meet individual farm requirements. In this way the farm needs as far as hardwoods are concerned can be provided for with little or no expenditure.

### Cuttings

Cuttings are simply pieces of branches taken from healthy trees; if properly cut and planted, these pieces will develop and grow into trees. They are easily made from willows and cottonwoods. Cuttings may be made in the fall when trees are dormant, or, better yet, in the early spring before growth starts.

### Nursery Stock

If you are buying young trees from a nursery, it is best to deal with growers who are as near your farm as possible, or are at least within your own state. In that way you will get trees best adapted to your soil and climatic conditions. Shipping costs will also be less. It is an advantage for several farmers to "pool" their tree orders, thus cutting shipping costs.

## POINTERS ON PLANTING

### Early Planting Best

**Early spring**, just as soon as the frost is out of the ground, is the best time for planting trees. The ground is then moist, the sun mild, so that trees have

a chance to become well established before summer drouths and weeds interfere with their active growth.

### Place Orders Early

Place your order early in the winter. This will give nurseries a chance to offer a greater selection and give better service. It will also assure early tree arrival in the spring, when the ground is in a good, mellow condition, and at a time when planting will not interfere with spring crop planting.

### Replacements

Shelter-belt success is assured only if a well-planted grove is brought to mature size. Dead trees cut down the efficiency of the grove. It is highly improbable that all of the small trees planted will survive. In ordering and buying trees, it is wise to get 10 per cent more trees than the plan calls for. These extras can be planted in the garden and used when and where needed for later replacements. If they are not needed for replacements, they can eventually be used for improving the farm-home grounds.

### Small Trees Desirable

Only trees with good sturdy root development should be planted. A well-developed root system is more important than a big top. Trees with large tops and insufficient root systems are likely to die of starvation, because the tops demand more food and water than the reduced root system can supply. For this reason, evergreen transplants of about four years of age or about 10 or 14 inches high (depending on the species) are most desirable, particularly those that have well-developed, compact root systems. Four-year-old good conifer stock is known as 2-2 stock; this means the trees have grown two years in a seedbed and two years in a transplant bed. Trees of this size are also easier and less expensive to ship than

larger trees, cheaper to plant, much easier to handle, and assure a greater survival.

Hardwood trees of about two years of age are large enough to give very satisfactory results. For some species, such as willow, cottonwood, and other poplars, planting cuttings are practical. Cuttings can easily be made from trees now growing on the farmer's own land.

### Handling Trees Upon Arrival

Call for your trees at the express office as soon as they arrive.

1. *Pour fresh water into the package immediately, before leaving town.* Nearly all trees come with their roots wrapped in moist moss to prevent them from becoming dry while in transit. The trees should not be left in the package too long or they will dry out, heat, mold, or otherwise become seriously damaged.

2. On arriving home, "heel-in" the trees in a trench, preferably in a cool, shady place. Make the trench deep enough and long enough to take the entire root system and a part of the lower stems. The trench should be dug fairly narrow so that one can straddle it easily. The ends and one side should be cut straight, with one side sloping (see figure 8). The trees should be placed in the trench side by side or in small bunches, and the dirt thoroughly packed around the roots. Soil removed from the trench can be used to pack around the roots. Trees may be left heeled-in for a week or so if the job has been well done.



FIG. 8. Heeling-in trees



When removing the trees for actual planting, only as many as can be carried in a pail half full of water or as many as can be planted in an hour or so should be removed from the trench at a time. The remaining trees should be covered again with dirt. *Under no circumstances should the tree roots be allowed to become dry.*

### PLANTING CUTTINGS

Cuttings 12 to 16 inches long and a half to three quarters of an inch in diameter establish themselves most successfully. Cuttings should be made from the younger and better-developed portions of healthy tree branches.

It is good practice to soak the cuttings in water for 24 hours before planting. Best results are obtained when the cuttings are planted at an angle of 45 to 60 degrees, with only two buds above the ground (see figure 9). This will assure the establishment of a strong root system, which is essential for good top growth. The soil should be firmly tamped around the lower end.

Another reason for planting cuttings in a slanting position is that the lower part will then always be in close contact with the soil, even after the ground settles. If cuttings are planted in an upright position, the ground often settles away from them and they dry out (see figure 10). It is just as easy to

plant them at an angle as it is to plant them upright. If the cuttings are planted properly, a growth of from 2 to 4 feet may be expected in one favorable year.

### Handle Cuttings Carefully

Pushing the cuttings into the soil damages and peels the bark, killing the cambium layer, or the living tissue. This results in failure to grow at the point injured. A good opening therefore should be made with a spade, the "cutting" carefully inserted, and the soil pressed down firmly about the lower end.

Another method is to plow a furrow, lay the cutting in the furrow, and turn the earth back on the cutting to the proper depth. The earth on the lower end should be tamped with the feet to force it into close contact with the root system. All plantings must be protected and given subsequent care if best results are to be expected.

### PLANTING SMALL TREES

During actual planting operation, small trees should be carried in a bucket of muddy water and taken out one at a time, but not until the hole has been freshly made. Roots of evergreens particularly should never be allowed to become dry by being exposed to sun or wind, even for a few

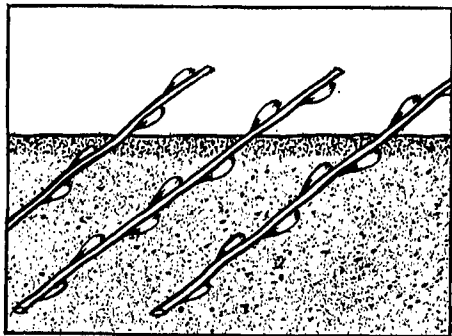


FIG. 9. Planting at a 45-degree angle brings the soil in close contact with the cuttings

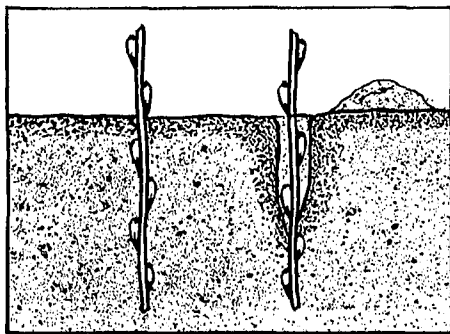


FIG. 10. If the cuttings are planted straight, the ground settles away from them



FIG. 11. Trees for planting should be carried in a pail half full of muddy water

minutes. The delicate small rootlets of evergreens are easily injured or killed upon exposure to sun or wind. *Dry roots mean dead trees.*

A shovel or spade is the most practical tool to use in tree planting. If the soil has been prepared properly, it will be loose and well pulverized and easy to plant in.

The tree roots should be kept moist and in good condition from arrival up to planting time. During planting and handling be careful not to skin or break the branches or roots.

The hole method of planting is recommended. The hole should be deep enough and wide enough to take the entire root system without crowding (see figures 12 and 13).

The tree must be held in a firm and upright position until the soil has been

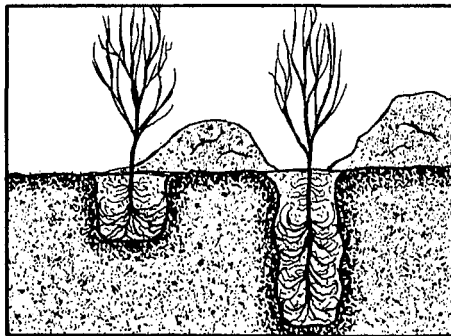


FIG. 12. Left, planting too shallow and too narrow; right, too deep and too narrow

well tamped around the roots (see figure 13). Packing the soil *thoroughly* is necessary to exclude air spaces next to the roots. If this is not done, heavy losses will occur during dry summer months. Usually it is not necessary to pour water into the hole after or during the planting process, particularly if the hole has been freshly dug.

The depth to plant trees can be easily determined by looking for the dirt ring on the lower portion of the tree. The portion of the tree that was formerly in the ground will be darker than the upper stem, which was above ground. The tree should be planted the same depth as it stood in the ground before being dug. If the ground is very loose, it should be planted an inch or so deeper to allow for settling of the dirt to the right depth. Above all, do not plant the tree shallow. Do not "hill up" dirt around planted trees (see figure 14). After the tree is planted, the ground should be level or slightly depressed so that rain will not run off (see figure 15). Plant each tree carefully and well.

### PLANTING WITH FARM EQUIPMENT

When the ground to be planted has been worked so that it is in a loose, mellow condition, good planting can be done rapidly with a tractor and a 2-



FIG. 13. Planted proper depth, roots well spread, soil tamped as dirt is filled in

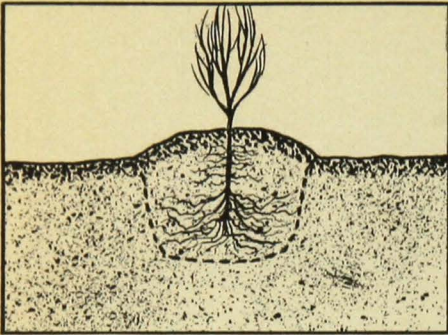


FIG. 14. Dirt hilled up too high

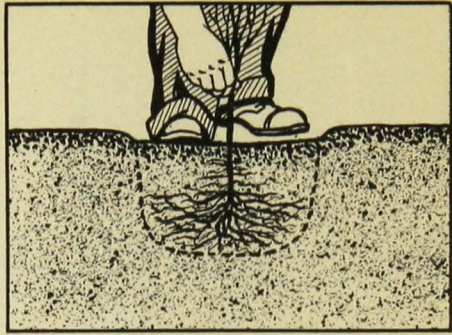


FIG. 15. A good planting

bottom plow. Stake out the rows where trees are to be planted, in order to turn a reasonably straight furrow and do a neat job.

A box can be placed on the plow beams to hold a supply of trees sufficient to plant each row or several rows. The man doing the planting sits on a board placed across the plow beam, holding an armful of trees. The tree is placed in the furrow made by the first plow and held there until the second

plow covers the root system with soil. Proper spacing of the trees in the row can be regulated by the speed of the tractor or the speed and ability of the man setting in the trees, who can time his spacing at regular intervals.

After the trees have been set in by the man on the plow, a second man or two men following behind the plow then straighten up the trees and tamp the dirt firmly around the roots. (See figure 17.)



FIG. 16. Planting trees with a tractor and a 2-bottom plow





FIG. 17. Straightening the trees and tamping the soil around the roots

## CARE AFTER PLANTING

### Cultivation

Frequent cultivation at proper intervals conserves moisture in the soil. This helps to carry trees over dry periods that are sure to come later in the summer. A duckfoot cultivator or a hoe is the best tool for cultivating a young plantation. Cultivation should be shallow and not too close to the trees, or the roots immediately below the surface will be cut off or pulled out.

Dirt should not be hilled up around the trees, especially around evergreens. Roots of trees, as well as the leaves, need air. Piling dirt high will encourage the growth of an extra set of surface roots, causing the lower and more important roots to cease functioning.

During the first few years, when the trees are small, corn or some other cultivated crop may be drilled in between the rows. After the corn is picked, the standing cornstalks may be left over winter. This helps catch and hold snow around the trees, preventing or reducing danger of winterkilling.

Cultivation after the middle of August is not necessary. Late cultiva-

tion tends to stimulate late-fall growth at a time when the trees should be getting ready to harden up for winter. Late weeds can be pulled or hoed or they can be left over winter. Tall weeds may help to catch a blanket of snow, offering additional winter protection.

Cultivation and protection after planting must be continued for a couple of years until the trees are large enough to care for themselves. Cultivation should be continued each year as long as physically possible, or at least until the trees are high enough to shade and protect all of the ground. Otherwise grass and weeds will come in to crowd, retard, or kill tree growth.

### Mulching

Mulching should not be done unless it is absolutely impossible to cultivate. Mulching tends to encourage surface roots, because moisture is held close to the surface. Roots as a result are not forced to go down into the ground for needed moisture and food. Surface roots thus developed are more susceptible to seasonal changes from drouth and from winterkilling.

The area around the trees should be kept black by keeping it free from weeds and grass. The best mulch is the dirt mulch, obtained by regular cultivation. If mulching is necessary, only clean straw or hay should be used. Do not use raw manure, as the ammonia contained in it tends to burn and harm the roots. Where soil is heavy and hard to work, well-decomposed manure placed around the base of trees in the fall and worked into the ground in the spring is beneficial.

If a straw or hay mulch is put on for winter protection, it should be done after the ground is frozen, to discourage rodents from making homes and girdling trees in winter.

### Pruning

Do not prune shelter-belt trees. The denser the planting, the better the shelter. Pruning the trees makes a sieve for the snow and wind to filter through. It also lets light in on the ground, which encourages the growth of grass and weeds and allows surface-soil moisture to dry out. Instead of pruning limbs when the trees are young, individual trees may be thinned out later, but only when crowding makes it necessary. Density of leaf surface as well as the number of stems in the grove are factors in wind-protection efficiency. Pruning and thinning are

problems to be considered only after a number of years, when health, efficiency, and growth are established.

### Protection

To establish a shelter belt takes patience and continued interest on the part of the home owner. Short-cuts end in failure.

Protect the plantings from fire, and put up good fences to keep all farm animals out. When evergreens are small even chickens will injure them by scratching around the base and exposing the roots to dry winds and sun.

Watch plantings for evidences of diseases and insect attacks. When disease or insect injury is noted, act immediately. Send specimens to the Entomology Department, or to the Extension Forester, Agricultural Extension Service, University of Minnesota, St. Paul 1, for identification and for control measures. Nearly all leaf-eating insects can be controlled by spraying with arsenic solutions.

Watering may be necessary at intervals during periods of continued drouth, but in normal years little else is needed but timely cultivation.

Water draining from manure piles and hog lots should not be allowed to wash around planted trees. Diversion ditches should be constructed.

## The Minnesota Standard Shelter Belt



UNIVERSITY FARM, ST. PAUL 1, MINNESOTA

Cooperative Extension Work in Agriculture and Home Economics, University of Minnesota, Agricultural Extension Division and United States Department of Agriculture Cooperating, Paul E. Miller, Director. Published in furtherance of Agricultural Extension Acts of May 8 and June 30, 1914.