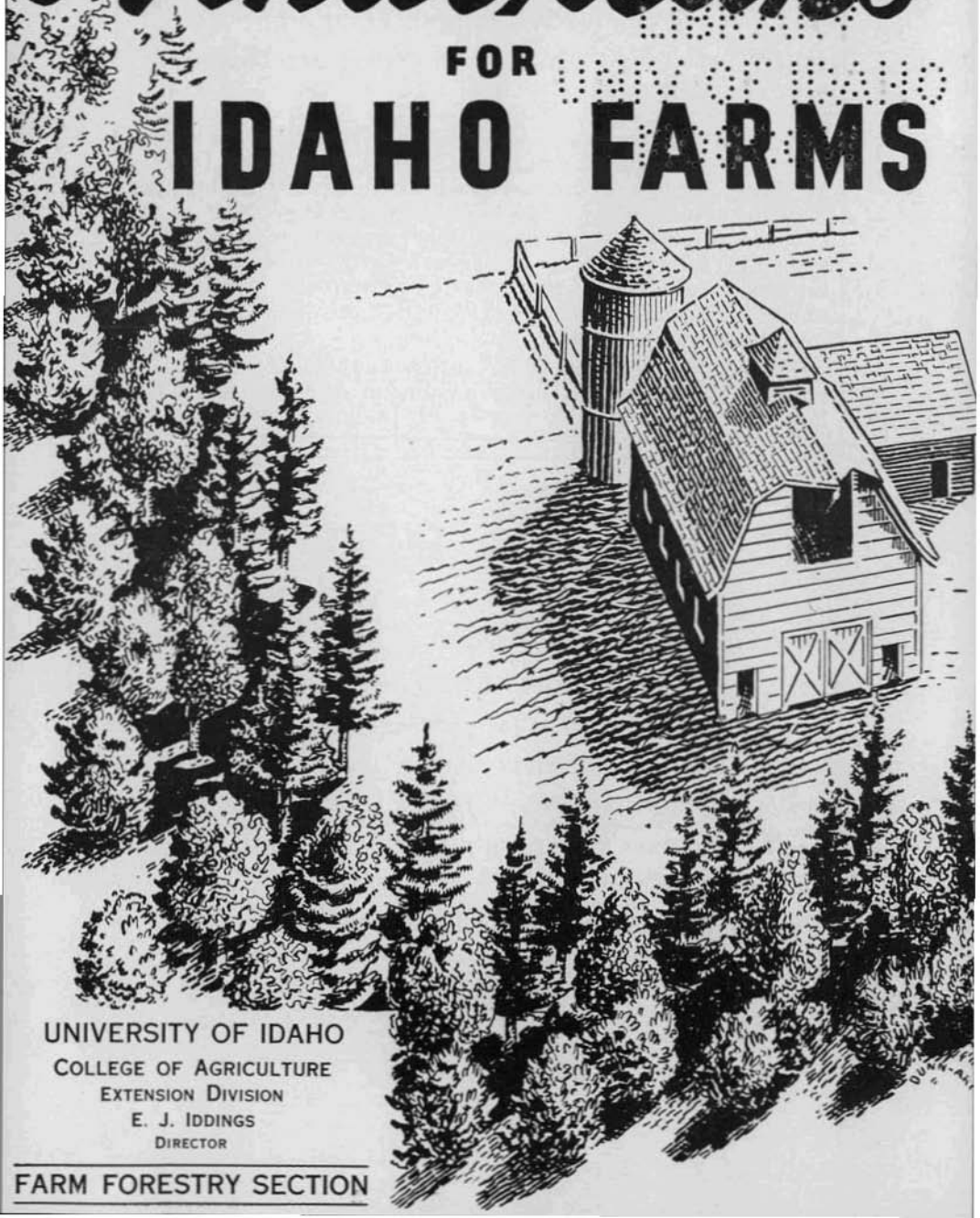


# Windbreaks

## FOR UNIVERSITY OF IDAHO IDAHO FARMS



UNIVERSITY OF IDAHO  
 COLLEGE OF AGRICULTURE  
 EXTENSION DIVISION  
 E. J. IDDINGS  
 DIRECTOR

FARM FORESTRY SECTION

## Trees for Windbreak Planting

**P**ROTECTION tree plantings for Idaho farms require that a relatively large number of trees be planted in a well-planned arrangement. Since 1927, the Idaho Agricultural Extension Service and the School of Forestry have cooperated with the Federal Government under the Clarke-McNary Act in providing educational material and tree planting stock. The object of this arrangement is to encourage forestry as a part of the program of diversified agriculture by assisting owners of farms in establishing, improving, and renewing woodlots, shelter belts, windbreaks and other valuable forest growth, and in growing and renewing useful timber crops.

If you desire more information than is given in this bulletin, contact your County Extension Agent or write the Extension Forester, University of Idaho, Moscow, Idaho.

<i>For A Successful Windbreak:</i>	<i>See page</i>
Carefully plan the location and arrangement .....	4
Choose only adapted trees for planting .....	6
Prepare the soil at the right time .....	9
Handle and plant the trees correctly .....	10
Care for the trees after planting .....	12
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# Windbreaks for Idaho Farms

By

GILBERT B. DOLL<sup>1</sup>

**I**DAHO farms need tree windbreaks to protect farmsteads, feedlots, pastures, lambing sheds, orchards, gardens, and erosive fields from the ravages of prevailing winds. Windbreaks also are useful in protecting driveways, walks, and farm buildings from deep drifting snows. The term *windbreak*, as commonly used in this bulletin, refers to a several-row planting of trees so arranged as to divert winds and thus provide protection.

Both irrigated and dry farms situated in the various sections of the state present these many needs for such tree windbreaks and are capable of growing adapted trees to meet them.

## Windbreak Benefits

Although it is not always possible to measure in direct income the values that are received from windbreaks, livestock protected from cold winds are known to make better gains or produce more milk. When protected, less feed is required by animals to maintain body temperature and health. Farm homes require less fuel and are maintained more easily at livable temperatures where cold winter winds do not blow directly about the buildings. Orchards and gardens pro-

duce better, and ornamental flowers and shrubs are less apt to suffer breakage when protected. Walks, driveways, and roads that become impassable due to drifting snows will remain clear when tree snow fences are established. Trees on a farm always add beauty, provide shade, and attract song and game birds. It also is possible to combine windbreak and woodlot plantings so as to produce wood for farm needs.

## Growth Expectations

Although trees generally are thought to be slow growing, surprising growth and early protection are possible if conditions are made most favorable for their growth. This is readily possible on the farms because the requirements of trees can be met through the practice of common farming methods.

It is possible under average irrigated farm conditions to grow trees to a protective height in 3 years. On dry farms trees are somewhat slower growing, depending on available moisture, length of growing season, and the care they receive, but within 5 years trees will grow to a protective height. Growth, of course, varies according to the conditions, and it is the purpose of this bulletin to assist farmers in learning the requirements for tree growth.

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Idaho Agricultural Extension Service.



Figure 1.—Notice the clean cultivation between rows of this year-old windbreak.

### Planning a Windbreak

#### Location

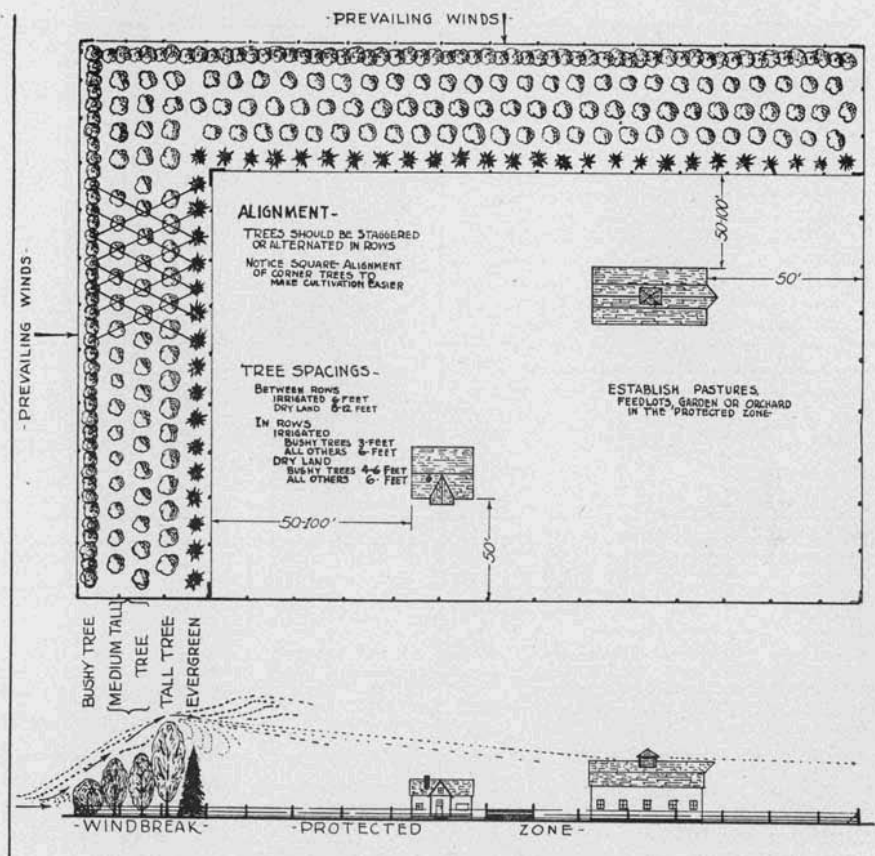
Care must be used in locating and arranging tree windbreaks so they will provide the greatest possible protection. A project so permanent as a tree planting should not be considered lightly or its possibility of success left to chance when a little careful planning will practically insure success. Therefore, such factors as prevailing winds, snow drifting, building arrangement, feedlot or garden location, soil condition, cultivation and irrigation demands, and tree root competition should be considered.

Where storm winds are consistently from a single direction, windbreak trees planted in rows at right angles to the wind and arranged in an  $\perp$  shape about the farmstead will provide ideal

protection (*See Fig. 2*). For protection in sections where storm winds are changeable in direction, a  $||$  or  $\square$  shaped planting will provide more adequate year-round protection. It usually is not desirable to plant trees for windbreaks on more sides of the farmstead than necessary because the view is impaired. Establishing a windbreak about a farmstead to provide the most ideal protection cannot always be arranged without changing existing farm roads, fields, buildings, and highways. Therefore, it is best to plan and establish the windbreak when the farmstead is built.

In farming sections where snow-drifting is a problem, the windbreak can aid materially as a snow catch. The wider the windbreak, the more snow it will

Figure 2.—Suggestions for planting a farm windbreak.



Standard Trees Recommended for Windbreak Planting

*Tree form	Irrigated 4,000 feet and below	Irrigated Above 4,000 feet	Dry land high elevation
Bushy	Russian olive or Siberian pea	Russian olive or Siberian pea	Russian olive or Siberian pea
Medium tall	Black locust	Honey locust or golden willow	Siberian elm
Tall	Green ash	Green ash	Green ash or silver poplar
Evergreen	Scotch pine, Austrian pine, or blue spruce	Scotch pine, Austrian pine, Douglas-fir, or Norway spruce	Scotch pine, blue spruce, or lodgepole pine

\* These growth forms are based upon maturity and during the younger life of the tree they may not conform.



catch and hold among the trees. Where winds are strong and windbreaks only 5 to 6 rows wide, it may prove desirable to plant, in addition to the windbreak, a snow hedge of low, bushy-growing trees about 25 feet to the windward side of the main windbreak. Most of the snow is thus trapped in the space between the tree plantings. In all cases the windbreak should be set back 50 to 100 feet from the main farm buildings or driveways to allow space for snow piling. This space (on the leeward side or for snow catch) can be used advantageously for garden, orchard, or a protected *summer* pasture or feedlot. However, a garden or orchard should be located sufficiently far away from windbreak trees to prevent possible tree root competition. Competition of tree roots with gardens or crop plants in adjoining fields can be minimized if ditches, roads, or other non-productive ground strips are planned to border and separate them from the tree planting. If this is not possible, an artificial V-shaped ditch 3 to 4 feet deep established at planting time will reduce possible tree root competition.

Best results are secured with soil suitable for growing farm crops, although rockiness, steep slope, sandiness or low fertility do not prevent its use. Particular difficulty is encountered if the soil is highly alkaline, or exceptionally wet. If one of these conditions exists, greater care must be used to select tree species that are adapted to such conditions, and slower growth must be expected. Although odd strips of land can be used, the area should be made available

for easy cultivation and irrigation.

### Length and Width of Windbreak

To afford adequate protection against storm winds for most Idaho farmsteads, the windbreak should extend 200 to 400 feet in length along the sides needing protection. The windbreak should extend at least 50 feet past the end of the last building or field in need of protection. This is necessary to protect against wind whipping around the end of the break. It should also be located so that the leeward row of trees is not less than 50 and preferably 75 feet from the first building. A windbreak will give good protection to a distance equal to 8 times its height on the leeward side. For a short distance on the windward side the air is banked and its velocity decreased. A windbreak 40 feet tall will protect for 320 feet to the leeward. If protection is needed for a greater distance, the windbreak should be taller or another strip planting should be made.

The number of tree rows needed in the windbreak depends upon the type of protection required, velocity of the winds, and snow drifting conditions. At least three rows of trees are desirable in localities which have mild winds, and five or six rows are desirable where strong winds prevail.

**Spacing of Trees**—The width or distance apart that trees should be planted depends upon growth capabilities of the soil and whether the planting is irrigated or dry land. For *irrigated plantings* and on soils of average fertility, studies have proved

that a spacing of 6 x 6 feet is best—that is, trees planted 6 feet between rows and 6 feet apart in the row. Shrubby or bushy-growing trees planted in the first or windward row and for snowbreak hedges should be spaced 3 x 6 feet, which is 3 feet apart in the row and 6 feet between rows. It also is desirable to stagger the trees in rows so as to provide a better windbreak as well as root space for the trees. A space wide enough for harrowing should be allowed around the outside of the planting.

Under dry land conditions a tree requires more root space for satisfactory development. Soil moisture conditions vary considerably between the various dry farming regions in the State. It has proved best to space trees 6 x 10 feet where moisture and soil conditions are average. On better than average sites spacing at 6 x 8 feet is satisfactory, but on poorer soils a spacing of 6 x 10 or 12 feet is necessary. In all plantings, both irrigated and dry land, the spacing should be adapted to widths whereby available farm equipment can be used for cultivation between the tree rows.

### Interspaced Garden

Certain garden crops may be raised interspaced between tree rows of *irrigated plantings* for the first year. After this time competition arises between trees and garden crops through shading and root competition. Row crops such as corn usually are most suitable when placed down the center between the tree rows. However, no crops should be planted so close as to compete with the trees. Such interspacing

of garden and trees may help to encourage consistent weeding during the first year.

In later years it is desirable to locate the garden on the leeward side of the windbreak in the space left between the windbreak and farm buildings. Here it receives ideal protection from winds and will produce much better. On dry farms snow that is piled by the windbreak in this leeward space aids materially in providing moisture for a garden. However, tree root competition must be prevented by establishing a V-shaped ditch or leaving sufficient space between the trees and the garden.

### Natural Woodland Windbreaks

In the northern Idaho cut-over farming sections many farms which have a considerable acreage of woodlands are being cleared with no consideration of the need for windbreaks. Although winds are not strong in this section, the winds which have always blown over the forests are reduced to ground winds following the removal of trees. They then become noticeable and often undesirable.

This can be prevented if strips of trees at right angles to the prevailing winds are left in the form of woodlands and windbreaks and located so as to give maximum protection. Such strips need not be very wide, 25 to 50 feet is sufficient, but it is desirable to leave a strip about every quarter mile. It also may be desirable to cut the larger trees and encourage younger trees. In this way these strips can be managed as a selectively cut woodland to provide many of the needed farm wood products.

Trees growing under forested



conditions often do not retain their side branches and, therefore, may not be most suitable for windbreak purposes. Such stands of trees, when opened to strips on clearing, can be improved as windbreaks by underplanting with desirable species of conifers to provide the necessary bushy windbreak.

### **Preparation of the Land**

Any land that is to be planted to trees should be planted previously to a cultivated crop for at least one year. This is particularly necessary on land recently broken out of sagebrush. If the new soil is exceptionally poor, sandy, or low in organic matter, it is often best to plant a soil-building cover crop such as sweet clover for one year and then turn this under as a green manure. It never is advisable to fertilize heavily with animal manure or chemical fertilizers. Very light applications are sometimes desirable but should be well mixed with the soil, as a concentration of fertilizer in spots may cause burning of the trees. Soil broken out of pasture which is soddy should be summer-fallowed for one year. When the soil is considered desirable for tree growth, actual preliminary preparation must be planned carefully and completed to fit the needs of either irrigated or dry land plantings.

### **Irrigated Plantings**

To secure best results from windbreak trees on irrigated land, the ground should be deeply fall plowed, leveled, and harrowed to a smooth surface ready for planting the following spring. It is desirable to have the ground harrowed smooth enough

in the fall for planting because in wet springs it often is not possible to get on the ground with equipment to complete this work as early in the spring as desirable for tree planting. Fall plowing also allows the soil to settle just the right amount so that it will hold moisture well during the following summer. On some heavy soils it may be desirable to spring plow. Where the soil is dry enough to permit harrowing, it is best to work the upper 2 inches just prior to planting. Plantings of trees never should be made in soddy or unprepared ground if good survival and growth are to be expected.

### **Dry Farm Plantings**

To provide a successful dry farm planting, the some thorough preparation of the soil necessary to secure a good stand of grain or any other crop is required. This can be accomplished best by fall plowing the area and leaving it rough so as to catch snow and moisture. Early the next spring it should be harrowed smooth and fallowed the entire summer for the purpose of building up a reserve supply of moisture and to germinate weed seeds so their control will be easy. The area then will be ready for planting the following spring. If possible it should be harrowed just prior to planting, but if too wet this can be done later after the trees are planted. The correct preparation of the site is vitally important and when properly done invariably will produce good results.

### **Other Considerations**

On sloping ground and particularly where erosion is a problem, contour planting of

tree strips often is necessary. The terrace ditches should be graded carefully so that irrigation can be handled easily. Low and high places in the terrace resulting from a poor job of terracing will provide too much water for some trees and too little for others. On dry farms where irrigation is no problem, cultivation should be practiced on the contour between tree rows. Contour planting helps to conserve needed moisture for the trees as well as to prevent erosion.

In many sections of southern Idaho hardpan is a problem. Where it is present at a shallow depth, a sub-soiler should be used to break it before trees are planted. Unless this precaution is taken trees never will develop satisfactorily.

### Handling the Trees

A tree out of ground is like a fish out of water, and a tree, the roots of which become exposed to the air long enough to dry, will not live. At all times handle trees with particular care to avoid injuring or drying the roots. When transplanting trees, as many roots as possible should be taken; and if the roots are severely pruned, the top branches should be cut back to even a greater degree. Small seedlings can be transplanted "soil free" with remarkable success if the tops are cut back to a length of 1 foot.

### Heeling In Trees

Most trees obtained from nurseries are received in a packed condition, and whenever possible it is desirable to plant the trees as soon as they are received. Where they cannot be planted soon after arrival, they

should not be kept in bundles. If kept in bundles for a long period, the trees often heat, mold, dry out, and the bark may slip from the roots. Trees can be kept in best condition until planted by heeling them in as shown in Figure 3.

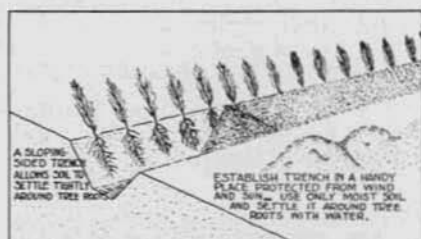


Figure 3.—Heeling in tree seedlings.

Trees may be kept in this manner for long periods although they should be planted within 10 days or they will commence to strike root and grow. When removing the trees for planting, place them in a pail of muddy water. This mud will cling to the roots and keep them from drying out during the brief period of exposure while planting.

### Planting Windbreak Trees

The best time for planting trees on Idaho farms is in March and April, just as soon as the frost is entirely out of the ground. If the ground has been prepared in the fall, such early planting is possible even though the ground is too wet to work. Early planting allows completion of this work before regular spring farm work begins and is also best for the trees. It enables them to develop roots before the temperatures become favorable for top growth and a more vigorous and fast growing tree results.

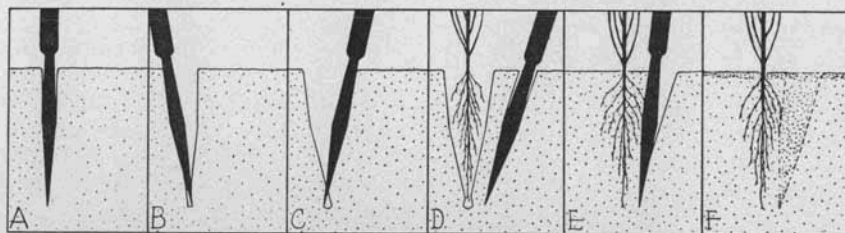
Two methods of planting

trees, known as the dibble (or slit) and hole methods, have proved desirable for use on Idaho farms. The dibble method is well adapted to use with small seedling tree stock. Any spade capable of making a slit deep and wide enough to receive the roots of the tree is usable, although if a great deal of planting is to be done, it would be best to make a dibble as shown in Figure 6. This method of planting is fast and reduces to a minimum soil moisture losses due to soil drying and aeration. This is

of particular importance in dry land tree plantings.

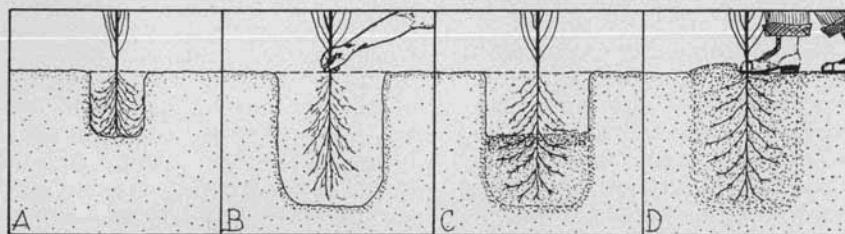
The **hole method** is commonly used by most people in transplant work and is best adapted to trees with delicate roots or to large tree stock. Where the soil is exceptionally heavy, it may be desirable to use this method and to fill the holes with fertile transplanted soil when planting. It is important to plant the tree slightly deeper than it was, although in doing so care must be used to prevent a bunching or turning up of the roots in the

Figure 4.—Planting a tree by the dibble method.



**A**—Use a spade, shovel, or dibble to make a vertical slit as deep as the tree roots are long. **B** and **C**—Press the dibble forward and backward to enlarge the “slit”. **D**—Place the roots of the tree into the slit and spread them making sure they are not crowded or massed at the bottom. Place the tree slightly deeper than it was previously, as shown. Also insert the dibble on an incline about 4 inches back of the slit. **E**—Press the dibble forward and wedge the soil tightly against the roots and remove the dibble. **F**—Fill the last slit with damp soil firm by tramping about the tree and the closure slit. Then mulch the surface inch of soil.

Figure 5.—Planting a tree by the hole method.



**A**—This hole is too shallow and narrow, crowding of the roots resulted. **B** and **C**—Dig a large enough hole, place the tree and hold with one hand while filling with damp soil. Spread the roots as the dirt is filled in. **D**—Tramp the soil firmly about the roots and then loosen the surface inch of soil.

bottom of the hole. Thus, a hole slightly deeper and wider than the root length and spread is needed. The steps in planting are illustrated and explained below.

### Planting Equipment

If the planting to be made is small, it is best to use a shovel or spade rather than purchase or make other planting tools. However, if it is large, 500 or more trees, it may be most economical and satisfactory to build or buy a planting dibble. Other planting equipment which usually is available on a farm is:

- (1) A 3- to 5-gallon water bucket for carrying trees.
- (2) Planting string or rope to be used as a guide line.
- (3) A rake is handy to use in mulching the soil about the tree after the soil is tramped firm.

### Planting Operation

The planting area first should be lined out and stakes placed at both ends of each proposed row. The planting string then can be tied to these to provide a straight row guide to be used as planting progresses from row to row. The judging of spacing distance between trees in the row may be made easier if knots or marks are made at these intervals on the planting string.

If the dibble method of planting is used, a three-man crew is best, while a two-man crew works well for the hole method.

The trees should be carried in a pail of muddy water and removed only as needed to prevent losses from root drying. Packing the soil tightly against the tree roots is essential to eliminate air pockets that hasten drying of the soil. When trees are planted

in good moist soil, no irrigation is necessary at the time of planting.

### Care of Windbreak Trees Cultivation

Cultivation is the most important care that can be given to farm trees during their establishment period under either irrigated or dry land conditions. Rapid growth of trees actually is dependent upon the effects of cultivation for several reasons: (1) it eliminates the root competition of weeds and conserves moisture for trees that would otherwise be used by weeds, (2) it lessens possibilities of attacks by insects and diseases which often spread from weeds, and (3) it provides a mulch of surface soil which tends to prevent the formation of cracks in the soil. Contrary to popular belief and because of the above reasons, a lack of cultivation cannot be offset by addition irrigation. Weeds as referred to here include grasses or any crop plant that might be allowed to grow and compete with the young trees.

Cultivation can be accomplished most readily by the use of a one-horse cultivator and cross-cultivating so that very little hand hoeing is necessary in the rows between trees. A suitable one-horse cultivator can be made by using a single section of harrow. Deep cultivation is apt to injure tree roots and soil hilled up around trees, particularly evergreens, encourages surface roots that tend to make the tree less drought hardy. Late fall cultivation encourages continued growth and is not advisable within three weeks of the first possible frost.

Cultivation should be continued as long as it is possible to operate between the trees or at least until trees produce a large enough crown to protect and shade all the ground. Otherwise, grass and weeds will come in to crowd and retard tree growth. This usually is necessary for a period of 2 to 3 years under irrigation and 3 to 5 years on dry land plantings.

### Irrigation

Irrigation of tree plantings is essential for satisfactory tree growth on most farms at elevations below 4,500 feet in southern Idaho. In northern Idaho irrigation is only necessary in some of the warmer valleys in the vicinity of Lewiston. It may not even be necessary to irrigate at these lower elevations, but it usually is advisable to speed up tree growth at all elevations where water is available.

Watering in a manner which will drive the roots deep into the soil will make trees most drought hardy. This can be accomplished best by long or deep irrigations and never by shallow waterings that encourage surface roots and favor weed establishment. Over-irrigating trees is entirely possible but can be prevented if a small stream of water is used for a longer time (thus allowing water to soak in deeply as it is received) rather than a short period of flooding.

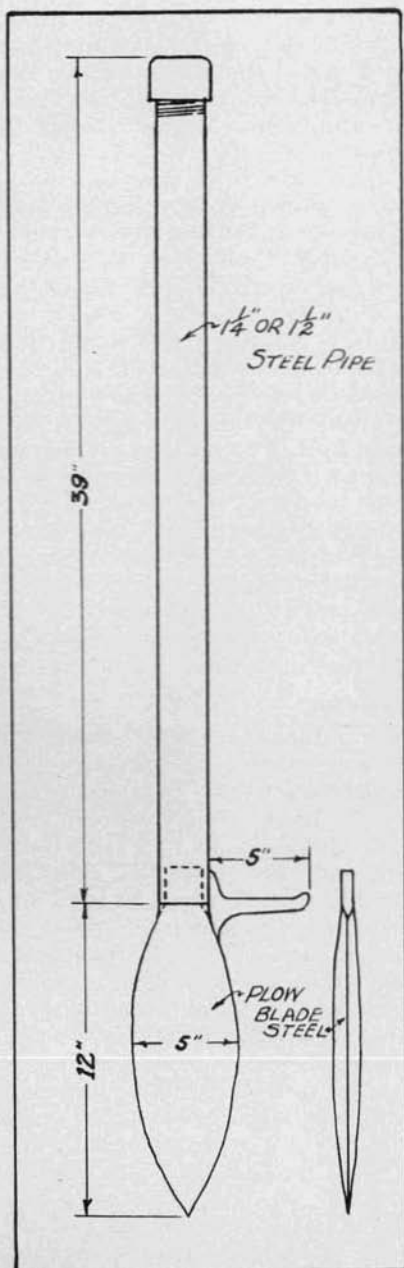


Figure 6.—Tree Planting Dibble.

**Materials for making a dibble—**  
**(Handle)** A strong handle can be made from  $1\frac{1}{4}$  inch steel pipe. A rust proof pipe makes a nicer handling tool.

**(Blade)** Plow steel makes a strong blade and it should be tempered and hammered sharp on the edges.

**(Footpiece)** A piece of mild or low carbon steel is best.

**(Welding)** Electric welding is most satisfactory for use on these materials.

An irrigation furrow on either side of the tree row at a distance of about 1 foot is best for the first season and can be replaced in later years by one furrow in the center between tree rows.

The irrigations should be periodically spaced through the dry season so that the last one comes not later than 3 weeks before the frost period. This allows the soil to dry, the new growth to ripen, and the trees to harden off so as to withstand severe frosts and cold weather. However, if the fall is exceptionally mild and dry and this procedure has been followed, the trees may become dry. Trees must go into the winter with sufficient moisture to keep them from drying out before spring. Therefore, if late water is available give them a *light* watering *after* the leaves have fallen.

### Pruning

Windbreak trees should *not* be pruned except for the elimination of weak crotches in the main trunk. Such crotches are objectionable because of their tendency to break, causing severe splits in the trunk, when strained by strong winds or heavy snows. The elimination of side branches lessens the efficiency of the windbreak in stopping the filtering of wind and snow. Also, more light penetrates to the ground and encourages weed growth and dries out surface soil moisture. The tips of bushy trees, such as Siberian pea tree planted for a snow catch, should be clipped once or twice during the growing season to increase denseness.

### Thinning

As the trees grow in size and

crowding for space becomes apparent, it may be necessary to thin out smaller trees which are being suppressed. This will prevent stagnation of growth and the fewer, thrifty trees left will soon fill the openings made by the removal of suppressed trees.

### Replanting

The trees that are lost should be replaced each spring. This best can be accomplished by ordering 10 per cent more trees than are needed for the original planting. These should be planted at one end of a windbreak row at 1-foot spacings and transplanted as needed. After 3 years further replacements should not be made as they will be shaded, suppressed, and unable to overtake the other trees. Those that are not needed for replacements always can be used for planting on other parts of the farm.

### Fertilizing

A group planting of trees such as a windbreak creates forest conditions and, when sufficiently dense, leaves and litter accumulate to form a "duffy" leaf layer which will provide sufficient tree food as well as conserve soil moisture. The application of animal manure or chemical fertilizers generally is not a good practice. Such food material often causes burning of the new tree growth.

In various sections of southern Idaho where the soil is highly alkaline, it may be necessary to improve the soil drainage through the hardpan layer or by runoff of surface water to leach out some of the basic salts before trees will do well. This is easiest and most satisfactorily accomplished before trees are planted. Any soil fertilizers to counteract

such an alkaline soil condition are temporary in effect and thus expensive to use.

### Protection

To establish and maintain a windbreak calls for continued interest on the part of the owner. After the necessary time and labor have been put forth to establish a windbreak, care and protection must be added to insure success.

**Grazing**—When the trees are young all farm animals should be fenced out. Even chickens injure young evergreens through scratching and exposing the roots so they become dry. In their search for green feed during the late fall and early spring they pluck evergreens bare of leaves. In later years the trees provide ideal protection for chickens but all grazing animals should continue to be excluded. The compaction of the soil about tree roots, baring of surface roots, and barking of trees caused by livestock is injurious even to mature trees.

Dry weeds in or about the trees present a fire hazard. If weeds close to trees are burned, many trees may be killed in a short time. Keep a strip of ground 6 to 10 feet wide plowed as a firebreak around the trees when such a hazard exists.

**Rabbits**—In some localities rabbits are a perennial pest and for this reason no trees are planted. Damage by rabbits can be eliminated if trees are fenced. However, where fencing is impractical for large plantings or because of drifting snow during the winter a *rabbit repellent paint* may be used. This paint is made available by the Fish and

Wildlife Service through County Extension Agents or by writing to the Rodent Control Leader, University Extension Service, State House, Boise, Idaho.

Best results can be obtained if the repellent is painted on all accessible parts of the tree needing protection with a 3-inch paint brush. A single application made prior to the season when rabbits are worst will protect the trees for a year. Evergreen trees may be treated by the same method without fear of damage to foliage. One gallon of solution will treat approximately 400 seedlings if they are less than 3 feet tall, but the amount needed varies considerably between species due to growth form. On larger trees a gallon of solution will paint approximately 300 square feet of bark surface.

**Insects and Disease**—The most satisfactory method of protecting trees against insect and disease damage is by their prevention. Farm trees planted and well cared for will be healthy and suffer a minimum amount of damage, while trees that are weak and unhealthy due to poor care are much less capable of withstanding attack. However, where damage is noticed, immediate steps should be taken for its control. Methods of combatting common insect pests of Idaho trees are described in Idaho Extension Bulletin No. 129, *Idaho Recommendations for Insect Control* which is available through your County Extension Agent or by writing the Director, Idaho Agricultural Extension Service, Moscow, Idaho.

Diseases of transplanted trees often result as a secondary effect due to a weakening or un-

healthy condition caused by some unfavorable growth factor. If the condition causing the weakness is eliminated, the tree may be revived. Where such conditions can be foreseen, they should be corrected before trees are planted. Act immediately when a disease is noticed and send a fresh specimen of it to the Extension Forester, University of Idaho, Moscow, Idaho.