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TREE PLANTING

NEAR DUGOUTS AND DAMS

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Tree Planting Near Dugouts and Dams

INTRODUCTION

Throughout a great part of the Prairie Provinces small water development projects, which include dugouts and dams of varying sizes, are considered by most authorities to be of inestimable value in establishing a sound farming economy. The factors contributing to the high evaluation placed on such developments are the innumerable locations possible and the real need and the multitude of uses for the water so accumulated.

On many prairie farms a dugout or dam is the only possible or immediate source of water for domestic and general use, and where sufficient water can be impounded they can provide the individual farmer with some of the benefits of irrigating, particularly a farm garden. Thus the dugout or dam can provide a measure of security in the matter of producing food products for the table not enjoyed by farmers dependent upon seasonal rainfall.

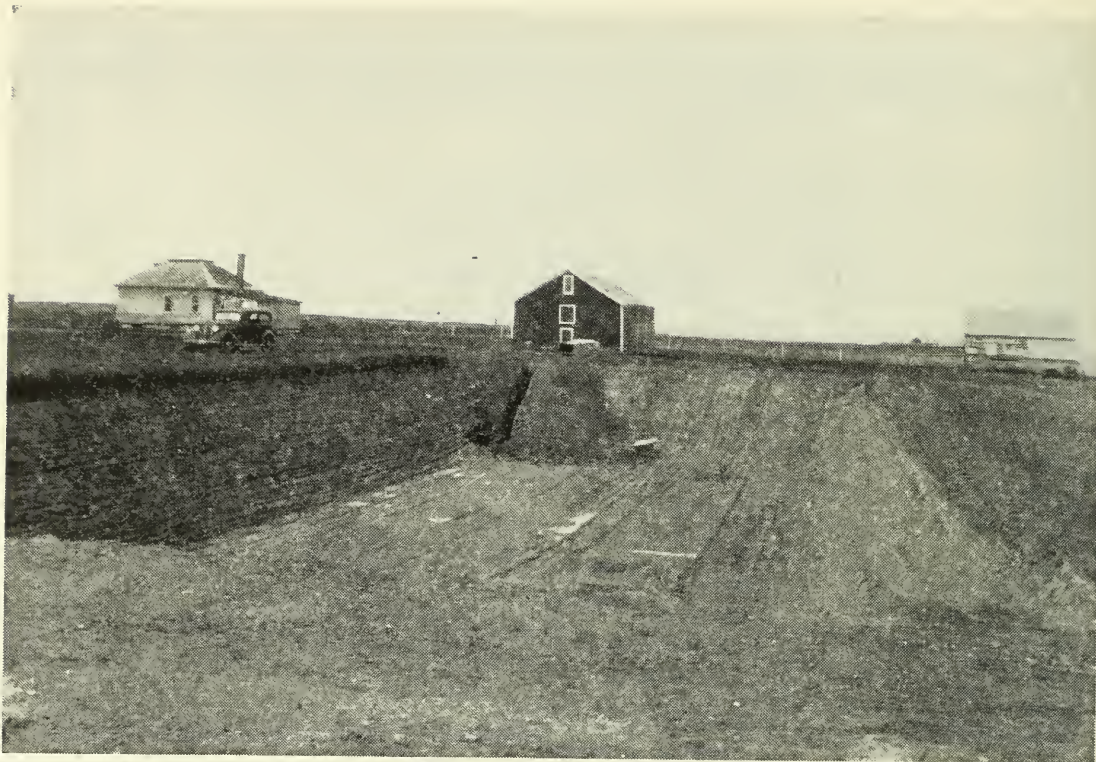
The contribution of a well planned tree belt in increasing the usefulness and value of these small water developments is set forth in this publication.

It has been determined that the loss of water by evaporation from dugouts and dams under prairie conditions during the summer months is about the equivalent of two to three feet of water. Loss also occurs through seepage and other causes. For small dugouts and dams these losses are most serious, and it is not to be expected that the planting of trees near them will compensate for lack of depth and water storage capacity.

Normal precipitation during the summer months is seldom sufficient to maintain the spring level of dugouts or dams. This means that unless the dugout or dam is filled to capacity in early summer the water supply may be exhausted before the summer ends. Such a shortage of water causes great inconvenience for the farm family, and perhaps necessitates the use of valuable time, labour and equipment in hauling water for considerable distances.

As the amount of water secured in a dugout or dam is largely dependent upon the spring run-off from melting snow little will be obtained in winters of light snowfall and this is particularly true when the drainage area is small. Therefore, every possible method known should be used to impound water in a dugout or dam. One of the most efficient methods is a well-planned planting of trees, which effectively increases snow accumulation and thus provides a greater water supply for the storage basin.

In the Prairie Provinces, an acute need for water for immediate use and for reserve, which was experienced particularly during the drought period of the thirties, has stimulated the building of dugouts and dams. Under the direction of the Prairie Farm Rehabilitation Branch of the Canada Department of Agriculture, Regina, Saskatchewan, the number of small projects actually constructed from 1935 to 1943 was about 21,000, with about two-thirds of these located in Saskatchewan. The planting of trees adjacent to these projects has not kept pace with construction, and only a very small number of these dugouts or dams have tree belts near them.



Dugout at Sykes farm of the Dominion Experimental Station, Swift Current, showing the opening through which water can be filtered for domestic use.



Typical farm dugout constructed under P.F.R.A.



Snow accumulated by a narrow belt of trees; valuable water results from the melting of such drifts.



Protective trees along bank of dam.

The following factors are suggested as responsible for this deficiency in plantings:

1. Lack of interest in further developing the dugout or dam as a farm asset, once water is secured, although the very location of dugouts or dams in low land is a guarantee that trees planted near them will succeed.
2. Failure to appreciate the need of trees to complete the project from the standpoint of appearance as well as utility.
3. Mistaken belief that trees would use considerable quantities of the stored water. If water reservoirs are of suitable depth (up to twelve feet deep), and the trees are planted at recommended distances from the reservoirs, it is believed that the reserve amount of water built up through snow accumulation and reduced evaporation will exceed the amount used by them.
4. No appreciation of the value of tree planting as a means of water conservation, although convincing proof of such conservation is available from the owners of those dugouts and dams with established tree belts near them.

WHY TREES SHOULD BE PLANTED

The planting of trees near dugouts and dams is desirable for the following reasons:

- (1) To ensure as great an accumulation of snow as possible and thus provide a large volume of snow water.
- (2) To lengthen the period, by the shading effect, in which the melting of snow in the spring occurs, and thereby lessen soil erosion by water.
- (3) To reduce surface evaporation and loss of moisture in summer by moderating the effect and velocity of drying summer winds. It may be argued that snow fences accomplish the same thing, but trees are more desirable and attractive than bleak fences.
- (4) To provide shelter and shade for livestock and a supply of fuel wood and fence posts for use on the farm.
- (5) To create picnic groves, bird sanctuaries and beauty spots. This is the aesthetic value of trees planted near a dugout or dam and should not be minimized as a factor in prairie farm home life.
- (6) To lessen soil drifting into dugouts and dams, which in time reduces their water holding capacity.

WHERE TREES SHOULD BE PLANTED

While each dugout and dam calls for a particular and specific planting plan some general considerations, applicable to all, are outlined:

- (1) The dugout which provides water for general use should have tree plantings arranged to permit ready accessibility to the water by truck, wagon, tank and stock. Trees should be planted from 50 to 100 feet from the edge of the dugout, thus preventing their use of stored water. It is an advantage to plant trees on all sides of the dugout, although the most valuable belts are those developed towards the higher levels of the drainage area. The trees should be fenced to keep out livestock including hogs, but allowing for convenient approaches to the dugout to be made where needed. (See Fig. 1.) For seasonal stock-watering projects the need of trees for the purposes already outlined may be less acute than for those constructed for continual use throughout the year.

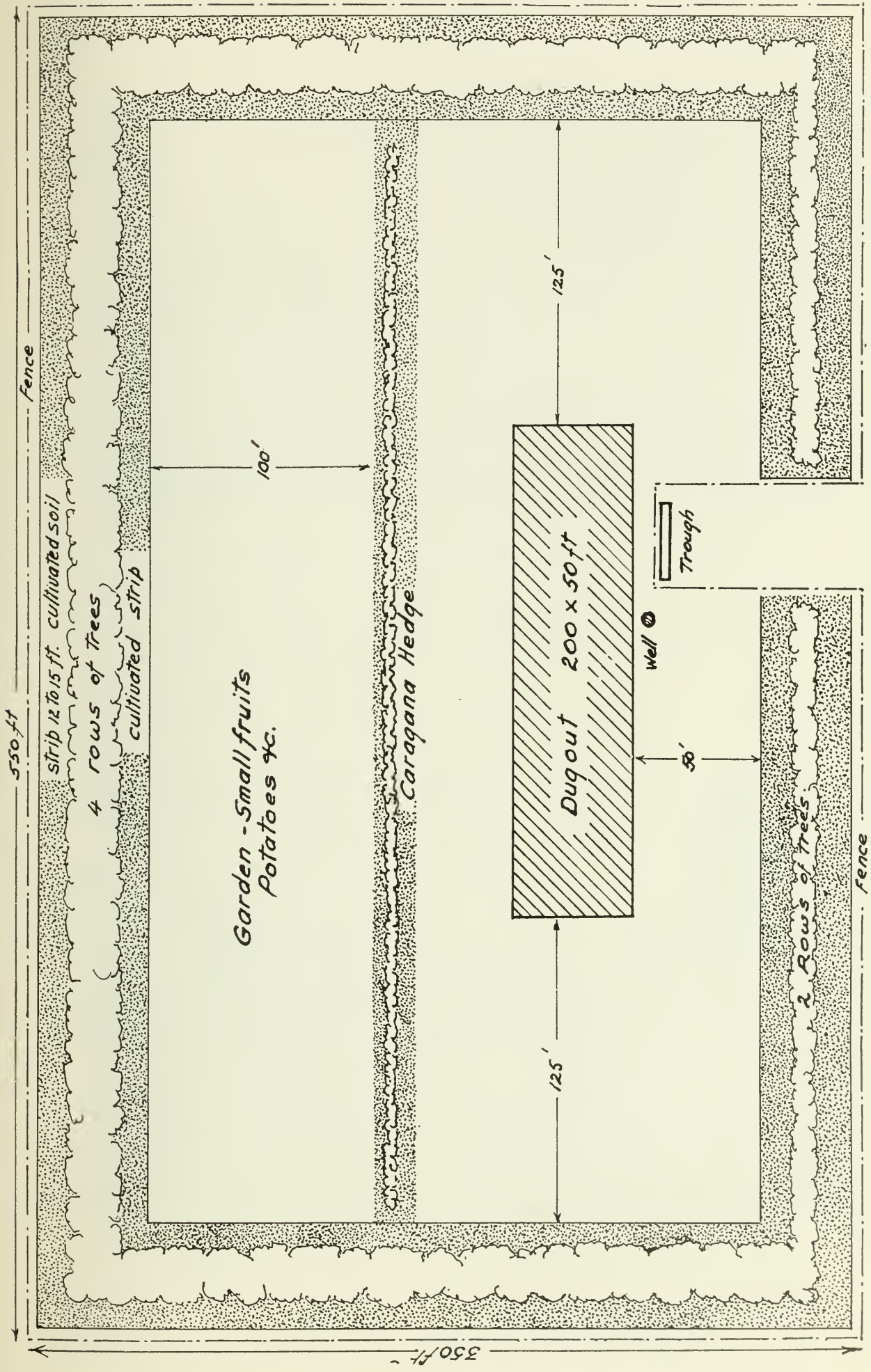


Figure 1 suggests a planting arrangement around a dugout including a garden plot close enough to the dugout to be irrigated with any surplus water available. This plan is only a suggestion; a larger area might be included within the shelterbelts. The position of the garden will depend on the natural slope of the land to allow for the best distribution of the water.

The number of trees which should be planted near a dugout to produce all possible snow accumulation, to delay the melting of snow in spring, and to reduce the drying effect of the summer winds, should be at least the equivalent of a three-row shelterbelt. Although some of these trees might be planted within twenty-five feet of the water's edge to further reduce surface evaporation, wave action, and water erosion, it is believed best, however, to have the banks immediately adjacent to the water covered with grass. Such grass should not be allowed to produce seed, and become a menace to the trees.

- (2) The slope of the land surrounding the dugout will influence the extent to which washing of soil and silt into the dugout will take place. Dugouts, particularly those near buildings, around which unsightly large mounds of soil are left, cannot be considered complete. Such a dugout may be compared with the walls of a living room covered with only a rough coat of plaster. In such cases, the mounds should be leveled as much as possible to lessen soil erosion by water, and to improve the possibility of establishing a surface cover of trees, grass, or underbrush. When these mounds are subsoil material it may require exposure to weathering agencies for a short time and provision of favourable moisture conditions before tree planting in them will be successful.

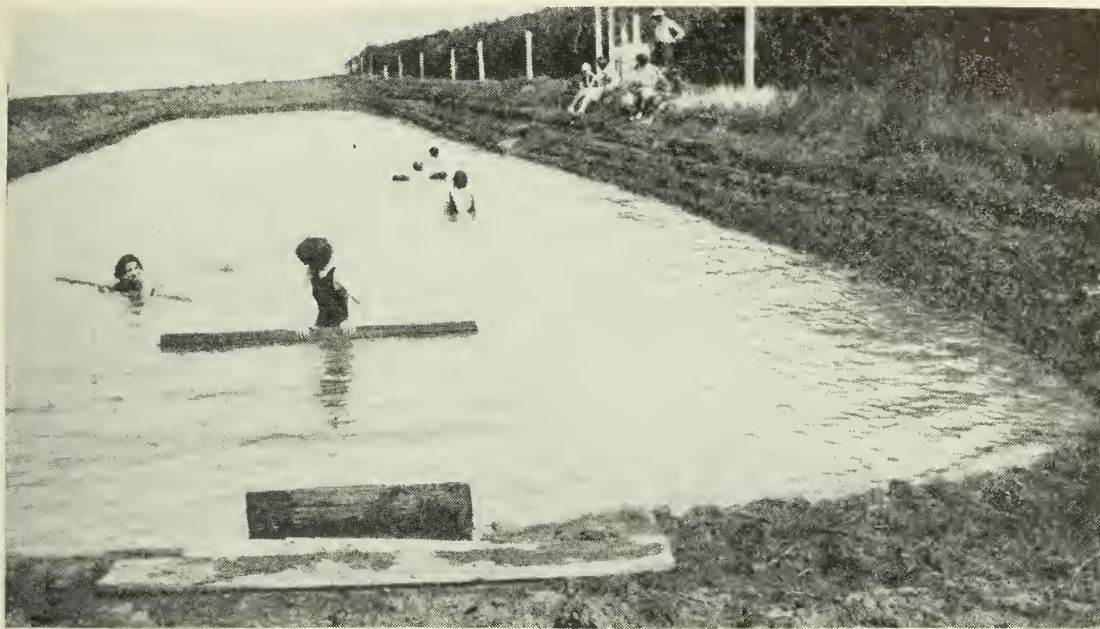
For planting in dugout mounds, caragana, ash and acute willow are the trees recommended, the acute willow in the lower levels, the ash in the middle area, and the caragana in the higher levels. Planters should dig the holes for the trees in the fall before winter sets in to allow the winter temperatures and moisture changes to mellow the soil. The holes for mound planting should be made from four to eight feet apart, and at planting time the following spring good garden or field soil should be placed around the cuttings and roots of tree seedlings.

- (3) Trees around dugouts, constructed primarily for irrigation and containing a reserve of water for summer use only, may be planted relatively near the water's edge. By a judicious arrangement and choice of varieties which include bushy willows, caragana, tall-growing poplars, elm, spruce and pine, protection against loss of water by surface evaporation is assured. In time, also, a very attractive picnic grove will be developed in the area around the dugout.
- (4) Tree planting at a dam is influenced by many considerations. Some of these are: its size, location and orientation, the purpose for which the water has been impounded, and, if for irrigation purposes, how it is to be applied, i.e., by pump or flood irrigation. The surroundings of dams usually lend themselves to ornamental, as well as utility, tree planting, and on a more extensive scale than is possible, necessary or desirable near a dugout. The drainage basin also is usually much greater, and the specific aim of tree planting to provide snow accumulation, although important, is not so urgent.

In general, for purposes of water accumulation and conservation, tree planting should be concentrated on the north and west sides of dugouts and dams to ensure a readily available supply from snow. It is particularly important to provide adequate windward shelterbelt protection against prevailing summer winds to reduce evaporation. Likewise it might be beneficial to plant trees in the up-stream basin.

The advantage of planting trees on the windward side of spillways to prevent them filling with snow is worthy of consideration. Thus in winters of heavy snowfall the danger of spillways damming up would be eliminated no matter how early or how intensive the surplus run-off.

In the lower bed of the up-stream basin where the slope of the land and type of soil are favourable, tree planting for the production



Dugout on farm of Mr. C. R. Jones, Netherhill, Sask. Trees on right catch enough snow in most winters to completely fill the dugout.



Water in the Jones dugout in 1944 after little snow the previous winter.



Large bodies of water also need shelterbelt protection.



Transformation of prairie landscape by trees and water.

of fuel wood and posts is sound economy. Although trees should not be planted much below the high water mark, some should be placed to benefit from early spring flooding. Among them there should be fruit-bearing trees like hawthorn, crabapple and mountain ash, all providing food for beneficial birds.

Tree planting should not be done on the dam, on the spillway, or immediately below it, because of the danger of tree roots causing an undue amount of water seepage. The ground cover should be grass. If conditions permit, the planting of trees beyond a distance of fifty or more feet below the dam, however, would be distinctly advantageous.

SOIL PROPERLY PREPARED FOR TREES

Before discussing the trees best suited for planting near dugouts and dams, it seems desirable to make a few specific observations on soil preparation. The very condition which makes the construction of a dugout or dam desirable, namely, the possibility of drought, requires that the soil for trees should be thoroughly prepared before planting. Its preparation should not differ greatly from the procedure followed previous to general farm tree planting. The soil should be summerfallowed for a year at least to eliminate all perennial weeds and grasses before planting is attempted.

For special plantings such as described on page 8 for dugout mounds and along up-stream or down-stream banks of dams, the digging of holes in the fall and the use of cultivated surface soil at planting time in the spring is recommended. For further information the owners of dugouts and dams who are contemplating planting trees near them should write to the Forest Nursery Station, Indian Head, Saskatchewan, for a copy of the Department of Agriculture Publication No. 514.

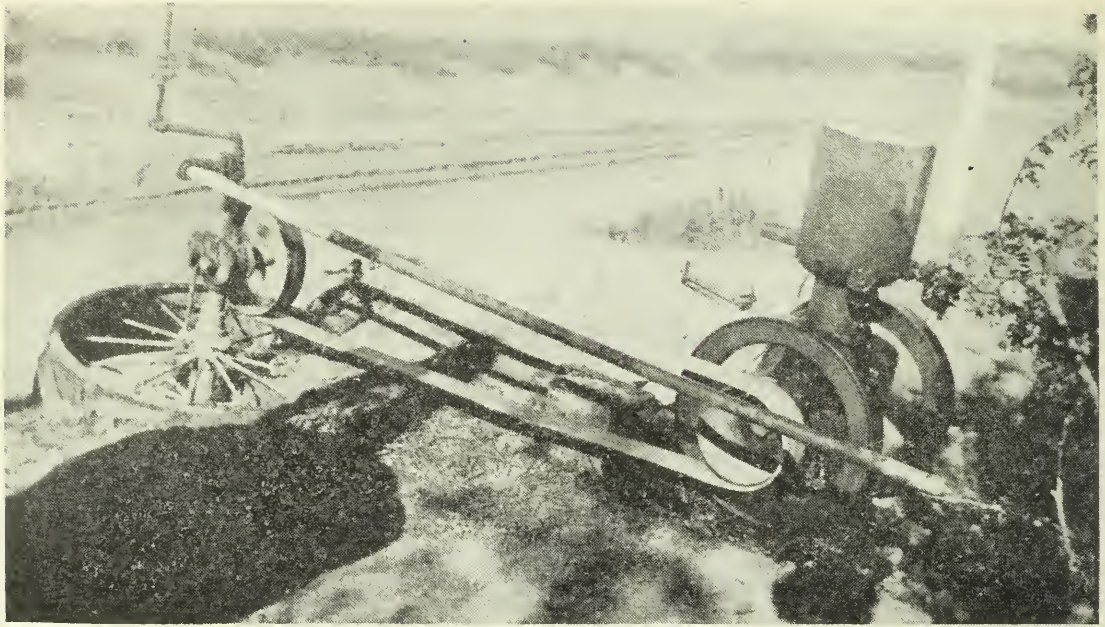
WHAT TREES SHOULD BE PLANTED

The recommendations for varieties to be used in tree planting around the sites of dugouts and dams do not differ greatly from those applicable to farm shelterbelts. The chief aim, namely to create an obstruction to wind and to control snow drift, is the same.

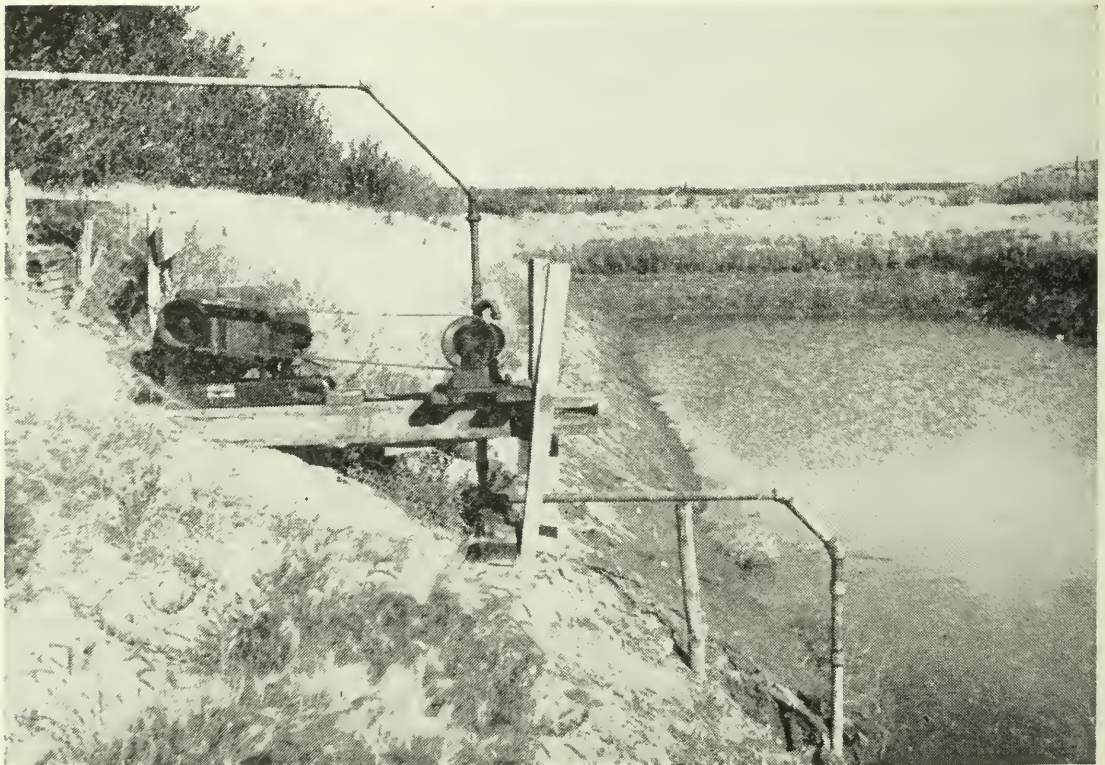
As the land adjacent to most dugouts and dams will be relatively heavy—if sandy, water could not be retained for any length of time—trees like maple (box elder), green ash, white elm, caragana, and a limited number of willow and poplar, should be selected for planting.

The spacing of trees and rows as in general windbreak planting may be adopted. Although the need for dense and complete shelter around dugouts and dams is not so great as in the protection of buildings and gardens, rows may be spaced a suitable distance apart to permit cultivation with tractor implements. This system, however, involves the use of a greater area of land, and requires that the space between rows be kept permanently cultivated to prevent weeds and grass interfering with the growth and development of the trees. In addition, there is a distinct advantage in adopting the narrow spacing of four feet between rows and between trees—caragana one foot apart—as the only cultivation needed after three or four years is that of a permanent marginal strip 10 to 20 feet wide on each side of the belts of trees.

The long-lived broadleaf trees, as green ash and white elm, should constitute a large proportion of tree belts planted near dugouts, although caragana should be included and some quick-growing maple and poplar also are desirable. A single row should be composed of caragana. The acute willow or woody plants with similar type of growth and development may be planted near the water's edge to prevent wave action on the banks. The soil-binding power of the roots



Inexpensive pumping plant on farm of Mr. C. R. Jones, Netherhill, Sask.



Convenient pumping arrangement on farm of Mr. J. H. Broeder, Maxstone, Sask.

will also supplement the protective action of the plants. The banks themselves should be seeded to grass, preferably crested wheat grass.

Plantings for bare mounds of soil have been suggested in a previous paragraph (page 8). Hardy evergreens may also be included in plantings near dugouts and dams. These are particularly recommended for up-stream and down-stream plantings near dams. Such plantings should be looked upon as woodlots, and in time would constitute sources of fuel wood, pickets, etc. As already stated, there should be included in plantings near dams some fruit-bearing plants for the benefit of beneficial birds.

IRRIGATING GARDENS FROM DUGOUTS AND DAMS

A few remarks about irrigating the garden would seem to be justified because of the relationship between tree planting, water use and conservation, and the production, under prairie conditions, of food for the family. However, specific problems dealing with irrigation should be submitted to the University, Experimental Station, or Department of Agriculture serving the community.

In many seasons one thorough irrigation from a dugout or dam may supply sufficient moisture for garden crops to make the difference between good returns and failure. In dry years the garden crops resulting from such an application may represent in terms of food for the family the most valuable returns from the impounded water. The equipment required to pump and distribute water from a dugout or dam need not be elaborate or expensive.

A planting arrangement around a dugout including a garden plot close enough to the dugout to be irrigated with any surplus water which may be available is suggested in Fig. 1. The areas within the shelterbelts may be larger than indicated, and the location of the garden will depend on the natural slope of the land to allow for the simplest method of distributing the water, i.e., by gravity once it is elevated from the dugout itself.

Another example of a satisfactory arrangement of shelterbelts and dugout is furnished by the sketch in Fig. 2 of the farm of Mr. C. R. Jones, Netherhill, Saskatchewan. Mr. Jones states that even in the driest year sufficient snow

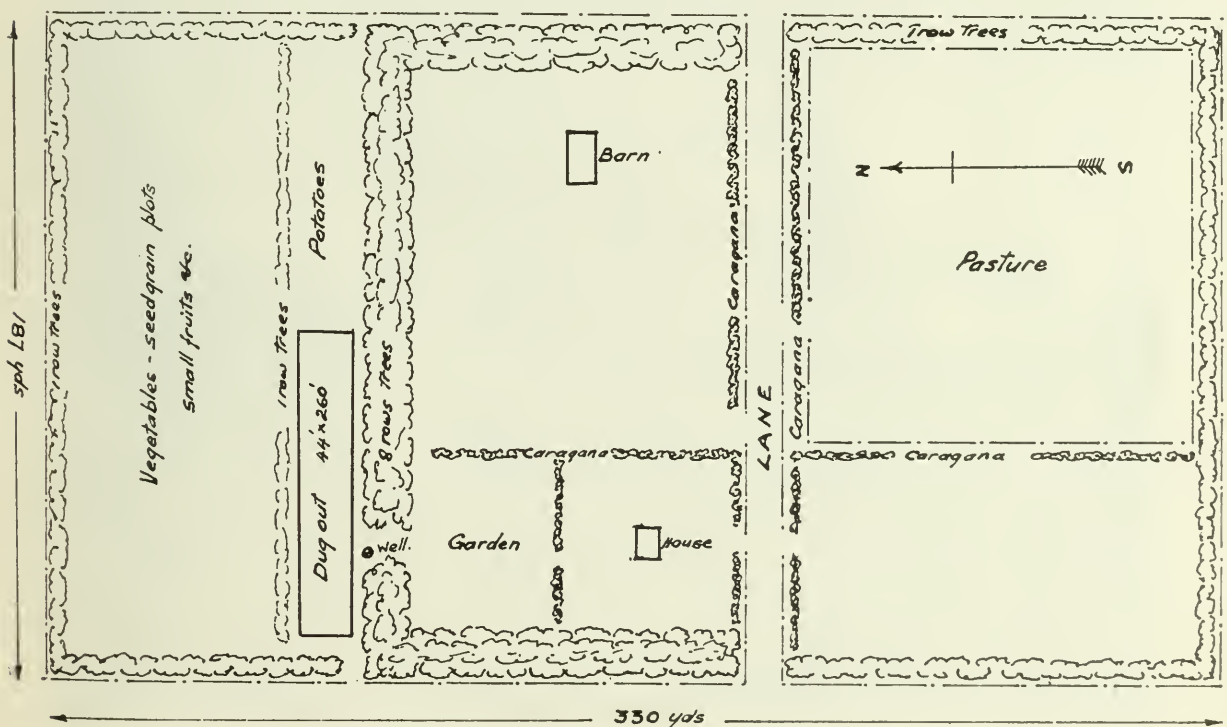
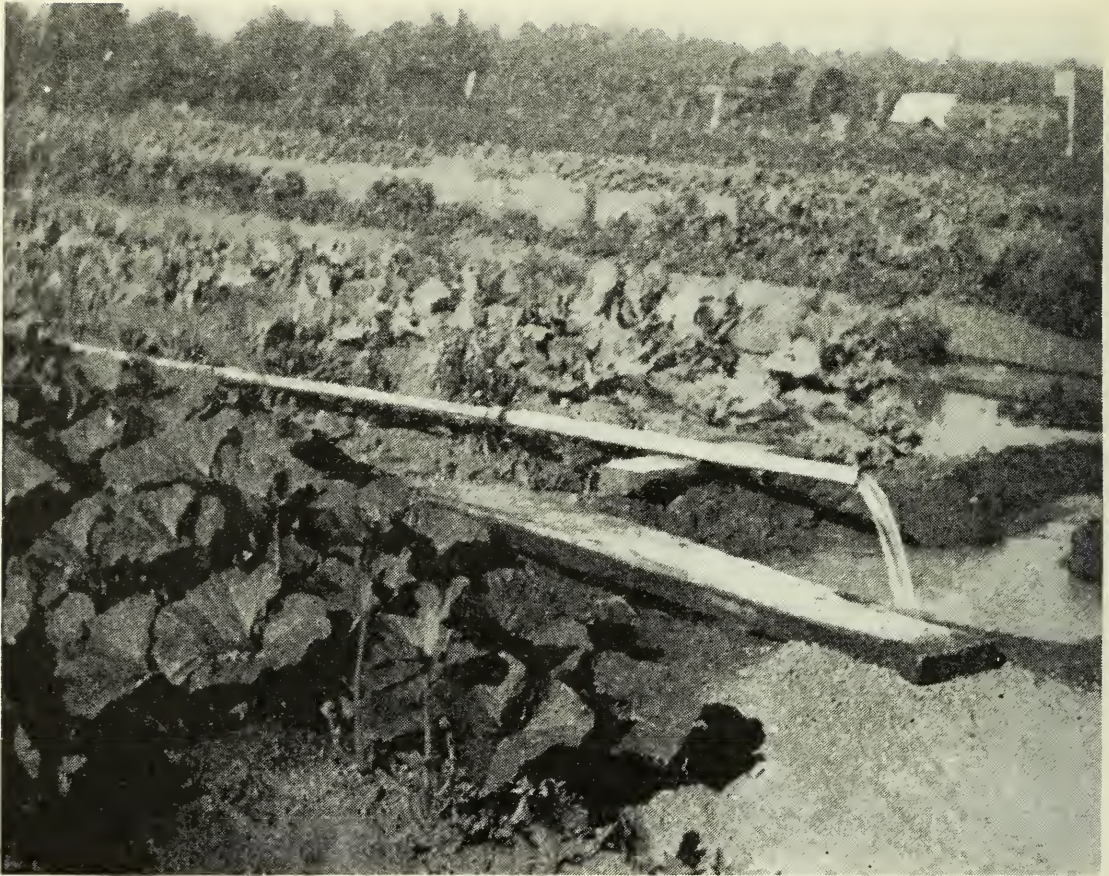


FIG. 2.—General Plan of Shelterbelts around Buildings, Gardens and Dugout on the Farm of Mr. C. R. Jones, Netherhill, Sask.



Farm of Mr. C. R. Jones, Netherhill, Sask.



Water is assurance against crop failure; food for the family in the Broeder garden.

was collected by his shelterbelts to more than fill his dugout each spring. The land is practically level, with a very slight fall to the east. When the dugout overflows in the spring it floods the plot where he grows his potatoes and this overflow water is held on the plot by small dirt embankments about a foot or so in height, thrown up on the north, east and south sides of the plot. This provides a thorough soaking of the soil in early spring and ensures a good crop of potatoes each season. When irrigating the garden south of the dugout a small rotary pump is installed on the bank of the dugout and 200 feet of one-inch pipe and 100 feet of rubber hose are used for distributing the water. Accompanying photographs show views of Mr. Jones' dugout, pumping plant and vegetable garden in the extremely dry season of 1937.

Other photos illustrate the pumping and using of water in 1944 from a dugout on the farm of Mr. J. H. Broeder, Maxstone, Saskatchewan.

Areas below the level of dugouts or dams may be irrigated by a suitable system of flood gates. Such areas may be used for vegetables, fruits, forage crops or grains, but they, too, should be protected by suitable windbreaks.

TREATMENT OF WATER FOR ALGAE

Algae or small greenish organisms often impart an objectionable taste and odour to still water during the hot summer months. Copper sulphate (bluestone), applied to the dugout water at the rate of one pound for a full dugout of the size previously mentioned, will control these algae. Copper sulphate may be obtained from hardware stores. Copper sulphate may be applied by placing the required amount in a muslin bag and dragging it across the reservoir from side to side by means of ropes. This operation should be continued until the copper sulphate has been well distributed and completely dissolved in the water. Overdoses of copper sulphate will prove harmful to fish life or to humans.

(For treating dugout water with bluestone the F.N.S. uses a strongly built raft. It may not always be possible to easily walk around the dugout and use a rope.)

The immediate effect of killing the algae may be to increase the taste and odour in the water for a short time. With some experience the dugout may be dosed at intervals so as not to permit the initial growth of algae. In warm weather the treatment needs to be more frequent.

Recommended Dosages of Copper Sulphate (Pounds)

Top Dugout Dimensions (ft.)	Overall Depth (ft.)	Depth of Water in Dugout			
		Full	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{1}{3}$
120 x 60.....	10	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{8}$
	12	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{8}$
	14	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{8}$
160 x 60.....	10	1	$\frac{2}{3}$	$\frac{1}{3}$	$\frac{1}{4}$
	12	1	$\frac{2}{3}$	$\frac{1}{3}$	$\frac{1}{4}$
	14	1	$\frac{2}{3}$	$\frac{1}{3}$	$\frac{1}{4}$
180 x 100.....	10	2	$1\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$
	12	2	$1\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$
	14	2	$1\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$

(1)References used: "Treatment of Dugout Water for Domestic Use"—H. D. Ayers.
"Treatment of Farm Water Supplies".



Farmers are urged to plant trees around their dugouts and dams. Trees are supplied for this purpose, free of charge, express charges collect—an additional charge of \$1.00 per hundred is made for evergreens—from the Dominion Forest Nursery Stations situated at Indian Head and Sutherland, Saskatchewan. For full particulars write to the *Dominion Forest Nursery Station, Indian Head, Saskatchewan.*

Acknowledgment: Helpful suggestions in the preparation of this publication received from Mr. W. L. JACOBSON, formerly Assistant Superintendent of Water Development, P.F.R.A., Regina, Saskatchewan, are acknowledged.

Further Information about Trees and Tree Planting

Information relating to trees and shelterbelts and a copy of any of the following publications may be obtained on request from *The Forest Nursery Station, Indian Head, Saskatchewan.*

1. Trees for Prairie Farm Planting (FNS Circ. No. 1)
2. Prairie Farms Need Woodlot (FNS Circ. No. 20)
3. Caragana is a Valuable Hedge and Shelterbelt Plant.
4. Conditions as to the Preparation of Soil for Tree Planting (Pub. 514)
5. Special Instructions for Planting Evergreens (Pub. 515)
6. How to Plant Hardwood Cuttings (Pub. 516)
7. Instructions for Planting Tree Seedlings (Pub. 517)
8. How to Make a Sketch of the Proposed Shelterbelt (Pub. 518)
9. Progress Report 1937-1946
10. Tree Planting Near Dugouts and Dams (Pub. 629)
11. Irrigating a Prairie Farm Garden (Pub. 657)
12. Vegetables for Prairie Farms (Pub. 663)
13. The Bluestone Treatment for Poplar Posts.
14. Pruning, Thinning and Utilizing Trees (Pub. 770)