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Winter Irrigation for Western Kansas

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WINTER IRRIGATION FOR WESTERN KANSAS

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During the past three or four years there has been a decided increase in the interest in irrigation in western Kansas. The severe drouths which have been experienced during this period have had much to do with this increased interest. The successful development of irrigation agriculture in western Kansas involves a large number of different factors. One of the important factors relates to labor, the supply of which ordinarily is short, particularly during the growing season. For several years experiments relating to problems of irrigation agriculture in western Kansas have been in progress at the Garden City Branch Station. One of these experiments has had to do with determining the feasibility of winter irrigation; that is, the artificial application of water to the soil between harvest time in the fall and planting time the following spring. This circular discusses some of the more important features of the results secured and emphasizes the desirability of winter irrigation in western Kansas with particular reference to labor economy.

ADVANTAGES OF WINTER IRRIGATION

Wherever winter irrigation can be successfully carried on in western Kansas, it is to be recommended. It offers many advantages. It utilizes labor during the winter months when labor is the most plentiful and requires correspondingly less labor during the busier months of the year. It allows the farmer that hires a great deal of labor to do a larger portion of the farm work during the winter months when labor is cheapest.

Other noteworthy advantages of winter irrigation are as follows:

1. Water applied during the winter months has more time to penetrate into the soil, and consequently penetrates to a greater depth than if applied during the growing season. This serves to deepen the zone in which the plants can feed. Where water is applied in amounts of from 4 to 6 inches during the

Historical Document
Kansas Agricultural Experiment Station

growing season it seldom has time to penetrate more than from 1 to 3 feet before the hot sun, wind, and the rapidly growing crop have taken out enough to arrest its downward movement. Thus the subsoil is kept too dry for root development, and the roots are compelled to spread out near the surface instead of being allowed to grow downward. The feeding zone is thus limited to the first few feet of soil, which is subjected to high temperatures during the hot summer months, causing the plants to suffer.

A loam soil, such as that in western Kansas, will hold from 2 to 3 inches of water per foot of depth. That being true, an application of 15 inches of water will penetrate it from 5 to 8 feet deep. The roots of nearly all farm crops will go to that depth if moisture conditions are favorable. The roots, therefore, may have nearly three times the feeding zone they would have if this amount of water was to be applied in three applications, aggregating 15 inches, during the growing season. This is of considerable importance if large yields are to be secured.

2. Much more plant food is liberated where the water has had time to saturatethe soil thoroughly. This is due not only to the fact that the feeding zone is deepened, but also to the fact that plant food is liberated more rapidly from soil that is fairly moist.

3. Thawing and freezing greatly improve the texture of the soil. The freezing process expands the soil and breaks up the soil particles. Thawing then leaves the soil in a loosened condition. Dry soil is not affected by the action of frost to the extent that wet soil is; therefore soil that has been irrigated in the fall and is wet through the winter will be in a better physical condition in the spring than dry soil.

4. Often water applied to a growing crop, especially one suffering for water, will produce excessive vegetative growth when the crop should be making grain. Or it may cause the plants to start a new growth and greatly delay maturing. If the crop were able to extend its root system for food and moisture, as might be the case on winter-irrigated land, a more normal growth would be produced and earlier maturity result.

Thus from the standpoint of crop production as well as from that of saving summer labor it is desirable that winter irrigation be practiced in western Kansas wherever possible.

Historical Document
Kansas Agricultural Experiment Station

RESULTS OF EXPERIMENTS

Experiments at the Garden City Branch Experiment Station covering a period of five years have shown that sufficient water can be stored in the soil by winter irrigation alone to produce good crops of corn, kafir, milo and certain other row crops. The soil on which these experiments were made is a deep silt loam, representative of most of the upland in the western part of the state. Good yields have been obtained each year with all crops grown on the winter-irrigated land. At the same time, with the exception of the wet season of 1915, unirrigated land produced practically nothing.

Table I gives the yields obtained with some of the crops in these experiments in 1916, 1917, and 1918.

TABLE I.—YIELDS ON WINTER-IRRIGATED LAND

CROP (*a*)	1916		1917		1918	
	Grain	*Dry stover*	*Grain*	*Dry stover*	*Grain*	*Dry stover*
Corn—Boone County White	58.0	1.20	30.0	4.40	20.4	2.14
Kafir—Blackhull White	30.3	4.74	46.4	5.63	47.8	3.38
Milo—Dwarf Yellow	35.3	3.30	33.4	3.04	53.0	2.00
Sumac sorghum	....	8.32	....	12.78	....	4.92

(*a*) Yields of grain are given in bushels per acre; of dry stover in tons per acre.

For the 1916 crop, 14 inches of water was applied in December of the preceding year; for the 1917 crop, 14 inches of water was applied in November of the preceding year; and for the 1918 crop, 18 inches of water was applied in the early spring before planting time. None of the crops was irrigated during the growing season.

The yields of some of the 1918 winter-irrigated crops compared with yields obtained on unirrigated adjacent land, otherwise under similar conditions, are shown in figures 1, 2, 3, and 4.

Historical Document
Kansas Agricultural Experiment Station

FIG. 1.—Comparative yields of 20th Century Yellow Dent corn, 1918. Left (unirrigated), yield—grain, 0.0; stover, 0.51 ton per acre. Right (winter irrigated, 18 inches applied in early spring), yield—grain 34.6 bushels per acre; stover 1.54 tons per acre

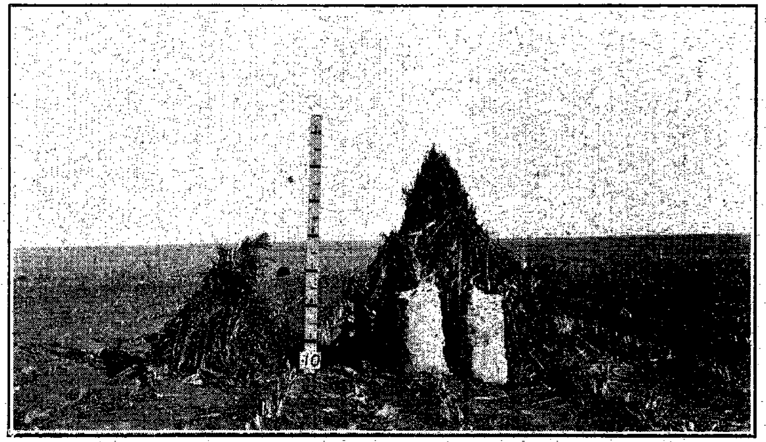

FIG. 2.—Comparative yields of Colby Bloody Butcher corn, 1918. Left (unirrigated), yield—grain, 0.0; stover, 0.79 ton per acre. Right (winter irrigated, 18 inches applied in early spring), yield—grain, 41.7 bushels per acre; stover, 1.69 tons per acre

Historical Document
Kansas Agricultural Experiment Station

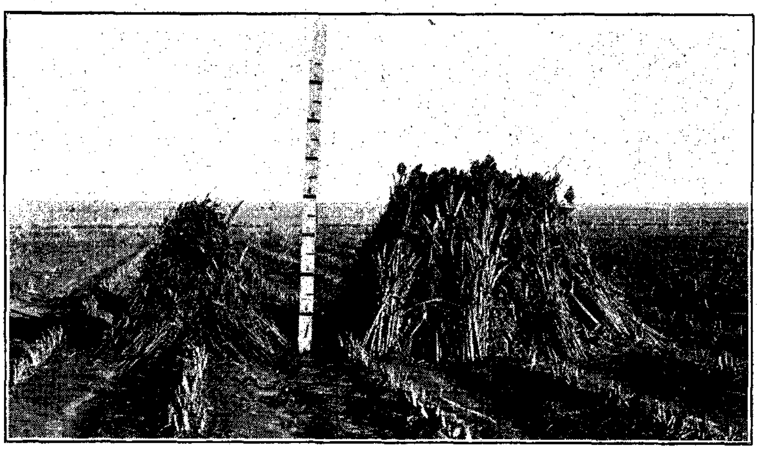

FIG. 3.—Comparative yields of Dwarf Yellow milo, 1918. Left (unirrigated), yield—grain, 4.0 bushels per acre; stover, 0.67 ton per acre. Right (winter irrigated, 18 inches applied in early spring), yield—grain, 72.2 bushels per acre; stover, 3.54 tons per acre

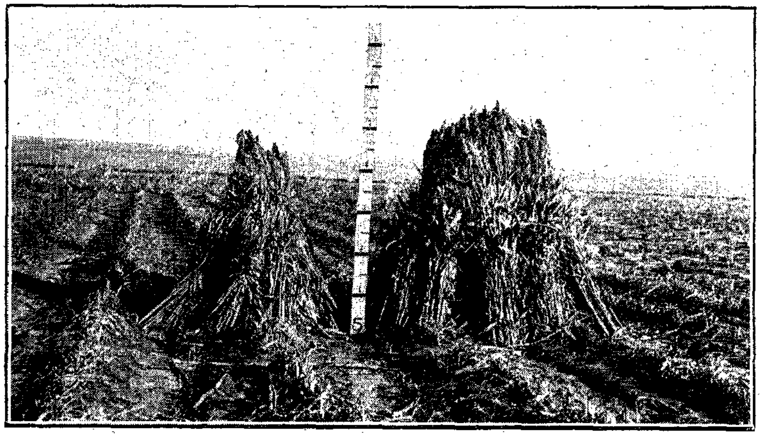

FIG. 4.—Comparative yields of Dwarf Blackhull kafir, 1918. Left (unirrigated), yield—grain 5.6 bushels per acre; stover, 0.85 ton per acre. Right (winter irrigated, 18 inches applied in early spring), yield—grain, 47.8 bushels per acre; stover, 3.38 tons per acre

REQUIREMENTS FOR SUCCESSFUL WINTER IRRIGATION.

Soil must be put in proper condition to receive winter irrigation. If not, it is difficult to get it to take at one application the large amount of water required (14 to 18 inches in the experiments at the Garden City station). If a large amount of water is applied to ground in poor condition an uneven irri-

Historical Document
Kansas Agricultural Experiment Station

gation results, an excessive amount soaks away in low parts of the field, much of it going below the reach of crop roots and being lost, while the higher ground will not receive enough water to carry the crop to maturity.

Both deep plowing and blank listing are good preparations for winter irrigation. If the ground is fairly level, listing will put it in good shape with a minimum of labor. The water can then be turned on until the lister furrows are full. Land that slopes materially should be listed on contour lines or prepared by deep plowing. The loose plowed ground obstructs the flow of water and gives it time to soak in. The surface soil also is capable of taking up a great deal of water when loosely plowed.

Neither of these methods involves unnecessary labor. Plowing or listing would have to be done before the next crop is planted, and whether irrigated or unirrigated, the ground is left in better shape in the spring if it is plowed or listed in the fall. Where the ground has been listed, the ridges can be split in the spring and it is ready for planting, or if it has been plowed, a double disking will put it in excellent shape to plant with a surface planter.

Surface planting is an excellent method for winter-irrigated land, as it is not necessary to list to get the crop down to moist soil. The surface soil is warm and a better germination is secured. In addition to this, one man can plant more than twice as fast with a surface planter as with a lister.

Winter irrigation can be applied almost any time after the crop is removed from the land in the fall. Successful results have been secured at the Garden City Branch Station by irrigating in November, in December, and in early spring.

Practically all of the soil in the irrigated district of western Kansas is well adapted to winter irrigation. The only exception is some of the land along the Arkansas River which has such a sandy subsoil that it will not hold a great deal of water. Much of the land in the valley, however, has a heavier subsoil and is adapted to winter irrigation. Heavy soil will hold more water than light soil.

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