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IN RESPONSE to many requests from farmers, this circular was prepared to give a few practical moisture-conserving methods that can be effectively and economically used.

Assistance in properly surveying land for the application of these conservation practices can be obtained from the supervisors of soil conservation districts that are now organized in Nebraska. Local county extension agents can give further information on moisture conservation and the functions and organization of soil conservation districts.

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Pictures furnished through courtesy of Soil Conservation Service.
Hold the Moisture in the Soil

E. H. DOLL

SHORT PERIODS of time without effective rainfall during the growing season have been recorded in Nebraska along with major drouths and hot dry winds. If the subsoil is dry, short drouths are sometimes as devastating to crops as are longer periods of subnormal rainfall. There is no way to prevent drouth, but something can be done to store the rain when it falls for the dry period that is likely to follow.

Storage Reservoirs

Soils vary considerably in their water-holding capacity. For each foot of depth, a sandy loam may hold one and one-half inches of water available for use by crops, while a silt loam may hold two inches. Annual crops may go to depths of five or six feet for moisture if it is available. Thus it is possible to store within the reach of crop roots in the soil of Nebraska’s cultivated fields ten times as much water as can be stored by the second-largest earth dam in the world, the Kingsley Dam near Ogallala.

Fortunately, most of the modern methods of conserving soil also save moisture. Much has appropriately been said about landowners’ being responsible for conserving their land for future generations, but not enough has been said about the immediate profit of conserving fertility and moisture by holding rain where it falls. Soils under virgin conditions have more pore space and greater water-holding capacity than do those under continuous cultivation. Water-holding capacity of cultivated soils can be improved by using a crop rotation which includes grasses and legumes.

*Water from a fast two-inch rain held by contour listing.*
Reducing Runoff Is Important

Whenever rain falls more rapidly than one-half inch per hour on smooth unprotected hard land, the water usually runs off if the field has any slope. Nearly as much water may run off from fields with slopes as gentle as one or two per cent as from moderately sloping land. This fact is not generally recognized, because water erosion may be negligible on the land that appears to be flat. Rainfall from small showers during the summer months is usually lost by evaporation and does not penetrate to the roots of crops unless several small showers occur during a day. A smaller percentage of the larger rains is likely to be lost by evaporation because the water can penetrate deeper into the soil. Consequently, it is chiefly the moisture from the larger rains that is responsible for the production of crops. Experiments covering a long period of years at Lincoln show that only one inch of water is actually used by plants in the production of from three to five bushels of corn or wheat per acre. Water that runs off a field, while it may not total many inches, may make the difference between a complete crop failure and a small crop, or between an average and a bumper crop.

Contouring Saves Water

Contouring (listing, cultivating, drilling, etc., across the slope, as nearly on the level as possible) was introduced primarily to reduce soil erosion. However this practice also greatly reduces water loss. Each furrow, ridge, or groove of the lister, drill, disk, or cultivator provides a dam or barrier to hold water where it falls until it can percolate into the soil. Experiments during a seven-year period on a 9-per-cent slope of Marshall silt loam with an average precipitation of 25 inches showed that this land gave an average yield of 29 bushels of

Plant residues on or near the surface of the soil reduce runoff and evaporation.
Strips of row crops reduce soil blowing and catch snow.

corn per acre when listed on the contour and 19 bushels per acre when the rows were listed up-and-down hill. Listing up-and-down hill resulted in seven times as much runoff as was true of contouring—and five times as much loss of soil. A very good job of contouring was done by means of accurately surveyed contour lines at 75-foot intervals across the slope.

With a 17-inch average precipitation during a four-year period, sorghums listed up and down a 4-per-cent slope yielded two tons per acre, and those listed on the contour gave two and one-half tons per acre. The difference in yield was due to the down-hill listing. In addition to saving water and soil, contouring generally requires less tractor fuel and less horsepower than does up-and-down-hill farming. Generally, for best results, crop rotations, proper use of crop residues, grassing waterways, strip cropping, and sometimes terracing should be combined with contour farming.

**Water-Saving Terraces**

On moderately sloping cultivated land, gradient terraces may be used as diversion ditches or dikes to stop rills or finger gullies, or to pick up runoff water from intense rains in order to direct it slowly off the field onto an area that is protected by grass.

On soils with a high rate of absorption, with flat or very gently sloping topography, and where normal rainfall is low, level terraces may be used satisfactorily to conserve water. Terraces may be built with blade or elevator graders, or fresnoes, or may even be started with a plow. Since terraces that are improperly designed or constructed may break when overtopped and thus create erosion, it is advisable to consult an Agricultural Extension or a Soil Conservation Service office for information in regard to the proper terracing system for a particular field.
Cover Reduces Runoff and Evaporation

Fallowing in such a manner as to kill weeds and leave a vegetal mulch or stubble on or near the surface has been recognized for a number of years throughout the Great Plains as a means of preventing wind erosion. Recent experiments at Lincoln show that water loss both by runoff and evaporation can be reduced on land with a cover of straw from combined wheat.

The weeds are controlled by tillage machinery that cuts off roots below the surface of the soil and leaves as much of the crop residue and stubble on the surface as possible. If the implement is drawn up and down hill, its shanks leave marks or grooves that may develop into finger gullies; therefore, it is advisable to use it on the contour.

On fields that lack a good cover, as is the case when corn or sorghums are cut for silage or fodder, wind erosion and water loss may be great. These may be reduced by basin or blank listing on the contour, or by the use of the eccentric disk, eccentric wheatland plow, or other implements that leave basins or holes to impound rain water which falls faster than the soil will absorb it.

In fallowing, tillage beyond what is necessary to control weeds may increase evaporation, thereby greatly increasing the cost per inch of water stored, and may also increase the danger of soil blowing.

Moisture in Snow

Frequently moisture that comes in the form of snow is lost by being blown from unprotected fields into huge drifts in creeks, canyons, draws, roads, and around farm buildings. In these places it may become a nuisance and may create an expense for labor and equipment to remove it. Generally, the most efficient method of holding snow on a field is by a good vegetative cover in the

These small contour grooves catch runoff and are rapidly covered with grass.
Spreader ditches effectively irrigate grassland with water that would otherwise run off in road ditches, gullies, or creeks. (See sketch on next page.)

form of cornstalks, sweet clover, small grain, sudan, or sorghums cut so as to leave a tall stubble. Breaking the wind by trees, shrubs, or strip cropping is also effective in keeping snow in the fields.

On fields that may not be protected from winds, such as fields of winter wheat, pastures, and meadows, snow can frequently be held by making snow ridges at right angles to the prevailing wind with a V-drag pulled either by horses or by a tractor. Such ridges or furrows may be made with a snow plow at frequent intervals across the field as soon as five or six inches of snow has fallen and is in a favorable condition for compacting. Since each of these barriers acts as a snow fence, additional snow may be caught. While a foot of loose snow may contain an inch of moisture, a foot of compacted, drifted snow may contain from three to four inches of water.

**Pasture Contours**

Maintaining a good growth of grass is an effective way of reducing water loss by runoff. However, pasture contouring can save water on hard land when rainfall is limited and economy necessitates grazing off grass that would otherwise give the soil adequate protection for maximum absorption of water. In central to eastern Nebraska, single furrows that were made by plowing on the contour have grassed over satisfactorily with either buffalo grass or a good sod of native grasses. West of this area shallow contour chiseling or smaller grooves made with a remodeled lister, as shown in the picture, have shown decided advantages over plow furrowing. Best results are obtained with pasture contouring on gentle to moderately steep slopes; the practice is not applicable to very steep slopes.
Flood Irrigation

Water from intense rains that can be expected to run off can frequently be diverted from road ditches, draws, and creeks to irrigate grassland. If the area to be flooded is relatively flat, cultivated crops may be irrigated by diverting runoff. In some cases a diversion ditch or dike, possibly in combination with a small diversion dam, may divert water satisfactorily from a small draw or road ditch in order to irrigate grassland. More efficient use may be made of runoff water from larger watersheds or, on cultivated land, from the construction of a combination of head gates, diversion structures, canals, dikes, or ditches with outlet boxes or other devices to control uniform water spreading. An important feature of a flood-irrigation system is that it should be able to use a large amount of water in a relatively short period of time. It should also be as nearly automatic as possible so that, regardless of when the rain or floods occur, the water may be used on the land with little attention given at the time. Someone who has had considerable experience with flood irrigation can be of assistance to those who have had none.

Sketch of flood-irrigation plan illustrated on previous page.