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Increased Crop Yields by Conservation Farming

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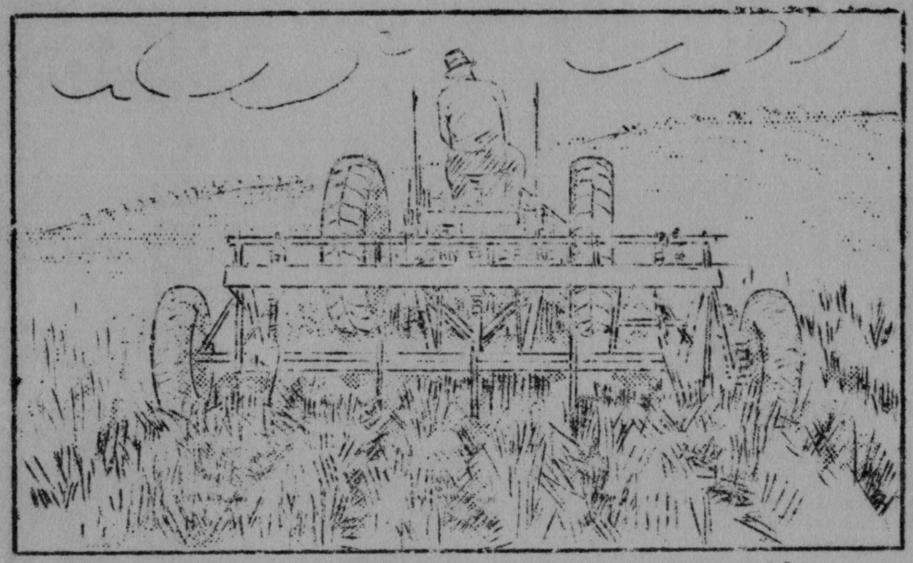

Crop Residues on the Surface Protect the Soil

Agricultural Experiment Station
South Dakota State College
in cooperation with Research Division of
Soil Conservation Service

SOUTH DAKOTA AGRICULTURAL EXPERIMENT STATION
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INCREASED CROP YIELDS BY CONSERVATION FARMING

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TILLAGE TRIALS

Tillage that leaves the surface of the soil cloddy and mulched with crop residues is effective insurance against soil washing and drifting. It also saves extra moisture to increase crop yields. The type of tillage implement used, largely determines the amount of vegetative residue that will remain on the surface. Because of variation in rainfall, weed growth and other soil and climatic factors tillage methods which are recommended for one area of the state may not be adapted to other areas.

The moldboard plow is one of the best implements for weed control and preparation of a desirable seedbed in the eastern part of the state but it is not the most desirable implement to leave crop residues on the surface for maximum protection from erosion. In drier areas the subsurface tiller, duckfoot, or some similar implement have been successfully used.

The use of subsurface tillage machines has steadily increased during the past few years. They consist primarily of a blade running several inches beneath the soil surface so that the soil is tilled or stirred without being turned over. Straw and other crop residues are thus left almost undisturbed on the surface of the soil to provide protection against erosion and run-off. The best results from this type of tillage have been obtained in areas where combines are used to return all straw to the land. Under these conditions increased crop yields have resulted from the use of subsurface tillage. Weeds may not be so effectively controlled by subsurface tillage in the eastern part of the state but crop yields obtained from field trials have been about equal to those from other types of tillage.

In addition to field trials conducted in several parts of the state detailed tillage and residue trials were conducted at two locations, one at Highmore and one northeast of Huron.

Tillage and Residue Results at Highmore Sub-Station

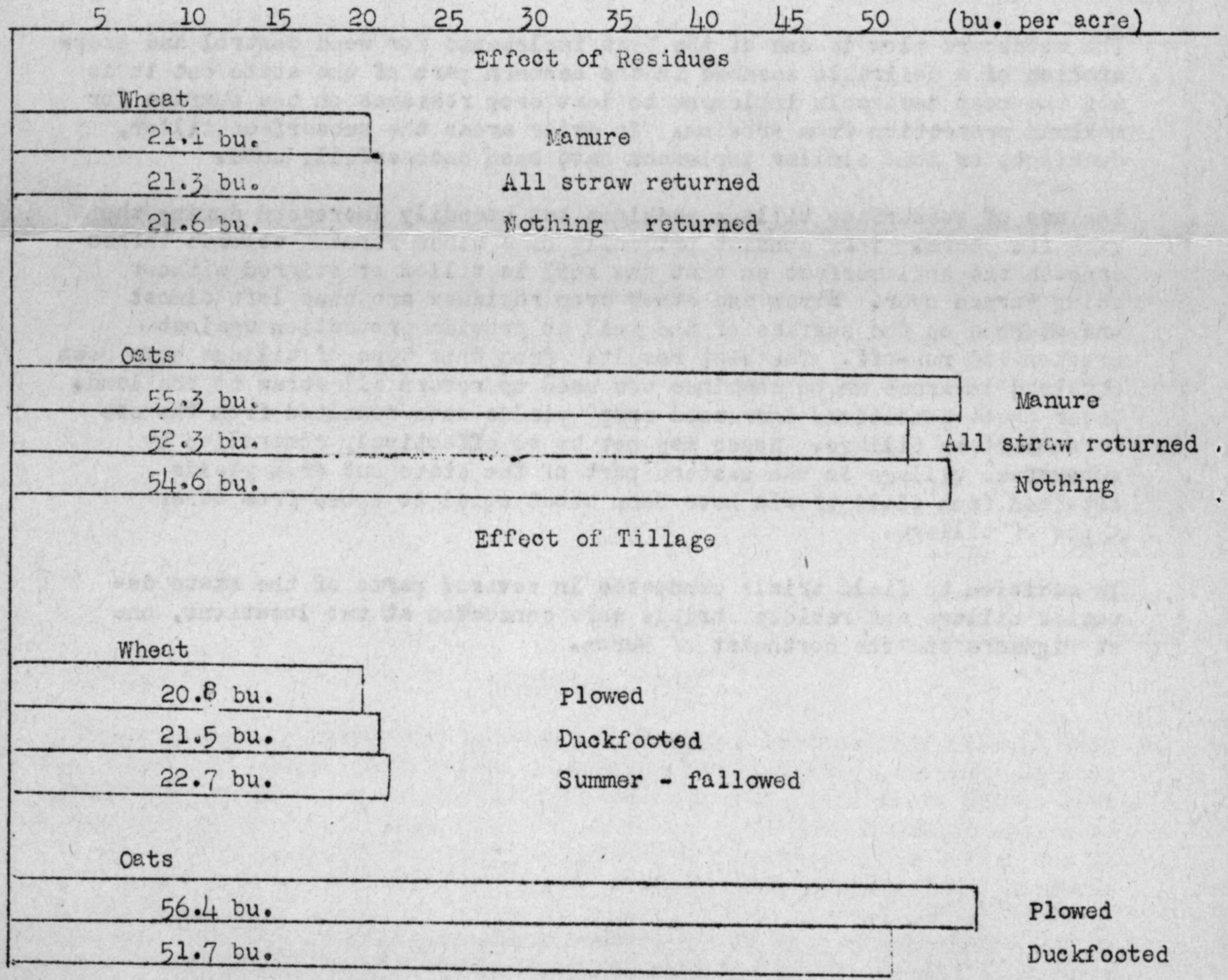
Tillage and residue trials at Highmore have consisted of three residue applications, straw, manure, and just binder stubble, with one set of each residue treatment plowed under and another set with the residues left on the surface by duckfoot tillage.

The results are presented in the following graph. Wheat yields have been about equal regardless of the tillage or residue treatments.

The oats crop followed wheat in the rotation and slightly higher yields were obtained on plowed land as compared to duckfooting. The application of residues made little difference in oats yields.

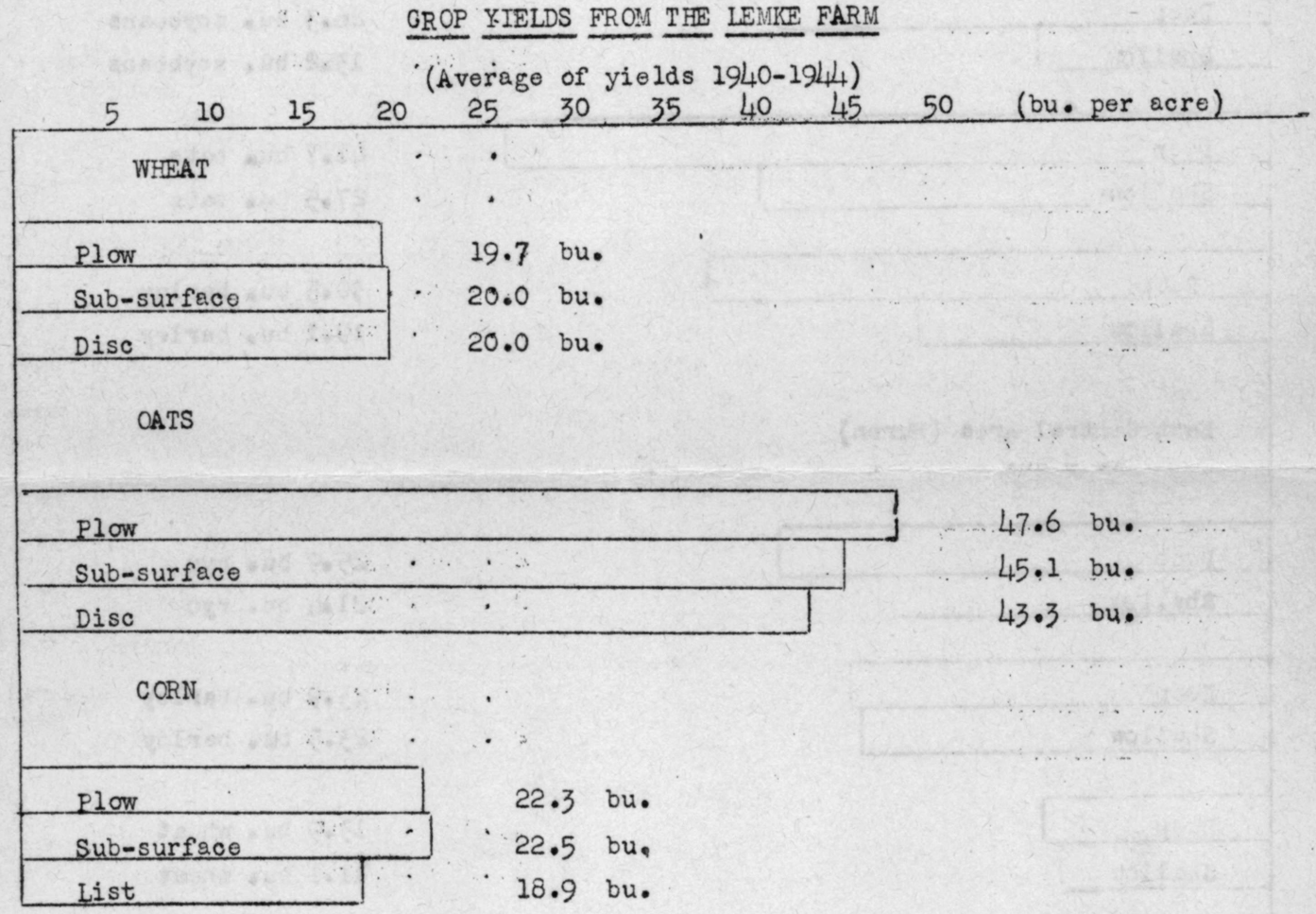
Sorghum yields were a little higher on plowed land as compared to duckfooting. Applications of manure increased forage yields of sorghum both on plowed land and on duckfooted land.

CROP YIELDS FROM THE HIGHMORE STATION



Huron Tillage Results

Additional information regarding the effect of various tillage methods has been obtained from plots on the Charles Lemke farm near Huron. A three year rotation of corn, wheat, oats was used. The tillage treatments and resulting crop yields are shown in the graph. Over a five year period various methods of tillage have made little difference in crop yield. The plowed fields however, have been eroded more by wind and water than where sub-surfacing or disking has been practiced. Less weed trouble has been experienced on plowed land.



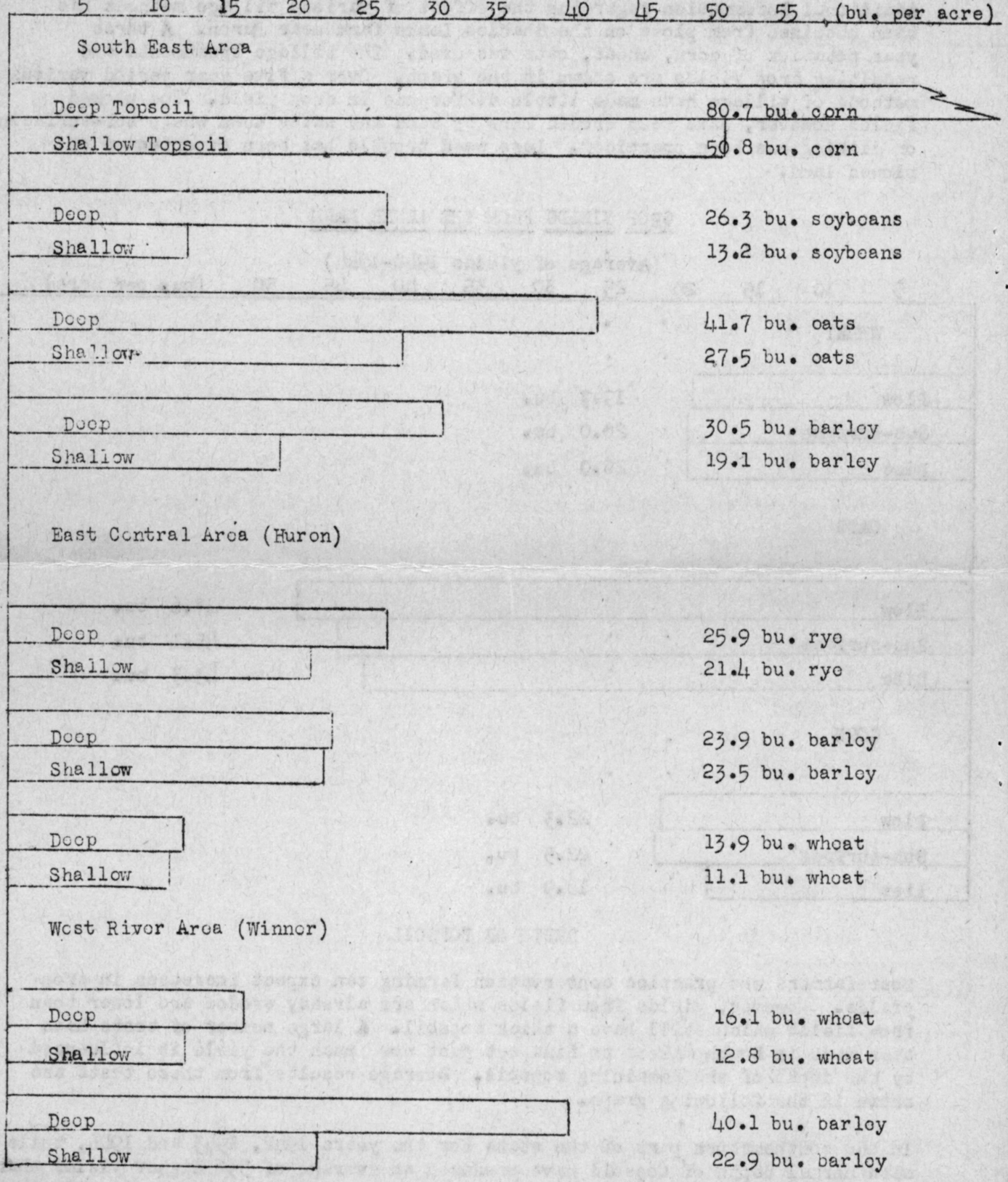
DEPTH OF TOPSOIL

Most farmers who practice conservation farming can expect increases in crop yields. However, yields from fields which are already eroded are lower than from fields which still have a thick topsoil. A large number of tests have been made in South Dakota to find out just how much the yield is influenced by the depth of the remaining topsoil. Average results from these tests are shown in the following graph.

In the southeastern part of the state for the years 1942, 1943 and 1944, soils with normal depth of topsoil have produced an average of 53% higher yields than identical areas in the same fields from which the topsoil had been largely lost by erosion. In the east central part around Huron the increase was 14% and in the area around Winner it was 57%.

To maintain high crop yields it is therefore important that conservation measures be applied before too much topsoil is lost.

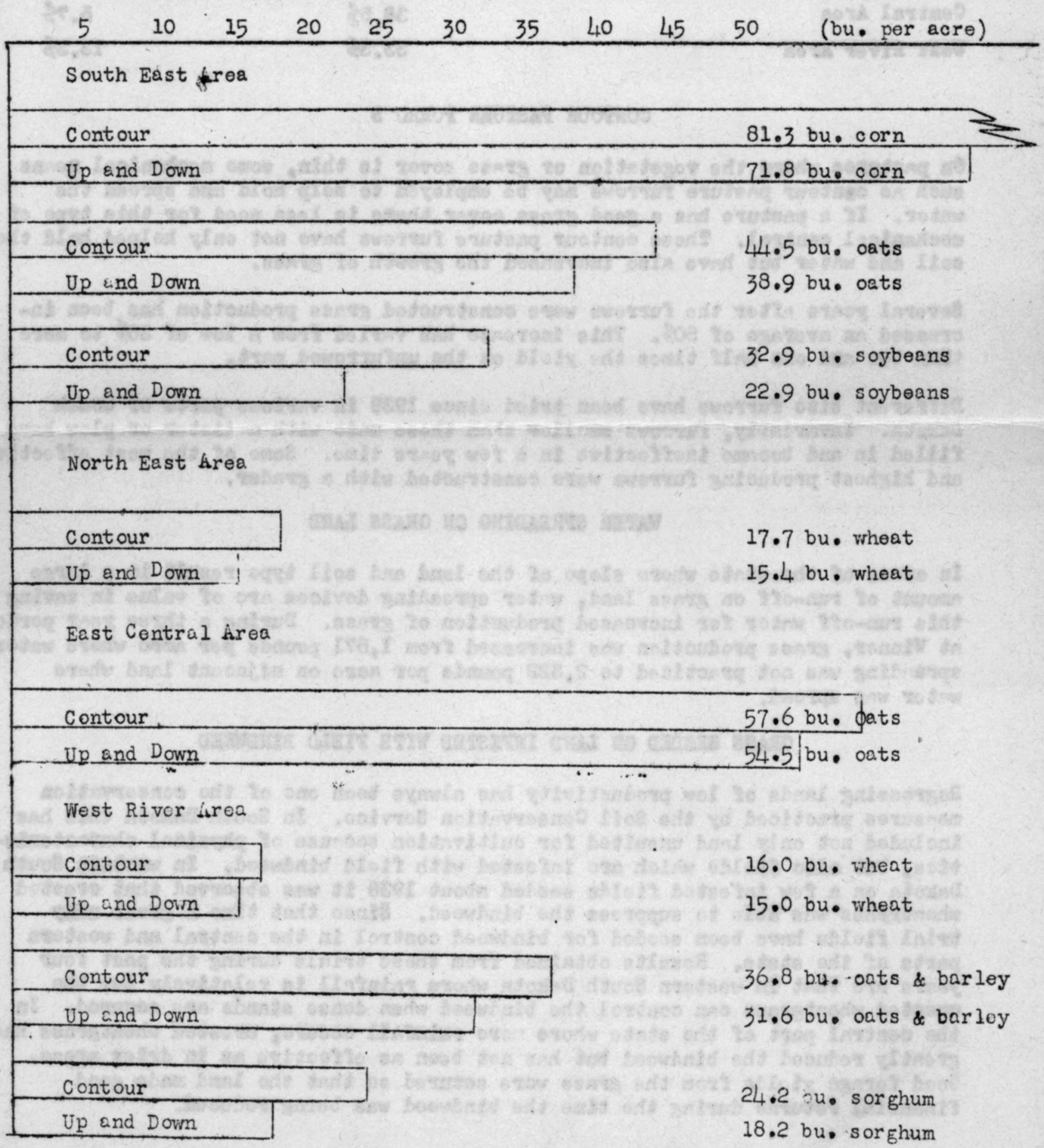
RELATION OF CROP YIELDS TO DEPTH OF TOPSOIL



CONTOUR FARMING

Crop rows planted on the contour of the land present a ridged surface to the escaping rain water or melted snow. Moisture trapped behind these ridges has ample time to penetrate or soak into the soil. The additional moisture held on the land has increased row crop yields in South Dakota as shown by the following graph of crop yields comparing contour farming and up and down hill farming.

COMPARISON OF CROP YIELDS FROM CONTOUR FARMING AND UP AND DOWN HILL FARMING



When benefits of contour farming are interpreted on a percentage increase basis the results are:

	Increase in Per Cent	
	Row Crops	Small Grain
South East Area	28.4%	14.4%
North East Area		15.0%
Central Area	38.5%	5.7%
West River Area	33.3%	13.3%

CONTOUR PASTURE FURROWS

On pastures where the vegetation or grass cover is thin, some mechanical means such as contour pasture furrows may be employed to help hold and spread the water. If a pasture has a good grass cover there is less need for this type of mechanical control. These contour pasture furrows have not only helped hold the soil and water but have also increased the growth of grass.

Several years after the furrows were constructed grass production has been increased an average of 50%. This increase has varied from a low of 30% to more than two and one half times the yield on the unfurrowed part.

Different size furrows have been tried since 1938 in various parts of South Dakota. Invariably, furrows smaller than those made with a lister or plow have filled in and became ineffective in a few years time. Some of the most effective and highest producing furrows were constructed with a grader.

WATER SPREADING ON GRASS LAND

In areas of the state where slope of the land and soil type result in a large amount of run-off on grass land, water spreading devices are of value in saving this run-off water for increased production of grass. During a three year period at Winner, grass production was increased from 1,571 pounds per acre where water spreading was not practiced to 2,322 pounds per acre on adjacent land where water was spread.

GRASS SEEDED ON LAND INFESTED WITH FIELD BINDWEED

Regrassing lands of low productivity has always been one of the conservation measures practiced by the Soil Conservation Service. In South Dakota this has included not only land unsuited for cultivation because of physical characteristics, but also fields which are infested with field bindweed. In western South Dakota on a few infested fields seeded about 1938 it was observed that crested wheatgrass was able to suppress the bindweed. Since that time a great many trial fields have been seeded for bindweed control in the central and western parts of the state. Results obtained from these trials during the past four years are that in western South Dakota where rainfall is relatively low the crested wheatgrass can control the bindweed when dense stands are secured. In the central part of the state where more rainfall occurs, crested wheatgrass had greatly reduced the bindweed but has not been as effective as in drier areas. Good forage yields from the grass were secured so that the land made good financial returns during the time the bindweed was being reduced.