TECHNICAL NOTES

U.S. DEPARTMENT OF AGRICULTURE OREGON SOIL CONSERVATION SERVICE

Agronomy - No. 29 - The Influence of Topsoil Depth on Yields

July 14, 1978

The information developed by Fred Wetter, Area Agronomist, SCS, Washington, for Whitman County should represent the influence of topsoil depths on wheat yields in Major Land Resource Area 9. It was reproduced without change.

" The effect of topsoil depth on yields of grain and straw was determined from data collected for the Whitman County Soil Survey Report.

Grain and straw rod-row samples were obtained from farmer cooperators of the Pine Creek Conservation District (northeast quarter of Whitman County) for the years 1970-1975. The data presented in this technical note represent a six-year average for the sampling period. (See table)

The sampling area extended from 4-miles west of Pine City eastward to the Idaho state line. The soils were primarily Athena, Palouse, Thatuna, Tilma, and Naff silt loams. The eroded soils with little or no topsoil, Calouse and Garfield, were also included. Other soils were the shallow Gwin, the bottomland Latah, and Caldwell silt loams.

The procedure was to cut two or three samples at each site. Each sample consisted of two adjacent rows, usually 9'4" in length. Topsoil depths were measured at each site using a soil probe or auger.

The term "topsoil" as used in this report is defined as follows:

> The darkened layer of soil measured from the soil surface to a point where the brown organic matter coloring is no longer evident and/or the structure or texture changes.

The amount recorded was the subjective determination of the area agronomist, based on his observations and measurements at each site.

Data for each crop was plotted on graphs. The yield-decreases of both grain and straw were found to be straight line curves from 24-inches down to 0-inches topsoil depth. At greater topsoil depths, yield-increases tapered off because of other limiting factors.

The table indicates that on soils with 24-inches of topsoil, the winter wheat, after fallow, yielded 90.4 bushels/acre. On soils with no topsoil, winter wheat, after fallow, averaged 28 bushels/acre. This represents a 2.6 bushel decrease in yield for each inch of topsoil removed.

The same relationship is true in regard to straw or vines:

> On soil with 24-inches of topsoil the peas, after winter wheat, produced 3,500 lbs. of vines per acre.

On soils with no topsoil, vines averaged 1,160 lbs/acre.

This represents a 98 lb/acre decrease in vines for each inch of topsoil removed.

The decline in yield, as a result of topsoil loss, is often masked by the fact that farmers do not normally harvest these areas separately. Increased field yields have been the result of improved varieties and other technology. However, the poor and eroded areas are not returning the cost of fertilizer, seed, equipment, and labor. As long as tillage and other forms of erosion move soil downhill, these unprofitable areas will continue to increase.

Another important fact is that crop residues are needed for erosion control. The eroded areas that need the most protection raise the least amount of stubble. Adequate crop residues, when produced and left on the land, also have direct beneficial effects on soil fertility, soil moisture intake, decreased soil surface crusting, and the ease of tillage. Mellow, friable soils require less energy to till than hard, dense soils.

In other areas of eastern Washington, a "rule-of-thumb" can readily be established by estimating the average yield of eroded soils and subtracting this from the average yield of non-eroded soils. By comparing the depths of topsoil, one can determine the loss of yield for each inch of topsoil removed."

MLRA-9

THE INFLUENCE OF TOPSOIL DEPTH ON YIELDS[1/]

Attachment to Technical Note
Agronomy - No. 29

Crop	Average per acre yield, 24 in. topsoil	Average per acre yield, no topsoil	Average decrease per inch topsoil lost
Winter wheat after			
Fallow	90.4 bu. (9,960)	28 bu. (3,280) [3/]	2.60 bu. (279)
Peas	85.6 (7,480)	27 (3,740)	2.44 (156)
Lentils[2/]	92.0 (7,840)	36 (3,117)	2.34 (197)
Spring barley after			
Winter wheat	2,730 lbs. (4,600)	1,425 lbs. (1,830)	54 lbs. (115)
Spring grain	3,270 (4,260)	1,608 (2,118)	69 (89)
Peas after			
Winter wheat	2,220 lbs. (3,500)	650 lbs. (1,160)	65 lbs. (98)
Lentils after			
Winter wheat	1,660 lbs. (3,895)	924 lbs. (1,900)	33 lbs. (80)

1/ Grain and straw samples were taken during the years 1970-1975 in Whitman County. There were 26 winter wheat samples after fallow, 22 after peas, and 29 after lentils. There were 12 spring barley samples after winter wheat and 28 after spring wheat or barley. There were 24 pea and 39 lentil samples after wheat.

2/ Samples of lentils (or wheat after lentils) were taken in the 20 to 22½ inch precipitation zone. Other crop samples were taken in the 16 to 22½ inch zone. The varieties included in the study were: Gaines and NuGaines winter wheat; Luther, Traill, or Steptoe barley; Alaska or First & Best dry field peas; and Chilean lentils.

3/ Numbers in parenthesis are straw or vine yields in pounds per acre.

Note: Crop year precipitation for the sampling years 1970-1975 averaged 18.56 inches for Pine City, Rosalia, Tekoa, and Belmont combined. The low combined average was 12.63" in 1973 and the high was 25.17" in 1974.