Adaptation of Grasses for Soil and Water Conservation at High Altitudes

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THE VALUE of grass for erosion control and the conservation of rainfall has been proved repeatedly. The value of grass sods for restoring organic matter and improving soil structure and the nitrogen relationships in cultivated soils has been the subject of many recent investigations (8, 9, 12, 13, 14). The evidence from work done in temperate climates shows that the soil conservationist can use grass to advantage in crop rotations for all of these purposes. This is especially true for coarse textured soils but there is some question of its application on fine textured soils (2, 9).

The results reported in this paper deal with adaptation and organic matter production by grass on a very fine sandy soil at high altitudes in eastern Idaho. The soil is subject to severe water and wind erosion when cultivated in a wheat-fallow system (10). Seasonal weather conditions of limited and fluctuating rainfall attended by wide and sometimes rapid fluctuations in temperature must be considered in determining species or strain adaptation (3, 7).

Grasses differ in the effect their sods have on soil structure (9, 12). These differences are caused by the quantity and quality of root production (11, 12). The choice of grass, therefore, becomes important. In recent years many new grasses have been introduced, several native species have been domesticated, and varieties within species have been developed (4, 5). The final choice of a grass species or strain will depend upon (a) adaptation to climatic conditions, (b) adaptation to land capability class and subclass, (c) production of roots for organic matter, and (d) production of forage and, in some cases, seed.

Procedure

Results reported in this paper were obtained from work conducted at the Tetonia Branch of the Idaho Agricultural Experiment Station. The Tetonia Branch Station is located in southeastern Idaho at an altitude of 6,200 feet. Average rainfall at the station is 13.08 inches. Greatest yearly rainfall was 19.95 inches in 1925; the least was 8.93 inches. Precipitation during the term of these trials varied from 11.82 inches to 18.11 inches. Production hazards are area by frequent occurrence of frosts. Frosts had for every month in the year.

The area served by the Tetonia Branch Station is characterized as having high altitude semiarid conditions, the transition zone between the Palouse and short-grass Prairies. The soil is deep, light-textured, and rapidly permeable. Production hazards are associated with organic matter 3.390% in virgin conditions, for trials is in land capability class II with a general fertility.

Agriculture in the area is based largely on a wheat-fallow system, with livestock production confined to grasslands and range lands. According to results reported and Moss (10) the wheat-fallow farming method results in deterioration of soil structure, increased wind erosion, and reduced protein content. Similar results are reported for cultivated soils (1, 2, 6, 8, 13). Erosion both by wind and water of the major problems in the southeastern Idaho areas obtained from newly broken land showed that agriculture can be established in the area only with a sound crop rotation.

Grasses thought to be adapted to this area or use groups, especially for conservation purposes, at Tetonia in 1940. Strains were selected on the basis of performance in similar seedings on other sites. The seeds were drilled in duplicate plots of solid stands on fallow land. Seedings were made at the standard rate for each species. No fertilizers were used during the trial. Data on total production based on air dried samples obtained each year by harvesting three quadrates. Top growth from the remainder of each plot was removed each year.

In October 1946 four soil samples were taken to determine soil organic matter. These samples, using a frame 6 inches wide by 36 inches long, were driven down flush with the soil surface. Grass and crowns were removed before each sample was removed from the frame to a depth of 8 inches. Each sample represents one cubic foot of the soil from the frame.

All soil samples were stored in a well ventilated room to dry out. After the samples were processed with a standard type hammer mill, using a screen and about 1,500 RPM to break up the occurring in each sample. This permitted the representative aliquots from each sample for organic matter determinations.

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