Crop Rotation Practice in the Red River Valley

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THE RED RIVER of the north constitutes the boundary between Minnesota and North Dakota, from the International Boundary on the 49th parallel of latitude, south for 187 miles. The valley through which this river flows ranges from 30 miles to 40 miles wide. At Grand Forks, North Dakota, which is centrally located in the valley, the average annual rainfall is 19.49 inches, and of this total approximately 65 percent falls during the 130-day growing season. Soils in the Red River Valley are black in color and range from medium to heavy clay types; and were originally very high in organic matter. However, continuous grain cropping has depleted the humus, with resulting loss of fertility. Water-holding capacity has been reduced and increase in wind erosion during the winter has increased, due to early farming practices.

Good soil management calls for definite but flexible crop rotations; rotations that include shallow and deep-rooted crops, intertilled row crops, grain crops, and legume crops, and a method of returning the maximum amount of organic matter to the soil. In the Red River Valley most crops are grown as cash crops and are not fed on farms. This system fails to produce sufficient farm manure to maintain soil fertility. Green-manure crops must then be used to fulfill the part of good soil management that calls for returning organic matter to the soil.

The basic crop rotation practiced by sugar beet growers in the Red River Valley is a 3- or 4-year rotation which uses the following sequence of crops: sweetclover sown with grain as a nurse crop, sweetclover summer-fallow, and sugar beets. The grain crop is the point of flexibility in this rotation. If a farmer does not have sufficient beet acreage for one-third of his farm land, he may extend this rotation into a 4- or 5-year rotation by increasing the years of a grain crop. The grain crop in the rotation is usually hard spring wheat or barley. When this rotation is extended into 4- or 5-years, the grain stubble is plowed and worked down in the fall immediately following threshing. This practice prevents the seeding of weeds in the stubble and conserves moisture for the following grain crop. For the green-manure summer-fallow year, a dwarf variety of either white or yellow blossom sweetclover is seeded with the grain crop in the spring. In the fall, the grain and sweetclover stubble catches and holds snow that will provide moisture for a rapid, heavy growth of sweetclover the following spring. The sweetclover crop is plowed under the following June, when it reaches the height of about 30 inches. After plowing, the fields are worked down by double discing and harrowing. This operation mulches

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and levels the soil, thus making an ideal seedbed for weed seed that was turned up by the plow. At this point in the rotation, many farmers level their fields with both home-made and commercial land levelers. The leveling operation also leaves a good seedbed for weeds. During the remainder of the summer and fall the summer-fallow field is worked with either a field cultivator or spring tooth from three to five times, depending on the weed growth started and the rainfall. At the last cultivation, the field is ridged at right angles to the prevailing winter winds. This ridging permits an even catch of snow and helps prevent wind erosion throughout the winter.

A few of the many advantages of the sweetclover summer-fallow year in a rotation are listed briefly:

1. Since the Red River Valley is located in a non-irrigated area of sub-marginal rainfall, moisture must be conserved throughout the crop rotation. The early summer plowing and subsequent tillings during the summer-fallow year keeps the top soil well mulched and holds moisture for the following beet crop.

2. The sweetclover summer-fallow year returns organic matter to the soil through the deep rooted, heavy growing sweetclover crop that decomposes readily when plowed under green. This legume crop increases the soil fertility, not only by fixing free nitrogen from the air, but also by increasing the supply of organic matter.

3. The summer-fallow method actually prepares a seedbed for weeds to grow in, and after a weed crop is started it is destroyed by complete mechanical cultivation. This is a very inexpensive method of cleaning weeds out of a field, since no hand labor is required. The beet crop following the summer-fallow is relatively free from weeds, a condition which is necessary to make complete mechanization of sugar beet growing a success.

4. Sweetclover summer-fallow puts land in first-class condition for early preparation for beet planting in the spring. Early planting is very important, because of the short growing season in the Red River Valley. In the spring preparation, a summer-fallow seedbed can be worked very shallow, which helps conserve the surface moisture for germination and does not bring up deep buried weed seed.

5. The crop rotation that includes sweetclover summer-fallow enables farmers to handle large acreages more efficiently with less equipment and labor, as summer-fallow work does not come during the rush season of planting and harvesting.

All successful crop rotations in the Red River Valley revolve about the sweetclover summer-fallow year. In this one season the farmer increases organic matter and available nitrogen, and kills many weed crops. With the application of normal amounts of high analysis phosphate fertilizer at beet planting time, a profitable beet crop is almost a certainty. Since over 95 percent of the beet tops are returned to the soil, this helps to maintain the organic matter of the land.

The beet crop answers all the demands of a good soil management program. It furnishes an intertilled row crop, and a deep-rooted crop. It also helps to maintain soil fertility, since over 95 percent of the beet tops are returned to the soil. Dunn and Rost (1), using commercial fertilizer prices of June 1946, report that the value of tops from a 15-ton beet crop are worth $21.94 per acre when used as green-manure. This green-manure readily decomposes and makes available plant foods for the crop which follows the sugar beet crop.

Literature Cited

(1) DUNN, L. E. AND ROST, C. O.
1946. Yield and nutrient content of sugar beet tops, Agri. Exp. Sta., Univ. of Minn., Bul. 391, June.