Comparisons of the Productivity of Permanent and Rotation Pastures on Plowable Cropland

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STUDIES conducted on the University of Wisconsin South Hill Farm (1) during the period 1935 to 1942 inclusive have shown that excepting for seasonal variations there was a marked tendency for yields of dry matter and crude protein from bluegrass and other permanent pastures to decrease as the stand increased in age. Yields of dry matter and crude protein were generally considerably lower during the second 4-year period of the study than during the first 4-year period. The data provided by these studies and those of a number of investigations conducted elsewhere (2, 3, 4, 5, 6, 8, 9) suggest that maintaining land in pasture for indefinite periods on productive, nonerodible cropland does not always give maximum returns of pasturage. If maximum yields of forage are desired, occasional plowing or renovation followed by adequate fertilization and the re-establishment of superior types of grass and legume species may be necessary in humid areas where white clover or other legumes cannot be readily and permanently maintained.

The studies which are described herein are a result of cooperative investigations between the Departments of Agronomy, Dairy Husbandry, and Soils of the Wisconsin Agricultural Experiment Station. They were initiated in 1944 to obtain additional information on the comparative effectiveness of various cropping systems in producing high yields of good quality feed.

Plan of Experiment

Four pastures, which are referred to hereafter as fields 1, 2, 3, and 4, were established with seedings on a gently rolling Miami silt loam soil on the University South Hill Farm in the spring of 1934. The seeding mixtures used together with the fertilization and management treatments accorded these pastures during the period 1934 to 1942 inclusive have been reported in detail elsewhere (1). These four pasture areas, each 6 acres in size, were utilized as follows during the period 1944 to 1949 inclusive:

Field 1. — A bluegrass pasture grazed annually during the 6-year period of the trial and annually for a period of 9 years prior to the initiation of the study.

Field 2. — A bluegrass pasture plowed in late fall of 1943 and utilized in a 6-year rotation consisting of a year of corn, a year of oats, 4 years of grazing derived from a well established stand of the same mixture of grasses and legumes used in the initial seeding in field 1 in 1934.

Field 3. — A bluegrass pasture plowed in late fall of 1943 and utilized in a 6-year rotation consisting of a year of corn, a year of oats, and 4 years of grazing of a well established stand of bluegrass and medium red clover used in the initial seeding in field 1 in 1934.

Field 4. — A bluegrass pasture renovated in the summer of 1944 to a mixture of alfalfa and medium red clover and grazed annually for the 6-year period of the trial.

Prior to initiating the study it was decided not to apply lime and commercial fertilizer to the four fields during 1934 to 1949 inclusive. This decision was based on the assumption that the soil was already in condition to grow alfalfa, and also on the assumption that surface applications of these materials which of necessity would have to be made might not have the same effects as treatments incorporated into the soil in the normal course of production for corn and oats in fields 2 and 3. By the removal and commercial fertilizer, differences in productivity among the four fields due to variations in fertility were probably eliminated, although the greater precision was probably obtained at the expense of yield.

Treatment of Fields

Fields 2 and 3 were plowed late in the fall of 1934 with the preparation of an adequate seedbed, hybrid redtop, whose maturity of 110 days was planted by the drill at the rate of 4 to 6 kernels per hill on May 11 and 12, 1944. The fields were harvested for silage during the month of September 2, 1944.

Following the removal of the corn, fields 2 and 3 were plowed late in the fall of 1944. A good seedbed was prepared for these fields early in the spring of 1945, and the following seedings in pounds per acre were made with oats on March 27, 1945:

Field 2. Kentucky bluegrass .................................................. Timothy
Redtop ........................................................................ Medium red clover
Alskie clover .................................................................. White clover

Field 3. Smooth bromegrass ........................................ Ranger alfalfa
Kentucky bluegrass .............................................................. Cossack alfalfa

The oats were harvested for grain with a combine and straw removed from fields 2 and 3 during the months of August 8 to 11, 1945.

Procedure Used in Grazing the Pastures

Dairy heifers were used for grazing the four pastures. The heifers were allocated according to the estimated carrying capacity of the fields and in such a manner that approximately one length of time was required for the removal of hay from each of the fields. Fields 2 and 3 were not grazed in 1945 when they grew corn and oats, but fields 1 and 4 were grazed in these years and subsequently. Thus all four fields were grazed each year during the 4-year period 1946 to 1949 inclusive. The average number of heifers used during the period of the study was 7 for field 1, 9 for field 2, 9 for field 3, and 10 for field 4. The heifers were divided into lots in 1944 and 1945 and into four lots each year. In the late years, as comparable to possible, equal numbers of heifers were placed in each pasture.