The Substitution of Chemicals for Tillage in Pasture Renovation

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This is a preliminary report based on 2 1/2 years' results in developing new techniques for renovating unplowable pastures in New Jersey. The study involves the use of chemical herbicides to prepare the sods for renovation and emphasizes the value of chemicals for reducing the tillage requirements in seedbed preparation and lessening competition to encourage seedling establishment.

HISTORICAL

Graber, in 1927 and 1928, first successfully undertook to burn, disk, fertilize, and reseed unproductive, unplowable, grub-infested pastures in Wisconsin with drought-resistant legumes (2, 3). This procedure he termed "renovation" (5).

The techniques that he developed for grub-killed sods showed good results soon after when applied to thin over-grazed live sods. More disking was required to subdue the perennial grasses sufficiently to facilitate the rapid establishment of seeded grass and legume species. This procedure had considerable merit over a plowed seedbed, inasmuch as it was applicable to large acreages which for one reason or another were unplowable. Renovation was particularly well suited for use on steep hill sides because in this way a seedbed could be prepared with a minimum of danger of erosion. In addition, stony ground could be surface tilled and seeded where plowing was prohibitive.

The more and heavier disking required of healthy, live grass sods directed the attention of researchers to heavier implements than are found on most farms. Larger smooth and cut-away disk harrows were employed, and chisel and sweep cultivators were tried with varying degrees of success. Studies in horsepower hours required per acre were undertaken. Sprague et al. (5) demonstrated on a moderately fertile bluegrass sod in Pennsylvania that 20 to 60% more work was required in preparing a seedbed with any one of several surface cultivator tools than was required for a plowed seedbed. The thin, burned over, or grub-killed sods of 15 to 20 years before had required much less tillage to insure a successful renovation.

Concerning seedbed preparation by renovation Graber (3) in 1928 said, "... the objective is to provide a favorable medium for germination and growth ... in competition with perennial grasses." Good soil contact with the seed is another requirement of germination and a high degree of seedling establishment. In 1947 Sprague et al. (5) describing tillage stated, "... the existing vegetation [must be] killed or subdued sufficiently to prevent serious competition with seeded species." This has been best accomplished in the Northeast when cultivation is started late in July and continued at weekly or 10-day intervals until late summer seeding time. Thus, midsummer heat and dry weather are used to advantage to kill the sod. Unfortunately, a large number of tillage treatments are required to expose a well established sod. The thin, burned over, or grub-killed sod is not accomplished by an average (plowing included), and most renovated pastures east revert too quickly to the bluegrass-white clover subjected to heavy grazing.

Regrowth of undesirable perennial grasses is a greater problem as better and more fertile pastures are developed. An average of six spring renovations by Ahlgren et al. contained 14% Kentucky bluegrass the year after 50% Kentucky bluegrass 2 years after seeding (plowing included), and of the amounts found in the unrenovated area (trials).

More than 2 years after the experiments of this paper were started it was learned that Brown et al. cut had undertaken preliminary investigations in 1945 testing the ability of 15 different chemicals to kill perennial grass species prior to seeding Ladino clover was published, although observations were presented at the meeting of the American Society of Agronomy in Columbus.

The studies reported in this paper were undertaken to evaluate the elimination of perennial competitive grasses by chemicals with normal tillage practices. Emphasis was placed on the preparation of seedbeds with different and more efficient herbicides. Only light cultivating and tractor equipment of the kind found on most small livestock farms was employed, and perennial grasses were eliminated in some plots and reduced in others. The pasture seedings were encouraged by fertilizers.

EXPERIMENT 1

In the summer of 1949 an overgrazed, stony, tile 3-acre pasture of Townsbury gravelly loam as representative of the many thousands of overgrazed lands in northern New Jersey. The slope was 20 to 25%, and the entire area was classed as pasture because of the steep slope likely to encourage a large number of stones that would prevent putting a plow into the soil. The old sod consisted of the most bluegrass and common white clover with sorghum grass and numerous broadleafed weeds, including dandelion, pasture thistle, cocklebur, and hawkweed. The pH in the soil was low except for calcium. Limes were common in adjacent pastures, and soil tests were 5.7. The pasture was grazed closely throughout the year and summer.

On July 25, 1949, separate plots were sprayed with trichloracetate at 26 pounds of parent acid per arsenite at 25 pounds per acre. The chemicals of water without a wetting agent, were applied with a farm sprayer, mounted on the back of a stationwagon and took for comparison.

On August 1, three replicated cross plots were sprayed with sodium arsenite at 25 pounds per acre. The pasture was grazed closely throughout the year and summer.