

Soil Treatment to Improve Permanent Pastures

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Fig. 1.—A good pasture of oats and lespedeza.

For each acre of cropland used for crop production in Missouri, there is approximately another acre used for permanent pasture. Three-fourths of the permanent pasture is plowable. The livestock carrying capacity of many of these pastures is exceedingly low because of their depleted soil fertility, over-grazing and infestation with unpalatable vegetation such as tickle grass, broom sedge, poverty grass, red sorrel, wild aster and other weeds, all of which have low nutritive value.

The dominance of these unpalatable weeds and wild grasses in poor pastures reduces the livestock carrying capacity and ac-

celerates erosion. Some of the land used for permanent pasture is now so low in fertility and so badly eroded that it is better suited to timber; in fact the weeds and wild grasses are woody in composition and grow on soils too low in fertility to support nutritious grasses and legumes. Such areas should be reforested and used exclusively to grow timber. Only those areas best suited to pasture should continue to be used for that purpose and should be given the soil treatments necessary to grow nutritious pasture forage.

The plant nutrients usually lacking in soils of pasture lands are the same as those deficient on croplands; namely, lime, nitrogen, phosphorus, and frequently potash. There are numerous experiments as well as observations by farmers which show that the use of soil treatments will greatly increase the quantity and quality of forage and the livestock carrying capacity and greatly reduce erosion on much of the pasture land in the state. Increasing the livestock carrying capacity of these pastures would materially reduce the need for hay and grain and save labor in livestock production.

Farm Manure Will Supply Nitrogen and Other Nutrients to Pasture Grasses

Since farm manure is available on every livestock farm and is an excellent source of nitrogen as well as of other plant nutrients, it can be used advantageously on permanent pastures. The pasture also affords a place where one can apply manure when other parts of the farm are not accessible. Since on most farms there will be an insufficient amount of manure to cover both the crop and pasture lands, the application of manure as a top dressing on thin eroded areas will help to re-establish grass and legumes on these spots and materially increase their carrying capacity. This will also check erosion.

Applications of 4 to 6 tons per acre will give greater response per ton of manure than heavier applications. A better balanced plant ration will be provided by scattering from 40 to 50 pounds of superphosphate evenly over the top of each load of manure. This will permit the covering of more acreage with the same amount of manure and thus practically double the returns per ton of manure. The feeding of animals on the thin spots in permanent pasture will also help to restore vegetation on these areas.

Legumes Furnish Nitrogen for Grasses

By using limestone and commercial fertilizer as needed, legumes such as white and sweet clover can be grown more regularly in permanent pastures. With these soil treatments, white and sweet clover and lespedeza produce more forage and serve better to supply the grasses with nitrogen.

Lime Usually Needed

Lime or calcium is needed on most of the permanent pastures in order to establish legumes in the pastures as well as to increase the growth and improve the quality of other forage plants. It also aids in making other plant nutrients available in the soil. The limestone should be applied in accordance with a soil test, which can be obtained by taking a representative sample of the pasture soil to the county extension agent. Limestone may be applied on permanent pasture any time the weather conditions will permit the lime spreader to be driven over the field. On plowable pastures it can be worked into the soil later.

Commercial Fertilizers Also Necessary

After the lime needs of the pasture soils have been met, commercial fertilizers high in phosphate are essential on most soils to furnish a balanced nutrient supply throughout the growing season. On nearly all the pasture land in the state, phosphate or a phosphate-potash fertilizer is also necessary to keep legumes growing if they are to supply nitrogen for the grasses associated with them and protein, and mineral rich forage for the livestock. These mineral fertilizers also enable the grass to maintain a thicker sod and thus reduce weeds and other undesirable species of vegetation. On very poor pastures a small amount of nitrogen in the fertilizer mixture may be advantageous.

The kind of fertilizers to use depends on the natural fertility of the soil, the lime supply in the soil, the amount of legume growth in the pasture and the manure applications that have been made. Some suggested fertilizer grades are given:

Pasture Fertilizers for Light-Colored Soils

As an aid in establishing legumes in pastures on light-colored soils well supplied with lime, it is profitable to use phosphate or phosphate-potash fertilizers such as 0-20-0, 0-14-7, 0-20-10, or 0-12-12. Fertilizer grades which contain equal parts of phosphate and potash, such as an 0-12-12, are suggested for these soils where sweet clover is to be established.

On soils which have not been limed, and where no legumes are in the pasture mixture, the growth of the grasses can be increased by drilling in a fertilizer high in nitrogen, such as a 4-10-6 or 10-6-4. The high nitrogen content of these fertilizers will supplement partially the nitrogen obtained by growing legumes. The annual gains or production from pastures fertilized in this manner will not equal those from pastures well supplied with lime and able to furnish the plant a balanced ration, which in turn conveys its composition as feed to the animal.

Fertilizers for Dark-Colored Pasture Soils

On dark-colored soils well supplied with lime, superphosphate is usually all that is needed. However, when new pastures are being seeded on dark-colored soils severely depleted in organic matter and where no legumes have recently been grown or no manure applied, a complete fertilizer such as a 4-12-4 is preferable for the first fertilizer treatment. For later treatments after legumes have been well established in the pasture mixture, superphosphate alone is recommended.

The grades of fertilizer suggested may be exchanged for others of the same ratio and the rates per acre may be increased or decreased as necessary to supply the same amount of plant food.

Rates Per Acre and Frequency of Applications

Tillage operations are essential to place fertilizer salts in the soil zone occupied by the feeder roots of the pasture plants. These operations require labor. Therefore, if we are to eliminate as much of this labor as possible, heavy fertilizer applications at a single application are better than numerous light applications. Somewhat better results can be expected at least in the beginning of a soil improvement program from rather liberal applications. The recommended rate is from 250 to 500 pounds per acre of the grades suggested. Such applications should be sufficient along with the fertility released by the soil itself to meet the needs of the pasture plants for 3 to 5 years. Full limestone applications usually meet the demands of the more exacting legumes for 10 to 15 years. When weeds begin to make their entrance into pastures, they indicate that some of the essential nutrients are lacking. Steps should be taken to supply the nutrients that are deficient.

Applying Limestone and Fertilizers on Permanent Pasture

Limestone and fertilizers containing phosphate and potash give best results when they are placed well down into the soils.

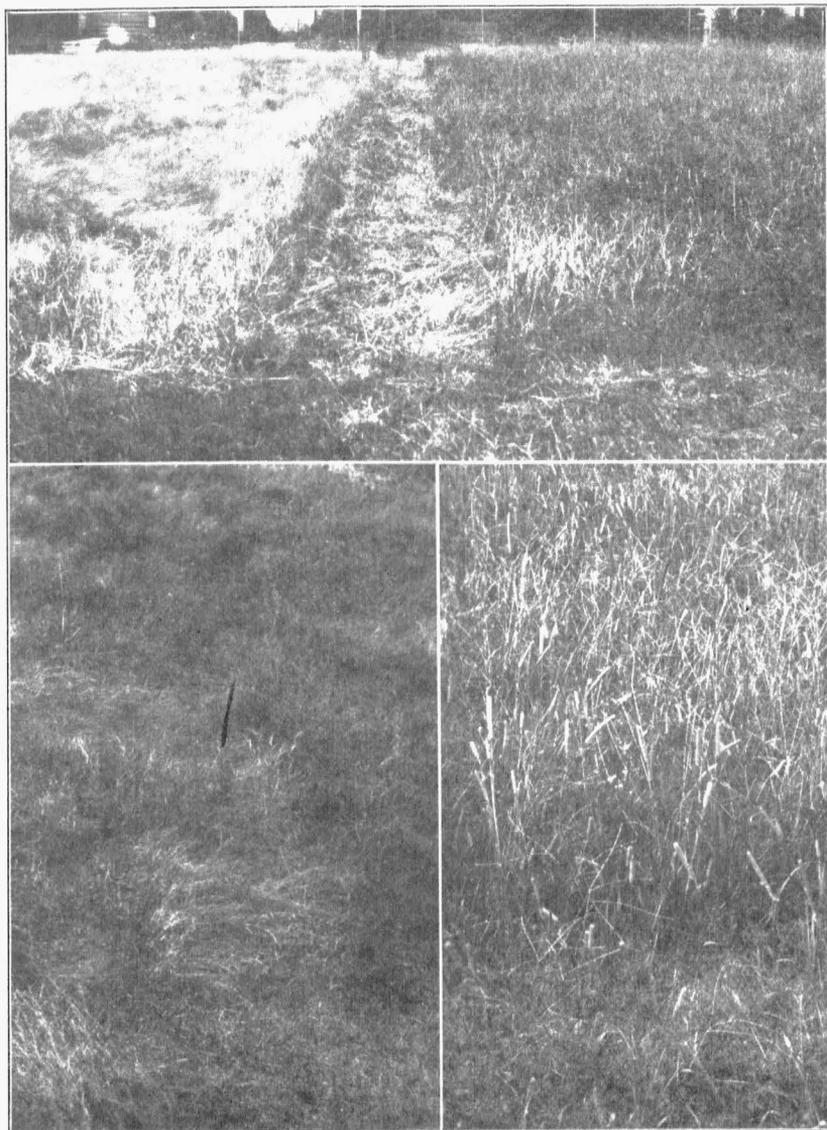


Fig. 2.—Limestone, phosphate and some manure were used in addition to crop rotation to produce the good growth of timothy at the right. Rotation alone—without soil treatments—gave only the tickle grass shown at the left. (Sanborn Field, Missouri Agricultural Experiment Station, Columbia, Mo., 1943.)

Since phosphate becomes fixed in the soil almost where placed and since potash and limestone move downward very slowly, it is desirable to place these materials deep enough so they will be close to the feeder roots of the plants, particularly of legumes which root deeply. When this is done, the lime and fertilizer will react more rapidly with the soil. It is while in this condition that they supply most of the plant nutrients.

While limestone can be applied any time that the spreading machinery can be driven over the pasture, there are certain seasons of the year when it can be best worked into the soil; namely, late fall or early winter, and spring when the ground is soft. Thoroughly cutting the pasture with a sharp disk, a field cultivator, or spring-tooth harrow, during one of these periods will help to get the lime into the feeding zone of the plant roots. On sloping land these tillage operations should always be on the contour.

Probably the most desirable time to apply fertilizers to permanent pastures is in the late fall or early winter, which will allow time for the fertilizer salts to react with the soil and be more available to the next season's growth. They may be applied, however, in the early spring by drilling the fertilizer as deeply as possible so that it will be in the zone of the feeder roots. Where a drill is not available, the fertilizer may be broadcast on the surface with a lime sower or oat seeder and cut into the soil in the same manner and with the same equipment as used for limestone.

Soil Treatments Help Even When Left on Surface

Because of stones, stumps, and other hazards, there are some areas of permanent pasture which cannot be worked with a disk or harrow. On these areas the broadcasting of limestone, fertilizer, manure and seed on the surface in winter will help materially to improve the growth. It should, however, be worked into the soil wherever possible.

Reseeding Permanent Pastures

After the application of soil treatments, a thin sod of bluegrass or redtop generally thickens naturally. It is only when there is little or none of these grasses that it is advisable to sow additional grass seed. After lime and fertilizer have been applied and the pasture has been thoroughly cut with a disk, spring-tooth harrow, or field cultivator, sweet clover and lespedeza may be seeded. One or both of these legumes should be in all permanent pastures to increase the production of forage and to supply the grass with

nitrogen. If the soil is deficient in lime, the sweet clover should be left out of the mixture.

Since the disking of lime or drilling of fertilizer into the soil on permanent pasture must usually be done in late fall, early winter or spring, the seedings of legumes can well be made at that time. If made during the winter on pastures which have been thoroughly cut with a disk or field cultivator, the sweet clover and lespedeza mixture can be broadcast on the surface at the rate of 10 to 25 pounds per acre. When either is sown alone, the same amount of seed is suggested. The alternate freezing and thawing of the soil can be depended upon for ample covering of the seed. If seeding is delayed until spring, it may be done by placing the mixture in the grass seed attachment on the grain drill and drilling so the seed falls behind the disk or hoe of the drill. The seed may also be broadcast on the surface of the cultivated area. Spring rains will usually cover the seed to a sufficient depth to insure germination.

Good Management of Pastures Helps to Keep Them Productive

Permanent pastures should be managed so as not to overgraze them. This can best be done by using supplementary or rotation pastures in conjunction with permanent pastures. Bluegrass pastures become woody and unpalatable and low in feeding value during the hot summer months. At this period supplementary or rotation pastures should be used so as to have green succulent feed during this period. Lespedeza is an excellent legume to use during this time.

Mowing as needed to control weeds and brush helps to conserve moisture and plant food for the more desirable grasses.

Additional information on pasture management is given in Missouri Experiment Station Circular 244 and Missouri Extension Service Circular 358.