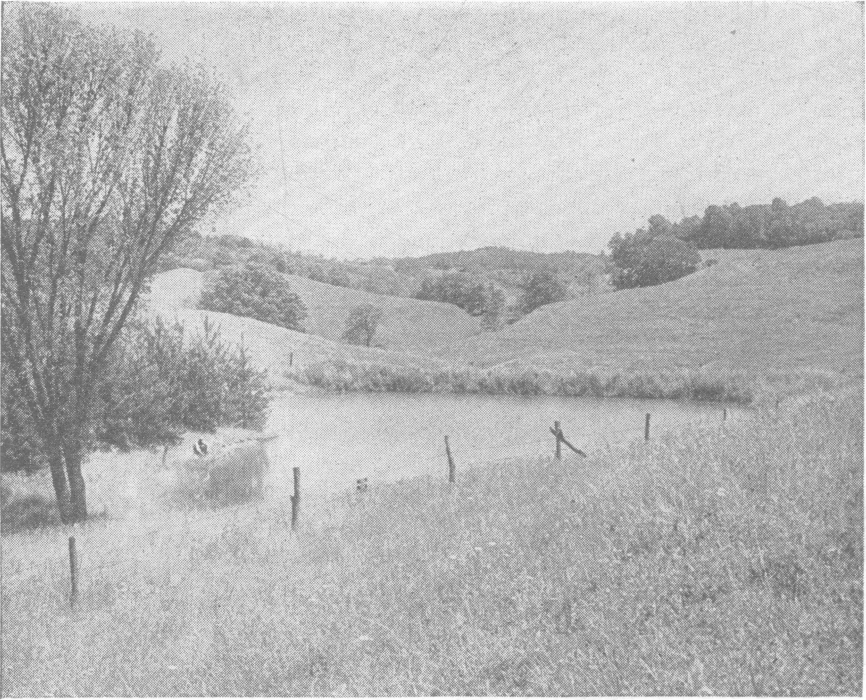


PERMANENT PASTURES

Treatment and Management

By

D. R. DODD, *Extension Agronomist*



Permanent sod land, when properly treated and managed,
becomes a thing of profit and beauty.

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Treatment and Management of Permanent Pastures

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Methods of Improvement

There are several satisfactory methods of improving permanent pasture lands. Where time and equipment are available, where soil erosion is not a factor or it can be controlled, and where the soil type renders the operation not too difficult, an old sod may be destroyed by plowing, disking or other soil working, and new seedings made. Generally, such a reestablishment may be expected to increase production 20 to 50 per cent for a period of 2 to 5 years above the level that might be attained without working the soil. However, against this gain must be charged the loss of use of the land for a part or all of the year of re-establishment, the cost of the seed, labor and equipment used, and the possibility of interrupting vital farm operations during the process. The gain may not be worth the cost.

Where the permanent type pasture is on land suitable for plowing, and in a location where the field can be handled conveniently, probably the better plan is to put the field through the regular rotation. It should be limed as needed, fertilized at the rate of 600 to 1,000 pounds per acre in connection with the row and small grain crops, and reseeded with a suitable pasture mixture. This should consist of an adapted hay mixture, with the addition of 3 to 5 pounds of Kentucky bluegrass and $\frac{1}{2}$ to 1 pound each of Ladino and southern-grown domestic white clover or a strictly permanent type mixture consisting entirely of the low-growing legumes and grasses only. Such a mixture might consist of 1 pound each of Ladino and common white clover, 7 pounds of Kentucky bluegrass, 5 pounds of perennial rye grass and 2 pounds of redtop. The resulting sod may then be held for 6 to 10 years without further treatment, except as nitrogen may be needed.

However, much of the permanent pasture land of Ohio is, because of soil type, topography or location, unsuitable for plowing and regular rotation crops. Usually such pastures are best improved by simply topdressing with lime and fertilizer or, under certain conditions, by disking or other surface working, before reseeding.

Start With Better Areas.—From the standpoint of returns on the money expended and feed produced, improvement work is best started on areas having some white clover and bluegrass, rather than on the poorest part of the pasture. If the entire field cannot be improved at once, a part may be improved each year.

Areas too steep, rough, eroded, or isolated for pasture should be fenced out for reforestation or other suitable use.

* The author is indebted to other members of the Department of Agronomy and members of the Dairy and Animal Husbandry Departments for helpful suggestions in the preparation of this bulletin

Lime Essential on Acid Soils.—Lime should be used in improving permanent pastures, if the pH is below 6.0. Practically all unlimed soils in Eastern Ohio and in the Clermont area of Southern Ohio, as well as the light-colored soils elsewhere, need lime. As an initial application on most unlimed soils in Eastern Ohio, 2 tons of good quality ground limestone per acre are usually satisfactory, although 3 or more tons may be more profitable, especially on the heavier soils of northeastern Ohio. On most farms,

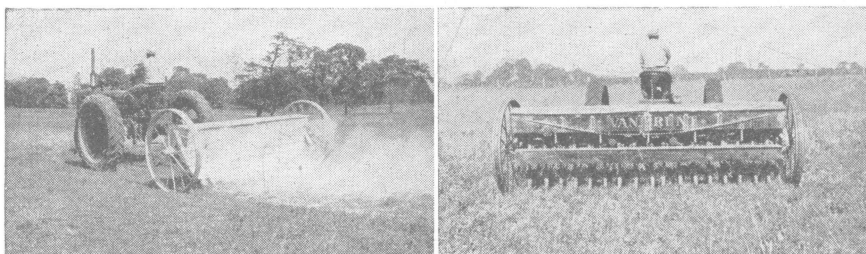


FIG. 1.—Lime and fertilizer are essential to good pasture.

the 2-ton application should be repeated in 4 or 5 years. After that, 1 ton every 8 or 10 years will usually be sufficient. Instead of 2 tons of finely ground limestone, equivalent amounts of other liming materials may be used.

Lime may be applied at any time of the year, but for initial pasture improvement treatments, it should be used before or by the time of the first fertilizer application.

Fertilizers and Seed.—The kind and amount of fertilizer and seed, and the time and manner in which they are used, depend upon soil and pasture conditions. These are indicated under three pasture conditions as follows:

Condition 1

Fair to good; may be thin in places. Considerable bluegrass and white clover in field.

Every third or fourth year, apply 400 to 500 pounds per acre of 20 per cent superphosphate or 0-20-10. The 0-20-10 is preferable in later applications for maximum production. Cut the fertilizer into the soil $\frac{1}{4}$ to 2 inches with a disk drill, if possible, in fall, winter or early spring. Surface applications, although they may be a little slower and less efficient in response, have been very effective.

Reseeding is not necessary usually, since the grass and clover present will soon thicken. However, the quantity of clover may be improved by an early seeding of $\frac{1}{2}$ pound each of Ladino and southern-grown domestic white clover. These are more tolerant to dry weather than our ordinary wild white clover and bring about more rapid improvement. In order to obtain sufficient volume for seeding, add 3 to 4 pounds of sand or ground corn or other grain screened to obtain particles about the same size as clover seed. In Southern Ohio, Korean lespedeza may be added for volume and as an extra pasture legume.

Where seed is used, the old vegetation must be subdued. This is best accomplished by severe disking, but where this is not possible, close grazing before or at the time of seeding will be helpful. This excessively close grazing must be discontinued as soon as the new seedlings are sufficiently developed to be eaten.

Condition 2 Fair to good bluegrass, on fair to good soil but where, because of climatic or other factors, white clover habitually fails.

There are situations in Ohio where due to site, management, or climate, white clover habitually fails. Although there may be adequate lime and mineral fertilizer, and a sod consisting of 75 per cent or more bluegrass, these pastures are low yielding and some-

times give rise to the belief that bluegrass pastures are not productive. The low yields are due to insufficient nitrogen and, if white clover cannot be

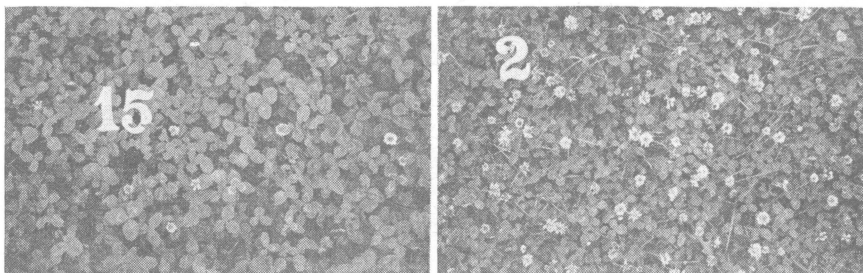


FIG. 2.—Two varieties of white clover. Left, Ladino. Right, common.

maintained, some other legume better adapted to the situation should be used or commercial nitrogen should be added.

As a means of correcting this low legume content, larger legumes may be introduced. They will furnish considerable extra pasture for the two to four years they usually remain and the accumulated nitrogen will increase the yield of the pasture for two or three years after the legumes have disappeared. The legumes suggested are 12 to 15 pounds of sweet clover, 10 pounds of alfalfa, or 6 pounds of red clover alone or, preferably, combinations of reduced amounts of one or more of these with $\frac{1}{2}$ to 1 pound of Ladino clover. A little alsike clover may also be added on poorly drained land.

The process of establishment requires, in addition to adequate lime and fertilizer, a thorough job of soil preparation by means of a disk or field cultivator, or by shallow plowing. The old sod must be completely torn up. There is no danger of overdoing it. The whole job of soil preparation, fertilization and seeding should be done as early in the spring as possible, better yet, the soil preparation may be started or even completed in the fall and the legumes sown in early spring. If larger type grasses as well as legumes are used they, except orchard grass, may be seeded in the fall. Orchard grass, like the legumes, is best seeded in the spring.

Condition 3

Badly runout, bluegrass and clover inconspicuous; plant species of low grade and growth poor.

With pastures of this nature, three procedures are possible. The first consists simply of applying lime and fertilizer as suggested for Condition 1. This is slow in producing improvement but in the course of a few years, with good management, results in a

good bluegrass-white clover sod even though no seed has been used.

The second procedure is to follow the lime application with harrowing or disking and then drill 500-600 pounds of 0-20-10 or 0-12-12 and at the same time seed $\frac{1}{2}$ pound each of Ladino and southern grown domestic white clover and 4 pounds of Kentucky bluegrass. One pound of red top and 2 pounds of timothy or 3 pounds of orchard grass may be added where more rapid development is desired. On the uplands in the southern part of the state 4 to 8 pounds of Korean or Korean and common lespedeza may replace the white clovers. These lespedezas are both drouth resistant and cheap but are less productive than the white clovers. This method has the advantage of bringing about a more rapid and probably a little greater improvement but naturally is a little more costly.

The third procedure is one in which encouragement is given to larger type legumes and grasses, as referred to in the preceding section. Where equipment, time and funds are available for this process, it gives excellent results. Where there is need for converting some of the permanent pasture-land into a mid-summer type pasture, the process is urged as the most desirable procedure.

Manure in Pasture Improvement.—Manure will improve runout pastures but it should be supplemented with 30 to 40 pounds of 20 per cent superphosphate, or equivalent, per ton of manure. Four to eight tons may



FIG. 3.—The difference in growth caused by the urine spots in an ungrazed pasture is an indication that nitrogen and probably other nutrients are deficient over the field.

be applied per acre every 3 to 5 years, or more frequently, if the manure is available. There are times during the year when crop land is not in condition to permit the spreading of manure. The permanent pasture is an excellent place for it during such periods. Since recently manured land is not grazed readily, it is advisable to avoid annual applications. It is also possible to use manure on a section of a pasture as a means of preventing overgrazing.

On badly runout areas, manure, in addition to lime, fertilizers, and seed, is very helpful, since it conserves moisture, and maintains a better physical condition of the soil, thus aiding the pasture plants in becoming established.

Nitrogen Fertilizer on Permanent Pasture.—Often nitrogen is a serious limiting factor in the production of a permanent pasture. This is in part due to a low legume content. Every effort should be made, therefore, to maintain a high legume content. There are two conditions in particular under which nitrogen applications are recommended.

The first is on a good grass sod, in order to promote earlier growth in the spring and thus avoid the necessity of buying barn feed. A good rate of application is 60 pounds of nitrogen per acre, the equivalent of about 300 pounds of sulfate of ammonia or 180 pounds of ammonium nitrate. The application should be made in the fall or early spring on about a third as many acres as there are cow equivalents for which early pasture is needed.

The second condition is where the legume content is low and adequate pasture for spring and early summer are not in prospect. If proper applications of lime and mineral fertilizer have been made previously, nitrogen at the rate of 50 to 60 pounds per acre may be used, as above, on as many acres as needed for the extra pasture. However, under this condition early application is not as essential as it is where extra early grazing is the objective.

In the event that lime and mineral fertilizers have not been applied previously, they should have first consideration. Nitrogen at the rate of 20 to 30 pounds per acre may be used at the same time to supplement the phosphate and potash on as many acres as are necessary to provide the required livestock feed. Five hundred to eight hundred pounds of 4-12-8 or 4-16-8 fertilizer fits this situation.

In order to prevent the smothering of legumes by the extra grass growth brought about by the nitrogen application, the extra growth must be grazed off as it develops.

These fall and early spring nitrogen applications will help very little in midsummer production. They are suggested only as a means of providing more pasture in the early part of the season. Provision for later pasture or barn feeding must also be made, or the livestock grazing load reduced.

Management

The maximum production possible from a pasture area depends upon the kind of soil, the soil treatment and the kind of pasture crop grown. How nearly this possible maximum production is attained depends on the manner

in which the crop is handled. There are five main objectives in the management of a permanent pasture. They are to: (1) Maintain an adequate legume content in the sod; (2) Maintain sufficient green top growth; (3) Check maturity and maintain vegetative production; (4) Utilize pasture when at its best; (5) Control weeds.

Maintaining an Adequate Legume Content.—There are two reasons for legumes in a pasture. They are high in calcium and protein, and supply nitrogen, which increases the protein content of the grass and the yield.

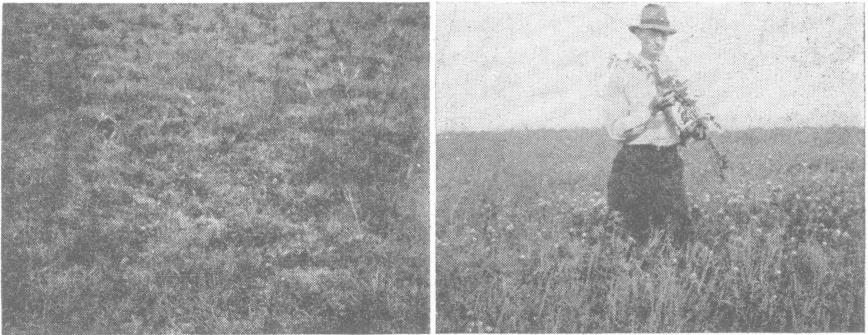


FIG. 4.—At the Zanesville Experiment Farm pasture like that at the left, producing nothing, was changed by liming, disking, fertilizing and seeding to an alfalfa mixture like that at the right, providing abundant grazing and good hay.

Under ideal conditions, permanent pastures may utilize 150 or more pounds of nitrogen per acre per year. This can be supplied in commercial form, but it is more desirable to provide as much of it as possible through legumes. For this purpose a 50 per cent legume content is desirable. The chief limiting factors where white clover is the legume involved, are heat and drouth. Also lack of grazing or heavy grass growth soon eliminates white clover. It is essential that surplus grass growth be kept down if the maximum stand of white clover is to be maintained.

Where alfalfa is the legume in question, mowing, except at the hay stage, should be avoided. Where Korean lespedeza is being encouraged late summer mowing should be omitted and where the hop clover is being encouraged mowing should be delayed in the early part of the season until the hop clover has seeded.

Maintaining Sufficient Green Top Growth.—All growth material, or plant food, from which new top or root is developed is manufactured in the green portion of the top. New growth is proportional to the amount of green top or, as in the case of early spring growth, to reserves of plant food stored in the roots. A sure means of killing plants is to keep the green tops removed. Continuous close grazing over a considerable period so reduces the reserves of growth material and the possibility of producing more, that plants lose their vigor and the pasture becomes, and may remain, unproductive for

several months. The maintenance of a growth ranging from 1½ to 6 inches is desired in the permanent pasture.

Early spring and midsummer are two periods when permanent pastures are very commonly over-grazed. This reduces the plant food reserves, and the green part of the plant in which they are manufactured, to such an extent that the plants remain weak and unproductive for the remainder of the season. Yields for the season may thus be reduced by 50 per cent or more. There are too many instances of live stock on pasture in March or early April before adequate growth has developed.

Checking Maturity and Maintaining Vegetative Production.—The first spring growth has excessively high protein and mineral content. This is, in part at least, responsible for what is commonly referred to as the “washy” effect of extremely early pasture. As the plants approach maturity, the mineral content declines by 50 per cent or more, and the percentage of protein may drop to a fourth or fifth of its early spring level, as expressed on a dry matter basis. The ideal in grazing is to avoid both extremes, or to supplement the high-protein, high-mineral herbage with extra hay and the low-protein, low-mineral herbage with protein feeds and hay.

Where the common permanent pasture plants are prevented from maturing by grazing or mowing, and growing conditions are favorable, they tend to continue more or less indefinitely in the vegetative stage. If the live-stock load is insufficient to prevent maturity, mowing is desirable, but should be regarded only as a supplement to grazing and not a prerequisite to it.

Frequently, pasture mowing is neglected until there is spare time in July. This is a mistake. The excessive grass growth has already done all the damage possible to the clover before this time and mowing then, especially in a dry season, serves only to remove the little vegetation that might have provided some feed for the livestock. There usually is little recovery following mowing in July. The mowing should be done in May and June, when the competition is developing, rather than in July when it is past, except to remove weeds and surplus old and dead grass.

Utilizing Pasture When at Its Best.—Adequate mineral fertilization, the use of nitrogen for early production, and the prevention of normal maturity by grazing or mowing lengthens the grazing period. The hot, dry weather of midsummer usually retards growth during that period. For best results, the pasture should be grazed to capacity but not overgrazed. This usually means grazing heavily during May and June, moderately in the fall and little or none in midsummer and during the winter. Other types of pasture, or barn feeding of high quality hay, must be provided for the deficiency periods during the summer, and in the winter.

Many beef cattle men do not mow permanent pastures except for weed control. They deliberately permit a surplus of ungrazed grass to accumulate during the early part of the season to provide grazing later. This makes a

low protein pasture with a low digestible nutrient content. Beef cattle can handle such a product better than can other livestock.

This results in lower total production but where the land area is sufficient, the practice simplifies the pasture management problem. A better practice would be to establish an alfalfa mixture on a part of the area, then utilize the regular pasture to capacity earlier in the season and hold the alfalfa mixture for midsummer grazing.

Control of Weeds.—Under good pasture management, weeds seldom require much attention. When they are a problem, they should be mowed to prevent excessive top growth and seed formation. Mowing as they approach the blooming period usually accomplishes this. Persistent types of weeds will require more frequent mowings. The time to mow will depend on the kinds of weeds present. On certain types the use of 2,4-D is very effective but may kill the clover.

Rotational Grazing.—Experimental results as well as opinions of farmers on rotational grazing have been conflicting. This is due to the fact that the reasons for rotational grazing have not been clearly understood and that trials have not been conducted in such a manner as to demonstrate its advantages, if any. The main reasons advanced for this type of grazing are: (1) It makes possible a more complete utilization of the pasture herbage at the optimum stage of development. (2) It prevents over or undergrazing and maintains a better balance of grass and legumes. (3) It helps in the control of parasites.

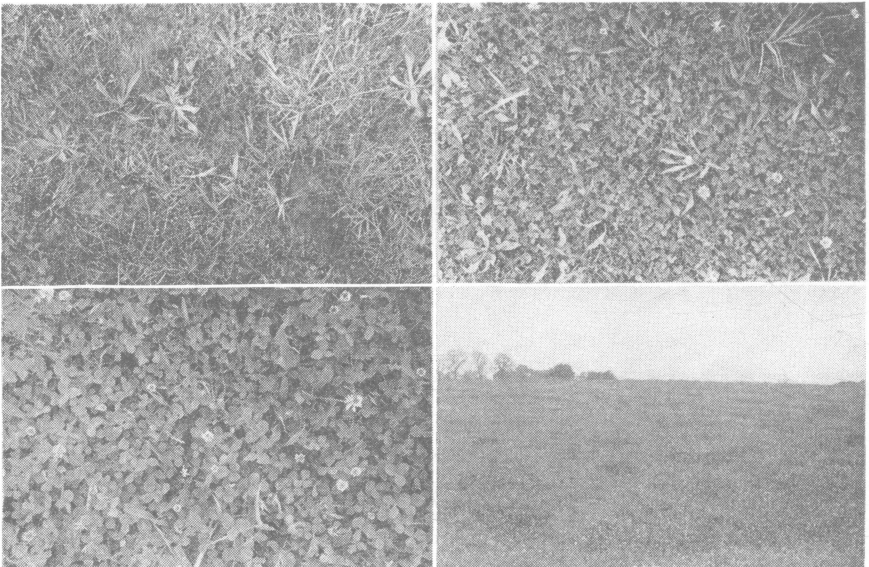


FIG. 5.—Steve Vallery, Pike county, had a pasture like that at the top, left, which he didn't like. He put on lime and phosphate and got a pasture like that at top, right. That was better but not good enough so he put on fertilizer containing potash and got a pasture like that at left, below. At right, below, two sides of the curving line show difference brought about by the second fertilizer application.

The system requires careful attention. Overgrazing injures the pasture and the livestock suffers from lack of feed. If undergrazed, the quality and eventually the yield of herbage declines, and considerable pasture is wasted. Where the livestock load is insufficient to utilize the production, there can be little advantage from the system. Where carefully handled, definite advantages are usually obtained.

Grazing Different Kinds of Livestock.—Different kinds of live stock have different habits of grazing, showing preference for different kinds of plants and grazing to different heights. A pasture grazed by cattle and sheep in succession is generally freer of weeds, requires less mowing and is more productive than when grazed by only cattle or sheep. However, if both are on the pasture at the same time and it is overgrazed, the sheep will starve the cattle and all advantages disappear.



FIG. 6.—Over-grazing early in the spring may reduce production by 50 per cent or more for the year as a whole.

Keeping Livestock on Pasture When Not Grazing.—Tests have shown that greater production can be obtained from a pasture field by harvesting the herbage and feeding it green in the barn. This prevents waste by trampling and soiling, and saves the extra energy the animals use in the grazing process. Usually this increased production is not worth the added cost. However, it is evident that the less the livestock is on pasture when not grazing, the less waste of herbage there will be. This is particularly true on small, high-producing areas. Thus, it may be economical to provide loafing quarters where hay and water are available for the livestock when not grazing.

Adapting Permanent Pasture to Midsummer Production

On many Ohio farms the acreage suitable for plowing is not large enough to provide the hay and grain necessary for winter feeding and at the same time provide deep-rooted, drouth-resistant, hay-type pastures for midsummer grazing. There may be a surplus of non-plow permanent sod land, much of which is in unproductive condition.

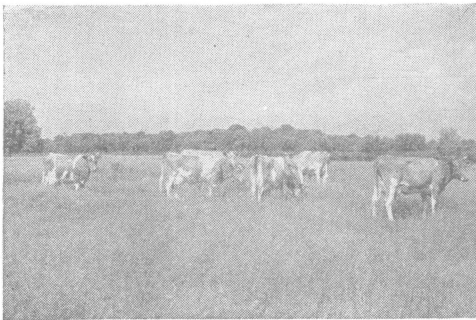


FIG. 7.—An excellent bluegrass pasture on the L. B. Tussing farm near Columbus, the product of plowing, liming, fertilizing and reseeding.

The renovation and reseeding of sections of such unproductive land by the "trash mulch" method is recommended, as a

means of providing midsummer grazing and additional hay, if needed. The more depleted areas, where poverty grass, broom sedge and weeds are most prevalent, frequently are the areas easiest to modify in this manner. Usually such areas can, at little cost, be excluded from the main pasture area by a temporary fence along the side or entirely around one or more "islands." As midsummer approaches, the fence may be opened and these "islands" added to the grazing area. If there is surplus production, it may be put up for hay or left on the land for soil improvement and to increase future productivity. At least one-third as many acres as there are animal units to graze should be provided.

Suggested Procedures

1. *Lime*.—Apply lime according to requirements of the soil to raise the pH level to 6.5 or 7.0. This is not likely to be less than 2 tons of agricultural ground limestone, or its equivalent, per acre and more likely 4 tons. This should be applied to the old sod as far in advance of the seeding as possible, as for example, during the previous summer or fall.
2. *Soil Preparation*.—Soil preparation is best started in the fall, when one or two workings with the disk or other suitable implement may be made, and the process finished in the spring. The last working before each rest period, in particular, should be strictly on the contour. Where soil operations are left until spring, they should be started as early as possible and enough time permitted to elapse between workings for the torn-up sod to



FIG. 8.—Russell Fairall, Licking county, replaced briars and weeds with bluegrass and white clover by applying lime and fertilizer. In the foreground is shown the type of vegetation that formerly covered the field in the background.

dry out and die. The object is to completely destroy the old sod and leave it on the surface as a dead mulch. If the old sod is heavy, the fall start is particularly important.

3. *Fertilizing*.—The drilling into the soil of 500 pounds per acre of 0-12-12, 0-20-10, 3-12-12, or other similar fertilizer is recommended.
4. *Inoculation*.—Inoculate all legume seeds.
5. *Seeding*.—Sow 7 pounds of alfalfa, 3 pounds or less of red clover, $\frac{1}{2}$ to 1 pound of Ladino clover and 6 pounds of timothy (3 pounds if fall seeded), 5 pounds of orchard grass or 7 pounds of bromegrass. Where conditions are most favorable for alfalfa, it might be increased to 10 pounds and the red clover omitted. Where the conditions are unfavorable, the alfalfa may be reduced, the red clover increased and a little alsike added.
6. *Method of Seeding*.—The method of seeding is important. Early in the spring the legumes and timothy seeds may be broadcast by a hand seeder or drilled from the grass seed hopper of the grain drill and dropped back of the disks or boots when drilling the fertilizer. The orchard grass or bromegrass may be broadcast or mixed at the rate of 1 pound of the seed to 20 of the fertilizer and drilled at once, but shallow enough that much of the seed fails to cover. Follow the seeding at once with a cultipacker on the contour.

Seedings in this same manner, but with reduced chances of success, may be made in the latter part of July or early August. As far as possible, summer seedings should be timed to favorable soil moisture conditions.

7. *Grazing*.—During the year of establishment, usually there should be no grazing, but weeds should be controlled by mowing, if necessary. In years of favorable growth, there may be some grazing in August but none after September 10.
8. *Care in Later Years*.—In later years, the crop may be used for hay or pasture as needed but it should be realized that if this first crop is removed late in June for hay, there will be little midsummer growth for pasture. Frequently it may be more advisable to leave the first crop unharvested until it can be utilized as pasture in late June or July. If grazed continuously during midsummer, a top growth of at least 6 inches should be maintained.

Every other year, as long as a good legume content is maintained, a fall or early spring top-dressing with 300 to 400 pounds of 0-12-12 or 0-10-20 is recommended. If the legumes have "run out" and the grass stand is still good, annual fall or spring applications of nitrogen fertilizer supplying 40 to 60 pounds of nitrogen per acre should be made if the extra is needed.