

different opportunities from a specialized dairy farm in northern Vermont. Likewise, a farm with a large acreage of permanent pasture presents a problem different from that of a farm primarily dependent on cropland pasture. Under some circumstances it may be

good business to make heavy purchases of concentrates; in others, it may pay to make the most use of forage. Forage management, to be effective, must be related to management of the farm business as a whole and be part of it.

## PERMANENT PASTURES

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THE GREATEST acreage of grazing lands in the Northeast is in permanent pasture.

When the land was first cleared, even the soil on fairly steep slopes produced good crop yields, but after those lands had been tilled for some years, their fertility was reduced by losses from cultivation, erosion, leaching, and crop removal. Furthermore, the lands often were not adapted to modern equipment. It was no longer economical to crop them, and such fields were permitted to go to grass.

Thus pastures have been relegated to the more extensive and less productive areas of the farm where plowing is difficult and erosion hazards are greatly increased by tillage. The belief is general, therefore, that land which cannot be plowed easily or land from which the fertility has been removed by a continuous cropping system will make good pasture more or less by itself. It is true that cleared land which is grazed will revert to grass, but farmers have not fully realized how low is the quality and how limited is the amount of the herbage produced by such fields.

Environment determines the kinds of plants that grow on any land. The factors of environment are many, but several that affect pasture plants are moisture, temperature, soil fertility, and grazing management. All, reacting together, determine the species that will persist on any area. In an all-season grazing-management system, soil fertility becomes a leading factor in determining the predominant plants.

In this region, on land of low fertility, povertygrass prevails. It occurs on the poor hillside pastures from West Virginia to Vermont; it indicates a need for phosphate, usually lime, and sometimes potash. In the southern part of the region, broomsedge also indicates a condition of low fertility. On pastures of slightly higher fertility sweet vernalgrass and bentgrass occur in the cooler and more moist areas; Canada bluegrass is found in the drier and warmer parts. As the fertility level is raised still further, either from naturally more fertile soils or by the application of lime, phosphate, and manure, Kentucky bluegrass and white clover predominate.

This cycle of the occurrence of various grass plants in a pasture can proceed in either direction. Good pastures of Kentucky bluegrass and white clover may revert to povertygrass if plant nutrients are continually removed and none returned; a povertygrass pasture may be changed into a productive Kentucky bluegrass-white clover pasture if the necessary plant nutrients are added. Thus, change always is a factor for good or ill.

All stages in the improvement or degradation of these various types of permanent pastures may be observed in almost any part of the region. Pastures on droughty soils or steep slopes may not be economical to improve. Such areas probably should be reforested. There are also many acres of potentially productive pasture land on which Kentucky bluegrass and white

clover could profitably be grown if the necessary lime and fertilizer were applied. Such land could then produce abundant and nutritious forage.

A survey of 232 farms in West Virginia has shown that 6 acres of povertygrass and weeds was required for one animal unit, but that only three-fourths of an acre of good Kentucky bluegrass and white clover was required to provide the same amount of grazing. Intermediate mixtures of povertygrass and Kentucky bluegrass and white clover provided intermediate amounts of forage. From this relationship a farmer is able to estimate the grazing capacity of his pastures and plan his farm program better.

Permanent pastures play an important role in a system of livestock farming. Since a considerable part of many farms is not easily tilled, this land is better suited to the production of forage. On steep, stony soils where difficulties would be encountered in working the land and seeding it to pasture plants, a permanent sod is most desirable. While the plants constituting permanent pasture sods may not yield so well as the grasses and legumes used under a system of intensive grazing management, they are not so exacting in their requirements. Thus, on land that is too remote to be cared for adequately or too rough for the use of farm machinery, a permanent sod may provide a valuable source of feed. Permanent grasses like Kentucky bluegrass and bentgrass are sod-forming, so that cattle may be turned out earlier in the spring with less injury to the turf. Pastures of such bunch-type grasses as timothy, orchardgrass, and meadow fescue are badly cut up if they are grazed when the soil is soft and wet in the spring.

Permanent sods are naturally most vigorous in the spring. A farmer can take advantage of this characteristic to supply nutritious pasture herbage while the hay land or the more intensively managed pasture land is producing a first crop for hay or grass silage. While permanent pastures do not produce so

much feed during the summer months as some of the larger growing meadow and hay plants, sufficient herbage is usually available during this period to maintain young stock and dry cows. Thus the farmer during the summer months can turn his milking herd into his better pastures and meadow lands, which usually are located nearer the farm buildings.

Very few permanent pastures in the Northeast have actually been established by seeding. Perhaps most have come from land which had been in cultivation but which, after a number of years of cropping, was badly depleted in fertility. Such fields were usually seeded to a hay mixture, often to timothy and red clover, and the hay removed for several years or until productivity declined. Because timothy does not stand heavy grazing, Kentucky bluegrass, bentgrass, and white clover became established naturally as the timothy went out if the fertility was not too low; otherwise, Canada bluegrass, sweet vernalgrass, povertygrass, broomsedge, and weeds became the dominant species.

More recently, old fields as well as other rough land that had been cleared and grazed but not cultivated have been greatly improved through fertilization. To accomplish this improvement most effectively, at least 1 ton per acre of ground lime had to be applied where the soils were acid. Afterward, manure and superphosphate were applied liberally at approximate rates of 6 to 8 tons of manure an acre, fortified with 50 pounds of superphosphate per load. In subsequent years an application of phosphate (and on many soils, potash) was necessary to maintain fertility and thereby increase the stand and yield of desirable pasture plants.

Through the use of such fertility practices and good grazing management, Kentucky bluegrass and white clover will volunteer almost universally throughout the region. On soils where moisture is not seriously lacking, such pastures will carry approximately a cow on an acre.

### *Grazing Management*

Besides adequate fertility, permanent pastures need care in grazing management if the greatest returns of palatable and nutritious herbage are to be had.

Grass by itself cannot produce the best yields unless it has a ready source of nitrogen for growth. Under most conditions this can be most economically provided by a legume growing in association with the grass. White clover is well adapted for the purpose. Unfortunately the very nitrogen that the legume supplies stimulates the grass to the extent that the grass may seriously crowd and thus weaken the clover. Unless the grass is removed either by grazing or clipping at or before its heading stage in early summer, the growth of the legume is inhibited and production again is lessened by a lack of nitrogen.

On some of the smaller pastures near the farm buildings it often has been found practical to apply 40 to 60 pounds of nitrogen in a commercial nitrogen fertilizer early in the spring. This practice stimulates the grass and provides grazing a week to 10 days earlier than would untreated pasture.

While the value of an intensive rotational system of grazing management on permanent pasture is questioned by some pasture specialists, it is rather generally agreed that all the permanent pasture should not be in one unit. Turning cattle into a large

pasture (especially in the spring when bluegrass makes its most rapid growth and the fullest possible utilization should be made of it) often causes waste by trampling and spotty grazing.

It is better to divide a large pasture into two or three parts and graze each separately: There is less waste of the feed produced and the grass has a chance to recover before it is again grazed off. Mowing the pasture in early summer to cut off the ungrazed grass and seed heads and mowing again in July or early August to cut any weeds is desirable if the lay of the land permits the use of a mower.

A limitation of the permanent pasture is its low productivity in midsummer, when higher temperatures and low soil moisture are most likely. Low productivity is due largely to the growth requirement of the plant species that comprise the sward. While adequate fertility and soils more retentive of moisture aid in delaying the drop in production, low midsummer yields cannot be prevented, especially in the central and southern part of the region. In Maryland and some parts of West Virginia and Pennsylvania, midsummer production of permanent pastures is increased by the use of lespedeza, a warm-weather legume. In some of the northern parts, birdsfoot trefoil, another legume, has shown promise under certain conditions, but so far the problem of how to establish it on permanent pastures has not been solved.

## SEMIPERMANENT PASTURES

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SOME NORTHEASTERN farmers still think that pasture is one of nature's gifts but many others consider the production of high-quality forage the equal of cultivated crops.

In the Northeast, where a large part of the concentrate feed is shipped in from the Midwest, the possibilities of replacing part of this high-cost feed

with locally produced nutritious forage cannot be ignored. Well-managed permanent pastures produce abundant herbage during the spring flush of growth, but are much less productive during the hotter, drier midsummer. Unless other forage is available, expensive concentrates must be fed if milk production is to be maintained;