GRASS FOR CONSERVATION

E. B. COFFMAN

RUNOFF from land in crops means a loss of water, and water is needed for plant growth. Runoff also causes losses of soil and plant nutrients: Material washed off an experimental field in New Jersey contained 4.7 times more organic matter, 5.0 times more nitrogen, 3.1 times more phosphate, and 1.4 times more potash than the field soil from which it came.

From a field of tomatoes where no conservation measures were practiced, the loss of nutrients by erosion equalled 500 pounds an acre of 4-12-30 fertilizer. On an adjoining field of tomatoes where grasses and legumes were seeded as winter cover crops, the losses were about half as much. Besides, the cover crops increased the yield from 16.6 tons to 23.2 tons an acre.

Row crops cover only a small part of the total area of a field and much of the surface is exposed to the action of rain. To protect the ground, a grass or grasses and legumes are planted in late summer or early fall to protect the soil during the fall, winter, and spring. Some of the more commonly used species are rye, vetch, wheat, domestic ryegrass, and field brome. The last two are usually planted at the time of the last cultivation of the row crop. An application of fertilizer at the same time brings a heavier and more rapid growth of plant material. Wheat seeding should be delayed until after the fly-free date, but the rye can be seeded at any time up to the advent of cold weather.

Cover crops on cultivated fields give two benefits: Soil and water losses are reduced, and soil organic matter is increased. The loss of soil from a field where a rye cover crop had been used amounted to 6.8 tons of soil an acre, but the loss of an all-year fallow area was 16.3 tons. Ryegrass is better than rye in its ability to hold soil and water. Records were obtained from a field near Geneva, N. Y., on which ryegrass had been seeded at the last cultivation of corn with a moderate application of fertilizer. In May of the following year, the yield of the ryegrass amounted to 1.5 tons an acre of top growth plus 2 tons an acre of oven-dried roots, which protected the soil in winter, gave more protection after plowing than did rye, and added appreciably to the organic matter.

Pasture and meadow mixtures of grasses and legumes protect the soil the entire year; corn, potatoes, many of the vegetables and many other crops offer little protection during the critical months, even when cover crops are used. At the Arnot Experiment Station, near Ithaca, N. Y., the amounts of soil and water lost from fields on a 20-percent slope seeded to various crops were determined over a 9-year period. All crops were produced on the contour.

The field in fallow lost 1,000 times more soil and 20 times more water in the 9-year period than meadow protected by a vegetative cover all of each year.

Land in continuous corn also suffered severe soil and water losses. On such land continuously cropped with intertilled plants, soil organic matter is destroyed and little is replaced by the corn roots or stalks. Here a poor physical structure develops, the capacity to absorb water is reduced, and erosion increases.

Under a rotation of corn, oats, and clover, losses of water and soil were greatly reduced and the yields of corn were twice as large. The effectiveness of the rotation was due to the cover afforded by the oats and clover during the second year and by the clover during the third. The clover sod improved the physical condition of the soil for the corn, increased the water-infiltration capacity of the soil, and reduced erosion.

Almost no soil or water loss occurred

Effect of Crops on Losses of Water and Soil During the Growing Season
[Averages for the years 1935–43]

Crop and treatment	Loss	
	Water	Soil [1] per acre
	Inches	*Pounds*
Fallow	3.81	19,583
Continuous corn, 200 pounds 5–10–5	1.77	5,239
Corn, oats, clover—6 tons manure before clover	.40	441
Idle, weeds, and clover	.29	394
Meadow, fertilized	.18	17

[1] Bath soil—20-percent slope.

on the fertilized meadow. Where grasses and legumes are grown, the soil has a more porous structure, soil organic matter is increased, and water can be absorbed more rapidly by the soil. Further, a greater percentage of the soil surface is covered by leaves and stems in the turf, and puddling action of raindrops is checked.

Much of the 22 million acres in pastures in the Northeastern States is steep and subject to erosion at some time of the year. To protect these areas, it is essential to maintain a good forage cover by means of adequate soil fertility and proper management. This protection brings about three distinct benefits: Loss of water and soil is reduced to a minimum, more forage is produced, and less land is required for pasture.

The amount of soil and water lost from a given field is in proportion to the intensity of the rainfall. When rains are intense the surface of the soil may be sealed by raindrop action. This reduces the infiltration of water into the soil, particularly on fields which have little or no ground cover.

In experiments on Bath soil conducted during 1935 at Arnot on fallowed ground, rains were of the highest intensity from June through September, in two cases exceeding 4 inches an hour. These intense rains caused a loss of more than 7 tons of soil to an acre.

Slow rains allow the soil to absorb a greater percentage of the water. On sodded areas, such as meadows and pastures, the vegetation breaks the fall of the raindrops—even of intense rain—and helps prevent sealing of the soil surface. It also slows the flow of the water, allowing more to be absorbed. On cultivated fields, the rapid runoff from high-intensity rains can be slowed down somewhat by contour planting, strip cropping, and such supplemental measures as terraces.

The amount of soil lost from grassland by erosion is small, except where active gullies are present. The water losses, however, are often great. The low midsummer production of Kentucky bluegrass pastures has often been ascribed to the injurious effects of hot, dry weather in July and August, but irrigated Kentucky bluegrass sods in Pennsylvania on a Hagerstown silt loam continued to produce during this period. It seems evident, therefore, that moisture rather than temperature is the primary factor in limiting growth. Further work was conducted to determine the moisture losses which may occur during thundershowers in midsummer on closely and heavily grazed, on lightly grazed, and on ungrazed pastures and meadowlands.

On heavily grazed pastures 45 to 70 percent of the rainfall was lost as runoff, on lightly grazed pastures less than 10 percent was lost, and on ungrazed

pastures and meadows no water was lost by runoff. From this and further studies of water relations in the management of pastures, methods may be developed whereby more of the midsummer rainfall will be retained and made available for use by grass and legume swards.

FORAGE AS A PART OF FARMING

MERTON S. PARSONS, IRVING F. FELLOWS

OVER THE YEARS, farmers in the Northeast have raised more livestock than can be fed from home-grown feed.

Being close to markets, they generally have found it profitable to build their livestock production up to the forage capacity and labor supply of their farms and then to buy whatever grain was needed to balance their feed needs. In recent years this additional grain shipped in from other regions has totaled 11 to 12 million tons a year, most of it used by dairymen and poultrymen.

Nevertheless, since concentrate feeds are products of agriculture, the question frequently arises as to whether farmers should continue to purchase so much feed or whether they should produce more on their own farms.

Insofar as grass can be substituted for grain in feeding livestock, increased production of more nutritious forage is a method of reducing feed purchases. The farmer's problem is broader than that, however, and his opportunity in using his grassland to best advantage is a part of his larger problem—the best use of all his resources. If he is interested, as most people are, in a better level of living for himself and family, then one test of his success in farming is his income. Any change that will increase his income over a period of years and still maintain the soil is a good one, whether it is producing more and better forage, expanding cash crops and purchasing more grain, doing more nonfarm work, or some other adjustments.

The farmer's problem is complicated. He must decide on his best course of action. For example, how far should he go in improving permanent pastures? He must consider the costs: Cash costs for varying quantities of lime, fertilizer, seed, tractor fuel, and such; overhead costs of additional labor or new uses of regular labor; additional cash outlays. He attempts to measure the probable benefits: Increased pasturage, land released for other uses, or both.

Later he may find there is excess feed during the flush period of May and June, and he must decide between adding more cows, releasing land for other uses, or preserving the excess feed as hay or silage. In any case he can reach the best decision only after considering the use of all his resources, including land, labor, equipment, livestock, and managerial ability.

Furthermore, the pasture program may require several years to complete, and the major results may appear long after most of the costs have been incurred. There is always the danger, as in 1948, that items bought at high price levels may have to be repaid when prices are lower, but, of course, the reverse may happen.

Despite these difficulties, thousands of northeastern farmers have seen fit to undertake at least certain phases of long-range programs of forage management. On some farms originally quite typical of the area, such complete programs have been adopted and such good results have been obtained that they serve as examples for others. Possibly the problems and the opportunities can be brought out best by looking at what some farmers have done.

Farms A, B, and C are operated by