B-147 1947

Fertilizing Texas Pastures

Issued by
The Extension Service
Agricultural and Mechanical College of Texas and
United States Department of Agriculture
Ide P. Trotter, Director,
College Station, Texas

ON THE COVER

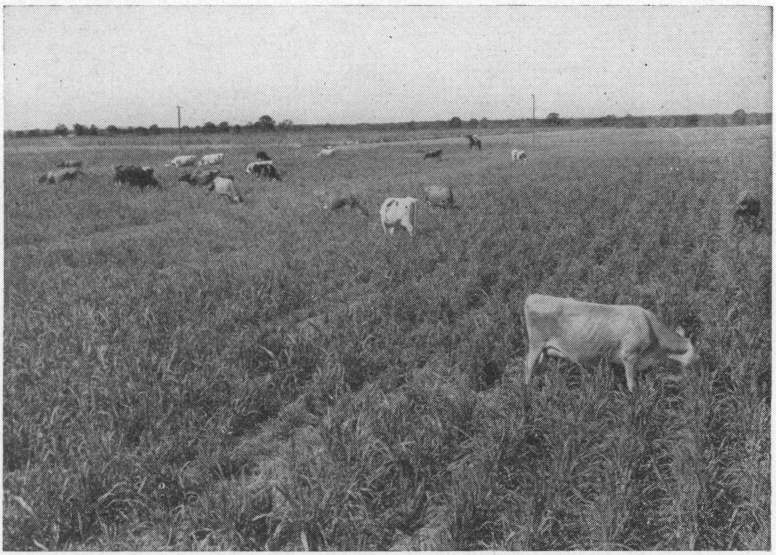
Shown on the cover is an improved pasture on the M. L. Gary place in Smith County. Mr. Gary uses limestone, phosphate and occasionally other fertilizers such as 6-8-4 on his pasture. He is a farm unit demonstrator.

Fertilizing Texas Pastures

— By —
M. K. Thornton, Extension Agricultural Chemist
Robert R. Lancaster, Extension Pasture Specialist
A. & M. College of Texas

Eight to ten months of frost-free sunshine, showers and moist breezes assure long growing seasons for green pastures in east Texas from the Gulf Coast to the Red River. Such seasons are only half utilized by cotton or corn. Naked fields, even on terraced lands, are depleted by cultivation and eroded by winter rainfall. But grass and clover, with every blade exposed to air and sunlight and every rootlet moist, fully utilize this climate and protect the soil.

About 95% of the substance in grass comes from sunlight, air and water. These capital resources are free, inexhaustible, untaxed and abundantly available, without work or worry, in the rainy regions of Texas. The remaining 5% of grass substance is from nutrients in the soil. The condition and fertility of the soil mainly determines whether there may be a pasture or merely idle land. A fertile soil



Fertilizers increase the quantity and quality of forage on temporary pastures. This pasture was fertilized with the complete fertilizer.

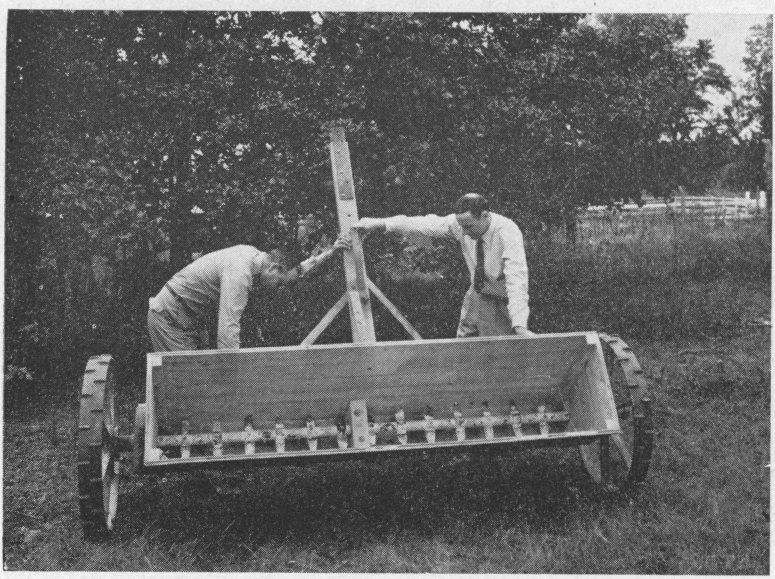
will contain adequate humus and it must supply nitrogen, phosphorus, potash, calcium and an abundance of many other elements.

Soils of limited fertility can produce woody products, fiber, starch and sugar largely from oxygen and carbon and hydrogen of the air and water. Soils rich in minerals are necessary for the production of proteins and vitamins essential to the life, health and reproductivity of plants, animals and humans.

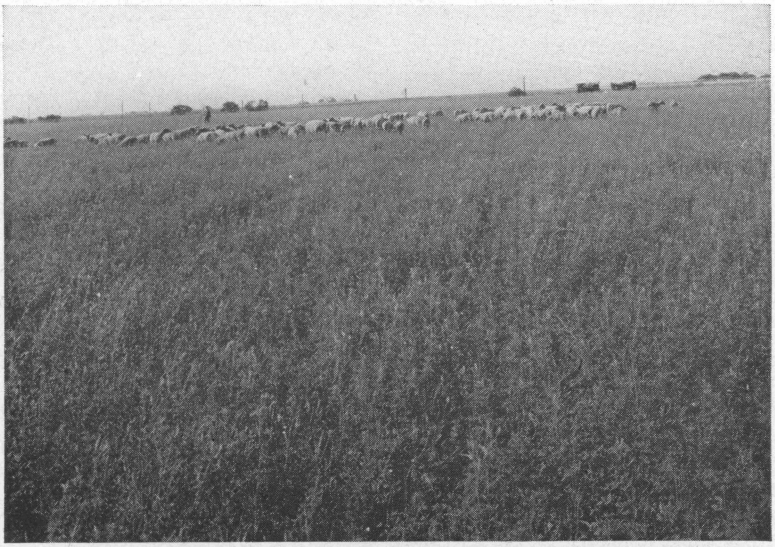
Organic matter is the life of the soil and largely controls production. In addition to carrying nitrogen, organic matter contains some mineral elements and during decomposition releases additional plant foods from the soil. Organic matter improves soil tilth, holds more water and supports useful bacteria, but it cannot be hoarded. It is most useful as it decays.

Organic matter decay doubles and trebles southward with every 18° increase in average annual temperature. So, in Texas, even though the growing season is long, the decay of organic matter is more rapid and more complete and there is less accumulation than in colder latitudes.

Cultivation greatly speeds up the decay of organic matter. Soil lacking organic matter becomes compacted which limits tillage and circulation of moisture and air. This results in less available minerals and nitrogen and a restricted root development.



A homemade distributor modeled after a commercial type. This distributor was made in Smith County when commercial machines could not be obtained. See description No. 2 under Machines, page 14 and 15.



Temporary pasture on old cotton land. Hubam and oats well fertilized furnish 150 sheep and 50 cows almost continuous grazing.

Perennial grassland maintains and increases organic matter by absorption and retention of moisture; by reduced soil temperature and evaporation; by the continual growing and dying of roots; the decay of surface litter, and by erosion control.

But while nitrogen is dependent upon organic matter, the latter is dependent upon nitrogen. Our natural prairie soils contain about four times as much nitrogen and organic matter as our forest soils. No amount of superphosphate and potash will overcome a deficiency of nitrogen. One nutrient element cannot usually substitute for another but can modify the intake of another. So a partial solution to our problem of increasing humus is largely a matter of increasing nitrogen. This basic principle underlines the use of clovers in grassland, also of legumes and stable manure for soil building.

Clover and lespedeza in pastures, and other legumes on cropland, which take nitrogen from the air, are made possible and are stimulated by the use of superphosphate or, in some areas, phosphate, potash and lime. These plants with the aid of nitrogen fixing bacteria take nitrogen from the air which becomes available for maintenance of organic matter, profitable production of nutritious hay and pasture, and for soil conservation and soil building. Phosphates in the soil stimulate growth of the nitrogen fixing bacteria on legumes. Where phosphate is low or deficient, legumes have relatively few nodules formed on the roots, even though they were well inoculated

when planted. When superphosphate is added to phosphate-deficient soil, these nodules become greatly increased in number and size. This is indicative of greater nitrogen fixation and it results in greater plant growth.

Clovers are Heavy Users of Phosphate and Potash. Even though inoculated clovers gather their own nitrogen from the air, they are heavy users of phosphate and potash. Our East Texas soils and Coastal Prairies are naturally low in phosphate. The continual removal of phosphate by crops, grazing livestock and erosion depletes the naturally low supply of phosphate. The greater part of phosphate removed from farms in animal bodies, animal products and erosion together with that consumed by mankind eventually finds its way to the sewer or to the cemetery. Net losses must be restored by fertilizer. Hence, soil building depends largely upon the use of commercial superphosphate with clovers. Abundant supplies of raw rock phosphate are available in America from which superphosphate can be manufactured. The use of potash where needed will increase the stand of legumes and cause the stand to persist longer.

Not only does pasture forage increase in growth and density through balanced soil fertility but it becomes more tender, more nutritious, more palatable and more digestible. Experimentally, a soil properly balanced in fertility produced lespedeza hay with a 30% increase in protein. This 30% richer hay caused a 50% greater gain when fed to fattening lambs. Further evidence of this is clearly shown where stock choose fertilized areas in pastures almost exclusively. Livestock grazing on fertile soils stay in better condition, make greater gains and have greater reproductivity, and maintain better health than stock on untreated soils lacking in plant food balance.

Pastures on fertile soil endure drouth, heat, and cold better than those on poor soils. Following periods of drouth or other adverse conditions, fertile pastures recover quicker and better than pastures on infertile soil. Grazing is extended several weeks by lespedeza in mid-summer heat, and by winter grasses and clovers. Bermuda grass starts earlier in the spring and remains green later in the fall. It is not uncommon to double and treble productivity by fertilizing pastures.

The response of pasture to fertilizer is general throughout most of the State where the rainfall is more than 25 inches and on some sandy areas between 20 and 25 inches rainfall and especially on depleted cropland.

Poor Pastures Due to Poor Soil.

Poor Pastures are more likely to be due to poor soil in many regions rather than to types of vegetation. A thin turf on poor soil generally in these regions can be thickened and palatability improved more effectively by fertilization than by seeding. Due to high rainfall, long temperate seasons and years of continuous grazing or cropping, our soils have lost much fertility. This holds especially for sandy soils originally in upland forests. Application of needed plant food

Spreading Barnyard manure with spreader. See page 14 and 15 for further explanation.

will often stimulate the existing grasses and clovers so that sod will result within a season or so without seeding. However, seeding to more productive and more palatable plants also is usually needed.

The high mineral fertility of West Texas plains, with some exceptions, produces enriched range forage that grows strong, healthy livestock and people. Irrigated pastures grazed by several animal units per acre require superphosphate for continued maintenance.

Sandy soils of the Rolling Plains, can be converted to pastures by returning of lost phosphates, especially to land depleted by cropping. Also such land is improved by replenishing organic matter and nitrogen by growing legumes or with stable manure fortified with superphosphate. This holds also for South Texas and the Cross Timbers.

Make Acidity Tests Before Liming

Texas grasses, when green, generally supply sufficient lime for the needs of grazing animals. Even so, on some East Texas and Gulf Coastal soils the grass yields and the variety of plants can be improved by liming provided the soil also has plenty of phosphate and potash. This is advisable only for soils which have been tested and found to have a pH of 6.5 or less. On such soils, ground limestone or oyster shell will often prove beneficial. Additional applications may be made in 3 to 5 years if the soil again becomes acid. Testing soils for acidity can be done by county agricultural agents or others.

Most acid soils have a pH range of from 5 to 6 and require from 1 to 2 tons of high grade ground limestone to make soil conditions more favorable for the best growth of pastures. The purpose of liming the soil is largely to cause soil fertility to become more available to plants. Therefore, liming poor soil without also fertilizing is not advisable in most cases. The following table shows the limestone

required to bring the reaction of different soils to pH 6.5.

Reaction Is: If Present	It Will Take: On Sand	On Loam	On Clay
pH 5.0	1.5 Tons	2.0 Tons	3.0 Tons
pH 5.5	1.0 Tons	1.5 Tons	2.0 Tons
pH 6.0	.5 Ton	.8 Ton	1.0 Ton

These figures are based on a fine high purity agricultural ground limestone—50% to 55% of which passes through a 100-mesh screen, mixed with upper 6 inches of soil. Lime should be applied in advance of chemical fertilizers.

Reference: "Make Acidity Tests Before Liming", Ext MS-634
"The Liming of Soils", USDA, FB 1845.

rainfall is above 25 inches and on many sandy soils of areas between 20 and 25. Definite application rates are not so important for pastures as for annual crops. Excessive amounts remain available for the continual growth of pastures except such as becomes fixed in the soil. Soil fixation is greater in clay than in sand.

One hundred pounds of 20% superphosphate per acre per year is commonly considered as a base requirement for pastures. But amounts sufficient for several years in advance are used at each application, that is 300 pounds at one application for three years, 400 pounds for four years, or 500 pounds for five years. Variations

Lespedeza and Bermuda replacing Needle Grass when fertilized.

Phosphate Is the Key to Pasture Improvement

Superphosphate has proved effective for pastures on most soils in the State where average annual from this rule should be more rather than less. Higher analysis phosphates such as 46% superphosphate would be proportionately less.

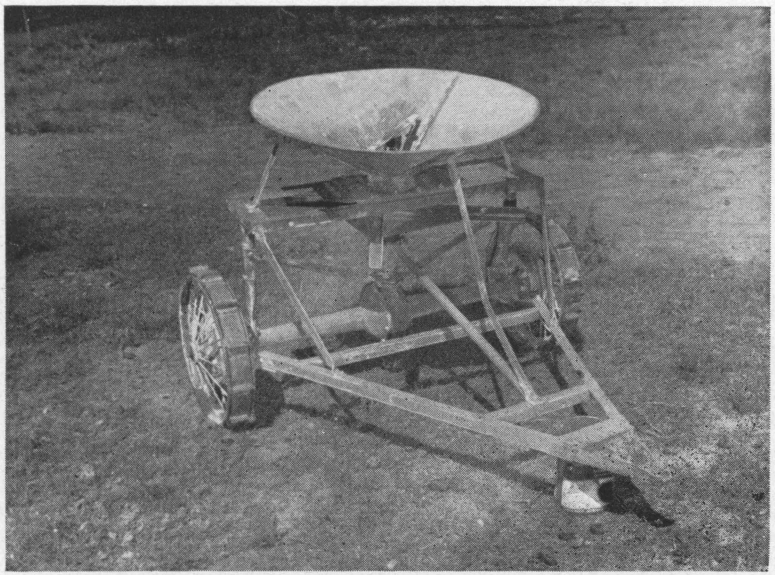
Experimental application of superphosphate to 12 different Texas soils made an average increased yield of 59 percent in Bermuda grass, and also of 35% in the phosphoric acid content of the grass. Increases in grass yield were consistantly greater where the soils were more deficient in phosphate and higher in percentage of phosphoric acid on the better soils. Small applications of superphosphate produced large increases in yields, but only small increases in mineral content of the grass. Higher rates applied made larger increases in both yield and mineral nutrients well above the minimum for range animals. Tex AES B-672.

In determining the amount of superphosphate to apply, the following points deserve consideration:

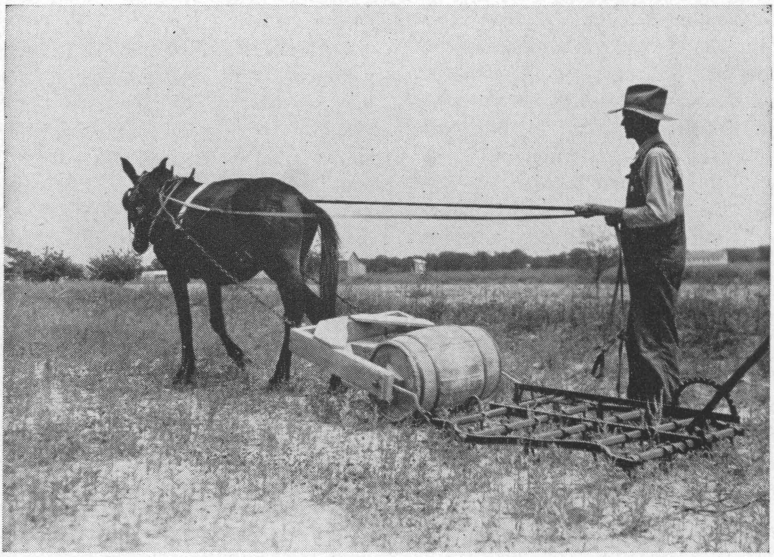
(1) Small fertilized areas in large pastures not separately fenced, may so attract stock as to result in over-grazing. If at all practical, a whole pasture, or at least a sizable portion, should be treated at one time. This suggests lower rates per acre, if necessary, for wider distribution of limited total phosphate supplies, or preferably a division of the pasture.

(2) The minimum application rate might approximate 300 pounds per acre of 20% superphosphate or about 150 pounds of 46% superphosphate.

(3) The need, the difficulty and expense of working superphosphate into heavy soils and the possible injury to the turf, indicate high



The auto-rear-end type of fertilizer distributor. Commercial machines of this type are now available. See description No. 3 on page 15.



View of homemade fertilizer distributor and drag in operation on the Stasney farm two miles southeast of College. Three eight-inch holes in the barrel distribute fertilizer. Rate is regulated by opening more holes or plugging them.

application rates such as 500 pounds per acre once in five years rather than more frequent applications of smaller amounts.

(4) Phosphate on extremes of alkalinity or acidity, especially on clay soils, is less effective. Such conditions require higher rates of phosphate.

(5) Off-setting these advantages of high rates and many years between applications is the tendency of phosphate to become less available by soil fixation, the longer it remains in tight clay soils.

Generally the best time to broadcast superphosphate on sod land is in the fall immediately after the land has been lightly disked. The soil should be moist before disking to keep down turf injury. Even so, getting the job done when time and labor permit may be most practical, whether the land is disked before or after fertilizing.

Old-Field Sandy Land Needs Potash Also

The available potash content of a soil is of great importance in the development of a good pasture. Sandy soils in rainy regions are usually low in available potash after long periods of cropping. Clay soils generally are better supplied with this nutrient but even these soils become depleted by long continuous cropping. Applying potash without other needed elements is not advisable.

Loss of potash from pasture is relatively low as compared with cropland. Potash in pasturage and

feed consumed by animals is largely returned in the animal urine. The chief loss from pastures is through leaching from the soil but this is slight in a dense sod or a vigorous cover crop.

Fertilizers for pastures on old cropland should be essentially the same in grade as for cotton, but at a higher rate and for a longer time; that is, for depleted sandy soils of the Gulf Coast and post oak regions, use approximately one-sixth as much 60% muriate of potash as 20% superphosphate. This amounts to a 0-2-1 ration. Any variation in the rate of potash applied to the soil should likely be more rather than less than this, the minimum being ½ sack of muriate of potash per acre. Potash can be applied in the fall with superphosphate, but because of leaching, late spring may be preferred. Adequate phosphate must always go with potash applications.

Try Nitrogen on Small Areas

For maximum yield of herbage and early grazing the nitrogen applied to the soil might be increased even at the expense of some possible suppression of clovers by the more vigorously growing grasses.

Nitrogen applications will not likely interfere with the growth of clovers on soils of below average fertility. On the contrary, its use will benefit the clover, but thrifty, well established clover usually needs no additional nitrogen.

Just before spring growth starts, is the generally preferred time for applying a nitrogen fertilizer. It stimulates the plant growth and will furnish earlier pasturage. The application of nitrogen fertilizers should be limited to small areas—¼ to ½ acre per animal unit. Increasing quick growth for grazing on large areas in the spring, when grass already is in full production, will only add to a surplus growth of grass. Even so, grass grown for seed or for hay will respond profitably to applications of nitrogen fertilizer.

Early fall application of nitrogen fertilizer stimulates increased plant growth and will furnish fresh grass. Also the forage for late grazing is strengthened. Greater winter storage of plant food in the plants from fall fertilization assures earlier spring grazing and more vigorous competition with weeds and clover.

The rate of nitrogen for permanent pastures is generally considered to be 30 pounds of elemental nitrogen per acre. That is about 100 pounds of ammonium nitrate or about 200 pounds of sodium nitrate or 150 pounds sulphate of ammonia.

Phosphate and potash should be abundant in the soil before nitrogen is used. Without adequate nitrogen, abundance of phosphate and potash in the soil are not fully effective.

APPLICATION OF CHEMICAL NITROGENOUS FERTILIZERS MAY BURN WET VEGETATION AT LEAST TEMPORARILY AND OCCASIONALLY PERMANENT INJURY FOLLOWS. DURING THE MIDDLE OF A DRY DAY IS THE SAFEST TIME TO APPLY NITROGEN FERTILIZER.

Fertile creek bottoms may be covered with wornout soil washed down from nearby hillsides. Here fertilizers may return greatest profit.

Don't Cheat Poor Soil Out of A Complete Fertilizer

Phosphate is usually the first soil mineral to become deficient. But most sandy land pastures in our rainy climate passed that stage long ago and need complete fertilization.

Attempting to reclaim seriously depleted land for pastures by growing clovers with nothing but lime and phosphate treatment is at best slow and may result in failure. Something more is needed—either manure in addition to the superphosphate, or if there is not enough manure, a complete fertilizer.

Establishing pasture grasses in humid regions requires a complete fertilizer. For badly exhausted pasture land, 5-10-5 should be about right. From 300 to 500 pounds per acre is suggested to start the grass plantings.

Then, before seeding clovers and lespedezas, an additional application of fertilizer will be needed, such as 300 pounds of 20% superphosphate and where needed 60 to 100 pounds of muriate of potash. Or these more stable elements might be plowed into the soil first to be followed by a complete fertilizer at seeding time.

If maximum yields of forage or early spring grazing is especially desired, even at the expense of some possible suppression of clover by more vigorously growing grasses, then the amount of nitrogen in proportion to phosphoric acid and potash should be materially increased.

Reference. "Green Pastures", National Fertilizer Association's Pamphlet, No. 140.

Apply Fertilizers Into the Soil

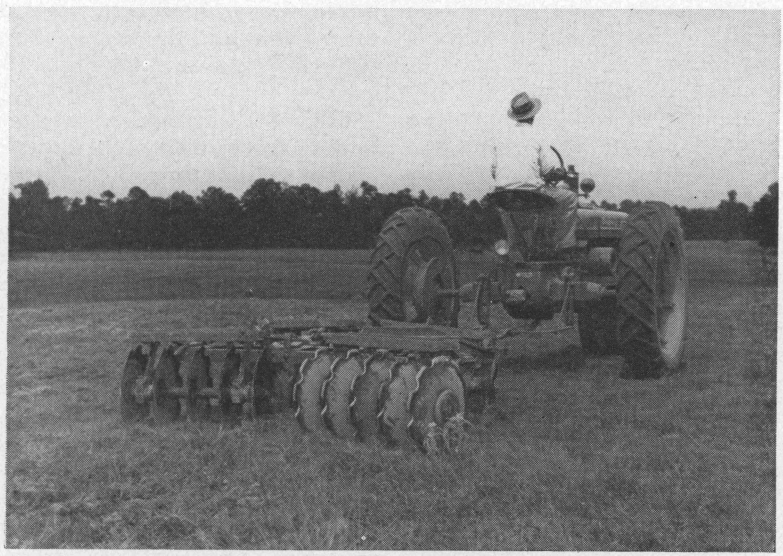
Plant food must be dissolved in soil moisture before the plant can use it. The first consideration in applying fertilizer is to have it where it keeps moist the longest. Left too near the surface, it will dry. This may increase fixation of phosphorus and potash in unavailable forms. Nitrates being highly soluble readily pass into the root zone. Potash also is fairly soluble and finds it way into the soil. Liming materials are still less soluble and should be mixed into the surface soil.

Because phosphorus combines with the soil, it moves downward into the soil slowly when applied on the surface. For greatest efficiency, therefore, phosphate should be worked into the soil.

The most effective method of applying fertilizers on sandy and loamy sod land is by the use of combination grain-fertilizer drill. The drill delivers the fertilizer in narrow bands along the drill rows and approximately 2 inches deep.

Experiments are underway to determine the effectiveness and cost of cutting phosphate into tight clay soil in grooves 18 inches apart and 3 inches deep. This concentrates the fertilizers in bands like drilling and more of it remains available than where applied broadcast. Very few farmers, however, now have such machinery.

The common method of applying fertilizer on sod land and temporary pastures is broadcasting with regular fertilizer spreader, an endgate seeder or trailer-type lime



Disking before putting out superphosphate.

spreader. Superphosphate applied broadcast needs to be worked into the moist soil by a light disking, chiselling, or springtooth harrowing. Preferably such soil treatment should precede the fertilizer so some of the material may fall in the scars.

When establishing new pastures, fertilizer may be applied before plowing or between the operations of plowing and disking. **Old bermuda pastures may be renovated** by fall plowing when the soil moisture is favorable, then applying superphosphate, and sowing some small grain or ryegrass and clover. This provides a winter pasture after which the bermuda is allowed to recover. In addition to superphosphate, and potash, 5 to 10 tons per acre of stable manure worked into old pastures is an excellent practice especially on weak or weedy spots. In lieu of the manure, nitrogen can be applied in spring at the rate of 200 pounds per acre of sodium nitrate or equivalent amounts of nitrogen in other nitrogenous fertilizers.

Stable Manure Lacks Phosphate and Potash

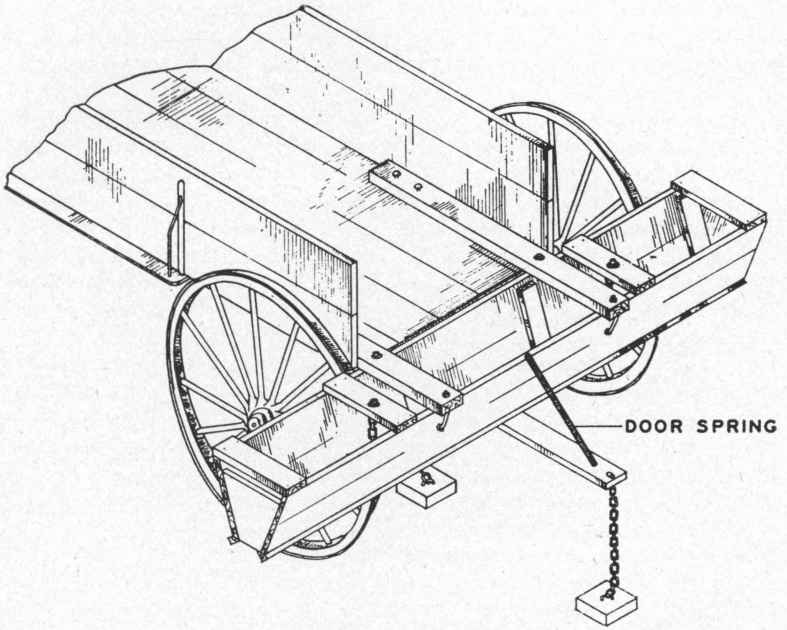
Fresh animal manure containing urine rates high among fertilizers. Even so, a ton of such manure at its best needs about 100 pounds of 20% superphosphate or its equivalent to balance its nitrogen and potash. Besides balancing manure as a fertilizer, superphosphate reacts with volatile ammonia and so decreases nitrogen losses. The usual amount of 20% superphosphate applied to manure in the stable gutters is one or two pounds per cow per day. Experiments show that 5 tons phosphated manure may equal 10 tons of untreated manure.

Without the urine, solid matter of fresh manure contains less than half as much nitrogen, so needs only about 40 pounds of 20% superphosphate per ton. Also because potash is mostly in the urine, a solid matter of fresh manure without urine needs 8 pounds of muriate of potash per ton to make a balanced plant food.

Thus, the use of 5 tons per acre of solid matter of fresh manure requires about 200 pounds of 20% superphosphate and 40 pounds of muriate of potash per acre for sandy land deficient in potash. The potash may be omitted for the central blacklands.

Old manure, leached and dry, having lost another 50% of nitrogen, can be balanced with half as much phosphate and potash per ton as with fresh manure without the liquids; but twice as much of the manure-fertilizer mixture must be applied per acre for equal results.

Legume green manure is rated next to animal manure for organic matter and nitrogen. The mineral fertilizers proposed above may be applied directly to grow the legumes for green manure. The minerals would be fully available for the pasture to follow, together with the legume manure turned under. Even so, a complete fertilizer is generally considered best for starting grasses in new pastures. It advances the pasture possibly a year. Also sodland with a clover is rated the best known means to restore organic matter and thus revitalize wornout land.



Fertilizer distributor attached to a wagon. It may be hung on a truck, or a farm implement. See description No. 1 on page 14 and 15.

Even without manure or legumes, most pastures respond well to applications of phosphate and depleted sandy soils respond to phosphate and potash. From 300 to 500 pounds of 20% superphosphate may be applied profitably without manure or legumes, but greater returns can be expected where legumes are present.

Livestock Droppings Help Maintain Pastures

The most universal pasture fertilizers are the solid and liquid droppings of the grazing animals. About half of the nitrogen and practically all of the potash in the feed consumed by the animals are in the urine, which penetrates the soil for immediate use. The rich green spots over a pasture are most likely from urine while much of the solid matter dries on the surface. Occasional harrowing to scatter dung makes it more effective over a large area in the pasture.

MACHINES FOR SPREADING COMMERCIAL FERTILIZER ON PASTURES*

The spreaders used in distributing phosphate and other commercial fertilizers on top the ground may be divided into three general types.

1. One type consists of a long hopper box, "V" shaped in section, which is hung on the rear of a truck, a wagon, or a farm implement. In most cases a shaker

operated by a rocker arm is used with these boxes to shake the fertilizer out. These distributors have been available commercially and may still be. Extension Service plan number 283 shows a distributor of this type.

2. Another type of distributor consists of a long "V" shaped box mounted on wheels. This type is pulled by a team or tractor, or trailed behind a truck. The wheels of the distributor operate the shaft which feeds the fertilizer out of the bottom of the box. This type of distributor is sold commercially by several concerns. Extension Service plan number 316 shows a homemade machine of this type.

3. A type of distributor, which is generally used now, consists of a pair of wheels which whirl a disk under a small hopper from which the fertilizer is fed out by an agitator inside the hopper. An auto rear end is commonly used as the driving mechanism for the whirling disk. This distributor is trailed behind a tractor, a truck, or a wagon. Some commercial concerns make a machine of this type. Some manufacturers use open gears instead of an auto-rear-end. A plan for a homemade auto-rear-end type spreader may be obtained from the Extension Service.

4. For spreading lime over large acreages, a truck with a large body or bed with spreading mechanism at the rear end of the bed, is more appropriate than the smaller equipment discussed above.

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*M. R. Bentley

Cooperative Extension Work in Agriculture and Home Economics, Agricultural and Mechanical College of Texas and United States Department of Agriculture Cooperating.
Distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914.
20M—2-47