

Controlled experiments have shown that lime is likely to encourage turf weeds and clover to the extent that turf grasses cannot successfully compete against them, particularly where soil fertility is low.

Finely ground limestone is commonly used. It is usually cheaper than hydrated lime and fully as effective. Unless soil is very strongly acid, the rate need not exceed $\frac{1}{2}$ to 1 ton to the acre. If hydrated lime is used it should not be applied within a period of 2 weeks of the time of application of fertilizers containing ammonium salts.

PLANTING

Many grasses are propagated either by seed or by the use of fragments of actively growing plants which are known variously as vegetative material, stolons, rhizomes, or sprigs. Also, pieces of established sod may be transplanted with the soil held together by the grass roots. In the establishment of turf throughout the country for various purposes, many different terms have been applied to the several methods used, resulting in considerable confusion. The synonymy among these terms has been carefully considered and has been discussed with members of the Roadside Development Committee of the Highway Research Board, with various workers in the Bureau of Plant Industry, and others who are interested in the terminology. Since these discussions disclosed the desirability of a uniform terminology, the following terms were agreed upon as a recommendation for general use throughout the country. In each case other terms which are applied to the same method are given in parenthesis.

The methods of planting are discussed in the order of increasing amounts of plant material required as well as the increasing



Result of lack of grass cover on airfield. Note the soil which has been washed onto the runway from adjacent bare areas. Such a condition might be prevented if a good grass cover were established.

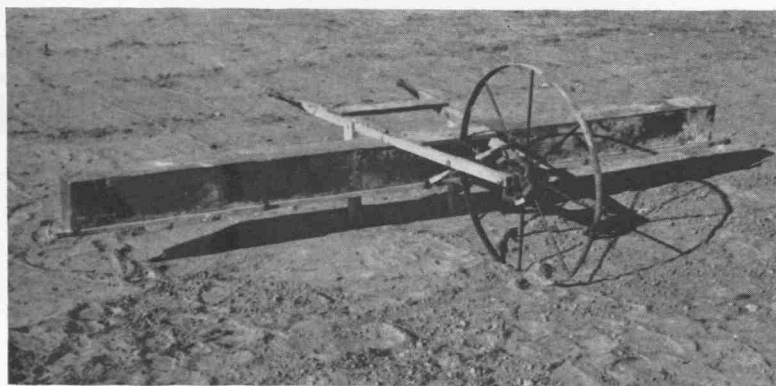
cost of planting; that is, seeding, sprigging (frequently called vegetative planting), and sodding. In planting seed, even under most favorable conditions, the young seedlings are extremely tender for some time before a tough sod is established. This is associated with the fact that in seeding it is actually the minute embryonic plants within the seeds which are planted. In sprigging, more mature plant material, and larger amounts of it, are used, and therefore a wear-resistant turf is much more quickly established than by seeding. By the planting of sprigs, moreover, it is possible to propagate grasses which do not produce viable seed in large quantities, and also to propagate selected strains which do not come true from seed, as is the case with the creeping and velvet bents. For the actual transplanting of sod, still larger amounts of plant material are used. On the other hand, this is by far the quickest way to



Bermuda grass turf five months after planting in August. Left, seeded; right, sprigged. Had seeding been possible earlier in the season, the area on the left no doubt would have had a much better cover of grass than is indicated in this photograph.

get a tough wear-resistant turf. There are locations on steep slopes and in drainage channels where the use of solid sodding may be recommended. However, combinations of mulching with seeding methods have recently been developed on highway slopes which have largely replaced solid sodding formerly practiced on such areas.

When dealing with grasses which may be established by any of the methods, such factors as cost and the requirements of the turf as well as the speed with which it is necessary to establish the turf should determine the method to be used. In most cases the establishment of turf by the use of seed is much less expensive than by the use of sod or sprigs. On the other hand, a durable turf is produced more quickly by the planting of sod or sprigs than by seeding. This factor is particularly important from the standpoint of some of the southern grasses.



The wheelbarrow grass seeder affords an effective means of distributing seed evenly over the seedbed. Like the cyclone seeder it is limited to use on small scale plantings.

When circumstances require late planting of these there is a danger that seedlings may not survive over winter. In such cases as this, plantings of sod or sprigs are better able to establish themselves sufficiently to withstand the cold.

Seeding

The chief points of concern in seeding are: even distribution of seed, depth of planting and rate and time of seeding. The matter of even distribution is usually taken care of, if mechanical seeders are properly employed. The depth of planting will vary somewhat with the type of seed used. The small seeded grasses such as bluegrass, redtop, Colonial bent, Bermuda grass and carpet grass should be covered only slightly. The brome grasses, ryegrass and the fescues can be safely planted to a depth of one-half inch.

Since rates of seeding are dependent upon the species of grass used, they are discussed separately under each grass listed. Par-



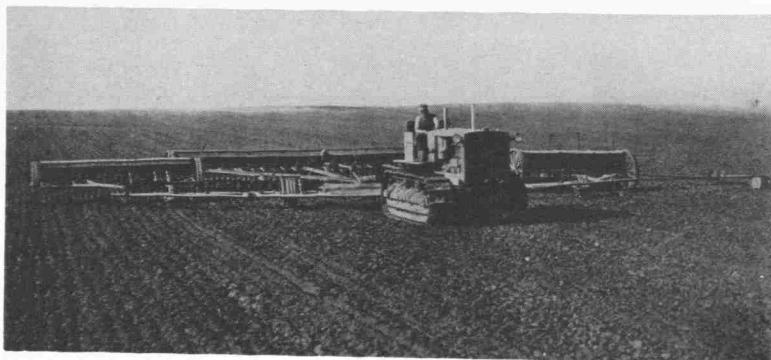
Hand operated cyclone grass seeder which distributes seed by centrifugal action. Such seeders are very useful on small areas such as lawns or roadbanks that are inaccessible to other types of seeders.

ticular consideration should be given to the most favorable time of year for seeding, in order to give the grass the best possible chance for survival. Since the time varies with the climatic regions as well as to some extent with the kind of grass to be seeded, this problem is discussed in general in the presentation of climatic regions and specifically under certain of the grasses.

The several types or methods of seeding commonly used are described in the following paragraphs. In general, the method used should be determined by the size of the area to be seeded, and the nature of the equipment at hand.

Broadcast seeding may be done by hand or with mechanical seeders such as the wheelbarrow or the cyclone types. To insure even distribution of seed it is suggested that half of the seed be sown over the entire area in one direction and the remaining half be sown crosswise. A rake, drag, cultipacker, or harrow may be used to cover the seeds to the desired depth.

Drill seeding is often practiced on fairly large areas, especially with the larger seeded grasses. Drills have the advantage of



Large scale seeding and fertilizing may be accomplished in one operation by the use of tractor-drawn drills.

being able to distribute seed and fertilizer in the same operation. Drill tubes on most drills are spaced 4 to 8 inches apart and spaces between the rows are ordinarily covered within a few weeks. Care must be taken in drilling the finer seeded grasses to see that they are not covered too deeply. Drills may be used to good advantage in reseeding thin, poor turf because seeds can be placed in the ground without damaging the turf already on the area.

Row seeding may be used where mechanical row seeders are available or by the use of drills in which part of the holes are closed. This method also presents the difficulty of planting seeds deeper than is desirable. It is not commonly used except in the planting of nurseries, where it is desirable to have the plants in rows.

Hay mulch seeding is a method sometimes used, particularly in the dry regions of the western states, in seeding certain native grasses, the seed of which is difficult to harvest. Hay is cut from native stands of such grasses after the seed is mature and scattered over the area to be seeded. The straw acts as a mulch or cover and is beneficial in protecting the young seedlings when not applied too heavy.

Sprigging

The term sprigging is recommended for the method of propagation which makes use of fragments of the growing grass plants. This method can be used particularly successfully in the case of grasses which spread rapidly by the production of runners either above or under ground. Runners produced above ground are called stolons, while those produced underground are known as rhizomes or rootstocks. Each node or joint of these runners will produce roots when covered with soil and provided with sufficient moisture. It is suggested that fragments of runners which contain nodes either with or without roots be called *sprigs*, and the method of propagation which involves the planting of this material be called *sprigging*.

With this method, sprigs which are dug out of a meadow or nursery with little or no soil attached are chopped or separated by shredding and are then planted. Sprigs with roots



Sprigging Bermuda grass on a southern airfield. Note the "army" of men necessary for large scale planting by the hand method. Bermuda grass sprigs are being placed in furrows by hand, after which they will be covered. Some mechanical planting method would not only greatly reduce the time required for this operation, but would prevent the drying out of sprigs before covering.

are preferred, but roots are not necessary when weather conditions are favorable. Sprigs must be covered immediately after planting to prevent drying out. The time of planting is very important when this method is used. Moisture and other climatic conditions must be such as to encourage the rapid growth of the newly rooted plants. As compared with sodding, sprigging is a relatively cheap method of planting, because little or no soil is taken up with the sprigs and less plant material is used.

Various types of sprigging are in common use. These types are described in the following paragraphs in the order of increasing amounts of plant material required.

Check sprigging is the planting of sprigs at regular intervals in rows. This method requires the least amount of planting



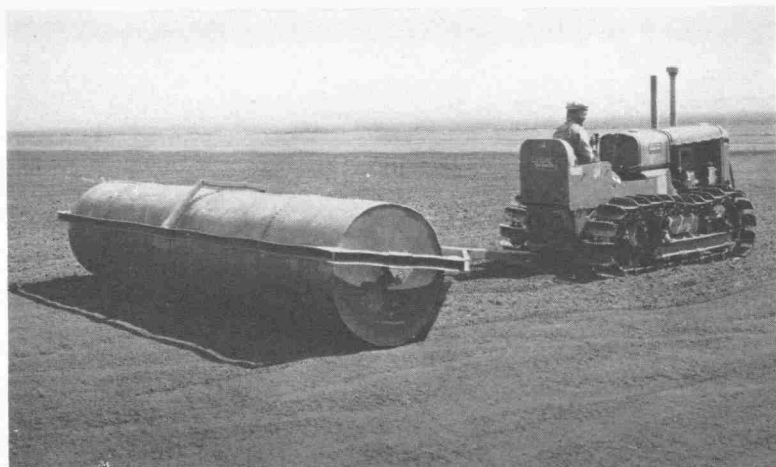
Bermuda grass sprigs may be scattered with a manure spreader such as the above much more rapidly than they can be planted by hand. When planting large areas in turf, the use of power equipment will often save much time and labor.

material of any of the methods listed. While check sprigging does not require as much planting material as the other methods mentioned, it should be borne in mind that when less planting material is used a longer period of time is required to establish a dense cover of turf.

Row sprigging is the planting of sprigs more or less continuously in rows. This may be accomplished by placing the stolons in furrows and covering with a plow, drag or hand rake; by dibbling in the sprigs by hand; or by the use of mechanical planters. These latter machines are still in the experimental stage but considerable progress has been made in the development of such equipment. In row sprigging, more planting material is used than in check sprigging.

Broadcast sprigging refers to the method by which shredded

or chopped stolons are broadcast over an area. This may be accomplished either by hand or by the use of machinery. Where small areas are being planted, the chopped stolons are merely scattered by hand, rolled, and then covered with a thin top-dressing of soil or compost. This method is commonly used in propagating selected strains of creeping bent on golf courses



After seeding or sprigging, the soil should be firmed by rolling. This process places the soil in close contact with the seed or sprigs and thereby aids in more rapid germination of seed or more rapid growth of sprigs.

and is known as vegetative planting. Naturally, hand methods are much too laborious for use on large areas. If large-scale plantings are made, the stolons may be distributed over the prepared surface by a manure spreader. Only grasses which produce stolons, however, should be distributed by this method. In order to cover the stolons lightly and firm the soil, the spreader must be followed by a disk and roller.

Sodding

The transplanting of sod with the soil held together by the grass roots is known as sodding. Thin sod is obviously cheaper to move than thick sod. Also, thin sod cut at 1 inch or even three-quarters of an inch has more surface roots exposed, and therefore becomes anchored more quickly than does thick sod, but it dries out much more quickly. Thin sod should not be used, therefore, unless plenty of moisture is assured either in rainfall or through available watering facilities. On the other hand, sod cut at 2- to 4-inch depths will not dry out so quickly but the grass will be more slow to become anchored and established. Several kinds of sodding are in general use. These are listed below in the order of increasing amounts of plant material required.

Check sodding (block sodding, tuft sodding or spot sodding) involves the planting of small blocks of sod at regular intervals. This method should be employed only when the grasses to be used are species which spread rapidly from stolons or rhizomes. The method is used chiefly in areas subject to periods of drought where plantings by methods such as sprigging are likely to fail. Buffalo grass which is slow to start growth and requires a small core of soil and undamaged roots in order to survive periods of drought, is the species most commonly planted by this method. It is important not to cover buffalo grass with soil after planting.

Strip sodding (trench sodding) requires more sod than check sodding but less than solid sodding and may be used successfully in many cases on slopes which are too steep for other planting methods to succeed. Spaces between strips may be seeded or sprigged.

Solid sodding (block sodding, also frequently simply referred to as sodding) is the complete covering of an area by strips or blocks of sod. This method is by far the most expensive because of the large amount of material and labor required. It may be used to advantage, however, on lawns, drainage channels, and areas adjacent to catch basins along highways and runways where immediate cover is necessary.

Topsoil Planting

This method, which is otherwise known as broadcast sodding, mulch sodding, or grass mulching, has been used rather extensively in the establishment of turf, particularly in the South. It is a method which combines the spreading of topsoil and planting in one operation.

The area to be planted is graded to any desired depth below the finished grade, sometimes as little as 1 to 2 inches. Topsoil obtained from a field upon which a desired grass is growing is then spread over the area to fill up to grade. The grass is indiscriminately mixed with the topsoil during the moving process and under favorable conditions resumes growth in the new location. When the soil used is dark in color and obtained from swampy areas, this operation is usually referred to as "mucking," which has already been described.

MOWING

One of the most critical periods in the establishment of grass is that time between germination, or beginning of growth in the case of sprigs, and the development of a good cover. If weeds are allowed to grow unmolested during this period the grasses suffer badly or may die due to competition. Usually such losses can be prevented if sensible mowing is practiced