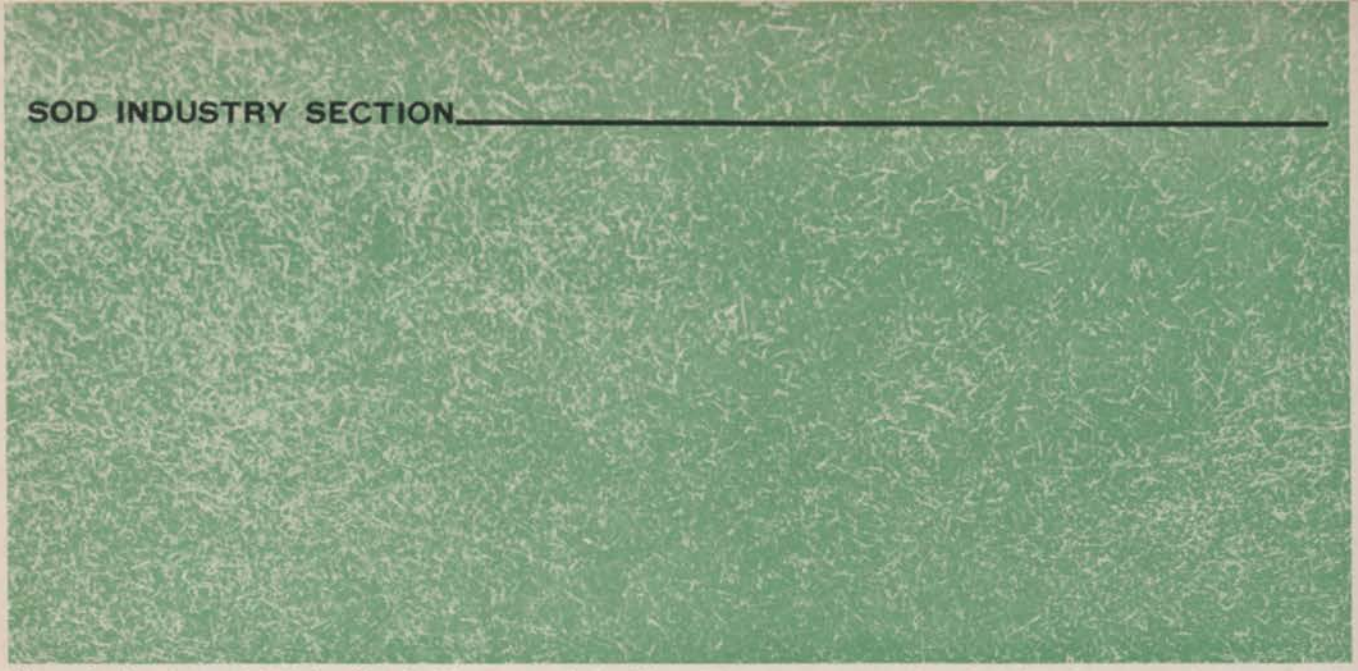

Figure 1. A mature sod of Merion Kentucky bluegrass ready for lifting. This represents the end result of following the practices and principles of establishing a uniform stand of turfgrasses and provided with proper maintenance. Portion of this field qualified for New Jersey certified sod.

How to Establish a Uniform Stand for Turfgrass Sod

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PRODUCTION, marketing, and utilization of sod as a vegetative means of quickly establishing lawn and other turfgrass areas is intimately associated with a high quality product. Sod quality is the net result of a combination of factors involving basic principles and practices of sod production. The degree to which they are incorporated into sod production will greatly influence or determine the quality of the marketable product.

An important criterion for measuring sod quality is the uniformity of stand of the desired turfgrass or mixture of turfgrasses. Successful establishment of a uniform stand, and its proper management after establishment, will produce a uniform and dense carpet of green leaves above the soil. More importantly, a well developed, extensive rhizome and root system will be produced below the soil when the turfgrass is fully and uniformly developed. (Figure 1)

Thin or bare areas can be corrected with proper overseeding techniques when recognized during the early development stages of a newly seeded sod field. However, such deficiencies in a mature sod present a problem at harvest time. These thin or bare areas complicate as well as delay "lifting" of sod. In addition, it becomes very wasteful because of the necessity of discarding sod pieces (such as illustrated in Figure 2) containing bare or thin areas. It is particularly wasteful when considered from the standpoint that such areas may comprise only 1% or less of an otherwise high-quality strip or roll of sod.

Realizing the importance of uniformity of stand of turfgrasses in relation to sod quality, sod growers should be overconscious of the principles and practices of sod production which aid

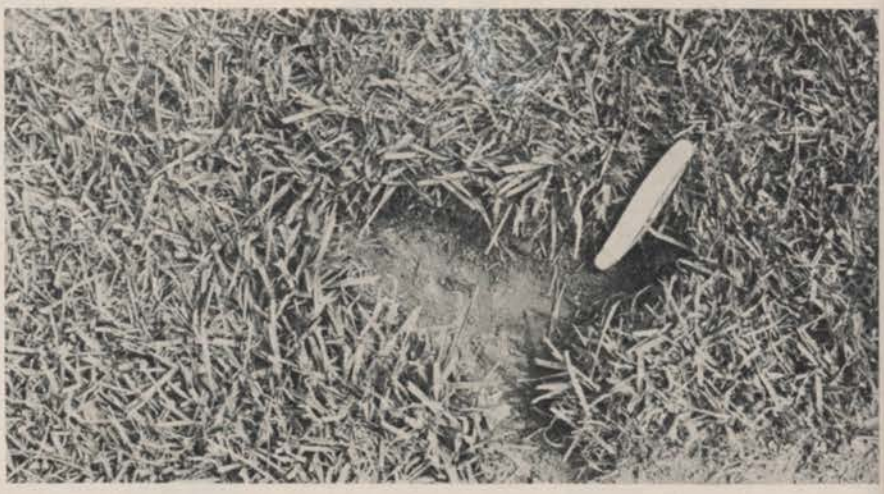

Figure 2. Lack of a uniform stand of the desired turfgrass has resulted in this type of condition in an otherwise high quality strip of harvested sod.

in getting a uniform stand. Let us consider factors which contribute to a uniform stand of turfgrass in the production of a high quality sod.

Weeds: Key to Land Selection

Observation of weed growth in an area before seeding will be time well spent in determining the suitability of a particular field for sod production. Avoid seeding fields which are known to be infested with difficult-to-control weeds such as quackgrass, bermudagrass, johnsongrass, nutgrass or other pernicious perennial weeds. Weed problems of this nature can not be resolved by selective control procedures in an established sod field. The best approach to control of weed infestations of this type is complete eradication before seeding.

Fields infested with difficult-to-control weeds can be made suitable with the proper use of chemicals, in combination with cultural practices. Chemicals are available which can be used as soil sterilants or others which are nonselective or specific for perennial grasses. Clean cultivation or clean fallow are helpful cultural practices. Use of cultural practices in preparation for sod production is advisable for two or more years before seeding any fields which have not been cultivated for the preceding five or more years.

Soil Preparation Affects Quality of Turf Stand

Proper soil preparation requires more patient and painstaking techniques than are normally required for other agricultural crops. Carelessly prepared fields may affect not only the stand of turfgrass obtained, but also its future management. Soil preparation involves proper provision for physical and chemical conditions.

Physical conditioning begins with mechanical preparation which may involve subsoiling, plowing, rototilling, discing, harrowing, and culti-packing. The objective or end result of using such implements is the preparation of a level, finely granulated but not pulverized seedbed that is smooth and firm. Utmost care should be taken to provide as level a seedbed as possible. An uneven seedbed affects seeding operations from the standpoint of variable depths of planting.

Seed planted too deeply will not germinate and therefore result in an uneven stand. As a general rule, the larger the seed size, the more tolerant it is to deeper planting. For example, a seed such as red fescue which is approximately 8 times as large as Kentucky bluegrass would tolerate deeper planting than the bluegrass. Conversely, a seed as small as bentgrass (about ¼ the size of Kentucky bluegrass) should be planted on the soil surface. When the soil surface is not even, it is very difficult to control depth of planting. The net result is a variable or uneven stand of turfgrass because of the variance in seed depth.

Furthermore, lifting sod from areas which are pocketed with undulations becomes very difficult. In situations when the normally used tillage implements are inadequate for preparing a level even seedbed, land levelers can be used to advantage.

Incorporation of organic materials in the form of green manure cover crops, well in advance of the anticipated time of planting, can improve very light or heavy-textured soils. Dense plantings of such crops as corn, sorghum or soybeans make suitable cover crops.

Seedbeds should be prepared well in advance of the seeding date with periodic, shallow tillage. This is an opportunity to destroy several crops of weeds before planting.

Chemical preparation involves adjustment of soil pH to approximately 6.5 (slightly acidic) with adequate amounts of lime. The amount of lime required will depend upon the degree of acidity as well as the soil type. A soil test is the best way to determine the amount of lime required for a particular soil.

Adequate Fertilization A Must

Adequate fertilization is necessary to get new turfgrass seedlings off to a vigorous start. A 1:1:1 (N:P:K) ratio of fertilizer applied at the rate to provide about 100 lbs. of actual nitrogen/acre is satisfactory for most situations. If soil test information is available which indicates very low levels of phosphorus and/or potash, a 1:2:2 or 1:2:1 fertilizer at equivalent rate of nitrogen (100 lbs./A.) to the 1:1:1 would be more appropriate. In situations where the phosphorus and potash are above average, a 2:1:1 fertilizer ratio (100:50:50 lbs./A.) or straight nitrogen material, applied at rates equivalent to the nitrogen rate suggested in the 1:1:1 ratio, would be adequate.

In some situations grubs and

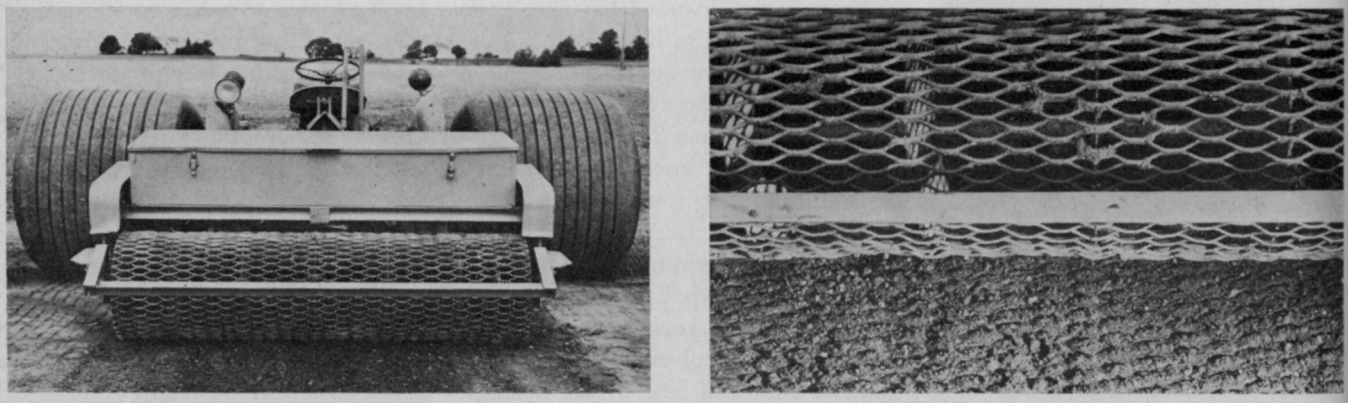

Figure 3. View of one type of seeder in popular use, together with a close-up view of the soil conditions after seeding.

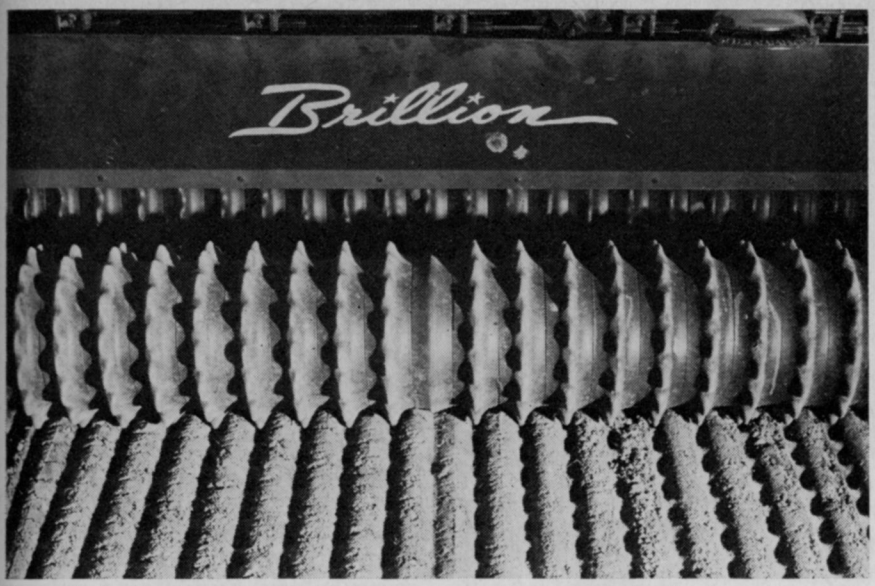

Figure 4. Another type of seeder in popular use showing close-up of soil pattern after seeding made by this machine.

other soil-borne insects may produce serious damage to the stand of turfgrass. Application of appropriate insecticides while preparing seedbeds will provide assurance against grubs. At present, the New Jersey Department of Agriculture requires soil insecticide treatment for interstate shipment of sod. Insecticides such as chlordane, dieldrin, aldrin, and heptachlor can provide long-lasting protection.

All soil improving materials broadcast evenly and completely on the soil surface should be thoroughly incorporated to a 6- to 8-inch depth. This will provide favorable conditions for extensive and deep root development.

Use Seed Label As Quality Guide

Select certified or registered seed of improved turfgrass varieties adapted for the location in which the sod will be produced and marketed. The seed label contains a wealth of information on the ingredients of a particular container of seed. It should be used as a guide to determine the quality of the seed selected.

Difficult-to-control weed problems may be introduced very easily into an area through poor quality seed. *Poa annua* and bentgrass are examples. Certified seed gives a considerable measure of assurance of high quality, but under present certification standards the weed problem is not entirely eliminated.

Fortunately, sources of seed are available which provide the added assurance of freedom from *Poa annua* and bentgrass. There are special lots of certified seed known to be free from *Poa annua* and bentgrass. Sod producers should request not only certified seed, but they should shop for certified seed free of these contaminants. Under present certification standards, up to 5% (by weight) of other crop seed can be included without label listings. A 5% contamination of *Poa annua* or bentgrass can pose very serious problems because of the large number of these tiny seeds involved.

Best Planting Season

Most successful plantings are made from late spring to early fall. During this period, temperature and soil moisture conditions are most favorable for the germination and establishment of an even turfgrass stand. Furthermore, competition caused by weeds is minimal or greatly reduced. Spring seedings can be successful, but establishment at that time is more difficult because it will be necessary to devote more attention to reduce weed competition and provide adequate soil moisture for survival of the new, spring seedlings. Commonly, late summer to early fall seedings will be ready for harvesting at the same time or even sooner than grass planted in the spring of the same growing season.

Light to medium seeding rates are suggested for best development of a vigorous rhizome and root system. The actual rate per acre will vary with the particular species of turfgrasses being seeded. In the case of Merion Kentucky bluegrass, which is popularly grown for sod, a desirable rate is 30 to 50 lbs. of seed per acre. Rates of 100 lbs. or more per acre are used primarily to shorten the time between seeding and harvest. Heavy seeding rates provide a more dense top growth sooner than the lighter rates. Rhizome and root systems from light sowing rates will not be as well developed as from heavy seeding rates. In the absence of a well-developed rhizome and root system, it is necessary to cut deeper into the soil to give harvested sod added strength.

The depth of seeding which a turfgrass can tolerate is closely associated with seed size. Certain seeds contain a pigment that is sensitive to light and controls germination. Stimulation of this pigment by light will either prevent or induce germination. Light is necessary to induce sprouting in Kentucky bluegrass, and if it is planted too deeply, sufficient light is not present to bring about the necessary reaction. Generally, depth of seeding should be within the top ⅛ to ¼ inch of soil. It is very difficult to regulate depth of seeding on poorly prepared seedbeds, and poor stands or bare spots will result where seed is planted too deeply.

Seeding equipment in good working condition, and operated properly, is an absolute necessity in order to obtain proper, even distribution of seed as well as planting depth. Two types of seeders in popular use today and the appearance of the seedbed after seeding are illustrated in Figures 3 and 4. Conscientious operation of such equipment is necessary to avoid blank areas between the seeded swaths. Operation at speeds faster than those recommended by the manufacturer is not compatible with

the internal mechanisms engineered for even distribution of seed.

Moist Soil Hastens Germination

Maintaining a moist soil condition helps reduce the time necessary for germination and obtain a more uniform stand. Any supplemental irrigation should be a constant program of light, frequent sprinkling with as fine a droplet as possible. Daily sprinkling would be desirable but prohibitive from the standpoint of portable irrigation systems.

Mulching with a weed-free, salt hay or grain straw can be very helpful by yielding quicker germination as well as a uniform stand. The need for watering becomes greatly reduced because the moisture retained by a mulch is held at the soil surface. From an economical standpoint, large scale mulching may not be economical.

Successful establishment of a turfgrass or mixture of turfgrasses does not, in itself, insure uniformity of stand. Once established, it must be developed and protected with a maintenance program. Close and constant attention must be devoted to fertilization, mowing, irrigation, and also weed, insect, and disease control. Each of these factors influences turfgrass stand uniformity which is a significant criterion in determination of sod quality.

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with no flexibility. This can be costly to the contractor. Establish a clear understanding on all phases of work, soil preparation, final grading, and other requirements. Highway sod is laid faster, depending on thickness which can be unreasonably thick. Water requirements are another concern; you may have to haul it. It is very important to consider every possible cost item when bidding on highway sod work.

Weed Control in Turf

One of the big factors in chemical weed control failures is poor