— BETTER TURF — A World Concept

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Editors Note: The following article was presented at the 6th International Grasslands congress in August 1952. See letter on page 10.

Grass has many uses. The use of grass for turf purposes has no relation to forage or pasture; yet this use has the greatest direct appeal to the majority of civilized peoples. Turf, in our world concept, refers to sod of grasses used primarily for appearance—for instance, of a lawn—and for a wearing surface on sports fields, airfields, roadsides and other areas. Turf combines beauty with utility. Regardless of the main purpose for which turf may be established, the control of soil erosion becomes a natural consequence. Good turf on sports fields reduces injuries to players. Turf controls dust and wind erosion, which are so very important in areas where aircraft operate. A good lawn turf helps the housewife keep her home clean. Good lawns around factories and offices raise morale and property values. Indeed, the value of turf to many millions of people cannot be denied.

Official recognition of turf management as a true function of the agriculture of a nation or a state or other political subdivision long has been delayed. A survey of the development of research in turf management reveals that a large part of the progress in the last half century has been the result of private funds. The pioneer among the states in the study of turf grasses has been the little State of Rhode Island, U.S.A. Turf plots at Kingston, R.I., have been operated continuously for over 50 years. Pennsylvania and New Jersey rank second and third, respectively, in the development of State turf programs. The private organization which has done much to develop turf knowledge in the United States is the United States Golf Association Green Section, organized in 1921. Scattered efforts to develop turf work at a few agricultural experiment stations before World War II subsided durng the conflict. It must be recorded, however, that the cause of turf management was advanced during the Fourth International Grasslands Congress even though the subject was not officially recognized. The greatest expansion in turf work has occurred since 1945. One reason for the development is the American Society of Agronomy's recognition of turf management as a true function of agriculture and it has provided a section for turf within its corporate body. Since that action was taken, nearly half of the 48 States have developed a turf program. The largest of these include Pennsylvania, Georgia, Rhode Island, New Jersey, Indiana, and California.

The development of turf programs in England, New Zealand, and South Africa have been marked by significant achievements and excellent publications. A free interchange of information has helped to create a valuable fund of knowledge and the establishment of sound principles underlying the science of turf management. May the Seventh International Grasslands Congress give further recognition to this highly important, nonforage branch of agriculture!

Classification of Types of Turf

A natural method of classifying and identifying turf seems to be that related to use.

Lawn turf describes turf by location rather than by any particular grass or quality of turf. Probably in no other turf is it possible to find such a wide diversity in sun and shade, in the choice of grasses, in soils, in the height of cut, and in degree of management and mismanagement. The reason lies in the fact that the law problem is world wide, that uncounted millions of laymen who do their own cultural research, resident teaching, and extension, largely have ignored the turf uses of grass. Thus the institutions have been unable to accumulate and disseminate accurate information on turf to their taxpayers, students, and constitutents.

Putting green turf immediately involves the concept of closely cut, immaculately groomed turf of the finest texture. It may be composed of any one of several grass

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species, but in order for a golf ball to roll smoothly to the cup when stroked, the quality must be of the highest order.

Fairway turf is familiar to most people as a smooth expanse of green grass which is the envy of many who would like to have a lawn like it. The golfer demands also a certain playing quality which may be described as a firm, closely cut cushion of turf which provides a good lie for the ball.

Other types of turf include cemetery, park, tennis, athletic field, golf-course tees, and golf-course roughs. Each type is bounded by a particular set of requirements which are similar in many respects.

Basic Attributes of Turf Grasses

Close Mowing

The true value of any grass for turf is determined first by its ability to thrive without injury under a system of management which includes close, frequent mowing. For this reason the height of cut is an important consideration in the testing of species and strains of turf grasses. Any grass, to be useful for putting greens, must perform satisfactorily when it is mowed daily at 3/16 of an in. There is no real compromise. Some of the best fairways are mowed at 1/2 inch. Therefore, any new fairway grass must perform well when it is cut at 1/2 inch on a three-times-a-week schedule. Lawn turf may include height of cut from 1/2 to 3 inches. Beyond that nearly any forage or pasture grass will survive if no premium is placed on quality. Some of the grass species which are included in turf-seed mixtures fail to qualify as turf grasses because they cannot tolerate close, frequent mowing.

Disease Resistance

The next important consideration in selecting and developing turf grasses is resistance to disease. Close, frequent mowing of any grass tends to reduce its ability to resist a disease attack or to recover from one. When water is applied artifically the problem is complicated further by providing conditions in the microclimate that are favorable to the growth of organisms. Add to this the effect of traffic on the grass blades and of soil compaction on root growth and it should be apparent that a grass, to survive the punishment of turf uses, must be rugged indeed. The diseases of turf grasses have been studied in a very limited way for more than a quarter of a century. This characteristically identifies the progress and development of turf research in the United States. The first publication on turf diseases appeared in 1932 by Monteith and Dahl. A more recent bullentin by Howard of Rhode Island amplifies the earlier work.

Drought Tolerance

Many types of turf in various parts of the world demand that the turf grasses be resistant to drought. The artifical application of water to supplement natural rainfall is utterly impossible in many locations and is inadvisable in others. The true value of a turf grass lies in its ability to produce satisfactory turf under natural rainfall conditions or with only the minimum of applied water where grass will not grow under natural precipation. This attribute is a necessity not only to economize in operations but to preserve ground water supplies for agricultural, domestic, and industrial uses. It is important to use only minimum quantities of applied water even where the supply is abundant. Many areas of turf virtually have been ruined (unnecessarily and at great cost) by applying too much water! Only in recent years have been learned the evils of using too much water. Still more recently we have begun to correct the effects.

The ability of a grass to resist or to recover from attacks of various insects is a mark of superiority. The development of low-cost efficient insecticides, together with rapid methods of application, means that insect resistance is not of the first order of importance. Therefore, when performance records are being compared the grasses that are insect tolerant or resistant must be given preferences when other considerations are equal.

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Color and texture frequently are given value far greater than can be justified under a plan of judging grasses by their performance under play. If two grasses should perform in identifcal fashion, preference naturally would be given to the one which developed the more pleasing color and texture is highly personal in character and can not be reduced to scientific terms capable of statistical analysis.

Resistance to weed invasion is a measure of the adaption and vigor of a grass which is affected by other attributes such as resistance to close mowing, diseases, drought, and insects. Weeds invade when turf density is lacking or when growth is checked or retarded. Weeds are the symptom or the effect. Too often we design elaborate systems of control for weeds in turf (treating the symptoms) before we seek the cause and devise a means of preventing weed invasion by producing turf that is capable of natural resistance through competition. Only in the past few years has any attention been given to weed control by competition under a system of generous fertilization, using superior strains of grasses. This represents a very fertile field for further development.

Major Turf Grasses

The principal turf grasses of the world are included within a surprisingly limited number of species. These have been reviewed adequatley in Grass, the 1948 USDA Yearbook of Agriculture; and Turf Management, a book sponsored by the United States Golf Association, H. B. Musser, author. For the purposes of this discussion I shall name only the major ones.

In the warm-season group we find the Bermuda grass (*Cynodon spp.*), Zoysia grasses (*Zoysia spp.*), centipede grass (*Eremochloa ophiuroides*), St. Augustine grass (*Stetaphrum secundtum*), Bahia grass (*Paspalum notatum*), buffalo grass (*Buchloe dactyloides*).

Among the cool-season turf grasses are bluegrasses (*Poa spp.*), bent grasses (*Agrostis spp.*), fescues (*Festuca spp.*), and rye grasses (*Lolium spp.*).

Superior Strains of Turf Grasses

It is the considered opinion of most turf workers that the cause of better turf will be advanced most rapidly when superior strains of turf grasses are produced and made available to the consuming public. Crab grass, the curse of turf in many countries, and other weeds represent simply an expression of the failure of the grasses we use to compete successfully with weed pests. The impact of disease, insects, wear and tear, poor soils, and indifferent management has been too much for the common pasture grasses which have been harvested and sold as turf grasses. The super-turf that is needed to overcome these hurdles has not been produced as yet, but important advances have been recorded. Here are some of the significantly superior types of turf grasses used in the United States:

BENTS
- Arlington (C-1)
- Cohansey (C-7)
- Congressional (C-19)
- Dahlgren (C-115)
- Polycross seed

CHEWINGS FESCUE
- Penn State Chewings fescue

BLUEGRASS
- Merion

BERMUDA GRASS
- U-3
- Tifton 57
- Tifton 127
- Gene Tift

CREEPING RED FESCUE
- Polycross seed (synthetic blend)

ZOYSIA
- Meyer (Z-52)

The list of superior varieties is meager indeed. Much work lies ahead of us in the field of genetics and plant breeding so as to develop the superior qualitities which are needed in all of our turf grasses. Until we have the right grasses, much of our work with fungicides, herbicides, and insecticides represents a "marking time" in doing the best we can with what we have.

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Other Achievements in Turf Mangagement

The National Coordinated Turf Program, headed by the United States Golf Association Green Section, is an achievement of which we can be justly proud. It was developed primarily on a research basis, but several schools have established courses of study in turf management with the result that undergraduate students in 4-year colleges have an opportunity to specialize in this important field. Extension services have recognized their duties and responsibilities with regard to turf problems in a few colleges. Penn State was the first (1935) to employ a full-time extension agronomist for extension work in turf. This phase of turf management on a national scale is still by far the weakest point in the entire program, when it should be the strongest.

Cool-Season and Warm-Season Grasses Combined

One of the great advances made in the first against weeds and for more perfect turf was reported by Grau and Ferguson in, What's new in Crops and Soils, for June-July, 1949 under the title, "Bad News for Crabgrass." The article described the trails at the Beltsville Turf Gardens where *Zoysia japonica* and various cool-season grasses were developed into a blend or combination turf which is remarkably resistant to weeds. Since that time we have discovered that the combination of Meyer Zoysia and Merion bluegrass developed as turf superior in every way for most lawn and fairway uses where it is adapted. The limits of the regions of adaption for this combination are not known but they appear to be very broad. This principle of developing a permanent turf of a warm-season and a cool-season grass is sound and deserves intensive study in all the regions where turf work is conducted.

Fool-Proof Fertilizers Needed

The development of a more fool-proof fertilizer long has been awaited. Only the professional turf superintendent can use ordinary fertilizers on our common grasses with any degree of success. Indeed, much turf is starved simply because the home gardener is afraid he will burn the grass if he fertilizes adequately. Organic fertilizers most nearly answer the problem. The recently developed ureaform materials act like the organic nitrogen carriers and can supplement the supply of natural organics.

Cultivating the Soil Under Turf

Various forms of spikers have been designed to aid in water absorption. Although used widely, they have failed in the needed purpose of loosening the soil to allow air and water to circulate freely. The development of the tubular tine in 1919 in England was a step forward, but it also failed to loosen and cultivate the soil. Not until 1946, when the half-round curved spoon was designed and built into a machine, was true soil cultivation beneath the turf achieved without destroying the surface. Data was developed to indicate the efficiency of the curved spoon in aiding water infiltration, penetration of fertilizer materials, and development of roots.

We must not fail to record here our advance in knowledge of selective weed control. The development of 2, 4-D and methods of using it successfully on turf rapidly have advanced the cause of better turf. Sodium arsenite gradually is gaining in popularity among professional men, and potassium cyanate finds more friends daily among the laymen. Mercury preparations have found limited application, and several new compounds appear to be very promising.

In the field of turf fungicides there have been several notable achievements. Mercury preparations, long the standard treatment for dollarspot and brownpatch, have found worthy rivals in the cadmium and in thiuram compounds. There are a number of turf diseases for which there are no specific treatments. In all probability the solution will lie in the development of superior varieties of grasses.

The ultimate development of turf management in all its phases, for the benefit of the millions of civilized peoples who need and want good turf, in a large measure will depend upon our ability to obtain full recognition among the tax-supported institutions of the world. The brunt of the burden has been carried by private funds far too long a time. It is the duty and the privilege of the agricultural colleges to meet the needs of all the taxpayers. It is true that food production is paramount, but as long as there is a gross waste of funds, time, and effort in turf management, the need for research, education, and extension service should be met. ■