NEW APPROACH IN GROWING SOD
THE NET SOD SYSTEM

Dr. James B. Beard
Department of Soil and Crop Sciences
Texas A&M University

In the summer of 1970 in England, Mr. Fred Loads experimented with a technique for growing sod more rapidly. He used a net mesh produced by the Netlon Company of Blackburn, Lancashire, England. The procedure he developed involved placing a Netlon mesh on top of a polyethylene film and then spreading a root zone mix over the Netlon mesh. The grass seed was incorporated into the soil root zone mix prior to spreading over the Netlon mesh. Utilizing this technique, the seedling grass was securely rooted into the Netlon mesh. Within 14 days it could be readily handled and transplanted. Based on these initial findings, a research program was initiated at Lancaster University under a grant from Dr. F. B. Mercer, of Blackburn, England. These studies began in early 1971 and continued through 1973. Results of this work confirmed the earlier observations of Mr. Loads, resulting in further refinements in the techniques involved in producing turf by this Tuft 1 system.

In 1972, Mr. Mercer contacted the author at Michigan State University concerning this net sod production technique and possible research that could be conducted in relation to commercial net sod production in North America. As a result, 14 greenhouse studies and 18 field experiments were conducted at Michigan State University from 1972 through 1974, under a grant from Dr. F. B. Mercer. Obviously, detailed results of these experiments cannot be covered in this brief article. Thus, a summary of the findings as they apply to conditions in North America will be presented.

Two basic systems of net sod production will be discussed. Tuft 1 involves a Netlon mesh and underlying polyethylene film over which the root zone-seed mix is added. The polyethylene film functions as a barrier to downward root growth, enhancing the intertwining of roots with the Netlon mesh. More rapid formation of a seedling sod results. Harvesting involves rolling the sod up within the underlying polyethylene film which has been precut in long, narrow strips. This product with the surrounding polyethylene film is particularly desirable for marketing in modest quantities through nursery outlets. Tuft 5 involves placement of the Netlon mesh onto or at a shallow depth in the soil along with seed application and subsequent rolling to provide good seed-soil contact and to stabilize the Netlon mesh in the soil. No polyethylene root barrier is utilized. Harvesting is accomplished with a standard sod cutter.

TUFT 1 STUDIES

Extensive greenhouse and field experiments were conducted on the Tuft 1 system of net sod production. These tests involved seeding rates, seed placement, seed mixtures, and the evaluation of 6 Kentucky bluegrass, 4 fine leafed fescue, and 5 perennial ryegrass cultivars. Results showed no difference between soil incorporation and placement of the seed in the surface quarter inch of the soil root zone. Net sod could be produced in 2 to 3 weeks after planting under greenhouse conditions. The sod could be readily handled, although the turf was still in a seedling stage. Under field conditions net sod could be produced in 4 to 6 weeks utilizing the Tuft 1 sod system. Higher seeding rates were required to produce net sod by the Tuft 1 system in this period of time.

The most rapid rate of Tuft 1 sod production was achieved utilizing polystands of fine leafed fescue-Kentucky bluegrass, perennial ryegrass-Kentucky bluegrass,

and perennial ryegrass-fine leafed fescue-Kentucky bluegrass. Most of the root binding with the Netlon mesh was attributed to the fine leafed fescue and perennial ryegrass components of the polystands rather than the Kentucky bluegrass. These polystands formed an acceptable seedling net sod within three weeks while monostands of Kentucky bluegrass required 2 to 3 times as long, depending on the individual cultivar utilized. Among the perennial ryegrass cultivars tested, Manhattan formed the most rapid net sod followed by Pennfine. In a monostand, an acceptable perennial ryegrass seedling net sod was produced in 8 to 10 days using the Tuft 1 system.

The Tuft 1 system grown under field conditions was prone to soil erosion during intense rainfalls and to rapid desiccation during periods of high evapotranspiration due to the shallow root zone depth for water retention. The former problem was minimized by the spray application of a surface soil binder of the elastomeric polymer type. The proneness to desiccation necessitated the use of a mist type irrigation system applying water at intervals from 2 to 6 times per day depending on the atmospheric evaporative power. Another important consideration was to avoid excessive water applications which result in conditions favorable to such seedling blight diseases as Rhizoctonia and Pythium. The best nutritional responses were achieved by foliar applications of a complete analysis fertilizer at regular intervals during the 3 to 6 week production period. The use of soil free of viable weed seeds and vegetative propagules was also a very important consideration.

TUFT 5 STUDIES

Most of the Tuft 5 studies were conducted under field conditions on a Houghton muck soil at the Michigan State University Muck Experimental Farm near Lansing, Michigan. Preliminary tests in the fall of 1972 showed that Tuft 5 Merion Kentucky bluegrass net sod was produced in 8 weeks under favorable moisture conditions. The sod possessed more than adequate sod strength for easy handling and the sod had reached a level of visual turfgrass quality and maturity comparable to that from standard field production. The sod cutter was operated through the net sod with no difficulty at all. One of the obvious observations from this test was the need for preplant weed seed eradication. The presence of weeds seriously reduces the visual quality of the sod. There was not sufficient time in such short production periods to achieve post-emergence chemical control of broadleaf and annual weedy grasses. Thus, the critical importance of ensuring control of weed seeds and vegetative propagules prior to planting.

Tuft 5 plantings were made periodically throughout the growing season for a two-year period. Results of these tests showed that the time required to produce Tuft 5 net sod varied seasonally under Michigan conditions. Early spring plantings required 13 to 14 weeks, early summer plantings 10 to 12 weeks, and late summer-early fall plantings 8 to 10 weeks to produce an easy to handle net sod of acceptable visual quality comparable to the standard sod now in commercial production in Michigan. These production times are achieved if adequate soil moisture levels are maintained by irrigation during droughty periods. Sod strength values for the Kentucky bluegrass Tuft 5 net sod ranged from 180 to more than 200 pounds required to tear. These results indicate that the scheduling of planting times relative to the projected sales-harvest dates will have to be varied seasonally, especially in relation to temperature conditions.

In the rate of seeding studies, acceptable Merion Kentucky bluegrass Tuft 5 net sod was produced at the standard seeding rate of 40 pounds per acre. In the net placement studies, five soil coverage depths (0, 0.25, 0.33, 0.5, and 0.75 inch deep) were compared. No significant differences in sod formation rate were evident among the five placement depths including placing the Netlon mesh on the

surface. It was found that rolling, following placement of net and seed into or on the soil, was particularly beneficial.

All the above results were based on monostand plantings of Merion Kentucky bluegrass or blends of Kentucky bluegrass. Polystand comparisons involving the addition of either Pennlawn red fescue or Manhattan perennial ryegrass were also conducted. The addition of either of these species to the seed mixture resulted in an increase in the seedling emergence rate, seedling height, sod strength, and rate of net sod production; plus a reduction in the weed content. These responses increased proportionally as the percentage of Pennlawn or Manhattan was increased up to 70% by seed weight.

TRANSPLANT ROOTING COMPARISONS

The transplant rooting capabilities of Netlon net sod were compared using both the root observation boxes and the Michigan Transplant Rooting Test. Results showed that the presence of a net in the sod had no negative effects on transplant rooting. The transplant rooting tests were conducted under both summer and fall growing conditions. Eight-week-old Tuft 5 net sod and 1-year-old sod produced under the standard commercial methods used in Michigan had comparable transplant rooting rates. In contrast, 4-week-old Tuft 1 net sod had a much greater transplant rooting rate and extent than sod grown under the other two production methods. The transplant rooting advantage of Tuft 1 net sod was attributed to the root tips not being disturbed and thus able to grow rapidly into the underlying soil. In contrast, harvesting sod grown under the other two production methods involved severing the roots. Thus a period of time was required before new roots were initiated from the meristematic areas of crowns and lateral stems. The Tuft 1 net sod was in a more succulent, delicate seedling stage than either of the other two sod types and therefore is more prone to traffic injury. This necessitates withholding traffic from the area until the turfgrass stand has reached a more mature state.

FUTURE POTENTIAL

The experiments which have been briefly described confirm the potential for these two net sod production methods as well as some of their limitations. The cost of the net and its installation must be evaluated from an economic standpoint, relative to the additional length of time which the land is tied up in production, and the additional maintenance costs for producing sod without a net. Advantages of the Tuft 1 net sod production system are (1) an extremely rapid production time; (2) flexibility to produce sod with prescribed root zone mixes, which can be of particular importance on sport fields and greens where root zone modification is utilized; (3) more efficiently utilizes the available land in locations where availability is extremely limited (such as in parts of Japan and England); (4) offers the capability to produce sod in areas where the existing soil is extremely rocky or is in a condition unfavorable for sod production; and (5) is an attractive method of producing moderate quantities of sod for marketing through direct nursery outlets with a grass composition and soil mix specifically suited for the local conditions and demand. The primary disadvantage is the high labor requirement for production which is of most concern in North America; but is of much less concern in other parts of the world relative to the previously cited advantages. The Tuft 1 net sod system is now in commercial production in England.

The Tuft 5 net sod system has more immediate promise as a new, innovative method of sod production in the United States and Canada. Advantages compared to the existing method of commercial sod production include: (1) a much more rapid rate of production which places less demand on land use and reduces maintenance

costs; (2) the ability to rapidly produce sod from such species as tall fescue, perennial ryegrass, bahiagrass, red fescue, and chewings fescue which have presented problems in the past due to their weak sod forming characteristics; and (3) offers flexibility to growers who are producing a majority of their sod by standard methods. They can expand their production in a relatively short period of time by net sod methods in order to adjust to unexpected increases in market demand. Exposure of the net to the ultra-violet rays of sunlight can cause rapid degradation, thus the use of a UV inhibitor in production of the net is important. Several methods for mechanically placing the net in or onto the soil have been developed by individual growers. From the standpoint of viable commercial production, there is more than 4,000 acres of sod now in production using the Tuft 5 net sod system. This is a ten-fold increase in one year. Increased use of this method can be anticipated.

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