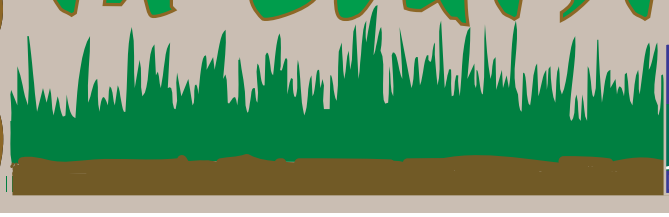
Sod Production in Louisiana



LSU AgCenter Research & Extension

Interest in commercial sod production has risen because of increased demand for an instant turf by many building contractors and their customers. Sod production involves growing a solid stand of desirable grass species and then harvesting it intact with a thin layer of soil and roots attached to it. Most sod operators also ship the product to market, and many offer custom installation. As with any new enterprise, cost and profit potential must be weighed before investing in equipment, land and labor. This publication discusses basic cultural practices and equipment required to produce quality sod.

Sod Production Outlook

The short- and intermediate-range outlook for turf sod production is good. With a continued strength in construction, demand for sod remains relatively strong. Louisiana's long growing season also offers green grass almost year-round. Competition, however, is keen; so potential sod producers should explore and firmly establish reliable markets before investing. Demand for turf sod is closely linked to housing starts and industrial development. With larger acreage, however, selling all that you produce in Louisiana is still a limiting factor for most farms.

Site Selection

Ideally, a site chosen for a sod farm should be based on several criteria: location (distance) in relation to targeted market, accessibility to major roads and highways, available water quantity and quality, soil type, land costs and preparation requirements.

To reduce shipping costs and because sod is a perishable product, a sod farm should be as near to an urban area as is practical. The preferred limit for transporting sod is a 100-mile limit. Sod that is stacked on pallets should be unstacked and laid within 72 hours after harvest, preferably within 24 hours. This is especially critical in summer. Refrigerated trucks have been used to prevent sod deterioration when high quality sod is transported over long distances. Sod on pallets waiting to be loaded or unstacked should be kept as cool as possible. Placing pallets in a shaded environment such as under trees or under shade cloth prolongs the sod's life.

Production

Production practices are divided into several areas: establishment, primary cultural practices, pest management and harvesting. Establishment involves land preparation, soil improvement, irrigation installation and turf planting.

Land Preparation and Establishment

Before planting, prepare the new turfgrass site to correct any present problems and to avoid harvesting difficulties. Preparation includes land clearing, removal of trash, land leveling, tilling, installation of drainage and irrigation systems, roadway and building site selection, soil fumigation and land rolling. The cutter blade on the sod harvester rides on a roller, allowing the unit to bridge the little hills, valleys and holes in the field. If the surface irregularities left by poor soil preparation are too severe, however, the blade will not uniformly cut the sod; therefore, the yield will be reduced. Proper soil preparation also eliminates layers or hard pans, provides better air and water movement and enhances deep rooting. Many Louisiana sites have poor drainage. Extensive leveling, drainage ditch digging and installation of drainage tile may be required. Contact your local Natural Resources Conservation Service (NRCS) for further assistance with these procedures and specifications.

Soil test the area under consideration to determine lime and fertilizer nutrient requirements. Apply and incorporate these amendments (especially lime and phosphorous) before establishing turf.

Usually, land is subsoiled to break up any hardpans and then plowed with either a moldboard or chisel plow to a depth of 10 inches. Follow subsoiling with soil incorporation of preplant fertilizer or liming material. Firm the seedbed with a cultipacker roller. The surface must be as smooth and uniform as possible so maintenance and harvesting problems

Prepared Field

are minimized. After cultipacking, use a laser or land plane for land leveling. The field should be planed in several directions to eliminate as many low spots as possible. After planing, dry soil is considered too fluffy if footprints are more than 1 inch deep. In this case, the field should be firmed by rolling. Preplant fumigation is recommended where previous weed, disease and nematode problems existed. Major weeds in sod production include common Bermuda grass, nutsedge, torpedo grass, sprangletop and crab grass. Preplant fumigation will be discussed in the Pest Management section. In any case, destroy all live plant material that is present or that returns. Plant only in a clean field.

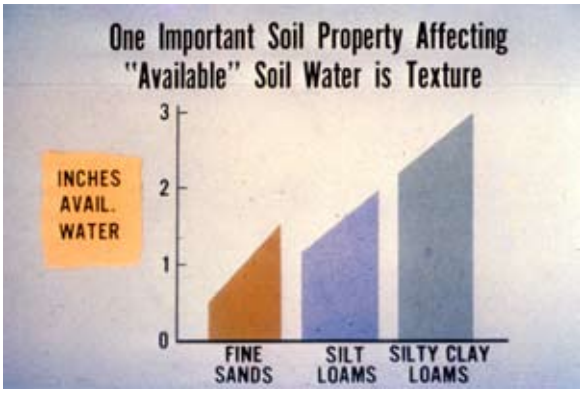
Soil Improvement and Drainage

Sod is grown on several general Louisiana soil groups. These include clay, sands and loams. The agricultural suitability of these soils is determined by their ratio of sand, silt, clay and organic matter fractions. Clay soils are more common and are least desirable because of difficulties in water, traffic and harvest management. Clay soils do not drain well and stay wet for extended periods. Precious harvest days may be lost because of the wet ground. Also, due to these soils holding so much water and their high bulk densities, clay soils are heavy to haul.

Loam soils, in general, have good moisture-holding capacity, drain well, are easy to work and are relatively light in weight for transport. These contain approximately 40 percent sand, 40 percent silt and 20 percent clay. Loam soils are most desirable as growing media. Ideally, these soils should have at least 2 percent organic matter and 15 percent or less clay. Sandy loams are desirable because of good drainage; therefore, traffic and harvest operations may be performed sooner after water application.

Sod is often produced on so-called "flatwood" soils. These are sandy soils overlying a hardpan or spodic horizon. This soil layering results in a perched water table, which increases the water reserves of the upper soil layer and often results in slow drainage following water applications.

Sod production is not recommended for deep, pure sandy soil (sand-dune-type sand) because of the difficulty of maintaining adequate soil moisture and nutrient levels. Furthermore, such soils typically have high levels of nematodes and mole crickets that adversely affect soil quality and handling. Sands also fall off the sod slabs after cutting, thus making the handling of the product difficult and a resultant poor sod.



Often during extended periods of drought and hot weather, soil salinity may become a problem. As water evaporates from the soil surface, salt is left behind. In these cases, irrigation is needed to leach the salt from the soil. The salts wash out of the soil if the irrigation water contains a lower salinity level than the soil. Calcium may be applied as gypsum to help dislodge the salts. Ample drainage capability is a prerequisite for this 'flushing' ability. The soil type in question can be determined by the LSU soil test laboratory. Characterizations of the soil type can be provided by the Soil Conservation Service, assuming that the land has been surveyed.

Proper soil water management is an important key to successful (and profitable) sod production. Poorly drained fields are unsuitable for competitive sod production. These fields often remain saturated, thus unworkable, for extended periods following substantial rainfall. Fields that are poorly drained need to be designed so that individual beds are crowned before planting. Lateral drain lines or ditches also need to be installed to intercept this surface drainage and to lower the water table to manageable levels.

Irrigation

Irrigation is required for all quality sod production. Ample water of good quality should be a priority during the planning stage. Water sources include wells, ponds, streams and canals, as well as effluent sources from nearby municipalities and industrial sites. Effluent or grey water can be an excellent and inexpensive source of irrigation, but these water sources may fluctuate widely in pH, salt and nutrient levels. Some municipalities may require a contract stating that the grower must accept a

certain number of gallons per given time whether irrigation is needed by the turf or not. These issues should be addressed early in the planning stage if effluent water must be used.

Big Gun

Louisiana irrigation systems normally involve center pivots, lateral pivots or traveling guns. Consider the size and location of your operation and the availability of a reliable mechanic, plus backup pumps and accessories, when choosing a particular system. Have an irrigation engineer plan your system for efficiency and efficacy.

Turf and Selection and Planting

Currently, the most commonly used grasses in Louisiana for sod production include the St. Augustine grass cultivars and centipede grass. Bermuda grass and zoysia are only somewhat in demand here. If certified sod is to be produced, foundation or registered planting stock must be used. The originating Experiment Station agency or individual must provide this foundation or registered planting stock. The La. Department of Agriculture and Forestry handles all certification and also classification (A, B or C class of sod). Contact them well before planting if you choose to certify some fields. All Louisiana sod must be classified by the grower if sold in lots of two pallets or more.

New growers should develop a nursery of the grasses intended to be grown. If grasses are purchased commercially, an acre of turf sod may cost between $200 and $1,000 for the planting stock. Approximately 15 acres may be planted with hybrid Bermuda grass or zoysia sprigs from an initial nursery stock of one acre. About 10 acres may be sprigged from an initial nursery stock from one acre of St. Augustine grass. Growers may establish one- to two-acre sod plots from which sprigs are obtained to increase acreage. The average quantity of stolons or sprigs harvested from an area will plant an area 20 times that size.

Table 1 suggests the quantity of grass needed for sprigging various grasses. When planting sprigs or stolons, the objective is to distribute these uniformly and cover them with soil. These can be distributed either by hand or with a manure-type spreader and then run over with a light disking or cultipacking. Several passes over an area may be necessary, but the grass should not be planted deeper than 2 inches. Always have some of the sprig extending above the surface of the soil. A sprig or plug planter is also available for efficient establishment.

Centipede grass usually is established from seed. Use certified seed to ensure variety characteristics, germination and prevention of weed seed introduction. A minimum of 10 to 12 pounds of centipede grass seed may be planted per acre, but faster stands will be obtained if more is used per acre. In most cases, cost will dictate which rates are used. Centipede grass seed is also established by spreading seed mixed with fertilizer or sand and then cultipacking.

Sprig Planters

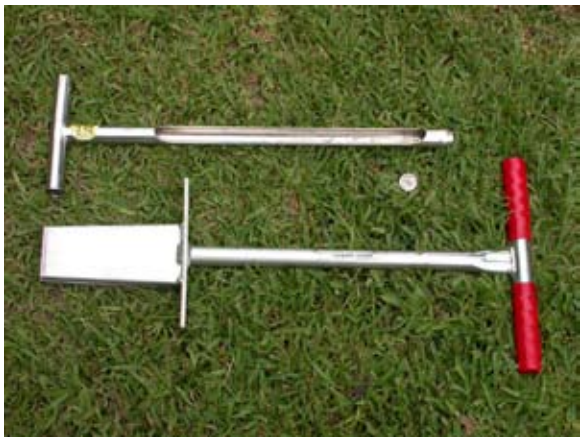
Rolling with a water-filled roller or cultipacker device improves seed establishment. Seeds are usually drilled, planted with a cultipacker, or broadcast and worked into the surface.

After planting, irrigate immediately and keep the area moist until the sprigs have rooted (seven to 14 days) or until the seedlings are 1 to 2 inches high. At this time, reduce watering to 1½ to 2 inches per week (including rainfall) until complete ground cover is achieved. Ideally, on established fields, irrigation amount is based on evapotranspiration (ET) information from a nearby weather station. Weather patterns such as rain or dry winds will require application of more or less water. For those growers

Cultipack Seeder

without ET information, fields are typically irrigated about twice a week with 0.5 to 0.75 inch each during the peak growing season (April to September). This is reduced to 0.5 to 1.0 inch per week for the remainder of the year.

A soil probe is a very useful tool in irrigation management. The depth the soil is dry or wet can easily be measured and irrigation scheduling adjusted accordingly. Tensiometers are soil moisture-sensing devices that measure the suction created by drying soil. If used correctly, the data gathered from these instruments' gauges can be used to determine irrigation scheduling. Remember that after the grass is planted, irrigation becomes the most important single factor for successful stolon establishment. It is critical not to plant more area than can easily be irrigated at one time.



Sampling Tools

Primary Cultural Practices

Fertilization

Proper fertilizing for sod production normally reflects the need for grass regrowth following establishment or cutting of the prior crop. Nitrogen is the most important nutrient regulating this regrowth. Generally, higher rates and frequencies of nitrogen application reduce the production time for a crop; however, excessive nitrogen rates forces excessive top growth at the expense of the roots, thus reducing the "liftability" of the sod. Economics also dictate, to an extent, the amount and frequency of nitrogen use. A balance needs to be maintained among all major and minor elements since the unavailability of any nutrient may weaken or delay the production process. Sod managers should test all fields before planting and yearly thereafter to regulate pH and nutrient levels and needs of the particular grass being grown.

Many soils naturally provide adequate phosphorous and soil pH levels. Apply phosphorous and liming material (if necessary) prior to planting. Phosphorous is available as Super Phosphate (0-18-0) or Triple Super Phosphate (0-45-0). Growers commonly use one fertilizer containing both nitrogen and phosphorous. Examples of such ammoniated phosphate sources include DAP(18-46-0) or MAP(11-48-0). The optimum soil pH for St. Augustine grass, Bermuda grass and zoysia is about 6.0 to 6.8. Centipede grass has an optimum soil pH of about 5.5-5.8. If acidulation is required, this may be accomplished by incorporating ground sulfur as you would lime, but most would opt for a more suitable soil.

After the first mowing, apply fertilizer at the rate of 40 to 45 pounds of actual nitrogen per acre. A fertilizer with a nitrogen: potassium ratio of 2:1 should be used to increase the turf's stress tolerance level and promote better rooting. Subsequent fertilizer applications should be made after the second mowing. Continue fertilizing every four to six weeks in the growing season until the grass develops a complete ground cover.

Scheduling and Rates

Once the sod has covered, fertilizer scheduling is largely dictated by economics. Obviously, if sod orders are strong, the grass needs to be aggressively fertilized to minimize production time. If sales are slow, fertilize less to save on fertilizer and maintenance costs such as mowing and watering. In Louisiana, delivered sod is expected to be well fed and not in need of immediate fertilization upon planting.

Bermuda grass and zoysia respond exceptionally well to ample fertilization. Quickest turn-around of these grasses occurs with monthly nitrogen application at the equivalent of 50 pounds of nitrogen per acre per application. This schedule should continue

unless cool weather halts growth or economics dictate otherwise. A 2:1 ratio of nitrogen to potassium fertilizer should be used with each application to encourage strong rooting. Phosphorous should be applied as suggested by a yearly soil test.

St. Augustine grass is normally fertilized every six to eight weeks during the growing season. As with Bermuda grass and zoysia, St. Augustine grass should be fertilized with a 2:1 nitrogen to potassium ratio and the phosphorous added as suggested by a yearly soil test. If over-fertilized in summer with quickly available nitrogen sources, St. Augustine grass becomes more susceptible to chinch bug infestation and grey leaf-spot disease. These problems can be minimized by using slow- (or controlled) release nitrogen sources and supplemental iron applications. These are discussed below.

Centipede grass is fertilized less than the other sod-grown grasses. It has a very specific fertilization schedule. If over-fertilized long-term with nitrogen, centipede grass will develop thatch, decreased winter survival and reduced rooting. The end result, referred to as centipede grass decline, is characterized as death or extremely weak spots, roughly 2 to 20 feet in diameter, which develop after the sod resumes growth in spring. Normally, centipede grass decline does not develop until several years after establishment. Therefore, sod managers should fertilize centipede grass similarly to St. Augustine grass for one year after establishment. If the grass is not harvested within 18 months after establishment, then the fertility rate needs to be reduced to minimize the occurrence of centipede grass decline. Established centipede grass should be fertilized only two to three times yearly in Louisiana with 25 to 35 pounds of actual nitrogen per acre. An additional 45 pounds of potash per acre should be considered in early fall to encourage proper rooting before winter. Supplemental iron or manganese application may be needed if unacceptable yellowing forms.

Fertilizer Sources

Several forms of nitrogen are available for growers. Examples of quickly available forms include urea (45 percent N), ammonium sulfate (21 percent N), ammonium nitrate (33 percent N) and calcium nitrate (15 percent N). These forms respond in several days but do not last long (about three to four weeks). However, they are the least expensive forms.

Slow-release nitrogen fertilizers are available, too. Examples include isobutylidine diurea (IBDU), sulfur-coated urea (SCU), milorganite, manures, sewage sludge, ureaform (ureaformaldehyde) and resin-coated fertilizers. Manures and sewage sludge are low in nitrogen and, because of handling costs and the potential of introducing weed seeds, are not used widely. The other slow-release sources last for two months, but cost more. Nitrogen release rate from ureaform depends on temperature. This release is slowed during lower soil temperatures.

Some sandy soils are low in micronutrients. If recommended by soil testing, at least two applications of micronutrients are suggested per year. Several iron products are used. The least expensive and most commonly used source is ferrous sulfate. Ferrous sulfate contains 21 percent iron and is quick-acting, but color enhancement lasts only thee to four weeks. Chelated iron products are more expensive but have been formulated to hold their greening effect for a longer period. A chelated iron source, plus a manganese (manganese sulfate) source, should be applied in spring and again in fall to correct any observed color deficiencies such as excessive yellowing.

Iron should be sprayed on most turf grasses to enhance color, especially near harvesting time. These are often injected into the irrigation system but may also be applied in a dry or spray solution form. Application of 20 to 40 pounds of elemental iron (100 to 200 pounds of ferrous sulfate) may be timed one to two weeks before harvesting to enhance color. To prevent burn, irrigation must be applied immediately after iron application during periods of high temperature to prevent burn. See 'Ironing Your Turfgrass' at

http://www.lsuagcenter.com/en/lawn_garden/home_gardening/lawn/soil_fertility/Ironing+Your+Turfgrass.htm

Liquid fertilizers are often used by injecting them into the irrigation system. Ammonium nitrate is the primary nitrogen source used for this. The major problems with using fertilizer in irrigation systems involve difficulties in maintaining uniform distribution and concerns with possible fertilizer leaching.

Mowing

After irrigation, mowing is perhaps the second most important turfgrass cultural practice for sod producers. Mowing helps control turfgrass growth and many undesirable weeds that are intolerant to close mowing. Sod fields require a mowing schedule similar to a well-maintained home lawn. Follow the '1/3 rule of cut' and don't remove more than the top third at any one cutting.

Three basic mower types include reel, rotary and flail. A reel mower is most desirable because highest possible mowing quality is achieved. Rollers on a reel-type mower also help smooth the sod field for easier, more uniform harvesting. It is best if reel mowers are used the last four or five mowings before harvest. This produces the finest cut available, and maximizes sod quality.

Rotary mowers are acceptable for St. Augustine grass and centipede grass production if blades are properly sharpened and balanced. Flail mowers can be used in production until sod has a uniform dense

stand, and then growers switch to a reel or rotary mower. Always keep mower blades well maintained and sharpened. Dull blades reduce turf quality by leaving grass tips shredded and bruised. Shredded leaf tips dry easily, leaving dead tissue which grows slowly, especially in hot weather. Also remember that field mowers are big, heavy pieces of equipment. Ruts, which cause harvest losses, may develop if these machines are used when soils are too wet. Choose equipment with wide tires and shallow lugs or turf tires.

Shredded Leaf Tips

New sod fields are generally mowed once every one to two weeks until complete coverage is obtained, depending on grass growth and weed encroachment. Mowing frequency will vary for established sod, depending on the fertility level, season of year, species and seedhead production. Table 2 lists the mowing height, frequency and mower type for grasses used in sod production. Establish a mowing frequency to ensure no more than one-third of the leaf area is removed at any one mowing. Maintaining this schedule will allow clippings to return to the field as nutrient recycling. An example of proper mowing frequency is a grass that is normally mowed at a height of 1 inch. In order not to remove more than a third of the leaf area, it should be mowed before exceeding 1½ inches. If that growth occurs in three days, then the field should be mowed every three days; if the growth requires two weeks, then that should be the mowing frequency. Established Bermuda grass and zoysia sod fields typically are mowed every three to four days; centipede grass and St. Augustine grass are mowed once every seven to 10 days.

Grass clippings may or may not be picked up. If removed, sweepers and vacuums are used. The purpose of removing clippings is to prevent them from filtering down into the turf stand and turning brown. When the sod is delivered, the presence of these brown clippings may cause the sod to appear to have less density than it really has. With restrictions on burning, dumping in landfills and problems with odor, disposal can be a problem to many producers. If clippings are removed, it is suggested that the removal begin during the one or two months before harvest. This timing will help prevent the browning effect clippings may impose and prevent having disposal problems throughout the entire growing life cycle.

Sweeper

Pest Management

Preplant fumigation with materials such as methyl bromide, dazomet (Basamid) or metam-sodium (Vapam) may be required when sod farms are established on land previously used for row crop farming. Fumigating will reduce perennial weed species such as Bermuda grass, nutsedge, torpedo grass and sprangletop. Soil sterilization will also reduce nematode populations that are difficult to control once the grass is established.

Methyl bromide is expensive (about $1,000 per acre) because of the plastic cover required to ensure activity and may be applied only by a certified applicator. This material provides better pest control, and the treated area can be planted within 48 hours after the cover is removed.

Fumigation with Cover

Metam-sodium or dazomet do not require a cover, but a certain amount of efficacy is sacrificed. If a cover is not used, metam-sodium, once applied, requires incorporation into the soil. Incorporation is achieved by rolling, irrigation and/or tilling the material to the depth of desired control (usually 6 to 8 inches). Poor performance will result if this incorporation is not performed. A minimum waiting period of 14 to 21 days is required before planting in metam-sodium- or dazonet-treated soil.

Weed Control

If preplant fumigation is not feasible, the use of a nonselective herbicide such as glyphosate is required on weed-infested fields. Weed-infested sod will reduce the salability of the product. Three applications of glyphosate spaced four to six weeks apart are necessary for post-emergence control of perennial weeds such as Bermuda grass or torpedo grass. These should begin in spring after weather is consistently warm and weeds are actively growing. Disk lightly 12 days after each treatment to start new weeds. If spray applications cannot be made before field establishment, spot treatments of competitive weeds such as Bermuda grass will be required thereafter.

Weeds can be introduced into a field in many ways. Irrigation water from open canals, ditches or ponds often contains weeds. Soil introduced during soil preparation, such as a landplane pulling untreated soil into a field, leaves weeds. Birds, wind, soil erosion and humans also deposit weed seeds. Good housekeeping by keeping ditches and fence rows clean and by washing equipment before entering a weed-free field does benefit the sod producer.

Once the grass is established, weed management involves proper mowing, cultural practices to promote turf competition and use of herbicides. Many upright growing broadleaf weeds can be controlled effectively through the use of continuous mowing. These include ragweed, pigweed, cocklebur and morningglory. Mow these before seedhead emergence to help prevent reinfestation from seed.

Grassy weeds that are a problem in sod production include annual bluegrass, crab grass, goosegrass, vaseygrass, signalgrass, sprangletop, torpedo grass and Bermuda grass. Broadleaf weeds include purslane, betony, pusley, pennywort (dollarweed), oxalis and spurge. Purple, yellow, annual, globe, cylindrical and Texas nutsedges are also weed problems. Immature weeds (seedlings) are most susceptible to herbicides, and certain turf varieties can be damaged when air temperatures exceed 80 to 85 degrees F at the time of herbicide application. The turf should not be under moisture or mowing (scalping) stress when treated with herbicide. Always read and follow all pesticide labels before use.

One of the most troublesome weeds in St. Augustine grass is common Bermuda grass. Seed from common Bermuda grass is easily dispensed by birds, animals, wind, erosion and humans. Control is a continuous, difficult chore. Spot spraying with glyphosate is the only effective method of controlling this weed. Regrowth quickly occurs from underground rhizomes and seeds, so repeat applications are necessary. Many larger sod farms use an all-terrain vehicle (ATV) equipped with a spray tank to perform this spot-spraying.

Herbicide recommendations are updated constantly; therefore, the reader should refer to the LSU AgCenter's Suggested Chemical Weed Control Guide, Pub. 1565, for the latest recommendations. It is available online only at http://www.lsuagcenter.com/en/communications/publications/Publications+for+Sale/Louisianas+Suggested+Chemical+Weed+Control+Guide.htm

Insect Control

Insect pests are generally grouped into three categories: shoot feeding, root feeding and burrowing. Southern chinchbugs, spittlebugs, grass scales and Bermuda grass mites suck plant juices. Chinchbug damage is normally associated with St. Augustine grass when it's hot and dry. Chinchbugs have three generations each year. Damage is apparent as yellowish to brown patches in turf and appears sooner on turf under moisture and/or heat stress.

Insect shoot feeders that eat grass leaves include sod webworms and armyworms. Armyworms feed during the day, and sod webworms feed at night. Injured grass has notches chewed in leaves, and grass has an uneven appearance.

Root-feeding and burrowing insects include mole crickets, white grubs and billbugs. Mole crickets injure the turf through their extensive tunneling, which loosens soil, allowing desiccation to occur quickly. Mole crickets may be flushed out by applying water with 2 teaspoons of lemon dishwashing liquid per gallon per 2 square feet on fresh tunnels. If present, crickets will surface and die within several minutes. White grubs and billbugs are root feeders and are typically C-shaped. Grub damage is erratic, with patches of turf first showing decline and then yellowing. Under severe infestation, sod may actually be removed by hand. Monitoring these insect populations involves cutting three sides of a sod piece and laying this back. If there is an average of three or more grubs per square foot, an insecticide is needed.

Sod must also be free of other nuisance pests such as fire ants. The reader should refer to the LSU AgCenter's Insect Pest Management Guide, Pub. 1838, found at http://www.lsuagcenter.com/en/communications/publications/Publications+for+Sale/Insect+Pest+Management+Guide.htm

Disease Control

Disease development requires three simultaneous conditions: a virulent pathogen, a susceptible turfgrass and favorable environmental conditions.

Environmental conditions that favor incidence of most turf diseases include periods of high humidity, rain, heavy dews or fogs, and warm weather (but not always) and stress from low fertility. Turf that is growing fast and succulent from nitrogen over-fertilization is typically more susceptible to disease and other pest invasion. Ideally, irrigate early in the day to minimize the time in which turfgrass remains moist. Do not over-fertilize with nitrogen. Generally, control begins with those management practices that favor good turf growth. These include proper watering, fertilization and mowing practices.

If a disease problem is suspected, prepare a sample for laboratory diagnosis. For these situations, do the following:

1. Sample the affected area before fungicide application.
2. Sample from marginal turf areas between diseased and healthy turf.
3. Cut a 4- to 6-inch plug from each area with symptoms.
4. Place these in paper bags or cardboard boxes (do not wet) and label.
5. Submit the sample to your parish LSU AgCenter Extension Office or room 124A, LSU Life Sciences Building, Baton Rouge, LA 70803. Remember to complete a Specimen Data form with each sample.

The major diseases that occur on sod-grown grasses are dollar spot on Bermuda grass and grey-leaf spot or brown patch on St. Augustine grass. Dollar spot disease forms small brown patches about the size of a silver dollar. Normally, dollar spot disease can be eliminated by a light nitrogen fertilization to encourage turf plants to outgrow the disease symptom. Grey-leaf spot disease of St. Augustine grass normally occurs during hot, humid weather. Brown patch occurs in wet areas and is most pronounced in spring and fall when grass growth is slow.

Sometimes Pythium affects St. Augustine grass or Bermuda grass. This disease reduces rooting and turf appearance. Pythium normally occurs in poorly drained areas where water stands.

The reader should refer to the LSU AgCenter's Plant Disease Control Guide, Pub. 1802, found at http://www.lsuagcenter.com/en/communications/publications/Publications+for+Sale/Plant+Disease+Control+Guide.htm

The use of excessive quick-release nitrogen or the use of atrazine or simazine during these conditions encourages these diseases. Use lower rates of quick-release nitrogen or choose a slow-release nitrogen source on St. Augustine grass. Foliar-applied iron also promotes desirable turf color without over-stimulating disease occurrence.

See also http://www.louisianalawnandgarden.org/turf_pest.asp and 'Common Lawn Diseases' in http://www.louisianalawnandgarden.org/lawn_pest.asp

Harvesting

Turfgrass sod is harvested when sod has developed enough strength to remain intact with minimum soil adhering when cut. Time required to produce a marketable sod from initial establishment depends on turfgrass species, soil type and growing conditions. Time typically required between harvests for most turf sod is listed as actual growing months in Table 3.

Several weeks before harvest, the turf should be conditioned to enhance its color. Suggested practices include mowing only with a reel mower, applying iron within two weeks of harvest and applying no chemicals during the week before harvest. Using a sweeper or vacuum to remove mowing clippings the last three to four weeks leading up to harvest also improves the turf's appearance.

Sod must never be cut when under moisture stress. The cutter blade bounces out of the ground, the sod has little strength and turf is under stress by the time of delivery.

Mechanical sod cutters harvest strips16 to 24 inches wide and 2 to 8 feet long. Growers with less than 50 acres commonly use a small, hand-operated, walk-behind unit that has a 150 to 200 sq. yd. cutting capacity per hour. Larger growers usually use tractor-mounted and/or self-propelled harvesters capable of cutting 600 to 800 sq. yds. per hour. Sod is stacked on wooden pallets either in small rolls or as flat slabs. The amount of sod harvested can be doubled if sod is rolled instead of stacked as flat slabs, but rolled, harvested sod must be more mature. Approximately 45 to 55 sq. yds. of sod is stacked on a pallet with a forklift required for placing pallets on transport trucks. A tractor-trailer load typically consists of 1,110 sq. yds. of sod. Forklifts that are rear-mounted on tractor-trailers provide a quick and easy method for unloading.

Recently, improvements allow larger rolls to be harvested. The "Big Roll Sod" cuts as a continuous

Sod Cutter

roll 24 to 48 inches wide and up to 125 feet long. This allows up to two dozen 100-foot rolls to be hauled on a semi-trailer totaling 933 sq. yds. of sod. The roll lies like a carpet runner and generally is more stable, requiring less water for establishment compared to traditional slab sod since fewer cut edges are exposed. The big rolls are being used now for stabilization of roadsides and landfills, on some lawns or on athletic fields. Less labor and more equipment are involved in installing the big rolls. They are more cumbersome on smaller sod installation jobs such as home lawns.

Big Roll of Sod

Thickness of soil removed during harvesting varies with turfgrass species. Removing the least amount of soil is the objective of an efficient sod harvest. Sod produces a great biomass, which replenishes and rebuilds soils to minimize topsoil loss. Even the IRS disallows a soil depletion allowance. Soil conservation still must be a priority to ensure long-term productivity of the soil. Ideally, ½ inch of rootzone should be removed when sod is cut. Sod that is thin-cut is easier to handle, less expensive to transport and knits in more quickly than thicker-cut sod. But, sod that is thin-cut is more susceptible to drought injury.

Rolled Sod

Growers may harvest up to 4,444 sq. yds. per acre per cutting; however, normal yields are generally between 3,800 and 4,200 sq. yds. per acre. A 2-inch ribbon of grass is typically left between harvested strips for re-establishment from stolons. Bermuda grass producers often clean-cut a field because it readily re-establishes from rhizomes as well as from stolons. Centipede grass and St. Augustine grass must re-cover the ground with stolons from ribbons left between harvested strips. Once harvesting has been performed, these strips should be roll-pressed into the field or lightly incorporated into the soil by chopping at 90 degrees and rolling to smooth the soil surface. If this is not done, the remaining strips will provide a bumpy surface for mowing, fertilizing and harvesting equipment. If

practical, harvest the second crop at 90 degrees to the first cutting direction to minimize this uneven surface.

Cut and stacked sod should be laid within three days or less. Refrigeration can extend this time. Keep loaded pallets under shade or cloth to prolong sod vigor.

Separating turfgrass cultivar areas in the field must be achieved to prevent contamination from adjacent areas. Normally, this is achieved by carefully planning, before establishment, with the use of service road or drainage ditches between cultivars. If these barriers are not used, a minimum of 8 feet of tilled or bare soil must be maintained between grasses. A nonselective herbicide such as glyphosate may be used to maintain bare soil.

Marketing and Delivery

Wholesale buyers for most Louisiana sod producers consist of landscape contractors, garden centers, building contractors and golf course/athletic field superintendents. Growers with small acreage and/or limited tractor-trailer shipping capabilities generally sell to contractors, homeowners and lawn care professionals. More growers like to price sod by the sq. ft. than by sq. yd if they can. It is easier to raise the price because of the perception of adding only a few pennies per unit versus the nine fold hike per yard.

Louisiana is bordered by large sod-producing areas in southeast Texas, Mississippi, Alabama and Florida. Establishing a market before planting and ensuring repeat business by providing a quality product are essential for most businesses. Advertising generally ranges from yellow pages, trade magazines and/or newspaper ads, to booths at various trade shows, by word-of-mouth and direct business contacts with garden centers, landscape contractors and others.

Shipping costs generally limit the competitive range for most producers. Delivery charges are typically determined per load, per loaded mile or per square yard. The weight of sod grown on mineral soils is about 5 pounds per square foot. A full pallet (50 yds.) is a little over 1 ton. Sod grown on muck soil is generally less expensive to produce and lighter in weight; therefore, it can be transported over longer distances still at a competitive price. Clemson lists shipping costs about $2 per loaded mile for big trailer rigs.

Truck-mount Forklifts

Delivery means for growers will differ. For large producers, usually an 18-wheel, tractor trailer rig is preferred and holds about 22 pallets. This load in 2008 might cost about $0.50 per yard for delivery 100 miles away. Many job sites do not have unloading facilities, so rear-mounted portable forklifts are brought along with the sod. Smaller producers or smaller loads will best be served by appropriately sized trucks.

Sod pallets used normally are 48 inches square and are built from inexpensive lumber. Locating and maintaining adequate pallets can be a problem for the manager. Many charge about $7 per pallet as a deposit.

Costs and Returns

Costs and returns vary considerably with location, equipment and labor available and with management practices. Generally, prices for sod increase as the farm size decreases. Data from a 1988 Alabama study had annual gross returns per acre as being from $500 to $2000 for small to large farms, respectively, when 2/3 of marketable sod was sold. Data from a 1988 Florida St. Augustine grass sod production lists capital costs of approximately $1,800 per acre, exclusive of land investment. Production costs would be about $650 per acre. Net profit per acre in Florida, including interest and principal payments on capital expenditures, is approximately $350 per acre. Capital investments for sod farms include land, buildings and equipment. Variable costs include labor, fuel, fertilizer, pesticides, repairs and parts. Fixed costs include insurance, taxes, depreciation, land charge, management charges and others. Labor for a 250-acre sod farm is estimated at five full-time and two part-time (seasonal) employees. Secretarial and/or record-keeping must also be considered. Machinery estimated for a medium-sized, 100- to 250-acre farm is listed in Table 4. Other costs include computers, phones, rakes, shovels, shop/office equipment, pallets and others.

Clemson Extension Service says to plan on investing as much as $800,000 (above land cost) in capital and labor for the first 100 acres of a new sod farm and to expect 12 to 14 months with no income.

Summary

Commercial sod production is expensive and labor-intensive farming. Keen competition, saturated markets and a fluctuating economy make a thorough investigation of potential markets and costs of production necessary. This publication provides some suggested guidelines on the management practices involved in sod production.

The sod farmer should also consider whether he wishes to get into the trucking/sod hauling business or provide custom services such as sprigging fields and turf grow-in.

More Information

For more detailed information on the sod farming business, readers are referred to *Turfgrass Sod Production*, 1988 (Publication No. 21451), purchased at:

Division of Agriculture and Natural Resources
University of California
6701 San Pablo Ave.
Oakland, CA 94608-1239
Phone: (800) 994-8849

and *Sod Production in the Southern U.S.*,1999 (pub.# EC702), Clemson CES, (864) 656-0109.

Table 1. Quantity of grass needed for sprigging (Clemson).

Grass	Bushels/Acre	
	Row Sprigging	Broadcast Sprigging
Hybrid Bermuda	400-600	400-600
Centipede	50 to 100	200
St. Augustine	75 to 100	200
Zoysia	50	—

Table 2. Mowing programs suggested for sod production (Clemson).

Grass	Mowing Height (in.)	Height Before Next Mowing (in.)	Frequency (days)	Mower Type
Bermuda	0.5-1	0.75-1.3	3	Reel
Centipede	1-1.5	1.3-2	10	Rotary/Reel
St. Augustine*	1.5-2	2-3	7	Rotary/Reel
Zoysia	0.75-1.5	1-1.3	7	Reel

*Semi-dwarf cultivars (Seville, Jade and Delmar) should be mowed between 1" and 2".

Table 3. Growing time required for various sod grasses.

Turfgrass Cultivar	Growing Months*	
	Initial Grow-in	After Harvest
Common centipede	18	6 to 12
Centennial centipede	18	9 to 15
Tifgreen 328 Bermuda	6 to 12	3 to 6
Tifway 419 Bermuda	6 to 12	4 to 8
Emerald zoysia	12 to 24	13 to 20
Matrella zoysia	12 to 24	15 to 20
Meyer (Z52) zoysia	12 to 24	11 to 18
St. Augustine	10 to 18	10 to 18

*from combined Florida and Clemson figures.

Table 4. Typical inventory for a 100 to 250 acre sod farm.*

- Chisel and moldboard plows
- Disk, 12 ft.
- Rotovator, 8-10 ft.
- Roller, 5-8 ft.
- Boom sprayer, 300-400 gallon
- Fertilizer spreaders, 1000 pound
- Reel mowers, 5 to 9 gang
- Sweeper, 5 ft.
- Cultipacker, 10-12 ft.
- Rotary mower, 10-16 ft.
- Flail mower, 16 ft.
- Tractors with turf tires:
  (1-2) 40 to 45 hp
  (1-2) 60 to 85 hp
  (2-3) 120-130 hp
- Trucks:
  (2) 20-22 ft.
  (1) 1-1.5 ton utility
  (1-2) pickup
  (x) flat beds for shipping (40 ft.)
- Forklifts and pallets (field and truck mount)
- (1-2) Irrigation with pumps center pivot, traveling gun or cable tow
- (2) Sod harvesters, 16 to 18 inch, tractor mounted and hand operated
- Building: shop, office, storage (telephones, computer, Fax)

*modified from combined Florida and Clemson figures.

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