Selection and Planting of Forage and Pasture Plants

1) **Crop Adaptation** …Species Selection will depend on the goals of the manager and adaptation characteristics of the plants available. On most farms there is a need for both warm and cool season plants to meet the year-round need for grazing or nutrient uptake.

   a) **Soil drainage**:
      i) Crops best adapted to wet soils ...... fescue, redtop, switchgrass, gamagrass, dallisgrass, and white clover.
      ii) Crops best adapted to well-drained soils..... bermuda, prairiegrass, ryegrass, orchardgrass, bluegrass, crabgrass, bluestems, red clover, alfalfa
      iii) Some special observations
          (1) Sorghum-sudangrass is better adapted to fine textured soils than millets.
          (2) Common bermudagrass is better adapted to somewhat poorly drained soils than the hybrids but all bermudagrasses do best on well drained soils.
          (3) Fescue is adapted to well drained soils, but it does not persist on excessively well drained soils.
          (4) Prairiegrass (sometimes called Rescuegrass or Matua) is a cool season grass more adapted to sandy textured soils than is fescue, but it persists mainly through reseeding.
          (5) The Native warm season grasses like gamagrass, switchgrass are tolerant of wide range of soils from droughty to somewhat poorly drained.

   b) **Adaptation to temperature extremes**:
      i) Optimum air temperature for top growth of cool season species is between 70-80°F (fescue, orchardgrass, ryegrass, bluegrass, alfalfa, clovers). Fescue and cereal rye will make limited growth at temperatures below 40°F or when temperatures are above 85°F.
      ii) Optimum air temperature for top growth of warm season species is between 85°F and 95°F (bermuda, millet, sudan, crabgrass, dallisgrass, bahia, Johnsongrass, lespedeza). These plants grow very little when night temperatures drop below 60°F.

   c) **Adaptation to precipitation extremes**:
      i) The grasses are more tolerant of extremes in moisture than the legumes.
      ii) The warm season grasses are more tolerant of moisture stress than the cool season grasses.
      iii) Flooding tolerance is related to length of flooding, stage of plant growth and season of year. In general, perennial plants like reedcanary grass, tall fescue, switchgrass, gamagrass, bahia and dallisgrass tolerate flooding better than other forage plants.
d) Influence of day length and temperature on flowering:
   i) Cool season grasses (tall fescue, orchardgrass, bluegrass) flower only once per year (in spring), and all subsequent regrowth following harvesting or grazing is vegetative (this effects yields and feed quality).

   ii) Warm season grasses (bermuda, dallis, bahia, switchgrass, bluestem, gama), legumes (alfalfa, clovers), and some cool season grasses (prairiegrass, timothy, reedcanary grass) make a flowering head following each harvest throughout the growing season. This repeated flowering often has negative effect on feed quality because of the high stem to leaf ratio.

2) **Species and Cultivar or Variety Selection.**
   a) The major challenge is to select the proper species of plant for the conditions and goals of the operation.
      i) For persistence under a wide range of management conditions choose
         (1) tall fescue and bermudagrass

      ii) Sod forming grasses tend to be most tolerant of “overuse” and short grazing while still protecting soil.
         (1) bermuda, bahia, endophyte containing fescue, bluegrass, redtop.

      iii) Endophyte concentration is often a criterion for using tall fescue. Toxic vs non toxic endophyte can impact animal performance. Low or no endophyte cultivars are more difficult to maintain than those containing high endophyte; in general these cultivars respond to management similar to orchardgrass.

      iv) Hybrid bermudagrass vs seeded or common types of bermudagrass
         (1) Cost of establishment is less for seeded types
         (2) Ground cover is quicker with seeded types
         (3) Yields may be similar, when less than 150 lbs of N is applied per acre.
         (4) Seeded types will spread over the farm and will be a potential “weed” pest as compared to hybrids.

      v) Forage quality may vary among plant species and cultivars within a particular species. However, the stage of growth that a plant is grazed or harvested has the most impact on forage quality and yield. Assuming P, K and pH are reasonably satisfactory for plant growth; N generally has a significant impact on yields and protein composition. Legumes almost always improve the quality of feed as compared to grasses.

         (1) Hybrid bermudagrasses tend to be of higher quality and yield than common types, but may be similar for improved “named” seeded varieties.
         (2) Fescue containing the non-toxic endophyte is of similar quality as non-endophyte fescue. Non-toxic endophyte is found only in specific varieties (MaxQ; Bar Optima +E34). Many varieties of tall fescue have differing levels of the toxic endophyte.

      vi) Disease and pest resistance will vary among cultivars; this is especially true with legumes.

      vii) Winter hardiness varies among cultivars of many species, especially bermudagrass, bahia.
3) **Response to Soil fertility:** Follow soil testing reports, but the following general remarks may be useful in understanding plant responses.

a) Generally, warm season grasses respond to higher levels of N or manure than cool season grasses. However, one must closely evaluate the lbs of dry forage produced per lb of N applied based on the cost of application.

b) Native warm season grasses will yield more dry matter per lb of N than non-native types. Often there is not economical justification for applying more than 50 to 100 lbs/acre to the native grasses.

c) Legumes mixed (30% or more of the mix) with cool season grasses yield about the same as pure cool season grasses receiving 150 lbs N/acre/year.

d) Maintaining legumes in mixtures is highly dependent on grazing management and maintaining medium to high soil test index for P and K at pH's above 6.0.

e) Ideal pH for grasses ranges from 5.8 to 6.3, whereas legumes persist better at pH above 6.3.

f) $K_2O$...is often the key to maintaining good legume-grass mixtures; it is often the limiting factor when bermuda winter-kills or has significant disease problems.

g) Plant nutrients may come from animal manure, commercial fertilizer or legumes (N fixation).

4) **Tillage systems for seedbed preparation**

a) **Intensive tillage:** Generally, there is little justification for complete seedbed preparation for establishment of most of the forage plants. However, when it is desirable to prepare a seedbed, it should be done as for any other crop. Prior to planting, the seedbed should be firm enough to leave footprints only ½ inch deep; this will provide for the most uniform planting depth of the small seeds. Many stand failures can be attributed to planting small seeds too deep in loose and soft soil seedbed.

b) **No-till:** The major difference in planting small seeded forages and other crops with no-till is related to amount of residue on the soil surface and planting depth. Always get old residue grazed or clipped to less than 2-3 inches. If mowing, removal of the dead residue should be considered because dead, thick thatch can result in poor seed contact with the soil. Seed placement should be no greater than 1/4 to 3/4 inch, depending on soil conditions.
   i) Fertilizer and lime may be surface applied, but if pH is below 5.4, consider applying lime before cultivation. When practical, it is best to apply lime several months in advance of planting legumes.

5) **Planting Suggestions**

a) **Seeding rates**
   i) Seeding rates vary because of seed size, weak seedling vigor, dormancy, and whether or not a plant can spread by rhizomes or stolons. Because most forage seeds are small and the soil and environmental conditions are often stressful, one
can expect only 10-50% of the seeds planted to survive.

ii) Seeding rates are 25-50% less when drilled into the soil as compared to broadcasting the seeds on the soil surface. This is because the density of seeds/sq. inch within the row has significant impact on emergence pressure and because of more uniform contact of seed with favorable soil.

iii) Broadcasting or close row spacing gives quicker soil cover and more uniformly distributed leaf area for capturing sunlight, which can have an impact on yields, soil erosion and trampling tolerance by grazing animals, especially during the first growing season.

b) Planting Depth

i) Planting depth is often the most limiting factor in getting successful stands of small seeded forages. Most forage seeds should be planted between 1/4 to ½ inch deep. The exceptions are for vegetative planted crops like hybrid bermudagrass. The small grains, corn, soybean, peas and gamagrass should be planted at 1-2 inches depending on soil texture.

c) Planting Dates.... Factors determining when to plant:

i) Temperature, moisture and competition from “weedy” species are the critical factors determining when to plant. Planting cool season grasses and legumes in spring may be only 50 to 75% as effective as planting in the autumn because of adverse conditions following planting.

ii) Although many cool season forage species can be established in spring or fall, the best time is usually fall mainly because weed competition is normally less than in the spring. This is so because many of the weed species that germinate and compete in fall plantings are summer annuals that are killed at the first hard frost.

iii) Most cool season crops have the best chance to survive when planted in late summer-autumn. Grasses planted into prepared seedbed should have 3-4 leaves before soil freezing occurs, but they can survive with 1-3 leaves when planted into a sod (due to the insulating effect of the sod).

iv) Legumes planted in prepared seedbeds should have 5-7 leaves before soil freezing occurs, but they can usually survive with 2-3 when planted into a sod.

v) Bermuda sprigs (rhizomes) should be planted while still dormant (prior to spring green-up of new leaves). However, some varieties may be planted after the stems form nodes that can sprout when placed in contact with moist soil (usually in mature hay stage of growth). Late plantings may be successful if soil moisture is favorable.

1) Bermuda sprigs (rhizomes) will die if exposed to dry air during several hours of hauling from source to the planting location or if placed into dry soil without moisture in the subsequent two days.

vi) Warm season grasses such as millet, sudangrass and seeded bermuda should be planted when soil temperature is greater than 55 to 60°F. Early planting tends to minimize competition with weedy species for moisture.
Native warm season grasses may be planted over a wider range of temperatures if the seed dormancy is taken into consideration. Dormant seeds may be planted in mid to late winter (Dec-Feb). Non dormant seeds may be planted anytime after soil temperature is above 40 °F.

6) **Consequences of planting outside the optimum target dates:**

a) The main consequence of planting at the wrong time is thin stands which allow for encroachment of “unwanted” weedy species. This is costly in terms of $ and lost production. Unfortunately, many people are tempted to “live with” marginal stands, and because of the perennial nature of the plants this can influence performance for many years. Stand density will significantly influence yields, nutrient removal, erosion and water quality.

7) **Management during the seedling establishment phase**

a) Insects - Insects occasionally can be devastating to seedling stands, especially from autumn plantings into sod. Stands should be carefully scouted just before and after planting to determine the need for insect management. Grasshoppers and crickets are often the most troublesome in autumn sod plantings and fall armyworms may be a problem on conventional and sod plantings. June beetle grubs are often a problem in autumn.

b) Weeds - Mowing and grazing may sometimes be successful in reducing competition from weeds. Grazing animals can be quite effective in controlling many weeds in the seedling stage, but it requires very strict grazing management to minimize the damage to the desirable forage plants. Restricting animals to very short graze periods and preventing lounging and/or regrazing of an area is effective.

c) Grazing During Seedling Development - Animals tend to jerk or tear the plant tops off rather than making knife-like cuts; this can result in the plants being pulled out of the ground if sufficient top growth is not present. Plants should be well developed with good seedling roots before grazing; for most cool season grasses this is after the plants reach 8 inches of growth. Grazing seedlings when the soil is wet or soft often results in damage or burying of the seedlings by hoof action. If the soil is dry and firm the grass seedlings are remarkably tolerant of foot traffic as long as they are not also grazed below 3-4 inches of stubble. As a general rule grazing after the plants reach 8 inches of height will encourage more tillering and thicker stands than waiting longer before the first grazing. Rarely is it wise to wait until the end of the growing season to first graze a new planting. The exception is for native warm season grasses which normally are not grazed or harvested during the first season.

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**Forage Fact (revised May 2011)**

Prepared by:

James T. Green, Jr. Professor Emeritus
Grassland & Forage Agronomist
Department of Crop Science
North Carolina State University