

Part I.

Crop Descriptions

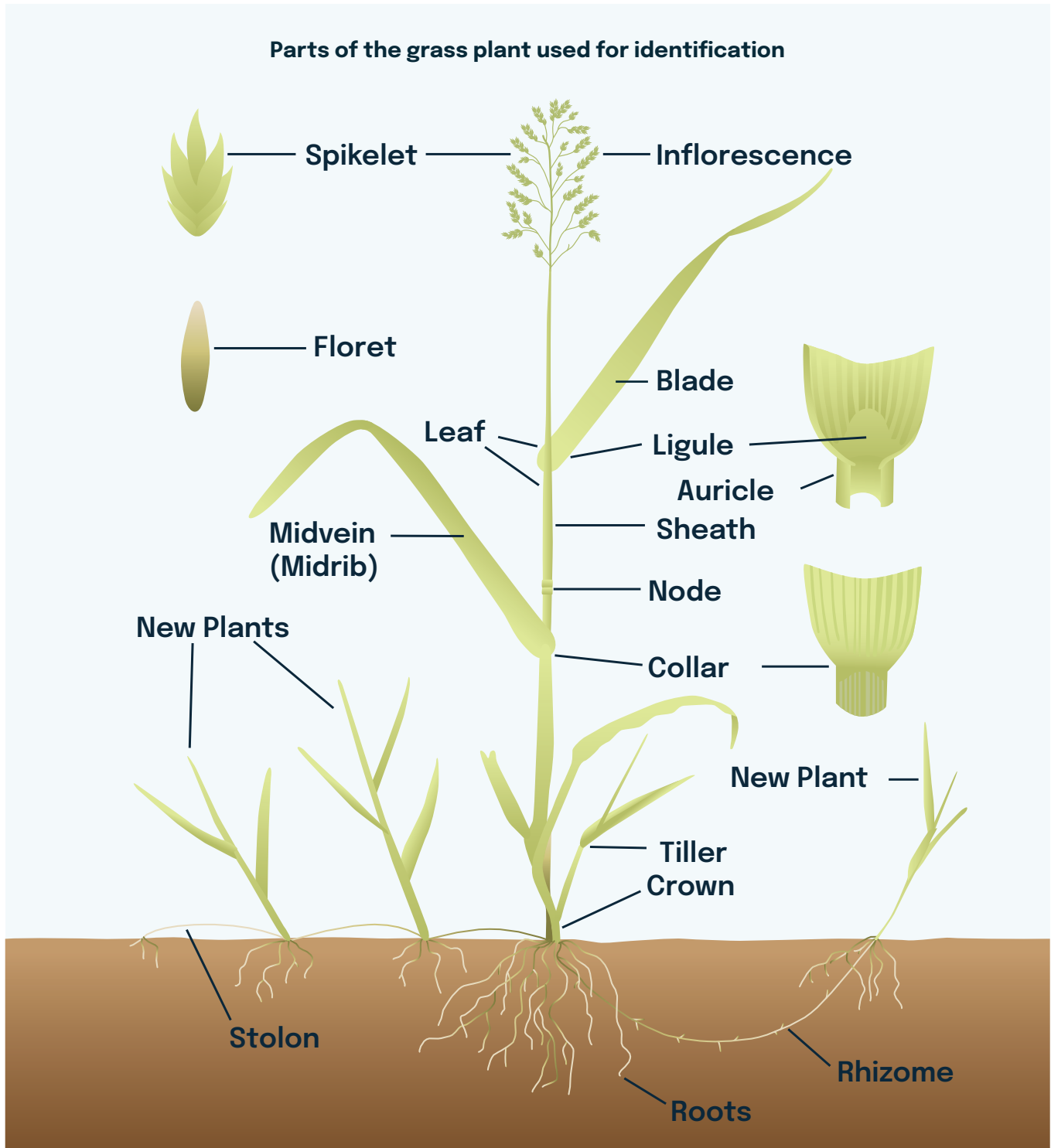
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This section provides basic yet detailed information about most plants used for cropping in Virginia. All values are generalizations which may vary with specific conditions. Rates of fertilizer application depend, to a large extent, on initial soil test levels and the productive potential of the soil. The fertilizer recommendations presented assume an average or medium soil test level and soils that are average to above average in productivity. For more specific recommendations, rely on soil test results. Fertilizer application rates and crop yields in this section are expressed on a per acre basis.



Alfalfa – Perennial (*Medicago sativa*)

Description	Distinct deep taproot; erect stems 2-3 feet tall from woody crown; purple flowers for most improved varieties; smooth stem and leaves; leaves arranged alternately on stem; each leaf has 3 leaflets with smooth edges.
Uses	Hay, pasture, and silage
Varieties	Consult current varietal information from Virginia Cooperative Extension.
Weight per bushel	60 lbs
Seeds per pound	220,000
Germination time	7 days
Fertilizer	At seeding: zero N, 110-140 lbs P ₂ O ₅ , 110-140 lbs K ₂ O at medium soil test levels. Use borate fertilizers (2-4 lbs B) annually. For topdressing: 70-90 lbs P ₂ O ₅ and 220-360 lbs K ₂ O annually for medium soil test levels. Split application: half in fall and half in spring. Lower levels required for pasture.
pH range	6.8-7.0
Soil adaptation	Deep, well-drained soils with sandy clay loam to clay subsoils.
Inoculation	Essential: Use commercial inoculants. Cross-inoculates with sweet and bur clover.
Time of planting	30-60 days before first killing frost in fall or 30 days before last killing frost in spring at 15-25 lbs alone, or 10-20 lbs with 3-5 lbs of orchardgrass.
Method of planting	6-8 inch rows or solid-seeded. Conventional seeding: cover no deeper than 1/4-1/2 inch, preferably with cultipacker. A firm and compact seedbed is essential. No-till seeding (graze or mow to have sod short). Kill all vegetative competition with herbicide; use insecticide; plant 1/2-3/4 inch deep with no-till drill.
Harvesting (hay or silage)	Harvest at late bud to 1/4 bloom, except first cutting. First cutting should be made in bud stage or when orchardgrass begins to head. Alfalfa may be cut 3-5 times/year at 30- to 40-day intervals, depending on location in state and average rainfall. Make the last cutting 3-4 weeks before the average date of first killing frost in fall or in time to allow 6-8 inches of regrowth. Allow at least one harvest to reach 1/10 bloom to help persistence.
Harvesting (pasture)	Use grazing-tolerant varieties under continuous stocking. Hay-type varieties should be rotationally stocked with 1-7 day grazing periods and 25-40 day rest periods. Avoid bloat by seeding with grass, turning cattle into new paddock only after forage is dry (no dew) and not allowing cattle to get too hungry prior to turn-in.
Approximate yield	3-6 tons hay/A

Alsike Clover – Perennial (*Trifolium hybridum*)

Description	Tillers from crown and stem, leaves smooth; pink or white blooms; stems do not terminate in a flower.
Uses	Hay and pasture; however, it does not make sufficient recovery after the first cutting for a second hay crop.
Weight per bushel	60 lbs
Seeds per pound	680,000
Germination time	7 days
Fertilizer	At medium soil test levels, apply 40–60 lbs P ₂ O ₅ and 85–110 lbs K ₂ O per season.
pH range	5.8–6.5
Soil adaptation	Well-drained to somewhat poorly drained soils. More tolerant to a high water table and acid soils than other clovers.
Inoculation	Important: Cross-inoculates with red, crimson, ladino, and white clover.
Time of planting	30–60 days before last killing frost in spring or 30–45 days before first killing frost in fall at 3–4 lbs in mixtures or 5–8 lbs alone.
Harvesting (hay)	1/2 to full bloom, about June 1–20.
Harvesting (seed)	When about 3/4 of the heads are ripe. Handle as any other clover.
Approximate yield	1–2 tons hay/A

Austrian Winter Pea – Annual (*Pisum areense*)

Description	Winter annual with purple flowers. Plants resemble those of garden pea.
Uses	Forage or cover crop
Weight per bushel	60 lbs
Seeds per pound	5,000
Germination time	8 days
Fertilizer	Zero N. Apply 60–80 lbs P ₂ O ₅ and 60–90 lbs K ₂ O on medium testing soils. Adjust rates based on soil test levels.
pH range	6.0–6.5
Soil adaptation	Well-drained soils
Inoculation	Cross-inoculates with garden peas, vetch, and Canadian field peas.
Time of planting	Fall: Sept. 15–Oct. 15; spring: March 1–April 15; in 6–8 inch rows or solid-seeded at 20–30 lbs with small grains, 30–40 lbs alone.

Austrian Winter Pea – Annual (*Pisum areense*) (cont.)

Harvesting (hay)	When barley or other small grain is in soft dough for silage or in full bloom for hay. Difficult to cure for hay.
Harvesting (seed)	When pods begin to turn brown.
Approximate harvest dates	Hay: May 1-June 1
Approximate yield	Hay: 1 1/2-2 tons; silage: 6-9 tons; seed: 300-500 lbs/A

Barley – Annual (*Hordeum vulgare*)

Description	Leaves are green with long, clasping auricles and a long ligule. Seed usually contains the husk (lemma and palea) that gives the seed a wrinkled appearance. The lemma and palea are removed during harvest for some varieties, making them “hulless.”
Uses	Grain is generally used for animal feed in Virginia. Also used for silage and in mixtures with other small grains for cover crops and winter grazing. Limited use in human food except malting barley.
Weight per bushel	48 lbs hulled; 57.6 lbs hulless (for feed); and 60 lbs hulless (for human consumption)
Seeds per pound	13,000
Germination time	6-7 days
Fertilizer	20 lbs of N in the fall plus 40-80 lbs each of P ₂ O ₅ and K ₂ O. Topdress with 80 lbs N in February or early March. These rates assume no carryover N from the previous crop. In general, a high-yielding crop will take up to 20-25 lbs/A fall N, plus at least 80 lbs in the March-May period. For best results, the winter/early spring N should be split into two applications: one in February and one in late March.
pH range	6.0-6.5. Barley is very sensitive to low pH.
Soil adaptation	Any well-drained soil. Barley will not tolerate poor drainage.
Time of planting	About 2 weeks before first average frost in fall: Sept. 15-Oct. 10 west of the Blue Ridge and Northern Piedmont; Oct. 1-Nov. 1 in Eastern and Southern Piedmont. Aphids should be controlled if they build up in the fall or early winter.
Rate of seeding	120 lbs/A (hulled) or approximately 30 seeds/sq ft (18 seeds/drill foot in 7-inch rows)
Method of planting	Planting with a grain drill is best, but broadcast disk-in to a depth of 1-1 1/2 inches can be successful.
Harvesting	Combine grain when fully ripe and 12%-14% moisture. Cut for silage in the soft dough stage or boot stage, depending on forage requirements.
Approximate harvest dates	Grain: June 1-20; silage: May 1-June 1

Barley - Annual (*Hordeum vulgare*) (cont.)

Approximate yields 8-20 bushels grain or 6-12 tons 35% dry matter silage/acre

Bentgrass, Creeping - Perennial (*Agrostis paulustris*)

Description	A stoloniferous grass used for golf greens; high maintenance required. Some varieties can be seeded while others must be vegetatively planted.
Seeds per pound	7,800,000
Rate of seeding	1/2-1 lb
Germination time	10-14 days
pH range	6.0-6.5
Time of planting	Early spring or late summer

Bermudagrass - Perennial (*Cynodon dactylon*)

Description	Spreads by soil surface runners (stolons) and underground modified stems (rhizomes); stems 6-12 inches tall; flowers are slender spikes, usually with 3 per cluster, similar to crabgrass; ligule is a fringe of hairs.
Uses	A warm-season grass that makes most of its growth during June, July, and August in Virginia; pasture, hay, silage, and turf. Greatest forage potential is in the Southern Piedmont and Coastal Plain.
Types and strains	Common: Occurs naturally in Virginia and throughout the South. Propagated by sprigs (rhizome and stolon pieces) and seed. Can be a major weed in crop fields. Hybrid forage types: Improved strains that are high-yielding, leafy, and cold tolerant enough for use in the Southern Piedmont and Coastal Plain. Midland, Tifton 44, and Quickstand have more cold tolerance than Coastal. All must be established using vegetative sprigs. Fine-textured bermudagrass: Developed for athletic fields, lawns, golf greens, fairways, etc. All improved varieties propagated by sprigs or sod. Seed is available for common bermudagrass.
Seed weight per bushel	35-36 lbs
pH range	6.0-6.5
Soil adaptation	Will grow on all types of soil but is better suited to sandy and droughty soils than other grasses. Prefers well-drained soils.
Time of planting	April 1-June 1
Rate of planting	For pasture use, 15-20 bushels of sprigs per acre in rows, or 30-40 bushels/A if broadcast. For turf, use 1 lb seed or 2-7 bushels of sprigs per 1,000 sq ft.

Bermudagrass – Perennial (*Cynodon dactylon*) (cont.)

Fertilizer	At planting, 70 lbs N, plus 70-90 lbs P ₂ O ₅ , and 70-90 lbs K ₂ O for medium testing soil. For turf: see Turfgrass section. For hay: 175-300 lbs N, 80 lbs P ₂ O ₅ , and 80-205 lbs K ₂ O annually, based on soil test levels. Lower rates required when used as pasture.
Method of planting	Seed broadcast by hand or seeder. Sprigs planted in rows manually or with a planter. May be broadcast, disked-in, and cultipacked. Cover sprigs with 2-4 inches of soil.
Harvesting (hay)	Cut when 8-12 inches tall before heading or every 35-45 days.
Harvesting (pasture)	Can be continuously stocked if grazed no shorter than 2-3 inches. Rotational stocking is preferred; turn in at 6-8 inches; move cattle at 2-3 inches. Minimize seed production to maintain quality and growth rate. Do not graze during establishment year; cut for hay instead.
Approximate yield	4-8 tons hay/A

Birdsfoot Trefoil – Perennial (*Lotus cornicalatus*)

Description	A fine-stemmed legume with a branching taproot. Adapted to higher elevations in Virginia. Grows 12-30 inches or more in length from a branching crown. Flowers are orange-yellow in groups of 4-8 at end of stems. Leaves consist of 5 leaflets alternately arranged with 2 at the base near the stem. Several seedpods attached to a single point give the appearance of bird toes. Short-lived perennial that can reseed.
Uses	Hay or pasture (nonbloating)
Varieties	No varieties have been developed for Virginia conditions. The erect or European types have been most satisfactory. These varieties include Viking, Granger, Cascade, and Mansfield. The Empire variety is a decumbent pasture type.
Seed weight per bushel	60 lbs
Seeds per pound	375,000
Germinating time	7 days
pH range	5.8-6.5
Soil adaptation	Does best on well-drained soil but can be grown with impervious subsoils.
Time of planting	March 1-April 15 or Aug. 1-Sept. 1. Should be sown with a grass such as orchardgrass or Kentucky bluegrass. In mixtures: 4-8 lbs; alone: 8-10 lbs.
Fertilizer	Zero N; medium soil test levels; apply 40-70 lbs P ₂ O ₅ and 50-80 lbs K ₂ O.
Planting	6-8 inch rows or solid-seeded. Well-prepared, compact seedbed is needed. Cover not more than 1/2-inch deep. Use cultipacker if surface-seeded. Can also be no-till drilled or frost-seeded on killed sod. Poor seedling vigor.

Birdsfoot Trefoil – Perennial (*Lotus cornicalatus*) (cont.)

Harvesting (hay)	When in bloom. Avoid clipping close if extremely dry.
Management	Permit seedlings to become well-established before grazing or harvesting. Clip weeds. Use rotational or moderate continuous grazing for pastures.

Bluegrass, Canada -- Perennial (*Poa compressa*)

Description	Sod-forming from underground rhizomes; blue-green foliage; sheath distinctly flattened, with a short, compact seed head; short ligule.
Uses	Pasture, but not recommended for Virginia. Makes very little regrowth when grazed.
Weight per bushel	14 lbs
Seeds per pound	2,500,000
pH range	5.0-6.5
Soil adaptation	Best suited to fine-textured, well-drained soils. Will dominate Kentucky bluegrass on acid, droughty, or low-fertility soils.

Bluegrass, Kentucky – Perennial (*Poa pratensis*)

Description	A low-growing, sod-forming perennial grass that spreads by underground rhizomes. The narrow leaves have tips shaped like the bow of a boat and reach a length of 7 inches; sheath flattened, short ligule.
Uses:	Permanent pasture and lawns. Requires several years to become well established. Good early grazing, goes dormant in summer, revives in fall to furnish good grazing.
Weight per bushel	14 lbs
Seeds per pound	2,200,000
Germinating time	14 days
Fertilizer	With white clover at seeding: 20 lbs N; at medium soil test levels: apply 90-120 lbs P ₂ O ₅ and 60-90 lbs K ₂ O. For pasture: topdressing every 3 or 4 years, 40-125 lbs P ₂ O ₅ and 40-125 lbs K ₂ O at medium soil test levels. For turf, see Turfgrass section.
pH range	6.0-6.5
Soil adaptation	Best suited to fine-textured, well-drained soils.
Time of planting	Late summer or early spring at 4-5 lbs in mixture for forage.

Bromegrass, Smooth – Perennial (*Bromus inermis*)

Description	Sod-forming because it spreads by underground rhizomes; leafy and grows to height of 3-4 feet; head is an open panicle; stem smooth and round; short ligule, fused leaf sheath.
Uses	Hay and pasture-drought tolerant
Varieties	Historically not well-adapted to Virginia because of diseases; however, newer varieties may have potential.
Weight per bushel	14 lbs
Seeds per pound	137,000
Germinating	14 days
Fertilizer	100–200 lbs N. Lower levels required when used as pasture in split applications; 40–90 lbs P ₂ O ₅ and 85–185 lbs K ₂ O annually on soils testing medium.
pH range	5.8–6.7
Soil adaptation	Well-drained, fertile soils
Time of planting	Early spring or with small grain in fall. Seeded at 10 lbs in mixture. Do not seed alone.
Harvesting	Early bloom stage. Do not graze or cut during stem elongation.

Buckwheat – Annual (*Fagopyrum esculentum*)

Description	Erect plant, 2-4 feet tall; single stem may have several branches; flowers light green, pink, or red in color.
Uses	Grain used for livestock, especially poultry; ground into flour (middlings for livestock). Good honey and green manure crop.
Weight per bushel	48 lbs
Seeds per pound	15,000
Germinating time	6 days
pH range	5.5–6.0
Fertilizer	20–30 lbs N, at medium soil test levels apply 40–50 lbs P ₂ O ₅ and 40–50 lbs K ₂ O.
Soil adaptation	Any well-drained soil. Will grow on infertile, acid soils better than most crops, but responds well to proper treatment.
Depth of planting	1/2–2 inches. Do not plant deeper than 2 inches.
Time of planting	Late May to mid-July. Seeds do not set well in warm weather. Likes cool, moist climate. Seed at 48–72 lbs in 6–8 inch rows or solid-seeded. No-till can work well.

Buckwheat - Annual (*Fagopyrum esculentum*) (cont.)

Harvesting (grain)	Combine when the maximum number of seeds has matured and plants have lost most of their leaves. Drying may be necessary for safe storage.
Approximate harvest dates	Sept. 1-15
Approximate yield	20-25 bushels/A

Caucasian Bluestem - Warm-Season Perennial (*Bothriochloa caucasica*)

Description	Long-lived perennial bunchgrass. It is an erect, fine-stemmed, leafy bunchgrass that produces many seed heads above the leaf base throughout the summer. Begins growth 2-3 weeks later than switchgrass in spring.
Uses	Primarily for pasture, but also for hay
Seeds per pound	1,000,000
Germination time	3-30 days
Fertilizer	Responds to N; apply 60-120 lbs N/A/year in split applications. Maintain P and K at medium levels.
pH range	5.5-6.2
Soil adaptation	Adapted to a wide range of soils. It performs better on the finer textured soils such as loams, clay loams, and silty loams, but will also grow well on sandy loam soils. Caucasian bluestem does not do well on extremely sandy soils and wetland soils.
Time of planting	After soil temperature reaches 65°F in late May or early June.
Rate of planting	2-3 lbs/A pure live seed
Planting	Plant into a prepared, firm seedbed no deeper than 1/4 inch. However, no-till seeding can be done if plant residue is not thick enough to prevent seed-to-soil contact.
Harvesting (hay)	Harvest in boot stage.
Harvesting (pasture)	Maintain in vegetative stage. Loses palatability after seedhead emergence. Tolerates close grazing. Rotational stocking best.
Approximate yield	3-5 tons hay/A

Comfrey, Quaker (Russian Comfrey) – Perennial (*Symphytum peregrinum*)

Description	Grows to a height of 3-4 feet; very large leaves feel somewhat sticky; large, fleshy roots that grow to 8-10 feet deep; purple or red-purple flowers borne in clusters at tips of stems.
Uses	Green manure; can be fed as forage.
Fertilizer	60 lbs N; Apply 60 lbs P ₂ O ₅ and 60 lbs K ₂ O at medium soil test levels.
pH range	6.0-6.5
Soil adaptation	Wide range
Time of planting	Fall or early spring. Root cuttings in rows 3 feet apart in a prepared seedbed.
Harvesting	Cut to a 2-inch stubble when leaves reach a length of 18-24 inches.
Approximate yields	Hay: 3-5 tons/A

Corn, Field Corn – Annual (*Zea mays*)

Description	Often referred to as maize. Leaves are arranged alternately on the stem. The tassel or male part of the flower is at the top of the plant, and the ear located below the tassel is the female portion. Even number of rows of kernels on each ear.
Uses	Grain and silage
Weight per bushel	Shelled: 56 lbs; ear corn: 70 lbs at 15.5% moisture
Seeds per pound	1,200-1,400
Germinating time	7 days
Fertilizer	For grain, 125-150 lbs N. Apply 40-60 lbs P ₂ O ₅ and 40-60 lbs K ₂ O at medium soil test levels. For silage, increase the amount of P ₂ O ₅ applied by 1/3, and double the amount of K ₂ O. Follow soil sample results for zinc and manganese and use tissue analysis to evaluate any other micronutrient needs. Consideration should be given to N and P residual from previous crops or organic sources.
pH range	5.8-6.2
Soil adaptation	Well-drained to somewhat poorly drained soils
Time of planting	Full-season corn should be planted one week before to one week after the average date of last killing frost in spring. Corn will germinate at 50°F, but growth rate is slow until temperatures reach 60°F. Corn can be planted up to July 1.
Rate of planting	On soils with high production potential where good production practices are followed, plant 25,000 to 33,000 kernels per acre. If planted on droughty soils, the rate of planting should be decreased by 10%-15%.

Corn, Field Corn – Annual (*Zea mays*) (cont.)

Pesticides	Herbicides are used on almost all corn grown in Virginia, and insecticides are used on considerable acreage. For pesticide recommendations, contact your Extension agent.
Cultivation	Cultivation may aid in weed control and reduce surface compaction on some soils, but most of the corn currently grown in Virginia is not cultivated.
Reduced-tillage or no-till corn	An annual cover such as small grain, permanent sod, or mulch from a previous crop is important for success with no-till. Herbicides are used to kill existing vegetation and reduce weed competition throughout the season. A specially designed planter is used to plant the corn in the mulch with no soil preparation. Yields of no-till corn are typically greater than corn grown on plowed land. Other advantages are water conservation and reduction in soil erosion.
Harvesting (silage)	Hard dough stage when kernels are dented and a black layer is formed at their bases; lower leaves and husks are turning brown. Dry matter content should be 35%-42%.
Harvesting (grain)	Corn is mature at 30%-35% moisture. A black layer of cells is formed at the base of the kernel at maturity. If corn is harvested with a picker and cribbed, the moisture content should be no more than 20%. The optimum moisture for field shelling is between 18% and 26%. It should be dried to 13% moisture before storage.
Approximate harvest dates	Silage: Aug. 15–Oct. 1; grain: Sept. 1–Nov. 1
Approximate yields	Silage: 14–25 tons of 35% dry matter; grain: 75–225 bushels/A

Corn, Popcorn – Annual (*Zea mays everta*)

Description	See Field Corn
Uses	Confection and meal
Fertilizer	Same as field corn
pH range	Same as field corn
Time of planting	1-2 weeks after the date of last killing frost at 22,000–28,000 seeds/A
Seeds per pound	3,000–6,000, depending on grade
Germinating time	7 days
Isolation	Do not plant where it will cross with other corn. Crossing reduces popping qualities.
Harvesting (grain)	Yields 1/3–2/3 less grain per acre than ordinary field corn. Shuck from standing stalks after it is thoroughly ripe. Do not put in the crib until well-cured. Maximum popping expansion is reached when kernel moisture is about 13%–14%.

Corn, Popcorn – Annual (*Zea mays everta*) (cont.)

Cultivation	Refer to Field Corn for information on fertilization and weed control.
Rotation	Same as field corn when grown commercially.

Cotton – Annual (*Gossypium hirsutum*)

Uses	Grown primarily for fiber; seed used for stock feed, fertilizer, and oil; primarily adapted to the Eastern Shore and Southeastern Virginia.
Weight per bushel	30 lbs
Seeds per pound	4,800 acid delinted
Germinating time	12 days
Fertilizer	50-70 lbs N. At medium soil test levels, apply 60-120 lbs P ₂ O ₅ and 10-80 lbs K ₂ O. Side-dress with 25-75 lbs N.
pH range	5.8-6.2
Soil adaptation	Well-drained sandy loams and loam soils but does well on some fine-textured upland soils.
Time of planting	After soil begins to warm, usually about April 5–May 1.

Crimson Clover – Annual (*Trifolium incarnatum*)

Description	Central taproot with many fibrous roots; 3 leaflets per leaf; hairy stem and leaves; pointed, conical flower at top of stem is bright crimson color; plants 1-3 feet tall.
Uses	Green manure, hay, and pasture crop
Weight per bushel	60 lbs
Seeds per pound	150,000
Germinating time	7 days
Fertilizer	Zero N. 40-120 lbs P ₂ O ₅ and 60-90 lbs K ₂ O at medium soil test levels.
pH range	5.8-6.5
Soil adaptation	Well-drained and moderately well-drained soils; best suited to the Coastal Plain and Eastern Piedmont.
Inoculation	Important: Cross-inoculates with red, alsike, ladino, and white clovers.
Time of planting	In the fall, 30-60 days before frost. Plant 20-30 lbs hulled seed alone; 15 lbs in mixtures.

Crimson Clover – Annual (*Trifolium incarnatum*) (cont.)

Harvesting (hay)	Cut when most advanced heads are beginning to show faded flowers at base. Dangerous as horse feed if cut when ripe.
Approximate yield	Hay: 1-2 tons/A
Seed yield	6-10 bushels; shatters easily when ripe
Approximate harvest dates	Hay: May 15–June 1; seed: June 15–July 1. For green manure, spray or till 20–30 days before planting succeeding crop.

Crownvetch – Perennial (*Coronilla varia*)

Description	Creeping underground roots; stems are leafy, hollow, and weak, reaching a height of 2-4 feet if supported; flowers white with shading to rose or violet; blooms all summer; seedpods break apart at maturity.
Uses	Ornamental, erosion control, and stabilization; limited potential for pasture and hay because of limited regrowth after defoliation.
Weight per bushel	55 lbs
Seeds per pound	110,000
Fertilizer	Zero N. 90-120 lbs P ₂ O ₅ and 60-90 lbs K ₂ O at medium soil test levels.
pH range	5.5-6.5
Soil adaptation	Does best on well-drained soils but will persist on moderately acid, rather infertile soils.
Inoculation	Important: Specific inoculum required.
Time of planting	Late winter or early spring at 5-10 lbs scarified seed. Plant in rows or solid-seeded. Rhizomes can be planted.

Dallisgrass – Perennial (*Paspalum dilatatum*)

Description	Leaves broad and flat; grows in clumps of a few to many stems; extremely short rhizomes; stems slender and usually drooped from the weight of flower clusters; flowers arranged in 2 rows along the tip of seed stalk. Grows 10-20 inches tall. Tufted, deep-rooted, and long-lived, with dark green leaves; no rhizome, but forms strong sod; small auricles; short ligule.
Uses	Dallisgrass is a hay and pasture grass in the more southern states that is not generally recommended for Virginia. It is a slow-starting grass and usually takes 2 or more years to establish a stand. Found in many native pastures in Virginia, but not usually seeded.
Weight per bushel	12-15 lbs
Seed per lb	340,000

Dallisgrass – Perennial (*Paspalum dilatatum*) (cont.)

Germinating time	21 days
Fertilizer	40-60 lbs N, 30-40 lbs P ₂ O ₅ , and 30-60 lbs K ₂ O at medium soil test levels.
pH range	5.8-6.2
Soil adaptation	Well-drained to somewhat poorly drained soils. Prefers rich, moist soils; does not do well on sandy soil.
Time of planting	Spring at 10-15 lbs/A alone, 3-5 lbs in mixtures.
Description	Tufted, deep-rooted, long-lived, with dark green leaves; no rhizome but forms strong sod; small auricles; short ligule.

Eastern Gamagrass – Warm-Season Perennial (*Tripsacum dactyloides*)

Description	3-8 feet tall, erect bunchgrass. Stem flattened at the purplish base and growing from stout, scaly rhizomes. The blades are wide with rough and sharp margins. The inflorescence has 1-3 spikes, can be up to one foot long. It has both male and female parts in the same spike (male spikelets above and female spikelets below the spike). Crowns of established plants can be 3 feet across.
Uses	Primarily for grazing, but also for hay, silage, erosion control, and wildlife.
Fertilizer	Responds well to N. Apply 100-150 lbs N/A/year, in split applications. Maintain P and K in medium range.
pH range	5.8-6.5
Soil adaptation	Grows in fertile bottomland, swamps, and along stream banks.
Time of planting	Seed dormancy is high, so special treatment is needed before planting. Plant wet, chilled seed about 1-1 1/2 inches deep after the soil temperature reaches 60-65°F. Alternatively, dormant seed can be sown in November-December.
Rate of planting	8-10 lbs/A
Method of planting	Best stands are obtained when planted in 6-10 inch rows using conventional or no-till drill. Alternatively, a corn planter can be used to seed in 30-36 inch rows.
Harvesting	Harvest 2-3 times per year in vegetative to early head stages. Can harvest to 5-inch (hay and silage) stubble.
Harvesting (pasture)	Use rotational stocking; turn in at 18-24 inches; graze to 8 inches residual.
Approximate yield	3-7 tons hay/A

Fescue, Creeping Red – Perennial (*Festuca rubra*)

Description	Narrow leaves that are folded with a very short ligule; base of stem is usually red.
Uses	Primarily for lawns in shade. Very similar to sheep's fescue except the leaves are bright green instead of bluish, and it spreads by underground-modified stems (rhizomes).
Weight per bushel	10-15 lbs
Seeds per pound	400,000
Germinating time	14 days
Fertilizer	See Turfgrass section.
pH range	5.0-6.2
Soil adaptation	Well-drained to moderately well-drained soils. Does best on sandy soils. Will tolerate shade and low pH better than ryegrass or bluegrass.
Time of planting	September or early spring at 3-5 lbs per 1,000 sq ft for turf.

Fescue, Meadow – Perennial (*Festuca elatior*)

Description	Tufted, deep-rooted, long-lived, with dark green leaves; no rhizome but forms strong sod; small auricles; short ligule.
Uses	Pasture. Found in many native pastures in Virginia but not usually seeded.
Weight per bushel	10-15 lbs
Seeds per pound	230,000
Germination time	21 days
Soil adaptation	Prefers rich, moist soils; does not do well on sandy soil.

Fescue, Sheep's – Perennial (*Festuca ovina*)

Description	A long-lived bunch grass that forms dense turf; numerous stiff, rather sharp, nearly erect bluish-gray leaves; a tough grass, eaten eagerly by sheep but to a lesser degree by cattle.
Uses	Pastures, seldom seeded.
Weight per bushel	10-15 lbs
Seeds per pound	530,000 Note: Commercial seed comes from Europe.
Germinating time	21 days

Fescue, Sheep's – Perennial (*Festuca ovina*) (cont.)

Fertilizer	40–60 lbs N, 30–40 lbs P ₂ O ₅ , and 30–60 lbs K ₂ O
pH range	5.0–6.2
Soil adaptation	Most well-drained soils. Does better than most grasses on sandy soils.
Time of planting	August or early fall is best but may be sown in spring at 25 lbs alone; 10–12 lbs in mixtures.

Fescue, Tall – Perennial (*Festuca arundinacea*)

Description	Long-lived, tufted, deep-rooted; noted for early spring and late fall growth; leaves are dark green, shiny, and barbed along the edges, making them feel rough; leaves rolled in bud; very short ligule; sheath reddish pink belowground. Most existing tall fescue stands are infected with a fungal endophyte that induces fescue toxicosis in cattle.
Varieties	Endophyte-free varieties are somewhat less hardy than endophyte-infected tall fescue, requiring more careful management. Modern endophyte-free varieties are stronger than earlier varieties. Endophyte-enhanced varieties have potential for greater adoption.
Uses	Pasture, hay, and turf. Excellent when seeded at high rates for turf. Widely used for winter grazing.
Weight per bushel	24 lbs
Seeds per pound	220,000
Germinating time	14 days
Fertilizer	Establishment: 40 lbs N, 120–140 lbs P ₂ O ₅ , and 120–140 lbs K ₂ O at medium soil test levels. Pasture topdressing 30 lbs P ₂ O ₅ and 30–60 lbs K ₂ O annually, or 40–125 lbs P ₂ O ₅ and K ₂ O every 3–4 years. (For winter grazing, apply 60–75 lbs N in mid-August.) Hay topdressing: 120–200 lbs N, 40–90 lbs P ₂ O ₅ , and 85–185 lbs K ₂ O. For turf, see Turf section.
pH range	5.6–6.2
Soil adaptation	Adapted to practically all tillable soils. Tolerant to both dry and wet soils.
Time of planting	Early fall or spring at 15–25 lbs when seeded alone, and 6–12 lbs in mixtures for pasture; 4–6 lbs per 1,000 sq ft for turf.
Harvesting (hay)	First cut when heads begin to emerge. Stems and seedheads of endophyte-infected fescue are highly toxic. Approximate yields 2–6 tons hay/A.
Harvesting (seed)	When the field takes on a yellowish-brown cast and heads droop.
Harvesting (pasture)	Tolerant of continuous stocking. With rotational stocking, turn in at 8 inches; remove cattle at 2–3 inches. Keep vegetative to reduce potential problems with endophyte. Remove pregnant mares from endophyte-infected fescue during last 3 months of gestation.

Field Peas, Canadian – Annual (*Pisum arvense*)

See Austrian Winter Pea.

Johnsongrass – Perennial (*Sorghum halepense*)

Description	Bushy shrub that grows 3-6 feet tall; strongly ridged and grooved stems. A coarse, tall-growing grass of the sorghum group that spreads by seed and strong underground stems; used as hay and pasture in some of the southern states, but is considered a serious pest in crop fields in Virginia and most of the eastern U.S.
Precautions	Johnsongrass is considered a NOXIOUS weed in Virginia and is prohibited as a seed contaminant. It is also against the law to seed this plant. It spreads easily by seeding to other fields. Precautions are similar to sudangrass.
Uses	Primarily as food for game birds and for erosion control. Not adapted to high altitudes because seed will not ripen in a short season. Not adapted to wet areas.
Weight per bushel	60 lbs
Seeds per pound	85,000
Germination time	21 days
Fertilizer	Zero N, 60-90 lbs P ₂ O ₅ , and 30-60 lbs K ₂ O
pH range	5.5-6.2
Rate of planting	Seed in rows 3 feet apart at rate of 10 lbs/A, or set plants 2 feet apart in rows spaced 3 feet apart. Use scarified seed.

Kudzu – Perennial (*Pueraria thunbergiana*)

Description	Legume, deep-rooted, long-lived, coarse-growing vine with runners that often grow 50-100 feet per season. Produces few seeds, but once established can be a serious pest.
Uses	For reclaiming gullies and wasteland. Tolerates medium acidity. May be used for pasture and hay.
Fertilizer	At 3-year intervals, 60-100 lbs P ₂ O ₅ and 60-100 lbs K ₂ O
pH range	5.5-6.2
Inoculation	Cross-inoculates with cowpeas, peanuts, and lespedezas.
Planting	Plant crown in holes or trench 15 inches deep and 18 inches wide. On gullied areas, plant in holes 15 inches deep and 18 inches wide on 20-foot squares. On wasteland, plant in deep furrows 20 feet apart and space crowns 4 feet in furrow.

Lespedeza, Bicolor – Perennial (*Lespedeza bicolor*)

Description	Bushy shrub; grows 3-6 feet tall; strongly ridged and grooved stems.
Uses	Primarily used as food for game birds and for erosion control. Not adapted to high altitudes because seed will not ripen in short season. Not adapted to wet areas.
Weight per bushel	60 lbs
Seeds per pound	85,000
Germination time	21 days.
Fertilizer	Zero N, 60-90 lbs P ₂ O ₅ , and 30-60 lbs K ₂ O
pH range	5.5-6.2
Time of planting	In spring after frost
Rate of planting	Seed in rows 3 feet apart at rate of 10 lbs/A, or set plants 2 feet apart in rows spaced 3 feet apart. Use scarified seed.

Lespedeza, Korean – Annual (*Lespedeza stipulaceae*); Lespedeza, Common – Annual (*Lespedeza striata*)

Description	Warm-season reseeding legume. Slender, branched stems; branched taproot; 3 leaflet stipules at base of leaf; stipules very prominent on Korean. Nonbloating.
Uses	Hay, pasture, and wildlife cover. Killed by frost and furnishes poor winter cover. Seed in mixtures with grasses or other legumes, or if seeded alone, use winter cover crop. May not reseed above 2,500-foot elevation.
Weight per bushel	Kobe: 30 lbs; Korean: 45 lbs
Seeds per pound	Kobe: 185,000; Korean: 240,000
Germinating time	14 days
Fertilizer	At seeding: zero N, 60-90 lbs P ₂ O ₅ , and 60-90 lbs K ₂ O
pH range	5.5-6.2
Soil adaptation	Will grow on almost any well-drained soil. Korean adapted to all areas of Virginia; Kobe is best adapted to Southeastern Virginia. Tolerant of acidity and low soil P. Cross-inoculates with perennial lespedezas, peanuts, and cowpeas.
Time of planting	February and March at 15-25 lbs alone; 10 lbs in mixtures. Plant in 6-8 inch rows or solid-seeded in small-grain fields. Harrow grain before seeding if soil is hard on top. Can be frost-seeded in late winter.
Harvesting (hay)	Early bloom stage
Harvesting (seed)	Combine in fall when ripe.

Lespedeza, Korean – Annual (*Lespedeza stipulaceae*); Lespedeza, Common – Annual (*Lespedeza striata*) (cont.)

Approximate harvest dates Hay: Aug. 1-Sept. 1; seed: Sept. 15-Nov. 1

Approximate yield Hay: 1-2 tons; seed: 200-500 lbs/A

Lespedeza, Sericea – Perennial (*Lespedeza cuneata*)

Description Growth habit similar to alfalfa; stems grow from crown buds in a height of 2-4 inches; deep-branched taproot. Warm-season, drought-tolerant, nonbloating.

Varieties High- and low-tannin types. Low-tannin varieties AV-Lotan and AV-Donnelly are more palatable but less persistent.

Uses Erosion control, hay, pasture, and cover for wildlife.

Weight per bushel 60 lbs

Seeds per pound 335,000

Germination time 28 days

Fertilizer Zero N, 60-90 lbs P₂O₅, and 30-60 lbs K₂O

pH range 5.0-6.2

Inoculation Cross-inoculates with annual lespedezas, cowpeas, and peanuts.

Soil adaptation Will grow on almost any well-drained soil. Very tolerant of acid soil and low fertility.

Time of planting Unhulled seed: late fall or early spring; scarified seed: March or April. Plant 30-40 lbs unhulled seed; plant 15-20 lbs scarified seed in 6-8 inch rows or solid-seeded. Slow establishment.

Harvesting (hay) When plants are about 15-24 inches tall. High tannin levels drop when harvested for hay, improving palatability and digestibility.

Harvesting (seed) Direct combined. Second growth produces more uniform seed and is easier to thresh than the first crop, but yield of the first crop is usually higher.

Harvest (pasture) Begin grazing at 8-10 inches; do not graze lower than 4 inches.

Approximate harvest dates Hay: June 15-July 1; seed: Aug. 15-Sept. 15

Approximate yield Hay: 2-3 tons; seed: 300-600 lbs/A

Matua Prairie Grass (Kunth) – Perennial (*Bromus willdenowii*)

Description	Matua, also known as “rescuegrass,” is a cool-season, short-lived perennial grass. Matua is an erect growing plant with a bunch-type growth habit. It grows up to 2-3 feet, including the inflorescence. It looks like orchardgrass except that basal leaf sheaths of prairie grass are densely covered with fine hairs, and the ligule is shorter and has no auricles. Matua grass leaves are light green to green rather than bluish green like orchardgrass.
Uses	Suited for hay, greenchop, or silage and can be used for dairy or beef pastures under rotational stocking management. It is not suited for continuous grazing.
Seeds per pound	90,000
Fertilizer	Requires high level of N: 40 lbs N/A at seeding recommended. For high level of production, apply 50-60 lbs N/A following mechanical harvest or 30-40 lbs N/A following each grazing. Apply 40-90 lbs P ₂ O ₅ /A and 85-185 lbs K ₂ O/A annually. Lower P and K amounts needed on pasture.
pH range	6.0-7.0
Soil adaptation	Adapted to well-drained, high fertility soils.
Time of planting	May be seeded in the fall or spring when the soil temperatures are at least 55°F. Seed treatment with fungicide prior to seeding may control head smut.
Rate of planting	25 lbs/A for drilled plantings; 30-40 lbs/A for broadcast seeding; and 10-15 lbs/A in mixture.
Method of planting	No-till or conventional planting methods can be used. Seed must be planted no more than 1/4-1/2 inch deep.
Harvesting (hay)	Mechanical harvest for hay or grazing should begin at the boot stage for best quality, yield, and longevity. A regrowth/rest period of 30-42 days, depending on the season, is essential. Matua has a yield potential of 3-6 tons/A/year. One regrowth per year must be allowed to set seed to maintain the stand.

Millet, Pearl – Annual (*Pennisetum glaucum*)

Description	Erect growth habit: thick stems that grow to 3-7 feet tall; spike head. Regrows after cutting/grazing.
Uses	Supplemental pasture, hay crop, green chop. Requires 60-70 days to mature.
Weight per bushel	40-55 lbs
Seeds per pound	86,000
Germination time	10 days
Fertilizer	At seeding: 60-80 lbs N, 70-90 lbs P ₂ O ₅ , and 70-90 lbs K ₂ O at medium soil test level. After each cutting: 40-60 lbs N.
pH range	5.5-6.5

Millet, Pearl – Annual (*Pennisetum glaucum*) (cont.)

Time of planting	May 1–July 1 at 25–40 lbs alone; 15–20 lbs in mixtures in 6–8 inch rows or solid-seeded.
Harvesting (hay)	Cut when heads begin to emerge from boot or at 30–40 inches.
Harvesting (pasture)	Requires high stocking rate, preferably with rotational stocking.
Approximate first harvest	July 1–15
Approximate yield	Hay: 2–4 tons/A

Millet, Foxtail – Annual (*Setaria italica*)

Description	Erect growth; slender, leafy stems 2–5 feet tall; spike-like head.
Uses	Supplemental pasture and hay crop, nurse crop for late spring and early summer forage seedings, smother crop prior to late summer no-till forage seedings. Requires 60–70 days to mature. Lower yield and regrowth than pearl millet.
Weight per bushel	40–55 lbs
Seeds per pound	220,000
Germinating time	10 days
Fertilizer	60–80 lbs each of N, P ₂ O ₅ and K ₂ O, at medium soil test levels.
pH range	5.8–6.2
Time of planting	May 1–July 1 at 15–30 lbs alone; 15–30 lbs in mixtures in 6–8 inch rows or solid-seeded.
Harvesting (hay)	Cut at seedhead emergence. Do not feed to horses.
Approximate yield	Hay: 1–3 tons/A

Milo (*Sorghum bicolor*)

See Sorghum, Grain.

Oats - Annual (*Avena sativa*)

Description	Panicle-type head; long ligule, auricles absent; leaf margins are heavy; seed usually retains the husk (lemma and palea), which has a very smooth surface; seed color varies with variety from white, yellow, gray to somewhat red. Winter oats require a period of cold temperature to initiate heading. Spring oats have no temperature requirement.
Uses	For grain, hay, and grazing. Excellent rotational crop for wheat or barley because it is not susceptible to the same species of diseases. Does not get “take all” disease.
Weight per bushel	32 lbs
Seeds per pound	14,000
Germinating time	10 days
Fertilizer	20 lbs N in the fall, plus 40-90 lbs each of P ₂ O ₅ and K ₂ O at medium soil test levels. Topdress with 60-80 lbs N in February or early March. These rates assume no carryover N from the previous crop.
pH range	6.0-6.5
Soil adaptation	Well-drained loams and silt loams are best.
Time of planting	Winter oats: (Not recommended west of the Blue Ridge.) Fall: Sept. 25-Oct. 15 in Eastern Virginia, and Sept. 1-Oct. 1 in Piedmont; midwinter: Feb. 1-March 1 for the entire state. Spring oats: March 5-April 1 in Piedmont; March 15-April 10 in areas west of the Blue Ridge. Spring oats are not recommended in Eastern Virginia. Plant at 65-80 lbs or 12-15 seeds per row foot in 6-8 inch rows or solid-seeded.
Harvesting (hay)	Cut in boot to early dough stage.
Harvesting (seed)	Combine when fully ripe at 10%-15% moisture.
Approximate harvest dates	Winter: June 20-July 15; spring: July 1-15
Approximate yield	80-120 bushels or 2 tons hay/A

Orchardgrass - Perennial (*Dactylis glomerata*)

Description	Long-lived, deep-rooted bunch grass; leaves light green and folded and flat at the base, tufted seed heads, long ligule. Flowers only in spring. Regrowth is vegetative with no stem or seedhead production
Uses	Pasture, hay, and silage.
Weight per bushel	14 lbs
Seeds per pound	590,000 unhulled, 625,000 hulled

Orchardgrass – Perennial (*Dactylis glomerata*) (cont.)

Germinating time	10 days
Fertilizer	At medium soil test levels. Establishment: When seeded alone, 40-50 lbs N, 120-140 lbs P ₂ O ₅ , and 120-140 lbs K ₂ O. Maintenance (hay): 120-200 lbs N applied half in early spring and the other half after first cutting, plus 40-90 lbs P ₂ O ₅ and 85-185 lbs K ₂ O. When seeded with clover, N rate should be reduced to 20 lbs. For maintenance, where there is more than 35% clover, no N is needed.
pH range	5.8-6.2
Soil adaptation	Does best on well-drained loam soil.
Time of planting	In Eastern Virginia, seed after first good rain in September and up to Oct. 15, or during February or early March. In the Piedmont and west of the Blue Ridge, seed after first good rain in August and up to Sept. 15, or March 1-April 15. Plant 8-12 lbs alone; 3-6 lbs in mixtures.
Harvesting (hay and silage)	Cut in boot to early head stage. Fiber percentage increases rapidly after blooming.
Harvesting (pasture)	Do not graze below 3 inches. Rotational stocking with 1-4 day grazing periods is best.
First harvest dates	Hay: May 15-June 1; seed: June 1-July 1
Approximate yield	Hay: 2-5 tons/A/year; seed: 200-600 lbs/A

Peanuts – Annual (*Arachis hypogaea*)

Description	Legume plant native to South America. Growth habit varies from prostrate to upright. Bright yellow flowers on either the main stem or lateral branches. Flowers contain both male and female parts and are self-fertile. Following fertilization, a “peg” bearing ovaries in its top elongates from the leaf axil and penetrates the soil. The peg then turns horizontally and pod and seed formation take place. Seed per pod varies from 1-5 depending on market type. A pod will most often have two seeds.
Uses	Food for humans and livestock.
Weight per bushel	18-22 lbs in shell; 48-52 lbs shelled
Seeds per pound	Virginia-type: 500-800; runner-type: 700,000; Spanish-type: 1,000-1,400 lbs in shell
Germinating time	7-10 days
Fertilizer	Direct fertilization not recommended. Increase the fertilizer application on the crop that precedes peanuts in rotation by 50-100 lbs P ₂ O ₅ and 10-60 lbs K ₂ O. Apply 900 lbs gypsum broadcast or 600 lbs banded over the row as plants begin to bloom.
pH range	5.8-6.5

Peanuts – Annual (*Arachis hypogaeae*) (cont.)

Inoculation	Cross-inoculates with lespedezas, cowpeas, and kudzu.
Soil adaptation	Best quality peanuts are produced on well-drained, light, sandy soils. May be produced anywhere east of the Blue Ridge Mountains, but yield and quality are usually poorer on heavier soils. Rotate peanuts with other non-legume crops.
Time of planting	April 20–May 10. Soil temperature should be at least 65°F for 3 consecutive days.
Planting	Peanuts should be planted 3–4 inches apart in 30–36 inch rows. This requires approximately 75–175 lbs of shelled nuts, depending on seed size. Plant 1 1/2–2 inches deep.
Weed control	Herbicides and cultivation may be used. Cultivation should be shallow and often enough to control weeds until pegs enter the ground. Do not cover any portion of the vine with soil. Rotary hoeing when crust forms can be beneficial.
Harvesting	Dig when about 70% of the shells turn brown on the inside, usually 130–170 days after planting.
Approximate harvest date	Sept. 15–Nov. 1
Approximate yield	2,500–5,000 lbs/A
Storage	Peanuts contain about 50% moisture when dug; must be dried to 10% moisture for storage.

Rape – Annual (*Brassica napus*)

Description	Cool-season plant in the mustard family. Closely resembles kale, with large, dark green leaves. At maturity it reaches a height of 3–6 feet with brilliant yellow flowers and pods that produce 15–40 small black seeds. Winter and spring varieties are available.
Uses	Pasture and as an oil crop. Usually ready for grazing about 8 weeks after seeding. Sometimes causes bloating in sheep.
Weight per bushel	50 lbs
Seeds per pound	160,000
Germinating time	7 days
Fertilizer	60–80 lbs N, 30–50 lbs P ₂ O ₅ , and 30–50 lbs K ₂ O at medium soil test levels.
pH range	5.2–6.2
Soil adaptation	Well-drained and moderately well-drained loams and silt loam soils.
Time of planting	February and March, or August and September at 2–3 lbs in rows, 6–9 lbs broadcast, 4–6 lbs when seeded with oats.

Red Clover – Perennial (*Trifolium pratense*)

Description	Numerous leafy stems arising from a crown growing to a height of about 2 feet; stems and leaves are hairy; flowers reddish purple on heads at tips of branches; branched taproot. Short-lived perennial that often behaves as biennial.
Varieties	New varieties are more persistent.
Uses	Hay, pasture, silage, and commercial seed production
Weight per bushel	60 lbs
Seeds per pound	260,000
Germinating time	7 days
Fertilizer	At seeding, 120-140 lbs P ₂ O ₅ and 120-140 lbs K ₂ O; for topdressing, 40-90 lbs P ₂ O ₅ and 85-185 lbs K ₂ O at medium soil test levels. Lower amounts needed when used as pasture.
pH range	5.8-6.5
Soil adaptation	Well-drained to moderately well-drained loams and silt loam soils properly limed and fertilized.
Inoculation	Important: Cross-inoculates with alsike, crimson, ladino, and white clovers.
Time of planting	45 days before last killing frost in spring or 30 days before first killing frost in fall. Plant at 8-10 lbs alone; 2-6 lbs in mixtures. Plant in 6-8 inch rows or solid-seeded usually with a grass. Broadcast or drill on small grain or closely grazed grass pasture in later winter or early spring.
Harvesting (hay)	Cut with a combine when heads have turned brown, flowers and stalks are deep yellow, and seeds have begun to show a distinct violet color. Will shatter badly if cut later. May use a desiccant to aid in drying the plant.
Approximate first harvest	Hay: June 1-20. Seed: Aug. 15-Sept. 1.
Approximate yield	Hay: 2-4 tons over season. Seed: 120-240 lbs/A.

Redtop (*Herdgrass*) – Perennial (*Agrostis alba*)

Description	Produces numerous stems from a well-developed base; spreads by rhizomes but does not produce a strong sod; flat, light green, sharp-pointed leaves; lacks leafiness under close grazing; long prominent ligule.
Uses	Primarily for erosion control and soil stabilization.
Seeds per pound	5,100,000
Weight per bushel	14 lbs
Germinating time	10 days

Redtop (*Herdgrass*) – Perennial (*Agrostis alba*) (cont.)

Fertilizer	40-60 lbs N, 60-100 lbs P ₂ O ₅ , and 60-100 lbs K ₂ O. The N is for annual applications; the P ₂ O ₅ and K ₂ O are rates for 3-4 years.
pH range	5.8-6.2
Soil adaptation	Well-drained and moderately well-drained loams and silt loams. Tolerant to wet conditions.
Time of planting	August and September. May be seeded in spring. Plant at 3-5 lbs alone; 3 lbs in mixtures. Plant in 6-8 inch rows or solid-seeded.
Harvesting (hay)	Shortly before full bloom.

Reed Canarygrass – Perennial (*Phalaris arundinacea*)

Description	Tall, coarse, sod-forming, cool-season grass; grows 2-5 feet tall; spreads underground by short, scaly rhizomes; semidense, spike-like panicles.
Uses	Hay, pasture, and silage. Conservation cover in wet areas and areas irrigated for disposal of liquid wastes.
Weight per bushel	45 lbs
Seeds per pound	430,000
Germinating time	21 days
Fertilizer	Establishment: 50 lbs N, 120-140 lbs P ₂ O ₅ , and 120-140 lbs K ₂ O. Maintenance (pasture): 40-60 lbs N, 30-40 lbs P ₂ O ₅ , and 30-60 lbs K ₂ O. Maintenance (hay): 120-200 lbs N applied, half in early spring and the other half after first cutting, plus 40-90 lbs P ₂ O ₅ , and 85-185 lbs K ₂ O. When seeded with clover: N rate should be reduced to 20 lbs. For maintenance where there is more than 35% clover, no N is needed.
pH range	5.8-6.2
Soil adaptation	Tolerates poorly drained soils. More drought-tolerant than many other cool-season plants.
Time of planting	Early fall or spring. Often slow to establish. Plant 12-14 lbs alone; 6-8 lbs in mixtures. Plant in 6-8 inch rows or solid-seeded.
Harvesting	First cut when heads begin to emerge.
Approximate harvest dates	Hay: May 15-June 15
Approximate yield	Hay: 2-4 tons/A

Rye - Annual (*Secale cereale*)

Description	The most winter-hardy of small grains. Seedlings often have a reddish coloration; leaves have small auricles with short ligules; seeds are round with the germ end distinctly pointed; seed color varies from greenish gray and tan to dark brown or black.
Varieties	Abruzzi types provide earlier grazing in late winter/early spring.
Uses	Cover crop, grain, silage, winter and spring pasture.
Weight per bushel	56 lbs
Seeds per pound	18,000
Germinating time	7 days
Fertilizer	20 lbs of N in fall, plus 40-80 lbs each of P ₂ O ₅ and K ₂ O. Topdress with 60 lbs N in February or early March.
pH range	5.8-6.2
Soil adaptation	Any well-drained soil. Will do better on poor soils than wheat, oats, or barley.
Time and rate of planting	60-90 lbs; 90-100 lbs for grazing. Plant from 2 weeks before to 4 weeks after first killing frost. Plant in 6-8 inch rows or solid-seeded.
Harvesting (yield)	Combine when fully ripe at 10%-15% moisture. Rye ripens slowly, and seed is easily damaged during harvesting.
Harvesting (silage)	Harvest at the boot stage.
Harvesting (pasture)	Earlier fall planting allows some late fall grazing. Stock heavily and rotationally to maintain leafy growth.
Approximate harvest date	Grain: June 20-July 10; silage: April 10-May 1
Approximate yield	25-50 bushels grain; 5-8 tons 35% dry-matter silage/A

Ryegrass - Annual (Italian) (*Lolium multiflorum*)

Description	Shiny, smooth leaves rolled in the bud, auricles narrow and long; short ligule; spikelets edgewise on stem with awns on seed. Bunchgrass.
Uses	Grows rapidly and in bunches to height of 3 feet. Used for hay and pasture, especially as a supplementary pasture mixed with crimson clover and/or small grain. Also used for green manure, winter turf, and overseeding bermudagrass. An annual that can volunteer in small-grain fields to become a pest.
Weight per bushel	24 lbs
Seeds per pound	227,000
Germinating time	7 days

Ryegrass – Annual (Italian) (*Lolium multiflorum*) (cont.)

Fertilizer	Pasture: 20 lbs N in fall and 30-50 lbs each of P ₂ O ₅ and K ₂ O. Add 50-70 lbs N topdressed in spring.
pH range	5.8-6.2
Soil adaptation	Will grow well on most soils used for crops in Virginia.
Time of planting	Aug. 15-Nov. 15. Use the earlier seeding date for Northern Piedmont and west of the Blue Ridge. Plant for pasture: 10-15 lbs in mixtures, 20-30 lbs alone. For turf: 3-5 lbs per 1,000 sq ft.
Harvesting (pasture)	Tolerates close, continuous stocking

Ryegrass – Perennial (English) (*Lolium perenne*)

Description	Similar to Italian in use, adaptability, and all other ways, but can be distinguished from Italian by flowers being awnless and leaves folded in the bud, not rolled. Special varieties adapted for turf purposes.
Uses	Pasture. High yielding during first year, but decreased yields in subsequent years due to poor persistence.
Time of planting	Alone: 20-30 lbs; in mixtures: 10 lbs
Approximate yield	2-6 tons hay/A

Sorghum, Forage – Annual (*Sorghum bicolor*)

Description	Sorghum is very similar to corn in the vegetative stage. Leaves tend to be narrower than for corn. Heavily covered with a white waxy coating that can be rubbed off the leaf sheath. Flowers are perfect in that both male and female parts are produced in a panicle-type head on top of the plant. Forage sorghum is 6-10 feet tall with a large stem, medium-size grain head.
Uses	Silage, hay, grazing
Weight per bushel	56 lbs
Seeds per pound	13,000-20,000
Germinating time	10 days
Fertilizer	60-80 lbs each of N, P ₂ O ₅ , and K ₂ O
pH range	5.8-6.2
Soil adaptation	Well-drained to somewhat poorly drained soils.
Time of planting	1-2 weeks after corn. Soil needs to be warm (at least 60°F). Plant 5-20 lbs in rows with a drill or corn planter.

Sorghum, Forage – Annual (*Sorghum bicolor*) (cont.)

Harvesting	Do not graze until 30 inches tall. Cut for hay or wilted silage no later than early head emergence. Cut in dough stage for direct ensiling.
Approximate yield	Hay or wilted silage: 3-5 tons dry matter. Silage: 14-18 tons of 35% dry matter/A.

Sorghum, Grain – Annual (*Sorghum bicolor*)

Description	See Forage Sorghum. Same genus and species except plant types that are shorter and produce lighter grain have been bred. Plant height 3-5 feet with high grain yield. Will recover from high temperature and drought better than corn.
Uses	Grain and silage
Weight per bushel	56 lbs
Seeds per pound	13,000-20,000
Germinating time	10 days
Fertilizer	Apply approximately the same amount that would be applied to corn when grown under comparable conditions.
pH range	5.8-6.2
Soil adaptation	Well-drained to somewhat poorly drained soils.
Time of planting	1-2 weeks after corn. Early-medium maturing hybrids can be planted following small-grain harvest in Eastern Virginia. Plant for grain at 5-7 lbs in rows; forage alone: 7-10 lbs.
Harvesting	Harvest grain with combine when seed is mature and shells easily from head. Chop for silage when grain is in the dough stage. Artificial drying can be a problem because the small seed size reduces air flow through the grain.
Approximate yield	Grain: 80%-90% of adapted hybrid corn yield. Silage: 11 tons 35% dry matter/A.

Sorghum, Sweet – Annual (*Sorghum bicolor var saccharum*)

Description	Similar in appearance to forage sorghum
Uses	Syrup
Weight per bushel	45-60 lbs
Seeds per pound	28,000-40,000
Germinating time	10 days
Fertilizer	30-50 lbs N, 60-90 lbs P ₂ O ₅ , and 60-90 lbs K ₂ O. Side-dress with N to make a total of no more than 70 lbs N when plants are 25-35 days old.

Sorghum, Sweet – Annual (*Sorghum bicolor var saccharum*) (cont.)

pH range	5.8-6.2
Soil adaptation	Any well-drained soil suited for corn.
Time of planting	2-4 weeks after corn, at 3-5 lbs in rows 30-36 inches apart. Plant 1-1 1/2 inches deep.
Cultivation	Shallow, level, and often enough to keep down weeds. Chemical control also practiced.
Harvesting (syrup)	When seeds are in the hard-dough stage.
Approximate harvest date	Sept. 1-Oct. 1
Approximate syrup yield	100-300 gal/A

Soybean – Annual (*Glycine max*)

Description	Legume 2-4 feet tall. Broad trifoliolate leaves with small white or purple flowers. Flower initiation is very sensitive to day length, but all plants do not respond the same way. Some cultivars bloom under relatively short days while others bloom under longer days. In Virginia, shorter-day cultivars are classified as maturity group 3 or 4; longer-day cultivars are classified as maturity groups 5 and 6. Two types of growth habit: determinate and indeterminate. Determinate cultivar's terminal bud ceases to grow when the plant starts to flower; indeterminate cultivar's terminal bud continues to grow several weeks after flowering. Tan or brown seedpods contain 2-3 round yellow seeds. Stems, leaves, and pods are covered with gray or tawny hairs.
Uses	Seed, hay, and silage
Weight per bushel	60 lbs
Seeds per pound	Small: 3,600; medium: 3,000; large: 2,500; extra-large: 1,600
Germination time	3-6 days
Fertilizer	Zero N, 40-60 lbs each of P ₂ O ₅ and K ₂ O
pH range	5.8-6.5
Inoculation	Use soybean inoculum where soybeans are not grown regularly. Does not cross-inoculate with other legumes.
Soil adaptation	Well-drained to somewhat poorly drained soils. Rotate with other non-legume crops.

Soybean - Annual (*Glycine max*) (cont.)

Time of planting	Two weeks after corn planting time for the area (full season); double-cropped with small grain, generally after June 15. Time of planting prior to June 10 results in maximum potential yield. Yield declines rapidly if planted later due to lack of time to develop adequate growth. Planting in 20-inch rows or less is recommended in order to meet canopy requirements and maximize yield. No-tillage planting requires the use of a "burndown" herbicide to kill existing vegetation either mixed together with a preemergence herbicide or followed approximately 2-3 weeks later by a postemergence herbicide.
Pest management	An integrated approach with cultural, biological, and chemical controls is necessary. Control weeds by 3 weeks after planting and maintain control until canopy closure. Rotation with nonhost crops becomes necessary to prevent buildup of several nematode species. Several insect pest species are occasionally a problem in Virginia. Frequent scouting is needed to detect infestations. Control measures should be implemented when pests exceed economic thresholds.
Harvesting (hay and silage)	When lower leaves begin to turn yellow and pods are about half-filled.
Harvesting (seed)	When leaves have fallen and pods are brown and dry; seed moisture will be 10%-15%.
Approximate harvest dates	Hay: Aug. 15-Oct. 1; seed: Sept. 20-Dec. 1
Approximate yield	Hay: 2-4 tons; seed: 25-70 bushels/A

Sudangrass - Annual (*Sorghum sudanense*) or Sorghum-Sudangrass Hybrid - Annual

Description	Smooth, erect stems, reach height of 5-7 feet; open panicle head; large leaves.
Uses	Supplemental pasture in 40-45 days.
Weight per bushel	25-40 lbs
Seeds per pound	Sudangrass: 55,000; sorghum-sudangrass hybrids: 20,000
Germination time	10 days
Fertilizer	60-80 lbs each of N, P ₂ O ₅ , and K ₂ O, plus 40-60 lbs N after each cutting.
pH range	5.8-6.2
Soil adaptation	Well-drained to somewhat poorly drained soils.
Time of planting	Two weeks after corn. Sudangrass: 25-35 lbs broadcast, 15-20 lbs in rows. Sorghum-sudangrass: 30-40 lbs broadcast, 20-30 lbs in rows. Plant in narrow rows or solid-seeded.

Sudangrass – Annual (*Sorghum sudanense*) or Sorghum–Sudangrass Hybrid – Annual (cont.)

Precaution	Do not graze or harvest for green chop until plants are 24–30 inches tall to reduce danger of prussic acid poisoning.
Harvesting (hay)	Cut just as heads emerge.
Harvesting (silage)	Cut direct when grain is in the dough stage or as heads emerge and wilt.
Approximate harvest dates	Hay or silage: July 1–15.
Approximate yield	Hay or wilted silage: 2–5 tons dry matter; silage: 12–15 tons 35% dry matter/A.

Sugar Beets – Biennial (*Beta vulgaris*)

Description	Same species as the red garden beet but grows much larger. Leaves are large and shiny; white roots average 1–3 lbs. Sugar content 14%–16%.
Uses	Sugar production and livestock feed
Seeds per pound	72,000
Germination time	10–14 days
Fertilization	40 lbs N, 100 lbs P ₂ O ₅ , and 100 lbs K ₂ O prior to seeding. An additional 40 lbs N will be needed 4–6 weeks later. Use a borated fertilizer.
pH range	6.0–6.5
Soil adaptation	Well-drained silt or silty loam soil free of stones and roots.
Time of planting	Late winter or early spring. If a field is to be thinned, drop 1 seed per inch of row. Thin when plants have 4–6 leaves, spacing plants 10–12 inches apart.
Approximate harvest dates	October–December
Approximate yield	20–30 tons/A

Sunflower – Annual (*Helianthus annuus*)

Description	Plants with large leaves and bright yellow flowers; young leaves and flowers tend to face the sun. Very susceptible to bird damage.
Uses	Oil crop, bird feed, snack food
Weight per bushel	26–30 lbs
Seeds per pound	5,000–8,000

Sunflower – Annual (*Helianthus annuus*) (cont.)

Germination time	10-14 days
Fertilization	100 lbs of N plus 40-60 lbs each of P ₂ O ₅ and K ₂ O
pH range	5.8-6.0
Soil adaptation	Any well-drained soil
Time of planting	Tolerates freezing temperatures better than most crops. Can plant 2-3 weeks prior to last killing frost. Because of early maturity, planting can continue until Aug. 1 in Eastern Virginia.
Planting rate	19,000-20,000 plants/A
Cultivation	1-2 cultivations will usually be necessary to control weeds. Herbicide selection limited.
Harvesting	110-120 days required from planting to harvest. Mature when the backs of heads turn yellow. Special attachments necessary on small-grain combine headers to prevent shatter loss.
Approximate yield	Seed: 1,200-2,000 lbs/A

Sweet Clover – Biennial (*Melilotus alba*; *Melilotus officinalis*)

Description	Erect with many branches; deep taproot; stems grow from crown second year; yellow or white flowers; 2-5 feet tall; leaflets notched on edges toward tips (unlike alfalfa with smooth edges). Plants and flowers have a sweet vanilla odor.
Varieties	Biennial white sweet clover preferred. Stems of the biennial yellow are finer, and the plant does not grow so high. Yellow blooms 10 days earlier.
Uses	Pasture, hay, and green manure. Poorly cured hay can result in hemorrhaging in livestock due to accumulation of dicoumarin.
Weight per bushel	60 lbs
Seeds per pound	250,000
Germinating time	10 days
Fertilizer	Zero N, 40-70 lbs P ₂ O ₅ , and 50-80 lbs K ₂ O
pH range	6.5-7.0
Soil adaptation	Well-drained to moderately well-drained soils.
Inoculation	Important: Cross-inoculates with alfalfa and bur clover.
Time of planting	February, using unhulled seed. Use scarified seed in late March or April. Hulled: 15 lbs; unhulled: 25 lbs. Drill on grain in February or March or sow on frozen ground.
Harvesting (hay)	Cut in the bud stage before any bloom appears.

Sweet Clover – Biennial (*Melilotus alba*; *Melilotus officinalis*) (cont.)

Approximate harvest dates	Hay: May 10–June 1
Approximate yield	Hay: 2–3 tons/A

Switchgrass – Perennial (*Panicum virgatum*)

Description	Native warm-season sod-forming tall grass (3–6 feet) that produces an open panicle seedhead. Scaly creeping rhizomes. Can be identified by the cluster or nest of hair at the base of the blade where it joins the sheath.
Uses	Summer pasture or hay. Will not persist under close or frequent grazing.
Seeds per pound	330,000
Germinating time	14–21 days
Fertilizer	Generally low fertility requirement. At establishment: zero N, 80 lbs each of K ₂ O and P ₂ O ₅ . Maintain K ₂ O and P ₂ O ₅ test in the medium soil test range. Apply 40–60 lbs N annually if legumes are not present.
pH range	5.5–6.5
Soil adaptation	Deep, well-drained to moderately well-drained soils.
Time of planting	May 15–July 15 using 6–8 lbs pure live seed.
Harvesting (hay)	Cut prior to seedhead emergence.
Harvesting (pasture)	Begin grazing when 18–24 inches tall. Do not graze below 8 inches.
Approximate first harvest	July 15–Aug. 1
Approximate yield	Hay: 2–5 tons /A

Tall Meadow Oatgrass – Perennial (*Arrhenatherum elatius*)

Description	Bunchgrass that grows 3–5 feet tall; has an open panicle head similar to oats.
Uses	Hay and pasture. Makes early spring growth but very little aftermath growth.
Weight per bushel	10–15 lbs
Seeds per pound	150,000
Germinating time	14 days

Tall Meadow Oatgrass – Perennial (*Arrhenatherum elatius*) (cont.)

Fertilizer	40-60 lbs N, 30-40 lbs P ₂ O ₅ , and 30-60 lbs K ₂ O
pH range	5.8-6.2
Soil adaptation	Well-drained to moderately well-drained sandy loam to silt loam soils.
Time of planting	Late summer or fall using 15-20 lbs alone or 10-12 lbs in mixtures.
Harvesting (hay)	Cut at early heading stage.
Approximate harvest dates	Hay: May 15-June 1
Approximate yield	Hay: 1-2 tons/A

Timothy – Perennial (*Phleum pratense*)

Description	Semi-bunchgrass; erect and dull green leaves gradually tapering to a point; in late spring, the lower joint swells to form a small bulb; spike-like head; shallow, fibrous roots; round stem with prominent ligule.
Uses	Primarily hay; best adapted to the northern U.S., but does fairly well in Northern Piedmont and western Virginia. Makes very little regrowth after spring cutting compared to orchardgrass or tall fescue.
Weight per bushel	45 lbs
Seeds per pound	1,230,000
Germinating time	10 days
Fertilizer	40-60 lbs N, 30-40 lbs P ₂ O ₅ , and 30-60 lbs K ₂ O
pH range	5.8-6.2
Soil adaptation	Well-drained to somewhat poorly drained fine-textured soils.
Time of planting	8-10 lbs alone; 2-8 lbs in mixtures. Usually seeded in mixtures with clovers or alfalfa.
Harvesting (hay)	When alone: in full bloom; in mixtures: when legume is in early bloom.
Approximate harvest dates	Hay: June 1-July 1
Approximate yield	Hay: 1-3 tons/A

Tobacco, Burley – Annual (<i>Nicotiana tabacum</i>)	
Description	See Flue-Cured Tobacco. Plants typically larger than flue-cured. Stalk and leaf midribs are light green to cream-colored. Typical culture is for 18-22 leaves that are lighter green than flue-cured. The crop is grown from transplants historically produced in plant beds but now typically produced in greenhouses.
Uses	Primarily cigarette blends with a small amount used in the manufacture of pipe and chewing tobacco products. Approximately 30% is exported.
Seeds per ounce	330,000
Germinating time	7-12 days
Viability of seed	6-8 years under proper conditions (temperature in °F and relative humidity should add to 100).
Fertilizer	175-200 lbs N, 60-120 lbs P ₂ O ₅ , and 150-300 lbs K ₂ O per acre. Follow soil test recommendations.
pH range	When checked in the spring, a pH of 5.8-6.2 is preferred. If the pH drops to 4.9 during the season, there is a danger of manganese toxicity.
Soil adaptation	Fertile silt loam soils that have good internal and surface drainage.
Time of planting	Transplant from seedbeds May 15-June 1 using 6,225-8,300 plants/A in 3 1/2-foot rows, with plants spaced 18-24 inches in the row.
Disease control	The most successful disease management program uses multiple control strategies. Crop rotation and the use of disease-resistant varieties should be used in combination with chemical control methods.
Weed control	Herbicides alone will not control certain weeds closely related genetically to tobacco. Tobacco benefits from some soil aeration, so always cultivate tobacco at least one time, usually at lay-by time, even though weeds are not a problem.
Insect control	The Integrated Pest Management approach to insect control recognizes that a certain amount of insect damage will not reduce tobacco yield or quality enough to pay for the cost of treatment. Natural control should be promoted by delaying insecticide applications until a pest insect reaches an economic threshold level and by using the insecticides that are least harmful to beneficial insects.
Sucker control	Top the tobacco when the 50% bloom stage has been reached. Growth of suckers is controlled through the use of plant growth regulators. Typical control is through backpack sprays of maleic hydrazide or a combination of maleic hydrazide and a local systemic material.
Method of harvest	Hand-harvest plants by stalk cutting. Spear 5-6 plants onto each stick according to the size of tobacco. Leave tobacco in the field on standing sticks long enough to wilt sufficiently to handle without breakage of the leaves.
Method of curing	Air-cure in ventilated barns by placing sticks of speared tobacco 9 inches apart on the tier rails. Any temperature from 65°F to 95°F is satisfactory as long as the daily average relative humidity is between 65% and 70%. An alternative curing method is one that uses laborsaving field-curing structures covered with black plastic.

Tobacco, Burley – Annual (*Nicotiana tabacum*) (cont.)

Approximate harvest date	Aug. 15-Oct. 1
Approximate yield	2,400-2,800 lbs/A of cured leaves

Tobacco, Dark-Fired – Annual (*Nicotiana tabacum*)

Description:	See flue-cured tobacco
Uses:	The majority is exported for the manufacture of smoking tobacco, chewing tobacco and cigars. The domestic use is for dry snuff.
Seeds per oz:	330,000
Germination time:	7-12 days.
Viability of seed	6-8 years under proper conditions (temperature in °F and relative humidity should add to 100).
Fertilizer	135 lbs N, 40-100 lbs P ₂ O ₅ , and 100-175 lbs K ₂ O
pH Range	5.6-6.0
Soil adaptation	Well-drained loams and silt loams.
Planting	May 1-June 1 using 5,000-5,300 plants/A. Rows: 42-48 inches apart; plants: 24-30 inches in row.
Topping and sucker control	Plant should be topped at 12-14 leaves depending on the vigor of the plant after the bud has formed, before the flowers begin to open. Growth of suckers is controlled through the use of plant growth regulators. Foliar sprays of contact fatty alcohols and maleic hydrazide (in sequential applications) are effective with minimal hand labor. Alternative control uses treatment of individual plants with local systemic plant growth regulators.
Method of harvest	Cutting stalk.
Method of curing	Numerous small, smoldering fires on the barn floor. Hardwood or sawdust may be used to generate smoke. Smoke several times during the 6-week curing period.
Approximate harvest date	Aug. 15-Sept. 1
Approximate yield	1,200-2,500 lbs cured leaf

Tobacco, Flue-Cured - Annual (*Nicotiana tabacum*)

Description	Central taproot with numerous short lateral roots. Single round stem 4-8 feet tall when not topped. Leaves are alternate, forming an ascending spiral up the stem. Leaves are 1 foot or more in width and 3-4 feet long, with a unique ability to accumulate nicotine. All green parts of the plant are covered with sticky hairs. Flowers are pink or rose-colored and self-pollinated. The crop is grown from transplants historically produced in plant beds but now typically produced in greenhouses.
Uses	Primarily used in cigarettes. Approximately 40% is exported as unmanufactured leaf.
Seeds per ounce	330,000
Germinating time	7-12 days
Viability of seed	6-8 years under proper conditions (temperature in °F and relative humidity should add to 100).
Fertilizer	50-80 lbs N, 40-100 lbs P ₂ O ₅ , and 100-150 lbs K ₂ O. If necessary, topdress with a nitrate source of N. Use materials low in chlorine (less than 2%).
pH range	5.5-6.0
Soil adaptation	Well-drained soils with sandy loam surface and sandy clay loam subsoils.
Time of planting	Transplant between April 25 and May 20.
Rate of planting	6,000-6,500 plants per acre; 44-48 inch rows, plant 20-24 inches in row. The optimal number of leaves per acre is 110,000-120,000.
Side-dressing	Pre-plant fertilizer rates should not exceed 40 lbs of N and 120 lbs K ₂ O per acre. Additional N and K ₂ O can be applied as a side application to obtain the total amount of nutrients desired. Side-dressing applications of the base rate of nutrients should be made as soon as the stand is established. When leaching occurs, N and K ₂ O in addition to the base amounts recommended may be necessary. The quality of N and K ₂ O required depends on the amount of water that percolates through the plow layer and the stage of plant growth at the time this occurs.
Topping	Plants should be topped at the button to early flower stage of development, which is about the time harvest begins. Plants should be topped at 17-22 leaves, depending on plant vigor and weather conditions.
Suckering	After topping, suckers develop in the leaf axils and should be removed or controlled. Growth and suckers is controlled through the use of plant growth regulators. Foliar sprays of contact fatty alcohols and maleic hydrazide (in sequential applications) are effective with minimal hand labor. Alternative control uses treatment of individual plants with local systemic plant growth regulators.
Method of harvest	Leaves harvested individually by removing or priming as ripening begins at the bottom of the stalk and progresses upward.
Method of curing	Typically in bulk curing barns following a schedule lasting 6-7 days regulating temperature and drying rate. Supplemental heat (maximum 165-170°F) is required to yellow the leaf, dry the lamina, and finally dry the leaf midrib.

Tobacco, Flue-Cured – Annual (*Nicotiana tabacum*) (cont.)

Approximate harvest date	Typically, 3 harvests or primings as leaves ripen. Harvest period may last 8-12 weeks, beginning as early as mid-July and ending as late as October.
Approximate yield	2,000-3000 lbs of cured leaves/A

Tobacco, Sun-Cured – Annual (*Nicotiana tabacum*)

Description	See Flue-Cured Tobacco. Smaller plants than flue-cured.
Uses	Primarily exported for making smoking and chewing tobacco. A small portion is used domestically for plug chewing tobacco.
Seeds per ounce	330,000
Germination time	7-12 days
Viability of seed	6-8 years under proper conditions (temperature in °F and relative humidity should add to 100).
Fertilizer	125 lbs N, 40-100 lbs P ₂ O ₅ , and 100-175 lbs K ₂ O
pH range	5.6-6.0
Soil adaptation	Well-drained loams and silt loams.
Time of planting	May 1-June 1
Rate of planting	5,000-5,300 plants/A. Rows: 3 1/2 feet; plants: 28-30 inches in row.
Topping and sucker control	Plants should be topped at 12-14 leaves, depending on the vigor of the plant after the bud has formed, before the flowers begin to open. Growth of suckers is controlled through the use of plant growth regulators. Typical control is from hand application of a local systemic plant growth regulator to individual plants.
Method of harvest	Cutting stalk.
Method of curing	Air-cured in barns constructed to permit good ventilation. Heat needed only in periods of extremely high humidity.
Approximate harvest date	Aug. 15-Sept. 1
Approximate yield	1,000-2,000 lbs/A

Tobacco Greenhouses

Production system	Transplants typically grown in Styrofoam plug trays floating in shallow plastic-lined pools containing a nutrient solution. An overhead-watered production system using plastic plug trays is an alternative production system.
Plant density	80-157 plants per sq ft in trays containing 200-392 plants.
Time of planting	Seed greenhouse with highest quality pelletized seed approximately 7-8 weeks before expected transplanting.
Fertilization	Use a complete (N-P ₂ O ₅ -K ₂ O) water-soluble fertilizer. More than 50% of fertilizer N should be derived from nitrate N. Fertilizer is added to the nutrient solution at a concentration of 100-150 ppm N.
Clipping	Clipping with a rotary mower is used to increase transplant uniformity, remove excess foliage, and regulate seedling growth. Clipping should begin when seedlings are 2-2 1/2 inches tall to the bud and clip 1-1 1/2 inches above bud. Clip 4-6 times before transplanting, raising blade height with successive clippings. Proper sanitation is critical for disease prevention.

Tobacco Plant Beds

Seeding	1/8-1/6 ounce of seed per 100 sq yards of bed
Plant bed space	75-100 sq yards/A to be transplanted
Fertilizer	1/2-3/4 lb of 12-6-6 to each sq yard
Soil adaptation	Locate beds near a source of clean water on well-drained, sandy loams or loams. Do not locate beds in a shady area or in low-lying areas along creeks or rivers.

Vetch, Hairy - Annual (*Vicia villosa*)

Description	Semi-viney legume with tendrils; hairy plants; stems 3-5 feet long; flowers bluish violet and white.
Uses	Hay, pasture, and winter cover. Sometimes called winter vetch. Because of the hardness of the seed, it often becomes a weed in small grain crops that follow.
Weight per bushel	60 lbs
Seeds per pound	21,000
Germinating time	14 days
Fertilizer	90-120 lbs P ₂ O ₅ and 60-90 lbs K ₂ O
pH range	6.0-6.5
Inoculation	Important: Cross-inoculates with garden peas and field peas.

Vetch, Hairy – Annual (*Vicia villosa*) (cont.)

Soil adaptation	Well-drained to moderately well-drained sandy loams to clay loams.
Time of planting	Aug. 1–Nov. 1, depending on location. Plant 20–30 lbs alone; 10–15 lbs in mixtures; usually mixed with 1/2–1 bushel of small grain. Plant in 6–8 inch rows with small grains or solid-seeded.
Harvesting (hay)	When seeds in the lower half of the plants are half-developed.
Harvesting (seed)	Cut when first pods are well-developed.
Approximate harvest dates	Hay: May 1–June 1
Approximate yield	Hay: 1–2 tons, or seed: 200–600 lbs/A

Weeping Lovegrass – Perennial (*Eragrostis curvula*)

Description	A warm-season perennial bunchgrass. Long, slender, drooping leaves that grow to a height of 2–5 feet but usually do not remain upright. Seedhead is an open panicle, 6–10 inches long. Produces relatively poor-quality pasture and hay. Several varieties available. Virginia is the northern limit of the adapted area.
Uses	Limited hay and pasture, relatively low in palatability. Its primary use in Virginia is for soil stabilization and critical areas.
Seeds per pound	1,500,000
Germination time	14 days
Fertilizer	40–50 lbs N, 60–70 lbs P ₂ O ₅ , and 40–50 lbs K ₂ O
pH range	4.5–6.2. Tolerance to low pH enhances its value for soil stabilization.
Soil adaptation	Best adapted to sandy soils but will grow in heavier soil types.
Time of planting	April 15–June 1 is best but can also be seeded June 1–Aug. 15; 1–2 lbs in rows; 2–3 lbs solid-seeded.
Harvesting	Cut for hay before seedhead forms. For grazing: stock at high rates to use all forage and then rotate as needed.

Wheat – Annual (*Triticum aestivum*)

Description	Dark green leaves with short hairy auricles and long ligule. Seeds thresh free of their husks and are caramel-colored with smooth surface and a whitish brush on the end opposite the germ. Soft red wheat is the traditional class of wheat grown in Virginia.
Uses	Grain, grazing, and cover crops.

Wheat - Annual (*Triticum aestivum*) (cont.)

Weight per bushel	60 lbs
Seeds per pound	13,000-16,000
Germinating time	7 days at 65°F; 14 days at 50°F
Fertilizer	20 lbs of N in the fall plus 40-80 lbs each of P ₂ O ₅ and K ₂ O at medium soil test levels. Topdress with 30-50 lbs N in February if the stand is thin or shows obvious N deficiency. Additional N should be applied in late March (40-80 lbs).
pH range	5.8-6.2
Soil adaptation	Any moderately well-drained or well-drained soil.
Time of planting	One week before to one week after the first killing frost, Oct. 15-Nov. 15 in Eastern Virginia; Oct. 1-Nov. 1 in the Piedmont; Oct. 1-25 west of the Blue Ridge. Plant 120-150 lbs per acre (36 seeds per sq ft or 20 seeds per drill foot in 7-inch rows). Plant in 6-8 inch rows or solid-seeded.
Harvesting	Combine when fully ripe at 10%-15% moisture. Cut for silage in the soft dough stage.
Approximate harvest dates	June 20-July 10
Approximate yield	50-100 bushels grain; 8-12 tons 35% dry matter silage/A

White Clover, Common - Perennial (*Trifolium repens* var. *latum*)

Description	Low-growing, short-lived legume; smooth leaves with 3 leaflets; shallow-rooted; spreads by soil surface stolons that root at nodes; white flowers.
Uses	Pastures, especially with bluegrass. Tolerates close, continuous grazing.
Weight per bushel	60 lbs
Seeds per pound	700,000
Germinating time	10 days
Fertilizer	With bluegrass at seeding, 0-20 lbs N, 90-120 lbs P ₂ O ₅ , and 60-90 lbs K ₂ O. For topdressing, 60-100 lbs each of P ₂ O ₅ and K ₂ O every 3-4 years.
pH range	5.8-6.5
Inoculation	Cross-inoculates with alsike, crimson, ladino, and red clover.
Soil adaptation	Well-drained and moderately well-drained loams and silt loams.
Time of planting	45 days before last killing frost in spring or 30 days before first killing frost in fall using 1-2 lbs in mixtures.

White Clover, Ladino – Perennial (*Trifolium repens latum*)

Description	Giant variety of white clover that resembles white clover in every respect except size.
Uses	Primarily for pasture with tall growing grasses such as orchardgrass. May be used for silage and hay, but hay is difficult to cure. Less persistent and grazing tolerant than common white clover.
Weight per bushel	60 lbs
Seeds per pound	700,000
Germinating time	10 days
Fertilizer	Alone at seeding: zero N, 90-120 lbs P ₂ O ₅ , and 60-90 lbs K ₂ O. Topdressing: no N, 30-40 lbs P ₂ O ₅ , and 30-60 lbs K ₂ O annually.
pH range	6.0-6.5
Soil adaptation	Well-drained and moderately well-drained loams and silt loams.
Inoculation	Important: Cross-inoculates with alsike, crimson, red, and white clovers.
Time of planting	30-60 days before the average date of the first killing frost in fall or 30-45 days before the average date of the last killing frost in spring. Fall seedings are preferred, especially in the Tidewater area. Plant 1-2 lbs with grasses. May be seeded alone at a rate of 3-5 lbs when used for hog or poultry pasture.

Zoysia (Japanese Lawn Grass) – Perennial (*Zoysia japonica Steud.*); Korean or Matrella Lawn Grass (*Zoysia matrella L.*)

Description	Closely resembles bermudagrass. Spreads by stolons and short rhizomes. Turns brown with frost but greens up earlier than bermuda in the spring. Ligule is a fringe of hairs with some hairs found on the upper surface of the leaf blade. Forms a dense turf with leaves upright, which provides more cushion than bermuda. Flower is a weak spike and is seldom branched.
Uses	General lawn areas. Sometimes used for lawns, athletic fields, and play areas.
Growth habit	Often sod-forming with both stolons and rhizomes. Slow-growing, particularly in areas having cold nights. <i>Matrella</i> is similar to <i>Japonica</i> except for a finer texture.
Climatic adaptation	Both species have low moisture requirements. <i>Japonica</i> is best adapted to the intermediate zone between cool-humid and warm-humid regions. <i>Matrella</i> is a warm-season grass best adapted to warmer sections of warm-humid regions. Severely injured by cold weather. Becomes dormant early in fall and starts late in spring.
Soil adaptation	Grows best on soils of medium or good fertility; will survive at low fertility levels. Tolerates medium acidity but needs good drainage. Moderately shade-tolerant.
Fertilizer	For fertilizer and other management practices, see Turfgrass section.

Zoysia (Japanese Lawn Grass) – Perennial (*Zoysia japonica Steud.*); Korean or Matrella Lawn Grass (*Zoysia matrella L.*) (cont.)

Method of establishment	Sod, sprigs, and plugs. The latter two are slow to establish, usually requiring at least 2 seasons.
Time of planting	Spring: 4-7 bushels/100 sq ft from May 15-July 1 in Northern Piedmont and mountains; and April 30-July 15 in Coastal Plains and Southern Piedmont. Plugs: 4,000 on 6-inch centers/1,000 sq ft. Plant from May 1-July 15 in Northern Piedmont and mountains, and April 15-Aug. 1 in Coastal Plains and Southern Piedmont.

