



King's AgriSeeds^{Inc.}

FEEDING YOUR FARM'S FUTURE.

PRODUCT INFORMATION GUIDE



Are You Ready for Change?

The truth of the matter is change is inevitable, whether we like it or not. Agriculture is constantly in flux, may it be market conditions that include commodity prices, niche markets and newly emerging crops; weather patterns and trends; land and other input costs; even government policies- just to name a few. It seems very likely with the results of the 2024 presidential election that we may expect to see some significant changes in agriculture on the horizon. Although it is too early to know details at the time of writing, I challenge us to focus on the opportunities that may arise from change.

King's AgriSeeds, founded on meeting the producers' unmet needs in 1993, has a rich history of serving our customers. We strive to "Feed Your Farm's Future" which implies a diverse product line to meet your changing needs. With that being said, forages and soil health building cover crops remain our primary focus. For example, as the major seed brands move away from alfalfa, we have enhanced our alfalfa line up to include top-end alfalfa blends that focus on yield, quality and persistence. In addition, our KingFisher* and Red Tail corn hybrids continue to shine in the World Dairy Expo Forage Super Bowl contest year after year- hopefully instilling you with confidence that we strive for providing products that bring you quality feed for your livestock.

We have also expanded our grain and alternative crop offering. You will find that our grain sorghum program is now one of the most solid lineups in the region. We have goals of improving other grain crop and fiber crop species as well as markets change. Diversity within reason is a key to resiliency in agriculture. What crops will provide benefits to your farming system?

This product information guide includes a multitude of species, mixtures and some biologicals, along with relevant management information that we trust will be beneficial to your farming operation.

All the best,
Tim Fritz, President

**A Note about KingFisher: KingFisher and its traited sister line, Red Tail, are a joint project of Byron Seeds, Choice Seeds, King's AgriSeeds and Southeast AgriSeeds, serving the eastern half of the United States and Canada.*

OUR MISSION

To serve the agricultural community by providing premium seed along with relevant information to our seed dealers and their customers to develop productive cropping systems. We strive for a God honoring workplace where the gifts and talents of each team member is used for His Kingdom.

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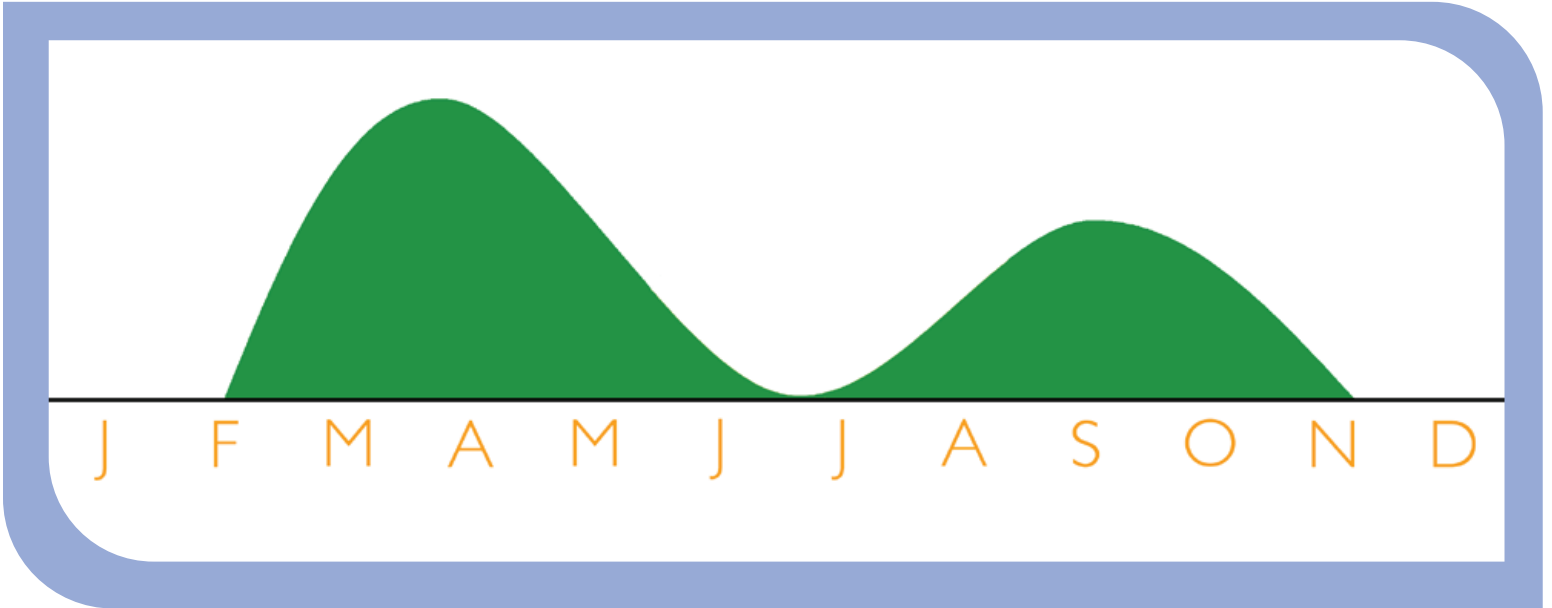


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COOL SEASON PERENNIALS



ADAPTED TO GOOD-TO-DRIER SOILS

E-Z DRY HAY

Make dry hay easily with this mixture created to dry quickly. This mixture was designed for the haymakers who want alfalfa in their bales but need quick dry down. This mixture is comprised of Meadow Brome, Orchardgrass, Alfalfa, and Timothy.

Adapted best to zones 5 to 7a.

Best Uses: Dry Hay, Fermented Forages

Seeding Rate: 20 to 30lbs /acre

Product Formula: 25% Meadow Brome
25% PLH Alfalfas
20% Inavale Orchardgrass
19% Echelon Orchardgrass
11% Timothy (early maturing)

NUTRAMAX HAY

OC/CT

This mix was balanced by a seasoned nutritionist for super high quality! It's an alfalfa, clover and highly digestible grass mix that is primarily adapted to central PA and north. Both protein and energy levels are superb.

Best Uses: Fermented Forages

Seeding Rate: 20 to 30 lbs/acre

Product Formula: 65% KingFisher Alfalfas
8% Meadow Fescue
8% Perseus Festulolium
7% Tall Fescue Type Festulolium
6% Alice White Clover
6% Freedom Red Clover

HIGHLAND HAY

OC

Contains a blend of two PLH resistant alfalfas, this mix is well suited for a management that does not include a leaf hopper spray. Highland Hay will make excellent mixed auction hay that feeds well.

Best Uses: Dry Hay, Fermented Forages

Seeding Rate: 25 lbs/acre

Product Formula: 50% PLH Alfalfas
25% Soft Leaf Tall Fescue
25% Orchardgrass

KING'S HAY PRO

A well balanced mixture of leafy late heading grasses and traffic tolerant alfalfa that makes soft hay that livestock, calves and horses love. Add it to dairy rations for a great source of high quality effective fiber to slow down rate of passage without sacrificing production.

Best Uses: Dry Hay, Fermented Forages,
Managed Grazing

Seeding Rate: 20 to 30 lbs/acre

Product Formula: 35% KingFisher Alfalfas
30% Late Heading
Orchardgrasses
25% Soft Leaf Tall Fescue
10% High Yielding Timothy

HILLSIDE

A highly palatable mixture of drought tolerant species and varieties that tolerate managed grazing well. Contains two varieties of orchardgrass, meadow brome, and a touch of perennial ryegrass to act as a nurse crop as slower, more drought tolerant species establish. Also has a lot of grazing tolerant ladino clover and improved red clover.

Best Uses: Managed Grazing, Fermented Forages

Seeding Rate: 25 lbs/acre

Product Formula: 50% Early to Mid Maturing
Orchardgrass
22% Meadow Brome
18% Tetraploid Perennial Ryegrass
5% Freedom Red Clover
5% Regalgraze Ladino Clover



King's Hay Pro

ORGANIC HAY BOSS

A well-balanced, alfalfa-grass mixture. The grasses in this mixture are not only very digestible, but also reduce potato leaf hopper pressure and help keep weeds from invading the stand. Makes a nice dry hay to feed on the farm or to sell on the hay market.

Best Uses: Dry Hay, Fermented Forages,
Managed Intensive Grazing



Seeding Rate: 25lbs /acre

Product Formula: 70% Alfalfa

10% Tall Fescue or Tall Fescue
Type Hexaploid Festulolium

10% Red Clover

10% Orchardgrass

ORGANIC STAR

Organic Star is a well balanced grass-clover mixture that is excellent for both grazing and baleage. This mixture will handle soil variability very well, although it is designed more for good to drier soils.

Best Uses: Grazing, Fermented Forages

Seeding Rate: 25 to 30 lbs/acre

Product Formula: 37% Late Heading Orchardgrass

27% Perennial Ryegrass

17% Meadow Fescue

7% Red Clover

6% Premium Timothy

6% White Clover



MADE FOR YOU

King's AgriSeeds, in conjunction with our dealer network and comments from many of you, has developed several premium perennial forage mixtures adapted to the Middle Atlantic and Northeast. All of these mixtures have great potential to make high quality forage. Selecting the best fit for your farm is primarily based on soil type and harvest methods. However, livestock needs, fertility inputs and other factors should also be considered.

SALE TOPPER

This all grass mix is primarily designed to be seeded as a stand alone crop to be fed to horses, dry cows, heifers or even milking cows. Also a great complement for new alfalfa and/or clover seedings. Includes: two premium late heading orchardgrasses, one early timothy and a late timothy to throw a few timothy heads over multiple cuttings for hay marketing purposes. Works excellent seeded with legume in small box and this mix in the large box.

Best Uses: Dry Hay, Fermented Forages

Seeding Rate: 15 to 20 lbs/acre as a stand alone seeding. 5 to 10 lbs/acre with a new seeding of alfalfa and/or clover (reduce legume seeding rate by 25 to 50%)

Product Formula: 80% Late Maturing Orchardgrass
20% Premium Timothy

SOUTHERN BRAUN

When quality, durability, and cost matters. This all-grass mix comprised of strong endophyte free tall fescue and earlier orchardgrasses is designed for zones 6b to 7b making it an ideal fit for VA, MD, DE, and Southeastern, PA

Best Uses: Dry Hay, Fermented Forages,
Managed Intensive Grazing

Seeding Rate: 20 to 30lbs /acre

Product Formula: 60% Endophyte free Tall Fescue
25% Mid Maturing Orchardgrass
15% Early Maturing Orchardgrass



ADAPTED TO GOOD-TO-WETTER SOILS

NORTHERN CREEKSIDE

A very palatable mixture of varieties and species designed for wetter soils and cooler climates. It will form a nice sod to handle hoof traffic. This mix is based on meadow fescue, which is both high quality and palatable. Best suited for USDA Hardiness Zones 4 & 5.

Best Uses: Managed Grazing, Fermented Forages

Seeding Rate: 25 lbs/acre

Product Formula: 35% Perennial Ryegrass
27% Meadow Fescue
10% Balin Kentucky Bluegrass
10% Birdsfoot Trefoil
10% Medium Maturing Timothy
7% White Clover

GREENFAST

A fast starting mix that is of very high quality. This mix can be used for wet hay and/or managed grazing. The main component, Perseus Festulolium, is very fast starting, high yielding and of excellent forage quality, but is short lived (typically 3 years). Also contains longer lived species. Can be used to thicken weak alfalfa stands and thin pastures. Best used north of the Mason Dixon Line.

Best Uses: Fermented Forages, Managed Grazing

Seeding Rate: 30 to 40 lbs/acre

Product Formula: 38% Perseus Festulolium
27% Grazing Tolerant Orchardgrass
22% Premium Perennial Ryegrass
9% Freedom! MR Red Clover
4% Alice White Clover

ORGANIC DAIRY GREEN

Superior winter hardiness along with high palatability and quality characterize this mix that will perform well on heavier soils. While best for wetter soils, it will also tolerate drought well.

Best Uses: Grazing, Fermented Forages

Seeding Rate: 25 to 35 lbs/acre

Product Formula: 42% Meadow Fescue
31% Perennial Ryegrass
13% Premium Timothy
8% Red Clover
6% White Clover



ADAPTED TO VARIABLE SOILS

BALANCER

With balanced energy and protein, this high end mixture of grasses and legumes is designed specifically to provide livestock the nutrition they need to maintain, gain and produce in the Mid-Atlantic climate. From its base of Martin II Protek Novel Endophyte Fescue to its complementary blend of clovers, this mixture has the best interest of your herd in mind! Best adapted to zones 7 & 8.

Best Uses: Fermented Forages, Grazing

Seeding Rate: 25 to 35 lbs/acre

Product Formula: 65% Martin II Protek and or
Triumphant Protek
10% Inavale Orchardgrass
10% Olathe Orchardgrass
10% Freedom Red Clover OC
5% RegalGraze Ladino Clover OC

BEEFMASTER PRO

A premium pasture mix that consists of Barenburg's best grazing tall fescues, orchardgrass, perennial ryegrass, and Alice White Clover. Excellent for beef grazing systems along with dairy heifers and dry cows.

Best Uses: Beef, Dairy Heifer, Dry Cow/Heifer
Grazing

Seeding Rate: 30 to 35 lbs/acre

Product Formula: 50% Soft Leaf Tall Fescue
20% Perennial Ryegrass
20% Leafy Orchardgrass
10% Alice White Clover

BROWSEMASTER PRO

A grazing mixture for small ruminants, complete with forbs. Makes a very attractive mixed stand. Yellow Jacket coated.

Best Uses: Grazing for goats, sheep – mixed species grazing

Seeding Rate: 22 lbs/acre

Product Formula: 36% Freedom Red Clover
28% Soft Leaf Tall Fescue
22% Hybrid Alfalfa X42
8% White Clover
6% Chicory

CLEAN & GREEN

This mix is primarily designed for conservation, but it can be used for forage also. Clean & Green will typically contain two durable endophyte free tall fescue varieties and annual ryegrass to give it quick cover while the tall fescue establishes.

Best Uses: Exercise lots, waterways, filter strips, around farm structures, bank stabilization, and cow calf operations. Can also be used as a forage.

Seeding Rate: 35 to 75 lbs/acre, depending on soil erosion risk.

Product Formula: 80% Rugged, Endophyte Free
Tall Fescue
20% Annual Ryegrass

EASYKEEPER HAY MIX

NEW

An easy to dry, all grass mix that is great for horses, dry cows, heifers, sheep, goats, and other ruminants not needing high energy. EasyKeeper will have lower carbohydrate and potassium levels due to its higher content of bromes and timothy. Its recommended laxed harvest timing is designed for 2-3 cuttings annually. EasyKeeper will also retain its green color in storage similar to its early maturing sister, EquiFlex. Management note: Delay first cut until bromes and timothy are headed out.

Best Uses: Dry Hay, Haylage/Balage

Seeding Rate: 35 to 40lbs/acre

Product Formula: 35% Succession Hybrid Brome
30% Fojtan Festulolium
15% Timothy
10% Artillery Smooth Brome
10% Barlegro Orchardgrass

EQUIFLEX FORAGE

An easy-to-dry hay mix of high-quality species designed for horse hay product that both looks exceptional for resale and performs well in the field.

Best Uses: Dry Hay, Managed Grazing.

Seeding Rate: 25 to 30 lbs/acre.

3 to 8 lbs/acre with legumes.

Note: Reduce legume seeding rate by 25 to 50% from pure stand.

Product Formula: 53% Orchardgrass
30% Meadow Brome
10% Timothy
7% Kentucky Bluegrass

GRASSPRO

An all grass mix that is great for stored forage, based on premium tall fescues as the dominant grass. Can be seeded alone or with the legume of your choice.

Best Uses: Fermented Forages, Dry Hay

Seeding Rate: 20 to 30 lbs/acre without a legume
3 to 8 lbs/acre with legumes.

Note: Reduce legume seeding rate by 25 to 50% from pure stand.

Product Formula: 50% Kora and Soft Leaf Tall Fescue
38% Premium Late Heading Orchardgrass
12% European / Premium Timothy

GRASS MAXX

A rugged mix of Martin II and or Triumphant Protek novel endophyte tall fescue with early orchardgrass. Grass Maxx provides the diversity you need in a hayfield or pasture while giving you the option of broadleaf weed control during the establishment year. After establishment, frost-seeding a clover or clover blend into the stand in late winter can be a great option to thicken the stand further and boost protein.

Best Uses: Fermented Forages, Dry Hay, Grazing

Seeding Rate: 20 to 30 lbs/acre

Product Formula: 60% Martin Protek II and or Triumphant Protek
20% Inavale Orchardgrass
20% Olathe Orchardgrass

HORSE SUPREME

Horse Supreme is excellent for all classes of livestock. Forage type Kentucky Bluegrass gives this mix excellent longevity and dense cover. Meadow brome and grazing tolerant orchardgrass add drought productivity while the diploid ryegrass gives it a quick start and excellent spring and fall production. A touch of white clover has been added for nitrogen production.

Best Uses: Continuous & Managed Grazing

Seeding Rate: 25 lbs/acre

Product Formula: 37% Grazing Tolerant Orchardgrass
20% Meadow Brome
20% Diploid Perennial Ryegrass
15% Balin Kentucky Bluegrass
6% Premium Timothy
2% White Clover

KING'S NORTHERN GRAZING MIX

A highly palatable mixture of winter hardy perennial ryegrasses, soft orchardgrasses, meadow fescue, clovers and forage chicory. Excellent for high producing livestock including dairy, grass finished beef and goats. Ideal for good soils that have high fertility. Chicory is included for better mineral nutrition and other animal health benefits. Adapted to USDA Hardiness Zones 4 & 5.

Best Uses: Managed Grazing, Fermented Forages

Seeding Rate: 25 to 35 lbs/acre

Product Formula: 35% Perennial Ryegrass
25% Grazing Tolerant Orchardgrass
25% Meadow Fescue
7% Medium Red Clover
6% White Clover
2% Chicory

KING'S SOUTHERN GRAZING MIX

A highly palatable mixture that is excellent for high producing livestock including dairy, grass finished beef and goats. Ideal for good soils that have high fertility. Chicory is included for better mineral nutrition and other animal health benefits. Adapted to USDA Hardiness Zones 6a, 6b & 7a.

Best Uses: Managed Grazing, Fermented Forages

Seeding Rate: 25 to 35 lbs/acre

Product Formula: 33% Perennial Ryegrass
33% Grazing Tolerant Orchardgrass
25% Meadow Brome
7% Medium Red Clover
6% White Clover
2% Chicory

LOWLAND HAY

A late heading mix that tolerates wetter soils and has a wide harvest window. Tall fescue adds consistent high fiber digestibility, superb yields and traffic tolerance. This mix includes a very late heading timothy that dries easily and does not absorb high potassium levels. This mix can also be blended with alfalfa on marginal alfalfa soils.

Best Uses: Fermented Forages, Dry Hay

Seeding Rate: 20 to 25 lbs/acre

Product Formula: 60% Kora and Soft Leaf Tall Fescue
20% European / Premium Timothy
20% Freedom & Clifford Red Clovers

MILKWAY



A mix of meadow fescue and soft leaf tall fescue for high quality, highly digestible forage. Milkway is traffic tolerant and can sustain multiple manure or N applications. Excellent with or without legume. Superior for dairies!

Best Uses: Fermented Forages, Dry Hay, Possible Grazing

Seeding Rate: 35 to 40 lbs/acre

3 to 10 lbs with legumes.

NOTE: Reduce legume seeding rate by 25 to 50% from pure stand.

Product Formula: 50% Meadow Fescue
50% Soft Leaf Tall Fescue

ORGANIC PARTNER

An all grass mixture that will give both high quality forage plus yield across many soils. Can be seeded alone or with the legumes of your choice. Use the large box for the grasses and the small box for the legumes.



Best Uses: Dry Hay, Fermented Forages

Seeding Rate: 20 to 30 lbs/acre without a legume
3 to 8 lbs/acre with legumes.

NOTE: Reduce legume seeding rate by 25 to 50% from pure stand.

Product Formula: 60% Kora Tall Fescue
25% Late Maturing Orchardgrass
15% European / Premium Timothy

Paddock EX

NEW

Ideal for exercise lots and sacrifice lots. Paddock EX, an all grass mixture made up of, Tall Fescue, Kentucky Bluegrass and Perennial Ryegrass. Very tolerant to the traffic pressure of equine, cattle and other livestock, and will persist under heavy utilization. Optimal performance depends on adequate hay and appropriate paddock rest periods. All forages are endophyte-free, safe for all livestock.

Best Uses: Exercise Lots, High Traffic Areas

Seeding Rate: 50 to 75lbs /acre

Product Formula: 65% Endophyte Free Tall Fescue
20% Kentucky Bluegrass
15% Perennial Ryegrass

VERSA

An all grass mixture with very good drought and heat tolerance. Featuring Fojtan Festulolium, good durability and strong quality but not as aggressive in pushing out other grasses as tall fescue.

Best Uses: Dry Hay, Fermented Forages

Seeding Rate: 15 to 30 lbs/acre straight seeding,
2 to 10 lbs/acre with legumes.

NOTE: Reduce legume seeding rate by 25 to 50% from pure stand.

Product Formula: 70% Tall Fescue type Festulolium
30% Early and Mid maturing Orchardgrass.



Versa is a versatile grass mixture that remains balanced over time.

DRILL CALIBRATION

Calibration of equipment by trial and error over several acres into planting can be costly in many ways and quite often profitable for your seed supplier. Seed lots and species vary in their flowability. To calibrate your seeding equipment right, all you need is a calculator, measuring tape, a small accurate scale, and something to collect seed before it is planted, such as a plastic sandwich bag and rubberbands or a small bucket wedged in place. A postage scale or dietary scale are adequate. It really does not take a lot of time and pays off in the big picture. Call us with your row spacing and we can send you a calibration chart.



STEPS TO DROP SEEDER CALIBRATION

1. Place tray or Half PVC Pipe under seed dispenser.
2. Make sure the Tray or Half PVC is attached to the drill securely.
3. Engage seeder and drive 100 feet.
4. Measure the amount of seed dispensed in grams or oz. (convert grams or ounces to lbs.)
5. Using the chart to the right, calculate the acceptable amount of seed.
Ex. If you are using a 5.5" row spacing, with 16 rows and collect a total of 6.24oz, or .39oz/row, you are seeding between 20 and 25 lb / acre.
6. If depth or rate is off, make adjustments and redo until acceptable.
7. Check for seed to soil contact. Soil needs to be firm.

SMALL SEED ESTABLISHMENT TIPS

1. Note soil types (droughty, wet, etc.)
2. Soil test and apply fertility before tillage. Lime should ideally be applied 6-12 months in advance.
3. Control perennial weeds prior to land preparation.
4. Select appropriate mixture for soil types, livestock and marketing needs and harvest management.
5. Determine ideal seeding time for your local area. (Late winter to early spring or late summer is usually ideal.)
6. Prepare a level, firm seedbed, or if using no-till, control vegetation prior to seeding with appropriate nonresidual herbicide.
7. Calibrate seeder for appropriate seeding rate and depth.
 - a. Our mixtures work best in the large box.
 - b. Call for a calibration sheet. Need to collect and weigh seed over a small distance to determine seeding rate.
 - c. Seed at 1/8 to 1/4" with about 10% of seed on surface.
 - d. Press wheels and/or cultipacking are critical to a good seeding. If conditions are dry, cultipacking twice is very beneficial.

Example: 5.5" Row Space Drill

Goal	Collection Per Row Needed
10 lb/acre	0.17 oz or 4.8 grams
15 lb/acre	0.25 oz or 7.2 grams
20 lb/acre	0.34 oz or 9.6 grams
25 lb/acre	0.42 oz or 11.9 grams
30 lb/acre	0.51 oz or 14.3 grams

Example: 7" Row Space Drill

Goal	Collection Per Row Needed
10 lb/acre	0.21 oz or 6.1 grams
20 lb/acre	0.43 oz or 12.2 grams
30 lb/acre	0.64 oz or 18.2 grams
40 lb/acre	0.86 oz or 24.3 grams

Example: 7.5" Row Space Drill

Goal	Collection Per Row Needed
10 lb/acre	0.23 oz or 6.5 grams
20 lb/acre	0.46 oz or 13 grams
30 lb/acre	0.69 oz or 19.5 grams
40 lb/acre	0.92 oz or 26.1 grams



ALFALFA King's selects alfalfas for forage quality, persistence and yield. All of these listed have excellent leaf to stem ratios, impressive disease resistance, yield and winter hardiness. These products are the latest, superior varieties on the market. Let these alfalfas work for you by choosing the product(s) that are most adapted to your management and soils. Our recommended seeding rate for straight stands of alfalfa is 18 to 22 lbs/acre.

KINGFISHER EXPANDER 470HD OC **NEW**

Expander 470HD alfalfa is a high yielding, highly digestible rhizomatous stemmed variety (creeping root). This variety also has a combination of sunken crowns, along with branch and tap roots that will result in excellent traffic tolerance and longevity.

- Fall Dormancy: 4.3
- Winter Survival: 1.7
- Disease Rating: 35/35

KINGFISHER 435HD CT/OC

A next generation high digestibility alfalfa, and was bred for quality. It has an excellent agronomic package that provides a very persistent and healthy plant for top production over a broad range of soils.

- Fall Dormancy: 4.6
- Winter Hardiness: 1.7
- Disease Rating: 35/35

KINGFISHER PLH 422 OC

A high performing PLH resistant variety of alfalfa. In addition to the Potato Leaf Hopper resistance, PLH 422 features multifoliate leaf structures for a high leaf to stem ratio.

- Fall Dormancy: 4.2
- Winter Hardiness: 2.4
- Disease Rating: 30/30

KINGFISHER PLH 433 OC **NEW**

KingFisher PLH 433 Alfalfa is a glandular haired alfalfa that performs well under potato leaf hopper pressure. KF PLH 433 is highly competitive in yield to non PLH varieties under a spray program.

- Fall Dormancy: 4.2
- Winter Hardiness: 1.7
- Disease Rating: 33/35

KINGFISHER STRONGHOLD 35-2 CT/OC

Stronghold brings a great defense to our alfalfa lineup. It features a sunken crown for great traffic tolerance, and branched roots keep it firmly in the ground and keeps more roots above the water table.

- Fall Dormancy: 4.3
- Winter Hardiness: 1.8
- Disease Rating: 35/35

44 MAG ORGANIC ALFALFA OC

A very high-yielding, persistent, branch rooted alfalfa that has excellent plant health & strong disease resistance.

- Fall Dormancy: 4.8
- Winter Survival: 2.0
- Disease Rating: 30/30



KING'S ECONO ALFALFA CT/OC

A solid alfalfa that is priced very competitively. Good agronomics and quality.



ALFALFA BLENDS The strength of our KingFisher SynergyX alfalfa combinations are the power of synergy—mutually advantageous combined action. Instead of competing, the varieties in the SynergyX combinations work together with their strengths to produce yield and longevity above what each individual variety could do by itself. The varying root systems of SynergyX alfalfas consistently feed the plants for better resilience in extreme weather patterns. These differences work together to bring a consistency in the yield across the field. Raising the yields of the poor spots in your field and bringing greater consistency to every square foot is probably the biggest way our SynergyX alfalfas bring more yield to your farm.

KINGFISHER SYNERGYX BLAZE HD2 OC NEW

A combination of our HD varieties with varying root and crown features. High digestibility, Increased NDFD30 and lower uNDF240, blazing yield and persistence combined for best performance. Use SynergyX Blaze HD2 for highest digestibility and yields.

- Fall Dormancy: 4.3
- Winter Survival: 1.8
- Disease Rating: 35/35

KINGFISHER SYNERGYX FORTRESS OC NEW

A combination of our two sunken crown varieties that tolerate headlands and high traffic areas. Fortress will also resist winter heaving and will have overall excellent persistence. Use SynergyX Fortress for best performance and persistence in heavy traffic conditions, including heavy equipment like manure spreaders.

- Fall Dormancy: 4.3
- Winter Hardiness: 1.8
- Disease Rating: 35/35

CT= Conventional Coating
OC= OMRI Approved Organic Coating
RR= Round Up Ready
Coating includes inoculant.

KINGFISHER SYNERGYX HYDRO-POWER OC NEW

A combination of an alfalfa blend with red clover added bringing many benefits. Benefits include improved performance on wet, clay soil types, along with higher yields in the seedling year. Use SynergyX Hydro-Power for high yields on heavier soils that may be a little wet at times.

- Fall Dormancy: 4.3
- Winter Hardiness: 1.8
- Disease Rating: 35/35

KINGFISHER SYNERGYX IGNITE OC NEW

Our most genetic diversified blend that features high yield, varying root and crown characteristics. Use this blend for highest yield and quality on well drained soils.

- Fall Dormancy: 4.2
- Winter Survival: 1.8
- Disease Rating: 35/35

ROUNDUP READY™

ALFALFA Genetically modified alfalfa, able to withstand glyphosate applications.

NEXGROW 6423R ALFALFA RR NEW

Top Ultracut alfalfa disease package variety in the roundup ready lineup with extreme cold tolerance. Excellent choice for poor soils.

- Fall Dormancy: 4.3
- Winter Hardiness: 1.4
- Disease Rating: 40/40

NEXGROW 6441 HVXR ALFALFA RR NEW

Harvxtra Alfalfa with roundup ready technology. Improved UltraCut disease resistance, cold tolerance, persistence and HarvXtra forage quality. Offers excellent harvest flexibility for optimal balance of quality and yield.

- Fall Dormancy: 4.4
- Winter Hardiness: 1.6
- Disease Rating: 39/40

WHITE CLOVER is the backbone legume of grazing systems and can be mixed with other species in wet hay systems. What makes our white clovers different? Focused on forage growth, these varieties grow larger, and recover quick. They are high quality and excel agronomically.

Seed 2 to 4 lbs/acre.

ALICE

OC

Alice is a tall, large-leafed clover developed for exceptional yields of palatable, high quality, high protein forage. Its vigorous spring and summer growth makes it a good choice for cutting or grazing management. Alice has greater stolon density than most ladino types, allowing for better persistence under intensive, continuous grazing.

KAKARIKI

OC

A large-leafed clover boasting high stolon density, high yields and excellent rooting. This combination provides increased yields and greater persistence. Ideal for both hay and grazing.

KLONDIKE LADINO

OC

A quick growing, large leaf clover. Include with pasture seeding or overseed into pastures.

Only available in organic 

LADINO WHITE CLOVER VNS

OC **NEW**

A taller type of white clover that can be used for various soil health and livestock applications. Plant ladino white clover for living mulch, erosion protection, green manure, and beneficial insects.


RENOVATION

OC

Renovation was bred for increased stolon density utilizing a combination of long-living Southern Plain ecotypes and disease resistant ladino types. The result is increased persistence, even under grazing. Increased stolon density also makes it ideal for erosion control and long term conservation.

RIVENDEL

OC

A shorter and small leaved white clover that is very persistent in pastures. Very suitable for both cattle and sheep grazing. **Only available in organic.** 

ALSIKE CLOVER is available in VNS only. Alsike clover is adapted to cool, moist, acidic soils and can tolerate more flooding than other clovers. Blooms continue throughout the season, making it suitable for hay over an extended window. Excellent winter-hardiness, intolerant of drought and extreme heat.

Seed 6 to 8lbs/acre, alone.

Not appropriate for equine feed.

RED CLOVER is more drought tolerant and productive than white clover, but not quite as high quality. Use some of each for grazing. Red clover is more tolerant of wet soils and lower pH than alfalfa.

Seed 6 to 8 lbs/acre in mixtures. 20 lbs/acre alone.


CLIFFORD

OC

Named for its very large leaf size, this exciting new medium red clover was selected from premium genetics to deliver high quality forage during multiple harvests over multiple years. A great choice for both dairy and beef producers.

COMMON MEDIUM VNS

OC/CT

A short lived, lower cost red clover. Common Medium is good for cover crop programs or frost-seeding into pastures. **Also available in organic.** 

FREEDOM MR

OC

Freedom MR is bred for yield, persistence and easier drydown as it has less pubescence. (hair) MR is a selection with exceptional resistance to mildew (MR). Great overall palatability and forage quality.

HARMONIE

OC

A European variety with good late season cuts.

Only available in organic. 



MILVUS RED CLOVER

OC

A popular choice for northern areas Zone 4,5 & 6a. A strong European Red Clover bred for persistence. Second year productivity is remarkably high. Milvus belongs to the "Mattenklee" family which can be described as "mat clovers" that produce stolens (runners) . Milvus has the ability to fill in the gaps, a major advantage compared to other varieties.

REDKIN

OC

A new Kentucky bred red clover that has excellent persistence and potato leafhopper resistance that results in excellent productivity.

FORBS are broadleaf forages. Many farmers may consider them weeds, but forage quality can actually be quite high, including medicinal properties. Chicory, plantain and dandelion are a few examples of forbs that are good grazing species.

Because of its very high energy, chicory boosts milk production and is fantastic for fattening lambs and steers. It will not persist if it doesn't have a 25 day rest period between grazings. However, it really boosts first year production in new seedings of dry land pastures. It's very high in mineral content and digestibility, low in lignin, and high in protein.

FORB FEAST CHICORY

OC

Forb Feast Chicory is a high quality, reduced bolting chicory blend. Reduced bolting means better feed value throughout the season. An excellent source of digestible energy, protein and minerals, with key anti-parasitic properties in small ruminants.

Seed 2 to 5 lbs/acre.

Our **CLOVER** mixes combine species to create a balanced solution to perennial hay and grazing ground. By combining red and white clovers we get short term aggressive yield and a long term durability clover stand.
Seed 4 to 6 lbs/acre.

CLOVER POLLINATOR MIX

OC

This mixture of clovers is purposefully designed to attract pollinators. The variable maturity/flowering within the mixture allows for a full season attractant. Best suited to fall plantings.

Product Formula: 27% Yellow Blossom Sweet Clover
18 % White Sweet Clover.
18% Crimson Clover
9% Kakariki White Clover
9% Ladino Clover
9% Balansa Clover
9% Alsike Clover

PREMIUM CLOVER MIX

OC

A mixture of our best perennial clovers. Red and white clovers combine to make a mixture that is great for interseeding into thinning alfalfa or grass stands, frost seeding or combining with your favorite grass mixture. Varieties utilized are hardy and long lived.

BIRDSFOOT TREFOIL

A non-bloating legume that holds quality well and provides tannins that benefit livestock. Even though the yield is not robust the animal productivity benefits are high.

Seed 20 to 25lbs/acre.

BRUCE BIRDSFOOT TREFOIL OC **NEW**

Bruce Birdsfoot trefoil is a newer variety bred in Nova Scotia. It was bred for higher plant vigor, improved soil borne disease resistance, and adaptation to both haying and grazing. Superior spring growth with excellent regrowth.

Red Clover Improves Protein Utilization And Protection

If your rations have too much NPN (non protein nitrogen), consider adding red clover to your forage system. During ensiling, red clover has 30 to 90% less conversion of protein to NPN than alfalfa.

BROMEGRASS The brome grass family is quite diverse from each other in their use and areas of adaption. Bromegrasses have larger seed size than other grasses, so attention to drill calibration is important.

SUCCESSION HYBRID BROME **NEW**

Succession Hybrid Brome is a cross between smooth brome and meadow brome. Its above ground growth habit and maturity is similar to smooth brome, but it has faster regrowth and more summer productivity. Wide harvest window, and ideal for growing with other grasses, since it does not have rhizomes and will not dominate the stand.

Seed 20 to 30lbs/acre.

ARTILLERY SMOOTH

Artillery is a drought-tolerant, productive smooth bromegrass. It is rhizomatous and early-maturing, and was developed from selections from arid regions of Turkey, Iran, Spain and Mongolia. The developed population was then selected in Oklahoma high stress conditions that included no irrigation with low nitrogen input.

Seed 30 to 40 lbs/acre.

ARSENAL MEADOW

A new release Barenbrug variety selected for drought tolerance. Arsenal's selection focused on plant vigor, seedling emergence from a deep planting depth, forage and seed yield, and seed mass under dry land environments.

Seed 35 to 45 lbs/acre.

CACHE MEADOW BROME

Developed by USDA-ARS for improved seedling establishment and increased forage yields. It is widely used for hay, pasture and forage production.

Seed 25 to 30 lbs/acre.



FESTULOLIUMS are crosses between ryegrass and tall fescue or meadow fescue. The variety differences can range from short lived to perennial. They also range in their agronomic traits from ryegrass-like to fescue-like.

Seed 30 to 40 lbs/acre.

FOJTAN

Fojtan is a tall fescue type festulolium with great nutritional qualities. The appearance of Fojtan is much like tall fescue and the two species share many properties: very high yield potential in combination with high persistence, drought resistance and tolerance to periodic flooding. What separates Fojtan from other festuloliums is the higher feeding value and it is less aggressive, so it works well in mixtures.

Also available in organic.



PERSEUS

Perseus is a three year Italian Ryegrass type that is later maturing than Perun. Perseus is a cross between Italian ryegrass and meadow fescue and belongs to the Italian ryegrass type of festulolium. The result is a variety with a very vigorous growth during spring and fall, with quality similar to perennial ryegrass. Best adapted to zones 4 and 5.

KENTUCKY BLUEGRASS

is a shorter-height, sod-forming grass that makes a nice, smooth-looking pasture. Bluegrass spreads by rhizomes and can survive very short grazing. The majority of its forage production is in the spring and fall, with its yields usually being relatively low compared to most other pasture species. Its persistence is excellent, but establishment is slow. Bluegrass seed is very fine, and a little seed goes a long way.

Seed 15 lbs/acre.

BALIN

Balin is a fast establishing, taller bluegrass. Balin is one of the few, true forage Kentucky bluegrasses on the market.

MEADOW FESCUE, a very winter hardy species with forage quality similar to ryegrass. It is very palatable but lower yielding than tall fescue. It does very well in variable soil conditions. We only recommend it to be planted as part of a mixture. It will fit organic farms well in that it does not have as high of a nitrogen requirement, but is still of high quality. Less summer headiness than perennial ryegrass. Meadow fescue is best adapted to USDA Hardiness Zones 4 and 5, which includes areas that are north of I-80 or areas further south with high elevation with good summer rainfalls. **Seed 35 to 45 lbs/acre.**

HDR BLEND

HDR stands for High Disease Resistance. The quality and palatability of HDR approaches that of ryegrass.

LIHEROLD

A strong variety with exceptional spring yield. Liherold is an earlier meadow fescue, making it an ideal component for grazing mixtures. Liherold will be included in many of King's grazing mixtures.

SCHWETRA MEADOW FESCUE **NEW**

Schwetra is a tetraploid meadow fescue that achieves good yields. It is persistent and is very winter hardy. It has good forage value with great sugar content and digestibility. The loose sward makes it a great mixing partner with alfalfa and other species. Best adapted to zones 3, 4, 5 and fair in zone 6.

ORCHARDGRASS is more heat and drought tolerant than most cool season grasses, and thus produces more feed in the summer. Orchardgrass is sensitive to cutting height, so we recommend a residual cutting/grazing height of 4 inches. Our later heading orchardgrass varieties work great seeded with alfalfa. **Seed 20 to 25 lbs/acre.**

ECHELON

Echelon is a very late maturing, high yielding orchardgrass with great quality. Pairs with alfalfa well due to the maturity timeline.

Also available in organic.



HLR BLEND

UT/YJ

A mixture of Barenbrug leafy late maturing varieties. Stands for High Leaf Ratio. HLR holds its quality for longer periods of time allowing for late cuttings.



KF OG BLEND- NORTH



NEW

A high yielding medium-late to ultra-late maturity orchardgrass blend, promoting the strengths of varietal diversity, curated to succeed in northern climates. Works well for grazing, or hay with high yield and good digestibility.

KF OG BLEND- SOUTH



NEW

A high yielding, persistent, early to medium late maturing orchardgrass blend, promoting the strengths of varietal diversity, curated to succeed in southern climates. Works well for grazing, or hay with high yield and good digestibility.

INVALE

UT/OC

A true medium-maturing leafy orchardgrass with strong disease resistance. Its summer heat tolerance makes it a great choice for grazing or hay. This orchardgrass was screened heavily in northern Kentucky and also looks strong in our Lancaster plots.

OLATHE

An early orchardgrass that stands up well to disease and heat. Olathe has become our top choice orchardgrass for the south but will also do well in the north. Because of its early maturity, we do not recommend it to be seeded with alfalfa unless 1st cutting quality is less important on your farming operation. Olathe is included in many of our grazing mixes.

PERSIST II OG

NEW

Selected from the original variety Persist, Persist II orchardgrass has even better persistence, disease resistance, and vigor than the original. This variety was chosen from the University of Kentucky trials, under abusive grazing management.

PERENNIAL RYEGRASS is the highest quality grass, especially when it comes to digestibility and sugars. Cows maintain better body condition and make more milk or meat on ryegrass versus orchardgrass or even alfalfa. However, ryegrass is harder to dry and does not perform well in hot or dry weather. Perennial ryegrass, if seeded by itself, should be planted in cooler climates on fertile, moist soils. Ryegrass comes in many different forms: Perennial, Hybrid, Italian and Annual. Besides this, it can be either diploid or tetraploid. **Seed 30 to 50 lbs/acre.**

DIPLOID / TETRAPLOID BLEND

BG-24T

A unique, innovative blend of early and intermediate maturing diploid and tetraploid varieties. Includes varieties that are both heat and cold tolerant.

TD BLEND

A tetraploid-diploid blend of European bred Perennial Ryegrasses. An excellent choice for overseeding pastures as part of a regular maintenance program.

Only available in organic. 

DIPLOID

MARA

An Intermediate maturity diploid perennial ryegrass with high yields. Mara has exceptional winter hardiness and exhibits more tolerance to heat and drought than traditional perennial ryegrasses. Mara establishes quickly, exhibits rapid regrowth and easily forms a dense sward.

PREMIUM

Premium is an excellent later diploid with superior winter and summer hardiness.

Only available in organic. 

TETRAPLOID

KENTAUR

A high yielding tetraploid variety that has balanced productivity. Kentaur has excellent winter and summer hardiness, making it a very durable tetraploid variety. Kentaur has some summer headiness.

Also available in organic. 

PAYDAY

A tetraploid perennial ryegrass variety with improved rust resistance, later maturity, sweet taste and high forage yields that can build more beef, make more milk, and put more money in your wallet! Excellent cold tolerance, meaning long lasting and fewer replants.

REMINGTON

A high-yielding, high-quality tetraploid ryegrass that shares many attributes of a diploid type. Selected for sward density, high yields, excellent disease resistance and winter hardiness. Well suited to grazing and high-moisture cutting systems.



TALL FESCUE deserves more recognition as a stored forage. Over the lifetime of a stand, tall fescue will typically out yield orchardgrass by about one ton of dry matter per year. If you are grazing tall fescue, use more palatable varieties and do not allow the plant to get too tall. It is also ideal for fall stockpiling and over-wintering. Many older varieties have given tall fescue a bad name as they have poor palatability and may contain a toxic endophyte. **Our varieties do not contain toxic endophytes and have improved palatability. Varieties that do contain endophytes use novel endophytes that are beneficial to the plant and is not harmful to the animal. Seed 35 to 40 lbs/acre.**

BAROPTIMA PLUS E34

BarOptima 

BarOptima is a soft leaf variety and E34 is a beneficial endophyte that improves the agronomics of the grass, but does not cause negative health effects of the harmful endophyte that is typically found in Kentucky 31 and many other older tall fescues. This product is ideal for long term grazing and hay swards in southern Pennsylvania and south. Best in zones 7A and higher.

CAJUN II



An endophyte free, earlier, very high yielding, hay type tall fescue with improved digestibility. Excellent for stockpiling for fall grazing. Adapted to both the south and the north, zones 4 to 8. A strong contender in our Lancaster grazing trial.

KORA

A late, very high yielding tall fescue with improved digestibility. Great on less than ideal soils. Kora works well mixed with alfalfa and helps it dry easier. Best adapted to zones 4 to 7a.

Also available in organic.



LIPALMA

Top in sward density and rust resistance. This tall fescue variety shows a good yield distribution over all cuts. Lipalma is suited for growing under extensive use and dry areas and variable soils. Best adapted to zones 4 to 7a.

Also available in organic.



MARTIN II PROTEK



A novel endophyte fescue, combining the proven genetics of Martin II with the innovative Protek endophyte. Expect increased longevity and animal performance. Best adapted to zones 7a and higher.

STF-43 BLEND



A blend of Barenbrug soft leaf, late heading varieties. Produces impressive dry matter yields with exceptional levels of digestible fiber. The varieties used have improved palatability for grazing and are also good for mixing with alfalfa or utilizing straight stands for stored forage. Best adapted to zones 4 to 7a.

TRIUMPHANT PROTEK

NEW

An early, high yielding, durable, but not coarse, tall fescue variety that contains the innovative novel endophyte, Protek. Triumphant has proven itself to be a top performer in our grazing trial in Lancaster. Excellent regrowth that livestock can graze again and again. Best adapted to zones 4 to 8.



Martin II

TIMOTHY is a very palatable grass and well adapted to heavy soils. Timothy usually has huge production in spring, but drops off in summer and fall. Sow in fall or very early spring. Plant shallow, no deeper than 1/4" in a firm seedbed.

Seed 10 to 15 lbs/acre.

COMTAL

An improved variety that is good for both hay and grazing. Similar maturity as climax.

DOLINA

A high yielding, persistent hay type European variety. **Only available in organic.**



RICHMOND

An early maturing, high yielding timothy, chosen for its outstanding performance in the field.

SUMMER GRAZE

NEW

A late maturing timothy for high quality hay and pasture application. Excellent resistance to fusarium and rust.

Only Available in Organic.



TENHO TIMOTHY

NEW

An improved high-yielding variety that performed very well in the Penn State trials. Similar maturity to Climax.

VALOR TIMOTHY

NEW

A new early maturing variety that is highly adapted south to north. More drought tolerant resulting in better summer regrowth after first cutting! Try beside Zenyatta.

ZENYATTA

Zenyatta was bred in the U.S. and is an improved Clair-type timothy. It has both early production and regrowth.

CLIMAX

The old standard variety.

TURF AND INTER-ROW GRASS MIXTURES

CONTRACTORS MIX (TURF)

NEW

Our most affordable all-purpose mix, this mix is best suited for areas that are either temporary or low end lawn seedings. Quickly establishes and will require minimal fertility or water to survive. This turf mix contains low cost but fast starting Annual Ryegrass, along with, Perennial Ryegrass, Kentucky Bluegrass and Creeping Red Fescue. Best adapted to zones 7a and lower.

Seed 175 to 260lbs/acre.

CONTRACTORS CONSERVATION MIX

NEW

A low cost 70:30 mix of VNS tall fescue and VNS annual ryegrass. For conservation use only, not for turf or forage use.

Seed 260 to 350lbs/acre.

COMPANION MIX



A slow growing mix for orchards, vineyards or around buildings that requires less mowing.

Seed 50 lbs/acre.

DIAMOND 3 WAY PERENNIAL BLEND

NEW

A blend of top perennial ryegrass varieties. Fast starting with great eye appeal. For turf use keep in zones 6 and lower. Also great to plant as a soil cover between produce rows to reduce erosion and mud.

Seed 220 to 350lbs/acre.



Zenyatta Timothy

DIAMOND SUN & SHADE MIX

A multi purpose lawn grass for both sunny and shady areas.

Seed 175 lbs/acre.

TLC PLUS

NEW

A blend of tall fescues with a little bluegrass mixed together for more diversity than straight TLC. Best in zones 7a and lower.

Seed 260 to 350lbs/acre.

TLC TALL FESCUE BLEND

NEW

T.L.C. Tall Fescue Blend is a special formulation of compatible tall fescues that fit together to create a beautiful, yet durable and hardy lawn. With its natural dark-green color and fine-leaved texture, deep roots, natural pest and disease resistance, and self-repairing rhizomes, T. L.C. Tall Fescue Blend should provide you with many years of beauty and durability. This blend can take the pressure of sun, shade, and heat while still looking great. Adapted to zones 8 and lower.

Seed 260 to 350lbs/acre.



Sun and Shade Mix

MISCELLANEOUS

REED CANARYGRASS

Reed canarygrass is slow to establish. Once established, it is very productive in a wide range of conditions, including very wet soils to very droughty or low pH soils. It is suitable for silage, hay and grazing, but requires good management to get high quality. We only sell low alkaloid varieties.

Seed 12 to 18 lbs/acre.



Reed Canary Grass



COOL SEASON ANNUAL FORAGES



CARGO

A mixture of crimson clover, annual ryegrass, and oats, CARGO makes a high quality, high sugar forage for grazing and baleage. It is a superb cover crop for southern Pennsylvania (south of I-78) and further south (6a and higher). The benefit of crimson clover is that it flowers early and will fix nitrogen earlier in the spring compared with other legumes. Annual ryegrass has very extensive root growth and improves soil structure better than cereal grains.

Pre Inoculated.

Seed 110 to 130 lbs/acre.

DOUBLE PLAY

A mixture of forage oats, triticale and annual ryegrass. This mix is designed to be planted late summer and harvested in both the fall and spring. Oats and annual ryegrass provide strong fall yields. The over wintered triticale and annual ryegrasses will provide good spring yields.

Seed 150 to 200 lbs/acre.

- High fall and spring yields
- Higher sugars and digestibility than small grains alone
- Excellent nutrient usage

RAY'S CRAZY FALL

A versatile 8-way cool season mix made up of grasses, legumes, and brassicas that can be used as a short-term cover crop, a soil-building transition crop to renovate depleted soils, a grazing mix or some combination of all. The Ray's Crazy Family of mixtures includes a Spring, Summer and Fall version.

Seed 40 to 60 lbs/acre.

SMALL BOX BOOSTER

This Booster mix is designed to be planted with the small grain of your choice. It features hairy vetch, clovers, timothy and daikon radish. This soil building mix can also be used in a forage setting. For drills with both a large and small box.

Seed 10lbs of booster for every 50-100lbs of small grain.

SOIL BUILDER PLUS

A mix of triticale, crimson clover, hairy vetch, ryegrass and daikon radish. An excellent spring forage and/or cover crop. Clovers and vetch provide protein in a forage application, and triticale and ryegrass contribute effective fiber and bulk. Plant in late summer for a late fall grazing.

Seed 120 to 140 lbs/acre.

TRITICALE PLUS

A mixture of triticale and annual ryegrass. Designed for two spring cuts of haylage. This mixture will have excellent NDFd when harvested prior to boot stage. Even more tonnage than triticale alone. Triticale adds bulk to the forage for easier silo unloading.

Seed 90 to 140 lbs/acre.

- Great forage for double cropping
- 2 Cut System
- Great for baleage or grazing
- More energy than triticale

KING'S PEA OAT

50/50 mixture of spring peas and oats. Excellent as a straight forage or a nurse crop.

Seed 100 lbs/acre.

OATS PLUS

A mixture of a true forage oat (60%) and annual ryegrass (40%). This mix combines the strength of each product and can be planted in early spring and late summer. It will work well for machine harvest and grazing. Oats and annual ryegrass are quick growing annuals that will make high quality forage. Harvest prior to boot stage of both products for super quality. Harvest oats in fall and get two cuttings of annual ryegrass in spring.

Seed 75 to 90 lbs/acre.

RAY'S CRAZY SPRING

This mixture is designed with the same goals as the summer and fall formulations - a dual purpose soil improving cover crop and high quality forage. This mix provides quick spring nitrogen for the following crop, recycles nutrients, builds soil health. This balanced mix contains a total of 8 species: grasses, legumes and brassicas.

Seed 120lb/acre.

Seed 90 to 140 lbs/acre.

ANNUAL RYEGRASS King's varieties have a high winter hardiness. Vigorous, extensive growth, both above and below ground. Scavenges and recycles soil nitrates, contributes fine root organic matter at deep soil levels. Can be seeded with crimson clover and with the winter annual small grains. **Seed 35 to 40 lbs/acre.**

ATTAIN**NEW**

A tetraploid variety that is very high in quality. Very good winter hardiness and yield.

FROSTPROOFCT **NEW**

A more upright, diploid, winter hardy annual ryegrass with 50% coating, intended for aerial seedings.

KINGFISHER FLEX ANNUAL RYEGRASS **NEW**

A leafy, ultra late-maturing tetraploid annual ryegrass is ideal for flexible harvest management as it stays vegetative longer! For machine cut, harvest once adequate yield is achieved and the weather window is right for harvest. Do not wait until flag leaf harvest. For grazing, Flex will remain vegetative two to three weeks later than other annual ryegrasses.

KODIAK

A diploid ryegrass. Kodiak showed very strong performance in the Penn State trials over the past few years.

LOWBOY

A low growing ryegrass that is easier to terminate. It's aggressive root structure makes it ideal for cover crop use, not for forage.

MCKINLEY

Another outstanding diploid from DLF. McKinley did very well in the Penn State trials. It's a high energy, winter hardy variety.

SPRING BARLEY

Seed 95 to 200 lbs/acre depending on use.

MASSY SPRING BARLEY

A new release, feed type, 6 row spring barley that is high yielding, and has excellent disease tolerance. Developed in eastern Canada. Best uses, forage, straw, grain for feeding.

TRITICALE is a cross between wheat and rye. There are many difference among varieties in both appearances and digestibility. We are offering triticale varieties that have been bred for fiber digestibility. In addition to excellent forage quality, the heading date, typically between rye and wheat. **Seed 100 to 150 lbs/acre.**

GAINER 154

A highly-yielding variety that is very responsive to good fertility and crop management. With its early maturity (compared to some other triticales), early spring management is important. Apply spring fertilizer earlier to push the crop out of dormancy for maximum yield and protein. Fall plant.

Also available in organic 

KF HYTON

A new KingFisher variety with strong seedling vigor, high yields, & excellent quality. Very strong prostrate fall & winter growth suppresses weeds & gives superior soil coverage. Wide seeding window and medium height. Fall plant.

Available in organic 

NITROUS

Nitrous delivers outstanding forage yield with a greater leaf to stem ratio. It's late maturity and leafiness creates a wider harvest window than most varieties. High eye appeal backed by strong yield and quality data will impress you. Fall plant.

SURGE

This high sugar awnless variety is facultative. Surge is best seeded in the spring but can also be seeded in the fall. Avoid early fall plantings.

**ASK US ABOUT ADDITIONAL
ORGANIC VARIETIES!**

OATS are fast starting, and can be used as a grain or a forage. For forage, they can be planted in the spring or late summer. Oats can also be used as a nurse crop. **Seed 95 to 125 lbs/acre.**

BADGER (GRAIN)

Badger is our earliest heading variety and our top grain oat. Badger is a yellow oat that has a very good groat percentage, high grain yield, good grain quality and excellent test weight.

Also available in organic. 

CANMORE (DUAL PURPOSE)

Canmore is a tall growing medium maturing oat with very good standability. Its grain yield should be very competitive in cooler climates. It is also an excellent straw producer along with a high forage yielder.

EVERLEAF 126 (FORAGE)

A true forage oat with delayed heading (about 2 weeks later). Everleaf is bushy and leafier and has a softer stem. Our samples of Everleaf Oats have extremely high forage quality.

NIAGARA (FORAGE)

Niagara is a medium maturity Canadian forage oat with improved rust resistance. At boot stage, Niagara is high in crude protein and in percent digestible fiber.

REEVES (DUAL PURPOSE)

A medium-early maturity, high yielding oat variety. Excellent dual purpose. For forage it is best suited for late summer to early fall seeding as it gives fast fall forage growth.

Also available in organic. 

SPELT is emerging as a solid option for high quality forages, as well as grain. In our trials, spelt averages three tons DM with great digestibility and protein values.

Seed 125 lbs/acre.

SONIC

Primarily a forage variety, but can also be used for grain. It has a vigorous growth habit and improved disease resistance and strong yield.

SUNGOLD

A food grade spelt with excellent baking qualities. Strong standability and winter survival. Medium brown chaff. Sungold can also be used for forage.

WHEAT often does not get as leafy or tiller as much as barley or triticale, but the quality, digestibility and effective fiber are quite high. Later harvest than rye or triticale.

Seed 100 to 150 lbs/acre.

ERISMAN

Erisman certified organic wheat is a bearded, early maturing soft red winter wheat variety developed for organic and low input cropping systems.

Only available in organic. 

MALABAR

A mid-season, awnless soft winter wheat, with consistent yields and excellent disease resistance. Slightly shorter stature than other wheat; good standability.

SUNBURST

NEW

A soft, non-bearded, winter red wheat. Greatly adapted to the mid-Atlantic region. Excellent winterhardiness, test weight, and high yield potential, good scab resistance and leaf stripe rust resistance.



With nitrogen prices remaining a major cost center, interest in Cool Season annual legumes has increased dramatically. Significant amounts of nitrogen can be produced for the following crops by the time these nitrogen fixing crops bloom. Maximum nitrogen is produced if the crop is left until flowering stage.

CLOVERS are an important part of crop rotations and cover cropping. Nitrogen fixation and quick cover are just a few of the many benefits they offer.

HEUSERS OSTAAT CRIMSON OC **NEW**

A winter hardy proven German variety that establishes fast and has strong spring yield. A must try for zones 6 and lower. Outstanding component for winter annual forage and cover crop uses.
Seed 15 to 25lbs/acre.

VIPER BALANSA OC

Quick to establish and early to bloom, Viper provides early nutrients and feed for both soil and animal health. Viper may be cut for stored forage or grazed. It is highly digestible and adapted to rotational grazing. Ideal for pollinators too!
Seed 3 to 8lbs/acre.

BERSEEM CLOVER is a cool season annual clover that resembles alfalfa. It is capable of producing 100-200lbs N.
Seed 15 to 20 lbs/acre.

BALADY-1 BERSEEM OC


Quick growth, single cut variety. Best used as a cover crop. Not winter hardy.

LIGHTNING BERSEEM OC **NEW**

Lightning berseem clover was bred for fast, early spring production and rapid regrowth with improved winterhardiness. Can be seeded in two planting windows similar to alfalfa and red clover windows. Lightning provides protein-rich forage, abundant nitrogen-fixing cover crop, and insect beneficial pollinator habitat.

FORAGE PEAS produce extremely high forage quality and very high crude protein. They make a good companion crop with oats and triticale.
Seed 60 to 100 lbs/acre.

4010 SPRING

A purple flower pea that can be planted in spring or fall. High-protein forage for grazing, haylage or baleage.
Also available in organic. 

KEYSTONE WINTER

Keystone has excellent early vigor and more spring growth than other winter peas King's has tested. As a white flowered pea, it does not contain anthocyanin found in non-white flowered peas, which means that Keystone has better palatability and better digestibility than Austrian Winter Pea. Can also be spring planted.

HAIRY VETCH is a thick, vining winter annual legume that is very productive, produces nitrogen and offers quick cover that supports pollinators and wildlife. Ideal for forage and cover crops.
Seed 25 to 30 lbs/acre.

PATAGONIA CT/OC

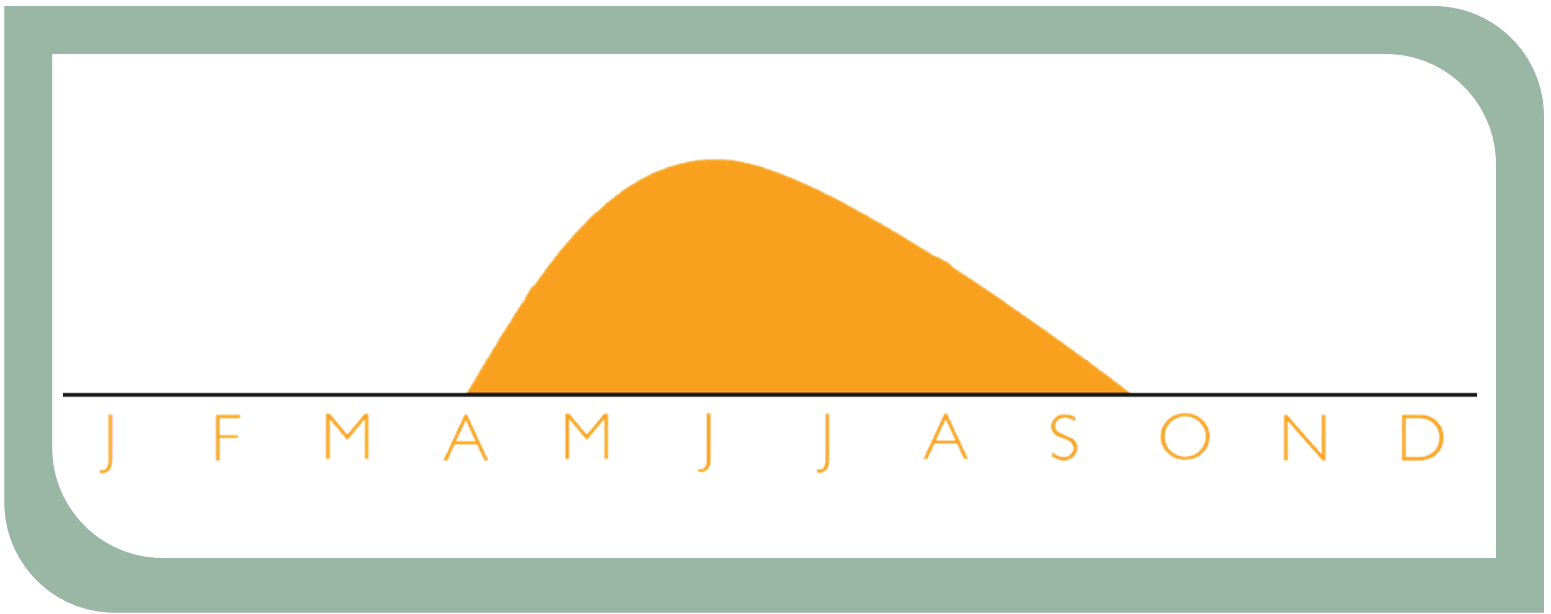
High-yielding hairy vetch bred in southern Argentina for early growth and better cold tolerance.



Heusers Ostaat Crimson



WARM SEASON ANNUALS



RAY'S CRAZY SUMMER

This diverse mixture was created for dual purpose grazing and soil health improvement. It contains 7 species including grasses, legumes and forbs. There is also a cool season/winter version of this mix available. p.52. Seeding rate varies depending on use and goals.

Seed 40 to 60 lbs/acre.

SUMMER SOLAR

A summer cover and forage crop that consists of cowpeas, sunnhemp, sunflower, buckwheat, and a touch of male sterile sorghum sudangrass.

Seed 35 to 60 lbs/acre

YIELDMAX

A unique and innovative alternative forage mixture that utilizes both cool season and warm season annuals. This mixture provides multiple cuts throughout the growing season in which components of this mix will express themselves in different ways. The first two cuts will be heavy with the sorghum sudan, while subsequent cuts will express more ryegrass and legume. Best suited to USDA hardiness zones 4,5, and 6a.

Seed 30 to 40 lbs/acre.

FOR COVER CROP FOCUSED MIXTURES, SEE PAGE 41-53.



KEEP IT COVERED ALL YEAR!



Whether you are farming conventionally, organically, or aiming for a no-till system, each field should have a living crop for as many months of the year as possible.

We have developed a variety of mixtures designed and tested to improve soil health. Multi species blends are far more beneficial at improving the life of your soil than monocultures. Cover crops are proven to help optimize your soil's long term productivity and profitability.

FORAGE SORGHUM is a warm season annual that is an excellent choice for one direct cut systems (like corn silage) on marginal corn ground or after double crops. Uses 30 to 50% less water than corn and less nitrogen too. The BMR trait has improved the digestibility of forage sorghums dramatically, and they are now considered an excellent dairy feed. Energy levels are comparable to corn, and protein level is around 6 to 9%. Sugar levels are also very high. **Seed 80 to 100K seeds/acre for soft dough harvest. Seed 25 to 30 lbs/acre for boot stage harvest.**

KF FIBER PRO 50



A dwarf BMR variety that is the shortest maturity in the lineup: 85-89 days. Can be direct chopped in soft dough OR harvested in a cut and wilt system following frost. The dwarf characteristic helps reduce lodging and improves the leaf:stem ratio.

KING'S 32 NON-BMR FORAGE **NEW**

One of the highest yields in its class with disease tolerance, plus Aphix sugarcane aphid tolerance. Excellent seedling vigor and plant uniformity, and superb standability. Adapted to a wide range of growing conditions and consistently out yielding competitors.

KF FIBER PRO 72 **NEW**



105-110 days to soft dough stage. A medium maturity brachytic dwarf hybrid.

KF FIBER PRO 74 **NEW**



A full season brachytic dwarf forage sorghum with superior standability and great nutrition. As a later hybrid, it is best used for south of the Mason-Dixon line. 110 to 115 days to soft dough stage.

KING'S 42IG



A new brachytic dwarf, non-BMR forage sorghum that is short in stature but very high yielding. Features iGrowth technology. Stewardship agreement required. Non-GMO.

GRAIN SORGHUM is a starch source for dry areas. It is a very low water use crop, but the starch is very vitreous. For livestock feeding, it should be taken as high moisture grain and fermented 6 months before feeding to ensure the starch is readily available. **Seed 80 to 100K seeds/acre.**

BME-66



NEW

A highly adaptable 66 to mid bloom hybrid with Bronze color grain.

RE-65

NEW

This red, early 65 days to mid bloom, finishes on the quicker side, about 7 days later than RUE-52.

RME-61IG

NEW

A short season, non-GMO red grain variety with Imi herbicide tolerance featuring iGrowth technology that is a consistent yielder and can mitigate severe drought. Stewardship agreement required.

RUE-52

NEW

A red, ultra early hybrid. 52 days to mid-bloom. Moves further north than all our other genetics.

SP 30A30DT

Early maturing bronze hybrid with herbicide tolerance featuring Double Team Technology. Non-GMO.

SP45A45DT

A medium maturing bronze hybrid with herbicide tolerance featuring Double Team Technology. Sugar Cane Aphid Resistant. Non-GMO.

SP 58M85 DT

NEW

A bronze, medium maturity hybrid. Double Team herbicide technology. Sugar Cane Aphid resistance.



Grain Sorghum Plots on King's Research Farm

SUDANGRASS has finer stalks, more tillers, and produces more leaves than forage sorghum. It has excellent regrowth potential and high yields. Can be harvested for dry hay, fermented forages or grazed. **Seed 3/4" deep at 25 to 30 lbs/acre.**

KF 200PS BMR

A widely adapted photoperiod sensitive BMR sudangrass hybrid, with fine stalks. Best palatability.

KF ENERGY PRO 93

A very exciting gene 6 BMR sudangrass that has great vigor and extremely high quality. Because of the dry stalk characteristic, KF Energy Pro 93 dries easier than sorghum sudangrass. Top yielding.

Also available in organic.



SORGHUM SUDANS have smaller stalks than forage sorghum and strong tillering. They have good re-growth potential but less than sudangrass. Should be harvested as haylage or baleage, or grazed. **Seed 35 to 70 lbs/acre.**

EONS SS

NEW

A strong BMR hybrid with excellent yield, quality, and resistance.

Only available in organic.



KF 150 SS BMR

A fast starting BMR Sorghum Sudan. Has very good leaf to stem ratio that provides good quality feed with proper management. Consistently one of our top yielding, BMR sorghum sudans.



KF 165 PS BMR

NEW

Fastest starting and yielding, photo period sensitive BMR sorghum sudan, which allows for a wider harvest window and multiple cuts.



KF RAPID PRO 64 DR BMR

NEW

Best disease resistance, tolerates cooler weather wetter soil better than the rest of the line up.



KF RAPID PRO 77 DS BMR

NEW

Very fast starting, higher yielder with a drier stalk.



KF 185 PS BMR SSX

A photoperiod sensitive BMR Sorghum Sudan. 185 has a good leaf to stem ratio that provides quality feed. The photoperiod sensitivity allows for an extended harvest window as it does not head out. The ideal choice for one large cut. For a one cut system, seed at 35lbs/acre.

S275 WITH APHIDAXE

An Aphid resistant non-BMR Sorghum sudan that is also Male Sterile. This variety can still produce quality forage with timely harvest. The Male Sterile attribute prevents grain/seed formation. Our top choice for cover crop and total yield.

SOYBEANS (GRAIN)

360 SB

3.6 Maturity. High end conventional soybean with great agronomics and overall yield. Great performance throughout PA.

Only available in organic.



SOYBEANS (FORAGE)

Are selected for late maturity and leafy tendencies.

Seed 140 to 170K seeds/acre

DERRY FORAGE (UNTREATED)

Group 6 forage soybean for wildlife.

TITAN FORAGE RR

Group 7 Roundup Ready forage soybean for wildlife.

SUNFLOWERS (GRAIN)

MAS 920.CP SUNFLOWERS

NEW

A very strong, mid-early linoleic oil variety. Straight head position, flat head shape, great disease resistance. Ideal for the bird feed market.

**ASK ABOUT HIGH OLEIC
SOYBEANS!**

MILLET is a warm season annual, similar to sorghum sudans, with no prussic acid danger. Millet needs a soil temperature of 65°F or more to germinate, and growth slows down when cool weather comes. When frost damaged, it can still be grazed with no fear of prussic acid. Will tolerate wetter years better than sudan. Like sorghum sudans, it can use lots of nitrogen. Safe for grazing horses and mules.
Seed 10 to 20 lbs/acre.

Start grazing at 12 inches, but make sure the roots are not being pulled up. It should not be allowed to grow taller than 3 feet (or it will lose palatability), nor grazed lower than 6 inches.

GERMAN FOXTAIL NEW

A one cut millet that is very easy to dry and does not grow back. Ideal for setting up pasture renovation where dry hay is desired. Note: seed heads can be toxic to horses.

KF PRIME 180M BMR

A compact and digestible forage for grazing, hay or silage. Improved staygreen for later harvests. As a dwarf, it has a high leaf-to-stem ratio, and its short stature means improved standability. More leafiness means better dry down and the BMR background improves digestibility and feed intake.

KF PRIME 360M BMR

A taller, leafy, digestible forage hybrid for grazing, hay, or silage. Improved staygreen for later harvests. As a dwarf, its short stature makes for excellent standability, but at maturity it is a little taller and leafier than Prime 180.

LEAFY T

Leafy T is a pearl millet known for its wide leaf characteristics. This dwarf variety has good disease resistance and seedling vigor.

JAPANESE

A millet that can be used for forage or summer cover crop. It does better in wet soils than many of the other summer annuals. Fast growth and a fibrous root system makes it an excellent cover crop. It has a finer stem than pearl millet and sorghum and makes high quality forage for grazing or hay.

CRABGRASS is a versatile summer forage that tolerates a variety of soil conditions. Positioned appropriately it can provide good grazing or hay throughout the dry summer months. Crabgrass can reseed if allowed to mature.

Seed 5 to 8 lbs/acre.

MOJO

An improved later maturing crabgrass blend, coated for improved germination.

Available in OC & YJ.



RED RIVER

CT

An improved crabgrass variety, coated for improved germination.

TEFF is a very small seeded warm season grass that has fine leaves and stems. This product is native to northern Africa (Ethiopia) and tolerates many soil conditions. Will make very palatable dry hay that livestock and horses love.

NOTE: Dries a little slower.

Seed 4 to 8 lbs/acre.

MOXIE

A blend of high yielding teff varieties that is coated with Yellow Jacket for improved germination and seedling vigor.

Available in OC and Yellow Jacket.



German Foxtail Millet

Summer annual **LEGUMES** provide a high protein source for grazing and are rapid nitrogen producers as cover crops.

IRON CLAY COWPEAS

A summer annual bean that is highly productive for forage. It can be seeded with a variety of summer annual grasses or seeded alone.

Seed 40 to 60 lbs/acre.

SUNN HEMP

Summer annual legume that is best for summer cover crop use. Can also be grazed but the stems are normally refused due to their lignification.

Seed 20 to 40 lbs/acre.

BRASSICAS are used to extend the grazing season into late fall/ early winter, or to provide very high quality summer or fall grazing, as they will not lignify in hot weather. They can be seeded in a variety of mixtures, and the seeding rate is quite low in both straight stands and mixtures, because their leafy growth habit, they can be very competitive in a stand. Brassicas' high forage quality helps cows pick up in milk. Sometimes cattle won't eat it the first day or two. Introduce them slowly and make sure to supplement with adequate effective fiber to slow the rate of passage. Brassicas are low in fiber. Typical forage analysis: 25% protein, 215 RFV.

Seed 4 to 5 lbs/acre.

BARKANT TURNIP

Barkant is a vigorous summer/autumn turnip from Holland. It is extremely high yielding and bred specifically for increased leaf growth. The highest concentration of protein and yield is in the leaf. The tankard shaped bulb offers good accessibility. It's suitable for milking, lamb fattening, ewe flushing or hog rearing. It can be grazed about 2 times.

BAYOU KALE NEW

Excellent for managed grazing. A favorite in the 2024 Lancaster grazing trial. Very palatable. Great summer performance.

BRACO WHITE MUSTARD NEW

A brassica cover crop that can be used to suppress weeds and nematodes in any warm-season window in a rotation. When turned into the soil at flowering it is an effective biofumigant. Root structures increase soil tilth. Beneficial to insects.

DWARF ESSEX RAPE

The old standard forage rape, best suited for cover crop applications, wildlife and grazing.

REDBONE ABYSSINIAN CABBAGE NEW

A brassica crop, ideal for cover crop mixtures. Handles summer heat and cold weather well. Can also be grazed.

TITAN RAPE NEW

A top choice in the Lancaster brassica trail. This highly palatable variety is late maturing, high yielding, and has great regrowth for multiple grazings. Strong tolerance to aphids and viruses.

Seed 3.5 to 4lbs/acre, if seeding alone.

T-RAPTOR

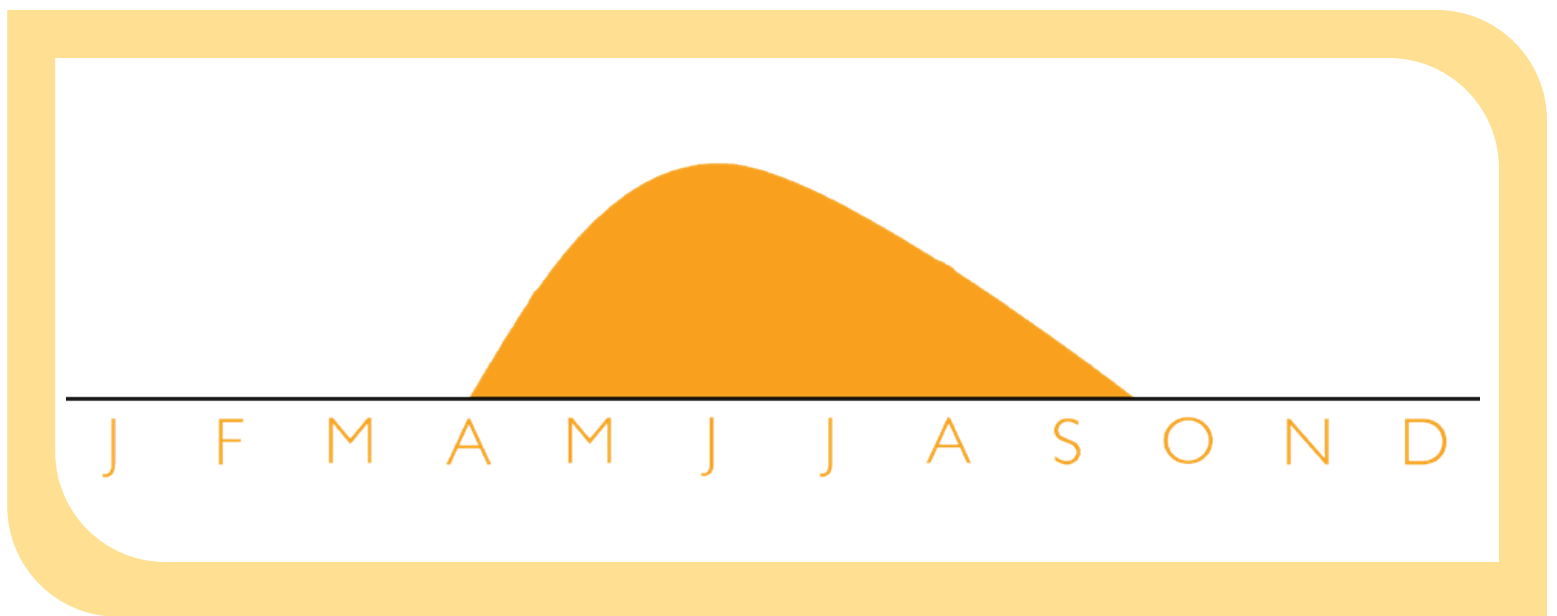
A turnip like hybrid that is super for multiple grazings. No bulb! Improved regrowth after grazing.



Barkant Turnip



FEEDING TYPE HYBRID CORN



Consistent Silage Corn, Year After Year

Producers want silage corn with strong agronomics and exceptional energy. And they want it consistently, year after year, across every relative maturity. KingFisher and Red Tail silage corn delivers consistent performance through out the complete lineup, so every producer can maximize digestible energy for his livestock.

Dedicated to livestock nutrition, KingFisher and Red Tail corn is focused on consistently maximizing the harvest of energy per acre and boosting livestock performance.

Specializing in development of hybrids for dairy corn silage:

- Increased Starch Digestibility
- Increased Fiber Digestibility

Most extensive silage corn breeding program available:

- Professional relationship with multiple genetic companies
- The best genetics worldwide, for consistent corn hybrids

Agronomics- a priority in the selection process:

- Yield
- Early Vigor
- Plant Height
- Stalk Quality
- Ear Height
- Leaf Structure
- Disease Tolerance
- Dry Down

A service-focused team with on-farm experience:

- A network of over 250 dealers/forage specialists
- Local experience to guide farmers in corn management and crop planning
- A strong commitment to seed quality, with up to 100% replant





DIGESTIBLE ENERGY

KingFisher®

Forage Foundations

Build from the ground up with KingFisher

Your profitable forage system needs a firm foundation. KingFisher has award winning corn, alfalfa and other forage seed products to build your forage system with both yield and quality.

Ensure you have the yield to fill your bunk and the quality to fill your milk tank.

KingFisher wins in the 2024 Forage Superbowl at the World Dairy Expo, verifying the quality of our forage.

4 Grand Champions:

- Standard Corn Silage
- Dairy Hay
- Baleage
- First Time Entrant

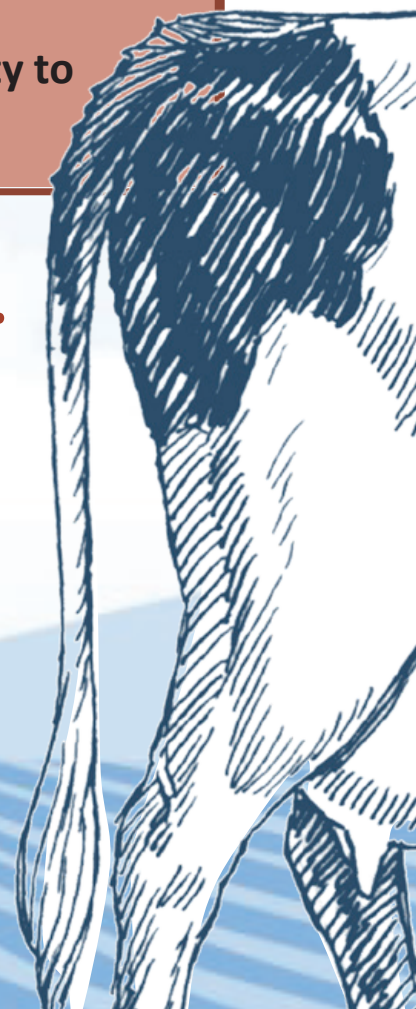
KingFisher Alfalfas Dominated the Dairy Hay Category

- Grand Champion
- 6 out of the 7 Finalists

KingFisher & Redtail Corn Dominated the Standard Corn Silage Category

- Grand Champion
- 6 out of the 8 Finalists

..... Plus so much more.



Start Growing Champion Genetics in 2025!



KINGFISHER CORN

Hybrid	Relative Maturity	GDUs 50% Silking	GDUs to Black Layer	Conventional (CV), Organic (O), BMR	Red Tail Hybrid (if any)	Irrigated/Productive Soil	Average/Variable Soil	Less Productive/Stress Prone Soil	Heavy Soils with Poor Drainage	Seedling Vigor	Plant Height	Ear Height	Ear Flex	Cob Color	Stalk Strength	Root Strength
KF 27C10	77	1132	2100	CV	27T11	8	9	8	8	8	Med.-Tall	Medium	7	Red	8	7
KF 34C30	84	1145	2145	CV, OR		9	9	9	9	8	Med.-Tall	Medium	8	Light Red	7	8
KF 37C60	87	1150	2230	CV, OR		9	9	8	8	8	Medium	Medium	8	Red	8	8
KF 38C80	88	1220	2260	CV	38T86, 38T89	9	9	9	9	9	Med.-Tall	Medium	7	Red	9	8
KF 42C20	92	1200	2280	CV, OR		9	9	8	8	9	Med.-Tall	Med.-High	9	Pink	7	7
KF 43C40	93	1210	2300	CV	43T48, 43T49	9	8	7	9	8	Med.-Tall	Medium	9	Pink	8	8
KF 44C20	94	1235	2320	CV, OR	44T29, 44T28, 44T21	9	9	8	8	8	Med.-Tall	Medium	8	Red	8	7
KF 45C30	95	1235	2370	CV		9	9	9	8	8	Med.-Tall	Medium	8	Red	8	8
KF 48C10	98	1250	2300	CV	48T16	9	9	8	8	9	Med.-Tall	Medium	8	Red	8	8
KF 48C90	98	1250	2300	OR		9	8	7	8	9	Medium	Medium	8	Red	8	9
KF 51C50	101	1220	2300	CV	51T51	9	9	8	9	9	Med.-Tall	Med.-High	8	Light Red	8	9
KF 51C80	101	1200	2290	CV, OR	51T86	9	9	9	8	8	Tall	Medium	8	Pink	9	8
KF 52C20	102	1298	2418	CV		9	9	8	8	8	Tall	Medium	9	White	8	9
KF 54C90	104	1250	2550	CV, OR	54T96	9	8	8	8	8	Med.-Tall	Medium	8	Red	9	8
KF 56C30	106	1300	2420	OR		8	8	8	8	8	Med.-Tall	Med.-High	7	Pink	9	9
KF 57H50	107	1300	2450	EE		9	8	8	8	8	Med.-Tall	Medium	8	Pink	8	8
KF 57C60	107	1330	2460	2700	57T66	9	8	8	7	8	Med.-Tall	Medium	8	Red	8	9
KF 57C80	107	1310	2460	CV	57T81	9	9	9	7	9	Tall	Medium	9	Red	8	9
KF 59B70	109	N/A	N/A	BMR		9	8	7	8	8	Tall	Medium	9	Red	8	8
KF 59C30	109	1310	2690	CV, OR		9	9	8	8	8	Med.-Tall	Medium	7	Red	9	8
KF 60S60	110	1350	N/A	CV		9	9	8	8	8	Tall	Medium	N/A	Pink	8	7
KF 61C90	111	1380	2400	CV	61T96, 61T99	9	8	8	8	8	Med.-Tall	Medium	7	Red	8	8
KF 63C10	113	1320	2790	CV		9	9	8	8	8	Med.-Tall	Med.-High	9	Pink	8	8
KF 64C40	114	1360	2855	CV, OR		9	9	9	8	9	Med.-Tall	Med.-High	8	Red	8	7
KF 65C90	115	1355	2790	CV		8	8	8	8	8	Tall	Medium	9	Light Red	7	9
KF 66B80	115	1490	N/A	BMR		9	8	8	8	7	Med.-Tall	High	8	Red	8	8
KF 67C20	117	1480	2700	CV	67T21	9	9	9	8	8	Tall	Med.-High	9	Light Red	8	7

Rating scale: POOR | FAIR | GOOD | VERY GOOD | EXCELLENT
 1-2 | 3-4 | 5-6 | 7-8 | 9-10

Stay Green	Dry Down	Test Weight	High Population Tolerance	Continuous Corn	Drought Tolerance	Gray Leaf Spot Tolerance	Northern Leaf Blight Tolerance	Goss's Wilt Tolerance	Common Rust Tolerance	Tar Spot	FiberGest (30-hr. NDFD)	SofStarch (IVSD7)	Milk per Ton	Digestible Fiber Per Acre	Hand Husking	Fungicide Response
8	9	5	9	7	8	6	8	7	7	7	7	8	7	7	8	8
8	8	8	8	7	8	7	7	7	7	5	9	8	8	9	8	8
9	8	8	8	8	8	7	7	9	8	7	7	7	8	6	7	9
9	8	7	8	9	8	8	9	9	8	7	9	9	9	9	7	9
7	7	8	9	7	9	7	7	5	7	4	9	9	8	9	7	8
8	7	7	8	8	8	8	9	7	8	7	8	8	8	8	8	8
9	8	8	9	7	8	8	7	7	8	5	8	8	8	8	8	8
8	8	8	8	8	9	9	7	9	8	6	9	9	9	9	7	7
8	8	8	8	8	8	8	8	9	8	8	8	8	8		8	9
8	9	9	8	8	8	8	8	8	8	5	7	7	8	9	8	9
9	8	7	8	8	9	8	8	7	8	7	8	8	8	9	7	8
9	7	8	8	8	8	8	8	7	7	9	8	8	8	8	8	9
8	7	7	7	7	8	8	8	7	8	5	9	9	9	9	9	9
9	9	9	8	8	9	9	9	9	7	8	8	8	8	8	7	9
8	7	7	7	8	8	8	7	7	8	7	8	7	8	8	8	8
8	8	8	7	8	8	8	7	7	8	5	8	9	8	8	8	9
8	7	8	8	8	9	8	8	8	7	8	8	8	8	8	7	8
9	8	8	8	6	8	8	8	6	8	7	9	9	9	9	7	9
9	N/A	N/A	5	8	8	8	8	6	8	5	9	9	9	8	N/A	9
9	7	9	9	8	8	9	9	7	7	7	8	8	8	9	8	9
8	N/A	N/A	9	8	8	8	8	8	8	7	9	N/A	9	8	N/A	8
9	9	9	9	8	8	9	8	9	7	8	8	7	8	9	8	9
7	7	7	7	8	8	9	7	9	7	5	8	8	9	9	8	7
9	7	7	7	8	9	8	8	8	8	7	8	8	8	8	7	7
8	7	7	5	7	8	8	8	8	8	6	9	9	8	9	9	9
9	N/A	N/A	7	8	8	7	8	6	8	5	9	9	9	9	N/A	9
8	7	8	8	8	8	8	8	7	8	7	8	7	8	9	7	8



RED TAIL CORN

Hybrid	Relative Maturity	Trait	GDUs 50% Silking	GDUs to Black Layer	Irrigated/ Productive Soil	Average/ Variable Soil	Less Productive/ Stress Prone Soil	Heavy Soils with Poor Drainage	Seedling Vigor	Plant Height	Ear Height	Ear Flex	Cob Color	Stalk Strength	Root Strength	Stay Green
RT 27T11	77	GT	1130	2200	8	9	9	9	8	Med.-Tall	Medium	8	Red	8	8	7
RT 35T12	85	GT, CB, LL	1180	2150	8	9	7	7	8	Med.-Tall	Med.-High	7	Pink	8	8	6
RT 38T86	88	Agrisure® Above	1220	2260	9	9	9	9	9	Med.-Tall	Medium	7	Red	9	8	9
RT 38T89	88	Duracade®	1220	2260	9	9	9	9	9	Med.-Tall	Medium	7	Red	9	8	9
RT 41T19	91	Duracade®	1210	2350	9	9	9	9	9	Med.-Tall	Med.-High	8	Red	9	7	8
RT 43T48	93	Viptera®	1210	2320	9	8	7	9	8	Med.-Tall	Medium	9	Pink	8	8	8
RT 43T49	93	Duracade Viptera	1210	2320	9	8	7	9	8	Med.-Tall	Medium	9	Pink	8	8	8
RT 44T21	94	GT	1235	2320	8	9	8	8	9	Med.-Tall	Medium	8	Red	8	7	9
RT 44T28	94	Viptera®	1235	2320	8	9	8	8	9	Med.-Tall	Medium	8	Red	8	7	9
RT 44T29	94	Duracade Viptera™	1235	2320	8	9	8	8	9	Med.-Tall	Medium	8	Red	8	7	9
RT 45T04	95	Agrisure Viptera® 3110	1250	2310	9	9	8	8	9	Tall	Med.-High	5	Red	8	7	8
RT 45T09	95	Duracade Viptera™	1250	2310	9	9	8	8	9	Tall	Med.-High	5	Red	8	7	8
RT 48T16	98	Power Core	1250	2300	9	9	8	8	9	Med.-Tall	Medium	8	Red	8	8	8
RT 51T57	101	GT,AT	1335	2460	9	9	8	8	9	Med.-Tall	Med.-High	8	Pink	8	9	9
RT 51T86	101	Power Core	1200	2290	9	9	9	8	8	Tall	Medium	8	Pink	9	8	9
RT 53T49	103	Duracade Viptera™	1250	2390	9	9	9	8	9	Tall	Med.-High	8	Pink	9	9	8
RT 54T11	104	GT	1390	2575	9	9	9	9	8	Tall	Medium	9	Pink	8	8	8
RT 54T96	104	Power Core	1250	2550	9	8	8	8	8	Med.-Tall	Medium	8	Red	9	8	9
RT 55T71	105	GT	1320	2430	9	8	8	8	8	Med.-Tall	Medium	9	Red	9	8	9
RT 55T76	105	Agrisure® Above	1320	2430	9	8	8	8	8	Med.-Tall	Medium	9	Red	9	8	9
RT 55T79	105	GT,AA,D	1320	2430	9	8	8	8	8	Med.-Tall	Medium	9	Red	9	8	9
RT 57T66	107	Power Core	1330	2700	9	8	8	7	8	Med.-Tall	Medium	8	Red	8	9	8
RT 57T79	107	Duracade	1310	2510	9	9	9	9	7	Tall	Med.-High	9	Red	9	9	9
RT 57T81	107	GT	1375	2570	9	9	9	7	9	Tall	Medium	9	Red	8	9	9
RT 61T96	111	Agrisure® Above	1380	2400	9	8	8	8	8	Med.-Tall	Medium	7	Red	8	8	9
RT 61T99	111	Duracade®	1380	2400	9	8	8	8	8	Med.-Tall	Medium	7	Red	8	8	9
RT 64T36	114	Agrisure® Above	1365	2602	9	9	8	8	7	Med.-Tall	Med.-High	8	Red	9	8	9
RT 64T39	114	Duracade®	1365	2602	9	9	8	8	7	Med.-Tall	Med.-High	8	Red	9	8	9
RT 67T21	117	GT	1480	2700	9	9	9	8	8	Tall	Med.-High	9	Light Red	8	7	8
RT 67T79	117	Duracade Viptera™	1370	2910	8	8	8	8	9	Tall	Med.-High	9	Light Red	8	7	7

Rating scale: POOR | FAIR | GOOD | VERY GOOD | EXCELLENT
 1-2 | 3-4 | 5-6 | 7-8 | 9-10

Dry Down	Test Weight	High Population Tolerance	Continuous Corn	Drought Tolerance	Gray Leaf Spot Tolerance	Northern Leaf Blight Tolerance	Goss's Wilt Tolerance	Common Rust Tolerance	Tar Spot	FiberGest (30-hr. NDF)	SofStarch (IVSD7)	Milk per Ton	Digestible Fiber Per Acre	Hand Husking	Fungicide Response
9	6	8	7	8	7	8	8	7	7	7	8	7	8	8	9
6	6	8	8	8	8	7	5	7	7	7	7	7	7	8	8
8	7	8	9	8	8	9	9	8	7	9	9	9	9	8	9
8	7	8	9	8	8	9	9	8	7	9	9	9	9	8	9
7	7	8	8	8	8	9	9	8	7	8	8	8	9	7	8
7	7	8	8	8	8	9	7	8	7	8	8	8	8	8	8
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HYBRIDS SUITED FOR GRAIN PRODUCTION



Hybrid	Relative Maturity	Trait	GDUs 50% Silking	GDUs to Black Layer	Also available as	Irrigated/ Productive Soil	Average Soil	Stress Prone Soil	Heavy Soils	Seedling Vigor	Plant Height	Ear Height	Ear Flex	Cob Color
KF 34C30	84		1145	2145		9	9	9	8	8	Med-Tall	Medium	8	Light Red
KF 38C80	88		1220	2260	RT 38T89	9	9	9	9	9	Med- Tall	Medium	8	Red
KF 43C40	93		1210	2300	RT43T49	9	8	8	9	8	Med-Tall	Medium	9	Pink
KF 44C20	94		1235	2320	44T29	8	9	8	8	9	Med-Tall	Medium	8	Red
KF 51C80	101		1200	2290	RT51T86	9	9	9	8	8	Tall	Medium	8	Pink
KF 54C90	104		1250	2550	RT54T96	9	8	8	8	8	Med-Tall	Medium	8	Red
KF 57C80	107		1310	2460	RT57T81	9	9	9	8	9	Tall	Medium	9	Red
KF 59C30	109		1310	2690		9	9	8	8	8	Med-Tall	Medium	7	Red
KF 61C90	111		1380	2400	RT61T96, RT61T99	9	8	8	8	8	Med-Tall	Medium	7	Red
KF 63C10	113		1320	2790		9	9	8	8	8	Med-Tall	Medium-High	9	Pink
KF 64C40	114		1360	2855		9	9	9	8	9	Med-Tall	Medium-High	8	Red
KF 67C20	117		1480	2700	RT67T21	9	9	9	8	8	Tall	Medium-High	9	Light Red
RT 41T19	91	Duracade Viptera™	1210	2350		9	9	9	9	9	Medium-Tall	Medium-High	9	Red
RT 44T29	94	DV, V, GT	1235	2320	44T28, 44T21	8	9	8	8	9	Med-Tall	Medium	8	Red
RT 53T49	103	Duracade Viptera™	1250	2390		8	9	9	8	9	Tall	Medium-High	8	Pink
RT 55T79	105	GT, AA, D	1320	2430	RT 55T76, RT55T71	9	8	8	8	8	Medium- Tall	Medium	9	Red
RT 57T66	107	Power Core	1330	2700		9	8	8	7	8	Med.-Tall	Medium	8	Red
RT 57T79	107	Duracade	1310	2510		9	9	9	9	7	Tall	Med.-High	9	Red
RT 57T81	107	GT	1375	2570		9	9	9	7	9	Tall	Medium	9	Red
RT 61T96	111	Agrisure® Above	1380	2400		9	8	8	8	8	Med.-Tall	Medium	7	Red
RT 61T99	111	Duracade®	1380	2400		9	8	8	8	8	Med.-Tall	Medium	7	Red
RT 64T36	114	Agrisure® Above	1365	2602		9	9	8	8	7	Med.-Tall	Med.-High	8	Red
RT 64T39	114	Duracade®	1365	2602		9	9	8	8	7	Med.-Tall	Med.-High	8	Red
RT 67T21	117	GT	1480	2700		9	9	9	8	8	Tall	Med.-High	9	Light Red
RT 67T79	118	Duracade Viptera™	1370	2910		8	8	8	8	9	Tall	Med.-High	9	Light Red

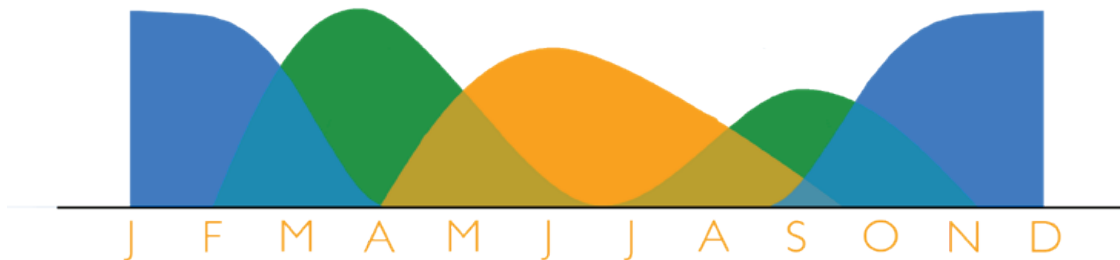
Rating scale: POOR | FAIR | GOOD | VERY GOOD | EXCELLENT
 1-2 | 3-4 | 5-6 | 7-8 | 9-10

Stalk Strength	Root Strength	Stay Green	Dry Down	Test Weight	High Population Tolerance	Continuous Corn	Drought Tolerance	Gray Leaf Spot Tolerance	Northern Leaf Blight Tolerance	Goss's Wilt Tolerance	Common Rust Tolerance	Tar Spot	Hand Husk	Fungicide Response
7	9	8	8	8	8	5	8	7	7	6	6	5	8	8
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King's AgriSeeds is committed to bringing you organic products that perform exceptionally well in the Northeast and Mid Atlantic. Our organic lineup is not an afterthought, but is made of carefully selected products that have been tested throughout our region and proven to perform on the farm. Whether you are growing organic grains and looking for an organic cover crop, grass finishing organic beef or marketing organic milk, we have high energy organic forage and cover crop seed available.

Our partnerships with industry leading suppliers allow us to offer a lineup of the top performing certified organic products in the world.

- **Certified Organic Perennial Mixtures**
- **Certified Organic Grasses**
- **Certified Organic Alfalfas/Legumes**
- **Certified Organic Summer Annual Forages**
- **Certified Organic Winter Annual Forages**
- **Certified Organic Cover Crops**



We offer a full line of organic products that are selected for quality. These are the same genetics as conventional versions, just produced organically.

	Seed Rate	Comment
King's Certified Organic Mixtures	<i>Custom mixes are available but arrangements must be made in advance.</i>	
Dairy Green	25 to 35	A mix that will thrive on good to moist soil.
Hayboss	25	An alfalfa/grass hay mixture
Partner	20 to 30	Grass hay blend to seed with alfalfa or alone. Use lower seeding rate with legumes (3 to 8lbs).
Star	25 to 30	For dairy quality pasture on varying soil types.
Alfalfa		
44 Mag Alfalfa	18 to 22	A very high-yielding, persistent, branch rooted alfalfa that has excellent plant health & strong disease resistance.
Clovers	Best for grazing & silage. For better establishment & more productive stands, inoculate before seeding.	
Premium Clover Mix	4 to 6	A mixture of premium red, white and ladino clovers. Seed alone or with grass.
Klondike Ladino Clover	2 to 4	A quick growing, large leaf clover. Include with pasture seeding or overseed into pastures.
Harmonie Red Clover	4 to 20	A European red clover.
Renegade Red Clover	4 to 20	An Improved red clover.
Rivendel White Clover	2 to 5	A very persistent, small leaf white clover.
Festulolium		
Fojtan	30 to 40	A long lived heat tolerant tall fescue type with good nutrition.
Meadow Fescue		
Liherold	50	A top performing variety with strong early growth.
Tetrax Meadow Fescue	35 to 45	A tetraploid variety ideal to mix w/ new alfalfa seedings to increase energy levels in strong grass-growing regions.

Orchardgrass		
Echelon	20	A very late heading and high yielding orchardgrass variety.
Lidacta	20	A leafy, medium-late European orchardgrass variety.
Ryegrass - Italian		
NEW - Hunter	35 to 45	A true tetraploid Italian ryegrass.
Ryegrass - Perennial		
Highest energy grass. Great spring and fall production. Needs high fertility and moisture.		
Kingfisher TD Blend	35 to 45	A Kingfisher blend of European tetraploid and diploid varieties.
Premium	35 to 45	An intermediate maturing diploid variety that does well under lower nitrogen fertility.
Tall Fescue		
Tolerates drought, heat, wet soil and traffic. Very long lived.		
Kora Tall Fescue	35 to 45	Extremely productive, hay type, very digestible.
Lipalma	35 to 40	Very high yielding hay type with late maturity. Improved digestibility and no endophyte.
Timothy		
A very palatable grass.		
Dolina Timothy	10 to 15	An improved high-yielding variety. Similar maturity as climax.
NEW - Summergraze	10 to 15	Late maturing timothy for quality hay and pasture application. Resistance to fusarium and rust.
Spring & Summer Seasonal		
VNS Buckwheat	50 to 70	Cool season or summer quick soil cover, weed suppressor, nectar for pollinators, loosens topsoil.
MN Pearl Oats	100	A new high-yielding, tall grain oat. Closely related to Deon. Can be used for forage at 130 lbs/acre.
Rushmore Oats	100	A medium maturing oat, with excellent test weight. Medium-tall in height. Good resistance to crown rust.
Badger Oats	100	An early high-yielding grain oat with high test weight. For short season forage sow 150 lbs per acre.
Jerry Oats	100	A taller, older oat variety. Can be used for forage at 130 lbs/acre.
Reeves Oats	95 to 130	An early, dual-purpose oat that is 1-2 days later than Badger.
Erisman Wheat	100 to 150	Bred for production under lower fertility inputs.
Gainer Triticale	100 to 150	An early, high-yielding triticale variety. About 5-7 days earlier than TriCal 815.
KF Hyton Triticale	100 to 150	A KF approved medium-late maturing variety that has a wide planting window.
VNS Cereal Rye	168	A Canadian rye that is leafier and later than local rye.
40-10 Spring Peas +	80 to 100	A high quality purple flower forage pea. Can be planted Spring or Fall. Small seed size.
360 SB Soybeans +	150 to 180	Organic 3.6 maturity.
Eons SS BMR SSX	40 to 50	A late maturing BMR Gene 12 SSX that allows for a wide harvest window. Excellent tillering & regrowth.

See KingFisher Hybrid Guides for complete listings of Organic Corn Hybrids.

FORAGE INOCULANTS are used to improve fermentation in stored feeds, which can both protect and enhance the quality. These high quality inoculates pair with the high quality forages from King's AgriSeeds.

MAGNIVA PLATINUM

Combines three strains of elite lactic acid bacteria with high activity enzymes to lower pH, reducing dry matter losses and improving nutrient retention for enhanced feedout value. MAGNIVA Platinum combines the patented *Lentilactobacillus hilgardii* CNCM I-4785 with research backed *Lactobacillus buchneri* NCIMB 40788 to achieve aerobically stable silage in 15 days.

MAGNIVA TITANIUM

Combines an elite lactic acid producing bacteria with high activity enzymes to drive a fast, efficient ensiling fermentation and improve feed digestibility. Titanium also contains the high dose rate of *Lactobacillus buchneri* for maximum feedout stability and minimum spoilage.

OMRI Formulation available.

MAGNIVA SILVER

Combines two specifically selected strains of bacteria and high activity enzymes to drive the fermentation for a quick pH drop, reducing up-front losses, along with producing some acetic acid which reduces heating when exposed to oxygen during feedout. Silver offers the highest lactic acid production for superior energy and digestibility.

OMRI Formulation available.

MAGNIVA HAY

A non-corrosive biological inoculant. Allows hay to be baled at a higher moisture and retains more nutrients and protein.

SEED STIMULANTS

GROPAK A.I.

NEW

AgXplore's "All-In planter box treatment". GroPak A.I. is a beneficial for all crops as it combines key micronutrients, a biological package, carbon sources and talc, to promote better seed flowability through the planter and to promote early season plant vigor. Also includes soybean inoculant as an extra benefit to the soybean growers.

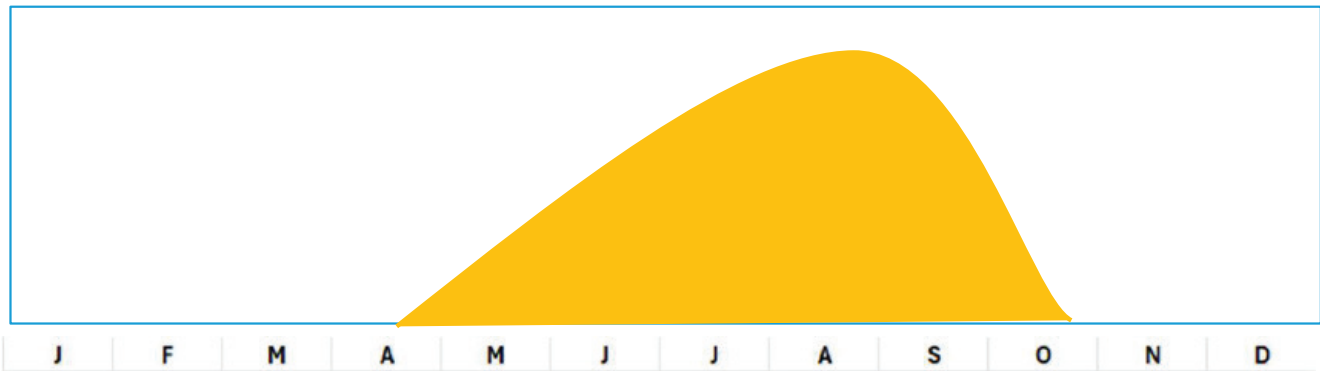
MYCO SEED TREATMENT

Improve crop performance with Myco Seed Treatment! (MST). Includes five species of *Bacillus* bacteria, *Trichoderma* fungi, Endomycorrhizal fungi, and Sucrose. Beneficial to all crops, by helping plants develop greating root systems, and release nutrients. OMRI approved.

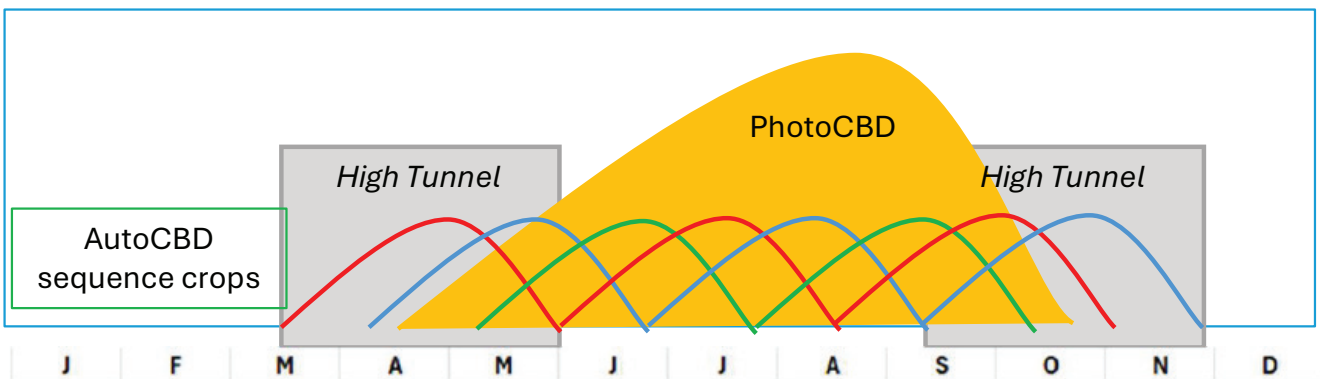




INDUSTRIAL HEMP



CBD HEMP



Hemp seed vendors are not alike. As a licensed seed dealer, our hemp portfolio is sourced from bona fide plant breeders. Industrial hemp varieties are certified by AOSCA, a standard of excellence in the seed industry. They are true to type with high seed viability and THC compliance. Efficient, rapid-cycle AutoCBD varieties are easily mechanized to save labor costs. High CBD photoperiod sensitive varieties are available upon request.

Offering reliable varieties is one part of our exceptional customer service. Unlike our competitors, King's AgriSeeds develops best management practices and grows robust variety comparison trials. The gates to the research farm are opened every summer to share this powerful knowledge. For six years, King's has built a network of plant breeders, farmers, processors, and manufacturers to form trustworthy relationships in this emerging industry. Depending on your business goals, King's has hemp varieties to serve your needs.

INDUSTRIAL HEMP

In addition to selecting the proper field, preparing a good seedbed, and applying fertilizer before planting, choosing the correct variety for your end purpose is equally critical to a successful crop. The variety list offered is appropriate for our entire growing region. The seed has been produced according to strict guidelines set by Association of Official Seed Certifying Agencies, or AOSCA. Our two breeding partners, Verve Seeds Solutions and International Hemp, supply only certified seed produced in North America. The blue tag with the AOSCA logo is your assurance that the seed in the bag is the genetically pure variety you requested.

Grain Hemp is a nutritious oilseed crop, much different from CBD oil. High in protein and antioxidants, hemp grain can be consumed as hemp hearts, hemp seed oil, and protein powder.

Fiber Hemp is used for seemingly limitless industrial purposes, from fabric and non-woven textiles, construction materials, bioplastics, even biofuels and computer chips. Many vertically integrated customers are processing their hemp on the farm for animal bedding. Hemp is highly absorbent and reduces odors.

Our varieties are all dual purpose, meaning they can be used for grain or fiber. However, some have more valuable grain qualities, while others' best characteristics align with fiber and/or hurd. Our varieties are either monoecious (male and female plant parts are on the same stalk) or dioecious (female plants are distinct from male plants). In monoecious varieties, all plants grow through the season and contribute to total yield of grain and / or fiber. Dioecious varieties are typically focused on high grain quality and volume. Once the male plants have shed pollen, they senesce (die), allowing female plants more sunlight, water and nutrients. Only the female plants contribute to yield in dioecious varieties.

Seeding rates are also determined by the ultimate purpose for industrial hemp. Lower seeding rates are typically used for grain production to allow seed heads to develop fully, and even produce branches for higher yield. Higher plant population is preferred when growing hemp for long bast fiber. Since plants grow taller and thinner with more competition, bast fiber will be a higher percentage of the stalk. Lower plant populations allow stalks to grow wider with a higher proportion of hurd (the inner, woody stem) compared to bast fiber.

ABOUT SERIES**NEW**

- Premium, grain-forward varieties with straw yield as bonus
 - Thick, 2-foot+ long, stacked seedheads on uniform plants
 - Central US breeding, suitable for Virginia to Maine
- Specs: Dioecious; 6 to 10 feet tall; seed yield 1400 to 1700 lbs / acre; stalk yield 5500 - 6500 lbs/ acre;

Seeding rate 25 to 28 lbs per acre**AMPLIFY HYBRID SERIES****NEW**

- First 90% female hybrids with strong seedling vigor
 - “Baseball bat” seed heads double yield of open pollinated varieties
 - Husky plants beat most competitive weeds
- Specs: 90% female; 5 to 8 feet tall; seed yield up to 2500 lbs / acre; stalk yield 3000 - 5000 lbs/ acre;

Seeding rate 25 to 28 lbs per acre**CARMENECTA****NEW**

- Robust, tall straw variety
 - Abundant hurd and fiber yield
 - Excellent for latitudes 35° to 42°N
- Specs: Dioecious; 10-15 feet tall; stalk yield 5000 – 10,000 lbs/ acre;

Seeding rate 40 to 45 lbs per acre**CFX-2**

- Processor favorite for flavor and efficiency, CN's gold standard
 - Small stature for easy, late summer
 - Short grow cycle offers flexible crop rotations
- Specs: 4 to 6 feet tall, seed yield 800 - 1400 lbs/ acre;

Seeding rate is 25 to 30 lbs per acre**BIALOBRZESKIE**

- Long, fine fiber variety with solid seed yield
 - Strong hurd production 42°N and higher
 - Earliest seedling emergence in our trials
- Specs: Monoecious; 7 to 11 feet tall; stalk yield 3000 - 5000 lbs/ acre;

fine fiber planting rate 55 lbs per acre, hurd and fiber rate 40 lbs per acre**JURASSIC****NEW**

- Jumbo stalk variety
 - Ideal green fiber harvest, late flowering
 - 2023 hemp field day favorite
- Specs: 10 to 13 feet tall, stalk yield 6000 - 8000 lbs/ acre;

Seeding rate 40 to 45 lbs per acre**URSA GRANDE****NEW**

- Cornell breeding with Pennsylvania seed production!
 - A rare THC-compliant extra-large plant
 - Excellent for all US, will grow taller 42°N
- Specs: Dioecious; 10-15 feet tall; stalk yield 6000 – 14,000 lbs/ acre; seed yield 2000 lbs/ acre;

Seedingrate 40 to 45 lbs per acre

CBD HEMP AutoCBD varieties are day neutral and programmed for efficiency. Rapid, 10-week average crop cycles plus mechanical planting and harvesting save production costs. Plant seeds directly in the field 10 to 18 inches apart in 30-inch rows to beat weeds and maximize tonnage. AutoCBD is thigh-high in size. Suitable for all latitudes, Florida to Alaska! PhotoCBD is a hybrid of a day neutral variety and Spectrum (photosensitive). The best of both worlds, PhotoCBD is CBD-potent, stocky and fast. Harvest in early fall. Perfect for northern US latitudes.

Ask about a production plan to harvest routinely from early summer through late fall. Greenhouse and high tunnel crops extend the season even further, very early spring to late fall.

AUTOCBD™ (NBS CBD-1)

- A favorite for rich terpene profile
- CBD Flower 11% \pm 2%; Biomass 7% \pm 1%
- Economic seed cost

AUTOCBD™ ALPHA EXPLORER, F1 HYBRID (AT30013FLE)

- More robust CBD and biomass
- CBD Flower 13% \pm 2%; Biomass 8% \pm 1%
- Harvest Index 86% (useable biomass)

PHOTOCBD™ QUIK SPECTRUM

- CBD Flower: 17.5% \pm 2.5%; Biomass 12.5% \pm 2.5%
- Transplant on 4 x 4 grid to maximize yield
- Early fall harvest



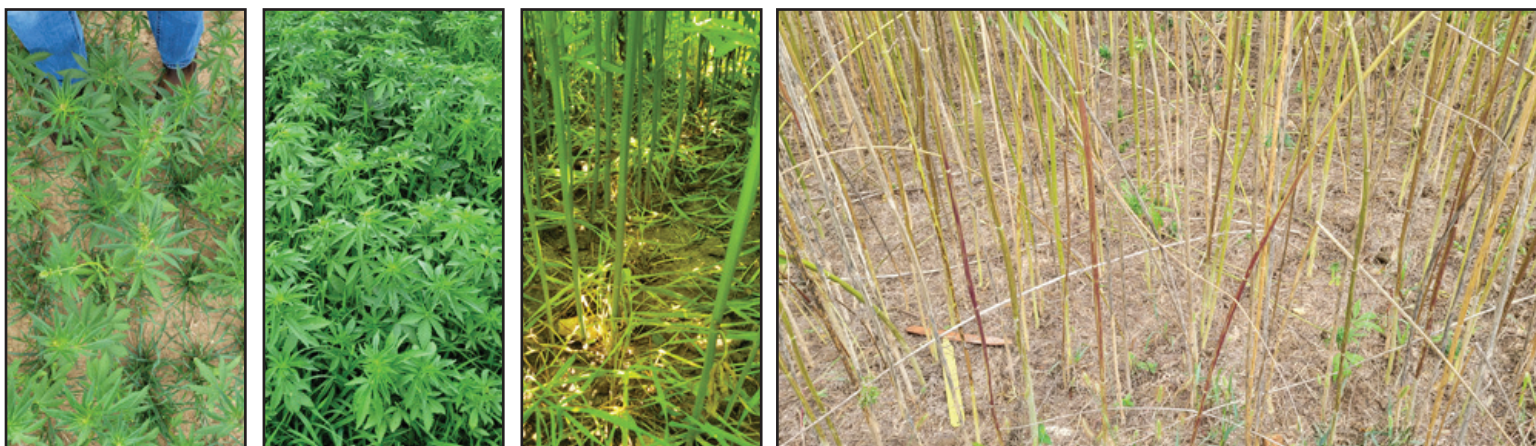
WEEDS: THE BANE OF HEMP PRODUCTION CULTURAL TIPS TO WIN THE BATTLE

By Sarah Mitchell, Industrial Hemp Specialist

Densely planted industrial hemp can drown in early weed growth, causing crop failure in the field or rejection at the processor. Using a “Temporary Nurse Crop Concept” can hold weeds at bay for the first three to six weeks of the crop cycle. Nurse crops are intended to assist hemp seedlings during their early, vulnerable growth phase and then disappear as hemp grows tall enough to fight the battle on its own.

Special note: nurse crops don’t guarantee success. Hemp, like all crops, has basic agronomic requirements that begin with a solid start. Successful farmers purchase high quality seed, choose the proper site, prepare the field for planting, and fertilize sufficiently to carry the crop through the season. On planting day, the planter is calibrated for rate and seeding depth, the soil is moist and there is good seed-to-soil contact. When seedlings are strongly established, hemp is quite drought tolerant through the remaining crop cycle.

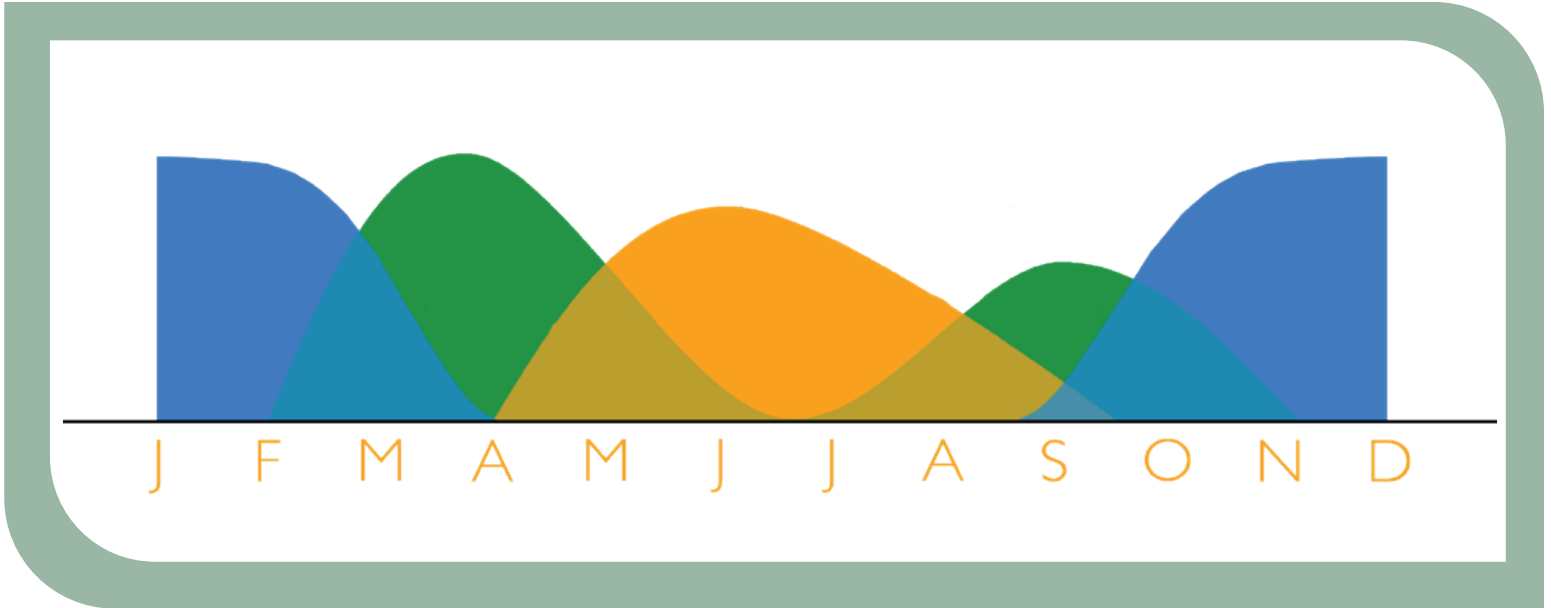
- Nurse crops are critical for tilled fields or when previous cover crop is too thin for weed control.
- Winter wheat and winter rye are ideal nurse crops. By their nature, winter cereal grains require many weeks of cold temperatures, or vernalization, to trigger flowering. When planted in May or June, vernalization is impossible and they remain vegetative or grass-like. By mid-summer, these winter crops are confused. Ultimately, they die, leaving a mostly weed-free field of hemp.
- A nurse crop is planted just prior to hemp on the same day. Since weed competition is the exclusive goal, use only about 50 lbs. per acre of the winter grain. Planter calibration is key, as the nurse crop seed should be planted a half-inch deeper than hemp seed.
- After re-calibrating the planter for seeding rate and shallower depth, plant hemp in a second pass. When hemp is planted half-inch higher in the soil, the nurse crop seed will not be disturbed.
- Ideally, hemp is planted diagonally or perpendicular to the nurse crop so it doesn’t compete directly. A little competition with hemp is good, but not so much that the hemp can’t get established.
- A pre-emergent herbicide approved for hemp contradicts the nurse crop concept. Choose one or the other.



Nurse crop progression, Left to Right: *In late May shortly after planting, the nurse crop looks like clumps of grass. By early June, the nurse crop looks more lawn-like, covering the soil as hemp grows over it. In early July, the nurse crop begins to fade in the heat. By September, the nurse crop has disappeared, and weeds are well controlled.*



COVER CROPS



COOL SEASON MIXTURES

Our cover crop mixes build soil health and biodiversity in the field, and can also be grazed or harvested for feed (higher seeding rates needed).

3-WAY CLOVER

A red, ladino, and yellow blossom sweet clover mix that can be frost seeded, spring seeded, fall seeded, aerial seeded, or broadcast after last cultivation of corn or seeded just before soybean leaf drop. With its diversity, it will grow in long cool springs and in the fall, and grows well in the summer or during drier spells.

Seed 10 to 15 lbs/acre.

BETA MAXX



BetaMaxx is a balanced blend that was carefully selected for vegetable and sugar beet cultivation. Common vetch contained in the mix has a beneficial effect on soil bacteria, which protects plants from pathogens. BetaMaxx enables vegetables and beets to be grown the following year because it does not contain cruciferous plants. This mixture will mostly winterkill. See tech sheet for full species listing.

Seed 30 to 40 lbs/acre.

BROADCASTER

For broadcasting in late summer with moisture. Will improve soils in many ways, including nitrogen fixation, soil tilth and drainage. Can be broadcasted with hand seeders, ATV seeders, highboy seeders and by airplane or helicopter. Great for seeding into a living corn crop and open fields in late summer. This cover crop mixes Annual Ryegrass, crimson clover, common medium red clover, daikon radish, and yellow blossom sweet clover.

Seed 25 to 30 lbs/acre.

CARGO

A mixture of crimson clover, annual ryegrass, and oats. It is a superb cover crop for USDA Zones 6A and higher. The benefit of crimson clover is that it flowers early and will fix nitrogen earlier in the spring compared with other legumes. Annual ryegrass has very extensive root growth and improves soil structure better than cereal grains.

Pre Inoculated.

Seed 60 lbs/acre.

CLEAN & GREEN

A perennial mixture designed for conservation. Contains durable endophyte free tall fescues and annual ryegrass that provides quick cover while the fescue establishes. Great for waterways, filter strips, around farm structures, etc.

Seed 30 to 70 lbs/acre.

CLOVER POLLINATOR MIX

This mixture of clovers is purposefully designed to attract pollinators. The variable maturity/flowering within the mixture allows for a full season attractant. Best suited to fall plantings.

Seed 5 to 12 lbs/acre.

CONSTRUCT

A tailored cover crop mix for the tobacco grower. Rapidly builds soil structure. Made up of Lowboy Annual Ryegrass, Spring Oats, Lifeago Buckwheat, Balady Berseem Clover, Flax, Persian Clover, Sorghum Sudan, Phacelia, Sunflower, and Daikon Radish. Seed during late summer recommended alfalfa seeding dates.

Seed 20 lbs/acre



Beta Maxx

LARGE BOX BOOSTER

Our Booster mixes are designed to help you add diversity to your small grain cover crop program. A three species mix (add the small grain of your choice to make it 4 species) featuring Keystone Winter Peas, which has excellent early vigor in the fall, and strong growth in the spring. Peas and crimson contribute to Nitrogen production, and daikon radish helps break up compaction. Mix the Booster with your small grain of choice in the large box of your drill, layering it in.

Seed 20 lbs booster per 50-100 lbs small grain.

MAIZE PRO DT



Maize Pro DT is the ideal mix for corn crop rotations. It selectively supports the formation of mycorrhiza in corn rotations, and as a result, improves the soil structure. The soils become more water stable, have an improved bearing capacity and are easier to work. The rooting channels with help the corn particularly during periods of drought.

Seed 35 to 40 lbs/acre.

MULCH MASTER RD

Are you growing pumpkins or melons? This mix is for you! An excellent forecrop that is planted in the fall and rolled down after flowering to terminate prior to planting in the spring. This mix builds soil, and the rolldown mat suppresses weeds and keeps the melons and pumpkins off the soil to help prevent disease.

Seed 100 lbs/acre

RAY'S CRAZY FALL

The Fall Formulation of Ray's Crazy mix, designed to build soil healthy by incorporating extreme diversity. Featuring winter peas, spring and winter small grains, vetch, clovers, annual ryegrass and brassicas. Can be used for both cover and forage.

Seed 50 lbs/acre.

RAY'S CRAZY SPRING

This mixture is designed with the same goals as the summer and fall formulations - a dual purpose soil improving cover crop and high quality forage. This mix provides quick spring nitrogen for the following crop, recycles nutrients, builds soil health. This balanced mix contains a total of 8 species: grasses, legumes and brassicas.

Seed 120lb/acre.

RIGOL DT



This cover crop mix is extremely effective in penetrating compacted soils as the plant types in the mix demonstrate intensive rooting activity. Numerous root channels are formed, which are used by following crop to rapidly reach rooting depth.

Seed 18 to 20 lbs/acre.

SMALL BOX BOOSTER

Our Booster mixes are designed to help you add diversity to your small grain cover crop program. This five species mix (plus the small grain of your choice makes it 6) features. The legumes in this mix contribute to nitrogen production, the timothy to soil tilth and the daikon radish to compaction. For drills with large and small boxes.

Seed 10 lbs booster per 50-100 lbs small grain.

SOIL BUILDER PLUS

A mix of triticale, crimson clover, hairy vetch, annual ryegrass and daikon radish. This mixture's diverse rooting structure builds soil organic matter and feeds soil microbes, contributing to long-term soil health and fertility.

Seed 60 to 90 lbs/acre.



Maize Pro DT

WARM SEASON MIXTURES

RAY'S CRAZY SUMMER

This diverse mixture was created for dual purpose grazing and soil health improvement. It contains 7-10 species including grasses, legumes and brassicas. There is also a spring and fall version of this mix available. Seeding rate varies depending on use and goals.

Seed 40 to 60 lbs/acre.

SUMMER SOLAR

A diverse legume-forb-grass cover crop mix of aggressively growing summer annuals, with possible dual use for wildlife food plots. The mix includes five very different components - buckwheat, cowpeas, sunflower, male sterile sorghum sudan, and sun hemp. Both conventional and organic growers will find this a useful break crop in between spring and fall crops that builds soil nitrogen levels and attracts pollinators and other beneficial insects. It can also be used in farmscaping strips to draw beneficials throughout the season.

Seed 35 to 60 lbs/acre.

SPECIALTY ITEMS

FLAX

NEW

Excellent for cover crop mixtures. Not intended for forage use. Helps with silica availability. Ask about its use as a natural fiber crop. Contracts possible.



Flax bundles

PERENNIALS

BIRDSFOOT TREFOIL

A legume that reseeds itself and tolerates low pH and wet soils.

Seed 20 to 25 lbs/acre.

RED CLOVERS

Red clovers are perennial clovers that can be interseeded, used in mixes or straight stands. Flexible fit in the rotation, from over-wintering cover crop to 1-2 year conservation and soil builder.

Seed 4 to 20 lbs/acre.

WHITE CLOVERS

White clover is a shorter growing legume that tolerates wetter soils and spreads by stolons.

Seed 2 to 4 lbs/acre.

COOL SEASON ANNUALS

BALANSA CLOVER

A cool season annual legume with similar winter hardiness to winter peas and crimson clover.

Seed 3 to 8 lbs/acre.

BERSEEM CLOVER

An annual clover that resembles alfalfa. Summer annual in North. A high yielding summer annual clover that makes a great winter-killed cover crop. Under the right conditions it can produce 100-200 lbs of Nitrogen as a stand alone crop. Works great in mixtures as well and can produce a very high protein forage for grazing or hay. **Now available in OC coated.** **Seed 15 to 20 lbs/acre.**

CRIMSON CLOVER

Winter annual clover, in early spring faster biomass and nitrogen production than other clovers, beautiful deep crimson bloom. Flowers attract many beneficial insects. Works well in combination with a small grain or with annual ryegrass as a cover crop or high quality nutritious forage mix.

Seed 15 to 25 lbs/acre.

SWEET CLOVER

Both white and yellow blossom sweet clover provide a strong nectar flow following vernalization. White blooming is typically 2 weeks after yellow blossom.

Seed 15 lbs/acre.

WARM SEASON ANNUALS

COW PEAS

Productive heat tolerant vining summer-annual legume, excellent drought resistance combined with good tolerance of heat, low fertility and a range of soils. If left to bloom it attracts many beneficial insects that prey on other pests. Slow to start, it does well in mixes with other quicker growing species, especially those that are erect-growing that can serve as a trellis to support its growth. Works well as a forage, especially in a mix.

Plant early summer, seed 40 to 60 lbs/acre.

HAIRY VETCH

A thick, vining winter annual legume that is very productive, produces nitrogen and offers quick cover.

Seed 25 to 30 lbs/acre.

SUNN HEMP

Tall-growing summer annual legume, tolerates drier conditions, high biomass producer, and good smother crop. Use as a green manure/cover crop to provide both organic matter and to fix nitrogen during the period between summer and the winter cash crop. Produces significant biomass in 6-7 weeks. Good in mixes to add varying heights to the cover, but keep seeding rate low. Low self seed risk.

Plant early to mid summer, seed 20 to 40 lbs/acre.



Sunn Hemp

WARM SEASON

BROWN TOP MILLET

A fast starting/growing millet with a fibrous root system that makes for a great summer cover crop. Brown Top works well for a smother crop or added to a summer cover crop mixture. **Seed 10 to 20 lbs/acre.**

BUCKWHEAT

True "smother crop" since it grows a thick canopy quickly and out-competes summer weeds. Good quick fill-in rotation between spring and summer or early fall crop, reseeds itself, but easy to kill. Good addition of broadleaves, especially in a mostly grass-based rotation. Fibrous root system, soil conditioner loosens up soil, makes organic phosphorous available. If left through bloom, it will attract pollinators. **Note: Plant late spring and anytime throughout summer. Seed 50 to 70 lbs/acre.**

LIFAGO BUCKWHEAT

A small seeded buckwheat with larger leaves and later bloom than VNS buckwheat. Not good for attracting pollinators. Excellent smother crop with great root development. Very quick summer growth for brief planting windows in rotation. **Note: Seed 25 to 35 lbs/acre.**

NON BMR SORGHUM SUDAN

Adds organic matter to worn-out soils. It is fast growing and loves heat along with having a strong ability to smother weeds, suppress nematodes and penetrate compacted soil. **Note: Plant early to mid summer; late summer as a winter-killed soil-covering mulch. Beware of prussic acid. Seed 40 to 60 lbs/acre.**

PEREDOVIK SUNFLOWERS

Sunflowers have many soil benefits that include: strong taproots penetrating vertically downward, widely spreading branch roots; enlarged taproot eventually grows many laterals. High biomass producer, tall growth and beautiful large blooms that attract pollinators and beneficial insects.

Note: Plant early summer. Seed 40 lbs/acre.

COOL SEASON

ANNUAL RYEGRASS

High winter hardiness. Vigorous, extensive growth, both above and below ground. Scavenges and recycles soil nitrates, contributes fine root organic matter at deep soil levels. **Seed 35 to 40 lbs/acre.**

COSAQUE BLACK OAT

Technically a winter oat, but can be planted in spring, late summer and fall with good cover crop benefits. This oat has strong alleopathic affects for weed and nematode suppresson. Best overwintering in zone 7b and south, when planted in barley/wheat dates.

BACKEN BLACK OATS (DUAL PURPOSE) **NEW**

Backen Black Oat is an earlier maturing, true *Avena strigosa* variety. Backen provides excellent weed control, with the species having alleopathic effects on small seed species. True black oats are also known for inhibiting certain nematodes. Scavenges nutrients. Great for cover crop applications and can also be used for forage.

PHACELIA

Excellent for beneficial insect and works well as a cool season soil builder. Planted in spring it will bloom in late spring. Planted in late summer it will bloom in the fall. 60 days to bloom. 4-6 weeks of bloom.

SPRING OATS

Grows quickly in the cool weather, excellent pre-summer weed-suppressing cover. Oats can be planted in the spring or in late summer as a universal nurse crop in mixes with slower growing perennial legumes (clovers or alfalfas) or brassicas. They are a quick scavenger of soil nitrogen, will recycle soil nitrates quickly in late summer, allowing slower growing winter annual companions to get started. If fall planted, they winterkill in northern regions, leaving a soil-covering mulch that leaves the soil ready for an early spring no-till planting. **Plant early spring and late summer. Seed 100 to 125 lbs/acre. For cover crop, 50 to 100lbs/acre.**

WINTER SMALL GRAINS

Wheat, Triticale and Rye are all small grains that are often used as overwintering cover crops. These fast starting grasses have fibrous roots for soil aggregation.

WARM OR COOL SEASON

DAIKON RADISH

Deep tap root growth, penetrates soil, improves tilth, scavenges and bio-accumulates nitrogen, calcium, sulfur and magnesium, from lower soil levels and moves them up to upper soil profile. Plant early spring as a quick weed suppressor or break crop. Great for mixing with small grains! **Plant mid August to mid September for maximum root growth, nutrient recycling and soil benefit for compacted soils. Seed 12 to 15 lbs/acre.**

PURPLE TOP TURNIPS

A fast growing brassica for cover crops that helps in reducing compaction and soil crusting.



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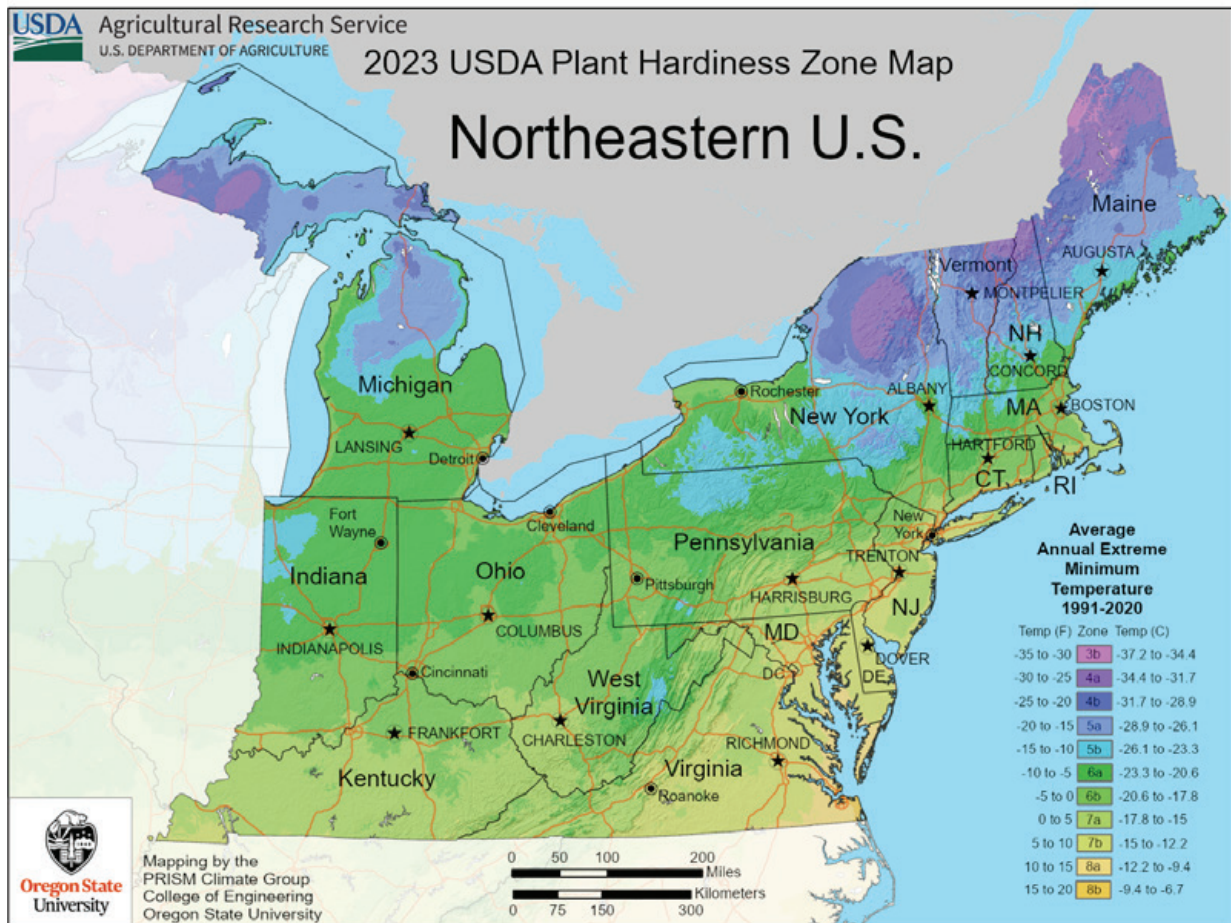
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SLUGS

By David Hunsberger

Slugs remain a pest of high concern across the territory. Weather events such as mild wet winters allow the overwintering of all 3 stages of their life cycle, egg- juvenile-adult. This can precipitate a large population of feeding slugs early in the crop season. Slugs being hermaphrodites can reproduce without an active partner although they do use mating to exchange sperm. A single gray garden slug can lay up to 500 eggs, and if cold weather comes they will often die after laying eggs.

Slugs eggs tend to hatch in late April and early May and slugs are comfortable in the cool moist conditions in spring. Most slug damage that is troublesome for crop production occurs to the youngest, most vulnerable plants. Cultural practices that enable a seedling to grow quickly are helpful in mitigating slug effects on the crop. Sometimes a shallow (3 inches or less) disking or turbotilling can lower populations by drying out soil and reducing cover, but research at Penn State has not detected a yield benefit of controlling slugs through disking or turbo-till. although there are plenty of anecdotal reports of horrendous slug damage in moldboard plowed “clean tillage” fields. The practice of planting green and providing an alternative food source of slow dieback cover crops has also been touted as beneficial. Use of a well-set row cleaner to provide for warmer soil temperatures is also helpful. Varieties with good early vigor and rapid growth along with adequate fertility can help the plants out grow the feeding from the slugs. Warm and sunny weather will also keep them to only feeding at night. The seed trench should be closed completely, this will not harbor the slugs in a dark moist environment and keep them from using the open trench as a conduit to the next seedling in the row. Some producers have used bait dropped from spinners or drones in high population outbreaks, this is quite costly. Some producers will cut 30% Nitrogen with half water and spray at night to act as a desiccant, this can also burn the crop. Extension does not currently have any published data on economic thresholds for damage but they do encourage scouting, using a white asphalt shingles or wet cardboard sheet laid down over night will allow you to do a count, this can give you an indication of how quickly the numbers are rising. Again, good robust growth and sunny weather is the best.

Crop rotation and having a biodiverse cover crop can help provide a good habitat for slug predators to thrive. Ground beetles, rove beetles, centipedes, firefly larvae, birds and frogs are major predators of slugs.

This author will relate some experiences we have seen on our operation. We have increased the population of predators by changing some of our management practices. Because they are types of insects, ground and rove beetles and firefly larvae and adults are affected by insecticides. Slugs are mollusks, not insects, and are usually unaffected by insecticides. Neonicotinoid insecticides are water soluble compounds often applied to corn, soybean, or other seeds and being soluble they can be taken up by the plant tissues, but the majority of the active ingredients remain in the soil and can leach out of fields into streams and aquifers. Slugs feeding on plants treated with neonicotinoids will show no ill effects even though neonics will be in their bodies. When the beetle predator bites the slug, it can receive a poisoning dose in just a little nibble, flops on his back and his legs go “running” just like a cartoon character while the beetle suffers. Neonicotinoids have a half life of 34 days in full sunlight exposed to soil biome. Without sunlight and microbes, neonicotinoids can have half lives in soil up to 7000 days depending on the active ingredient and soil type, all the while being harmful to beneficial insects including bees and other pollinators.

Case Study/Story

We signed up for CSP in 2016 or 2017..... Conservation Stewardship Program. This is a federal program operated out of the USDA NRCS office, rewarding producers for good practices and offering incentives to try further new beneficial strategies. For us the program was heavy on the rewards as we were long term no till, cover crops, manure management plans, crop rotation etc. As the program is written to get full reward credits we needed to do new practices also, we did some buffer strips, tree planting and we also signed up to reduce neonicotinoids on our plantings, this was an easy move as Kings has many options for alternatives for seed treatments. We participated in a “soil your undies” program with NRCS where you bury some men’s cotton briefs in the field and then retrieve them some weeks later. I was away from the farm for work the time they needed to be dug up, our local NRCS person dug them up for us and she commented on the veritable buzz that was going on in the corn field from all the activity of the insects. We participate in a local soil health group that meets quarterly. I am one of the few farms that does the reduced insecticides on seeds. The majority are no tillers and many of them have complained about the excessive replants they have had on corn and bean the last few years. We have not needed a replant for slug damage since we began this practice. I am convinced that is due to our robust predator population keeping them in check, I have some stripping feeding on the lower leaves, so I know I have a few slugs but not any damage to stand count...

Final comments, if you want to go to no insecticides on corn, you must use conventional hybrids. Kings does offer a few duracade above and below ground protection in a fortenza non-neonicotinoid insecticide. As part of their federal registration with EPA, genetically modified traits targeting rootworms are required by law to have an insecticidal seed treatment. This is our Story, if you want more resources to corroborate our suppositions you may wish to contact Dr John Tooker Entomologist from PSU for references regarding this topic. I hope some of you will consider looking at these types of management changes to increase your farm’s ability to reduce slug damage!



IS TAR SPOT FINDING A NEW HOME IN THE NORTHEAST?

The quick answer is yes- Tar spot seems to have found its way to the Northeast and the experts believe it's here to stay. So you're probably wondering- "ok- so now what?" Well let's back up a little bit and talk about what Tar Spot actually is first.

Chances are good that you've heard of and have seen some of the common corn diseases such as gray leaf spot and northern corn leaf blight over the years. Well there's a new corn disease called tar spot that has been on the rise across the US and has made its way into the Northeast. Tar spot is caused by a fungus called *Phyllachora maydis*. Not only can this fungus be carried in the wind from field to field, but it also resides in the residue of corn fodder from year to year. This disease, like others, is a yield-robbing disease that causes bumpy black spores (that do not rub off) to infect the leaves and creates the visual effect as if someone threw black paint or tar onto the leaves. If this disease comes in early, it can reduce yields as much as 20-60 bushels per acre, as the plant loses its live active leaf surface area (which is used for photosynthesis). A study done by Penn State University showed that if the infection is severe, it can reduce plant health quickly which ultimately leads to yield reduction. This can be a major concern for silage harvest as correct moisture is critical for proper fermentation. Tar spot can infect a corn plant at any time during the growing season, even if the plant has already senesced, it can still be infected by the fungal spores.

It is critical to scout your fields and know what is happening to the corn plants, leading up to harvest so you know how to plan for the following year. Late season infection is not a big concern for the current year's crop as the plant has already set its ear and yield should not be affected. The real concern in a late infection scenario is that if the plant is infected by tar spot, chances are almost guaranteed that it will reappear in that field the following year as the spores will over winter in the residue. Crop rotation is very beneficial to avoid tar spot in that field the following year. For example, tar spot has not been found to

affect the sorghum family. There are also many studies being done on different management options including fungicide usage, and the possibility of using foliar applied micronutrients to help suppress the fungus. There is still a lot to learn about tar spot, as it is a fairly new disease.

At King's AgriSeeds, we continue to work very closely with our corn genetic suppliers, expressing our strong desire for tar spot resistant corn hybrids and are working diligently to bring forward additional new hybrids that have resistance to tar spot. Both our genetic suppliers, as well as our own corn trials here in the east have been testing for tar spot resistance (as well as many other data points). When we introduce a new hybrid with a high tar spot rating, you can feel confident that it has been thoroughly tested in multiple trials in multiple locations. As always, we continue to work hard to stay up to date with the major agronomic issues that affect our crops, so we can be confident that we are providing the best products for our customers.



MAKING FERMENTED FORAGES

Forage quality starts with high quality genetics and ends at feeding. Poor storage management can destroy forage quality. For proper fermentation, oxygen must be removed, usually by means of tight packing and prompt, tight wrapping (if using wrapped bales or an ag bag), and the appropriate bacteria must convert plant sugars into organic acids, which lower the pH to a point of stability. When forage heats, energy is lost. Factors that affect fermentation include:

- Maturity at Harvest
- Sugar Content
- Moisture of Crop
- Length of Chop
- Filling Rate
- Packing Density
- Bacterial Inoculant
- Cover
- Feed Out Rate

For corn silage, it is better to err on the wet side.

For haylage or baleage, it is better to err on the dry side.

HAYLAGE / BALEAGE IN A DAY MAKES MORE MILK!

Wide swath management can get moisture levels low enough to make wet hay in a day. The result is silage that contains more NSC (sugar and starch), which makes around 300 lbs of additional milk per ton of feed. Some are even questioning the need for conditioning when making haylage/baleage. Freshly cut forage exposed to the sun continues to make sugar (photosynthesis) until the plant is wilted to 60%. The faster a crop is dried and harvested, the less sugar and starch is lost in the field due to respiration (cells using energy). Stomata (pores in the leaves) stay open in the sunlight even after cut. Keeping the forage spread out on the field keeps the stomata open for faster drying and increased sugar production. More sugar and starch (NSC) means more milk!

Basic Principles:

- Swath must be at least 80% of cutting width
- Leave 3 to 4" of stubble. Allows air to flow through swath better and helps grass productivity.
- Cutting time: Between late evening and late morning is best.
- Rake or merge before crop is too dry.
- Harvest at appropriate moisture (less than 65%).

More information can be found at this excellent web site:

http://www.hoards.com/E_crops/cf6

NOTES FOR SPECIFIC STORAGES

Baleage

Harvest as soon as crop reaches 50% moisture (40 to 60% is acceptable). Make bale as tight as possible and wrap immediately with plenty of plastic. Store bales in an area that is convenient for feeding. Repair bales when damage occurs. Feed out bales at a rate that will not cause heating. Also try to feed older bales first if practical.

Top Unloading Silo

Store at highest moisture possible without causing seepage. Higher moisture gives better packing and, with corn silage, makes more milk. In most structures optimum moisture is about 65%. The size of the silo should be matched closely with the feed out rate to prevent heating.

Bunkers

Bunkers can be very efficient for storing a high volume of feed, but losses can be significant. Proper sizing and face management of bunkers are critical. Another critical issue with bunkers is adequate packing. A good goal is 40 to 50 lbs of wet weight per cubic foot. Covering with plastic and weights to keep air out is also critical. Corn silage moisture for best milk production should be around 70%. For haylage, 60 to 65% moisture is a good goal.

Ag Bags

Ag bags can be an effective alternative to bunkers. Ag bags should be put on a workable surface and all holes should be repaired quickly. Forage moisture should be similar to bunkers. Sizing and face management are both important to prevent heating during feed out.



RUMINANT DIETS WITH MULTIPLE PROFIT BUILDING OPPORTUNITIES

By Doug Hering

Building ruminant diets that are cost effective is paramount. Building ruminant diets with similar forages that meet the needs of all feeding groups economically is also a challenge. Additionally, considering storage of feed, feed out, equipment, labor, AND soil productivity can be a daunting task. Balancing all these takes planning and thought. Your on-farm management staff, nutritionist, veterinarian, seed salesperson, and agronomist will all play a role in the decision-making process. Developing a plan to allow this type of thought process to occur is not easy but pays large dividends. Here are some examples of what could be done.

BRED HEIFER and DRY COW FORAGE OPTIONS

❖ FORAGE SORGHUM

- Early Summer planting. Great substitute for corn silage. Higher protein, lower starch than corn silage. Yields are very good. Feeds the soil biome incredibly well with high volume of root exudates, along with root development deep into the soil profile.

❖ SOFT DOUGH WHEAT SILAGE

- A winter crop harvested late spring replacing some corn silage and straw. Builds organic matter to the soil with its fibrous root, fits great, followed by a summer annual such as forage sorghum.

❖ TIMOTHY AS A ONE CUT HAYLAGE

- A winter crop that provides a low potassium source of protein forage that feeds the soil microbiome. Extends the winter feed cutting schedule to reduce weather risk. Use a one cut forage harvest approach

❖ TIMOTHY DRY HAY

- Can be used as a one cut harvest or a one-year break crop with multiple cuts. Low potassium protein forage that also provides needed digestible fiber. Timothy's unique rooting structure is an excellent source for improving and feeding soil.



HEIFER FORAGES FOR 6 to 22 MONTHS

❖ RYE / TRITICALE SILAGE

- A winter crop that is rumen friendly for developing replacements. Great source of metabolizable energy and protein. Feeds soil in late fall and early spring by root exudates and builds soil OM with its fibrous root structure

❖ CLOVER/TIMOTHY/SPELT

- A winter crop intended to be harvested later in the spring. It brings diversity to diets by adding protein, high levels of fiber digestibility in the form of NDFd 30 hour. Designed to be a one cut crop. Soil benefits include nitrogen production, building soil organic matter, improving carbon nitrogen ratio, and biodiversity in how it feeds the soil ecosystem.

❖ SUMMER ANNUALS/SUDANGRASS

- Very late spring/Early summer planted, Soils must be 65F. Multi-cut system. Summer annuals offer drought tolerant forages with very good DM yield per acre, high fiber digestibility, great rumen microbial protein production, and are very palatable. Soils benefit structurally by its deep, fibrous root system, improves the overall soil health with the high volume of root exudates and is a great crop to help aid-in weed control through shading and frequent cutting. Additionally, can be used as a fore crop to help establish a perennial forage when seeding in late summer

LACTATING SHORT ROTATION FORAGE

❖ CORN SILAGE/LATE MATURING TRITICALE/YIELDMAX/CORN SILAGE - north of I-80

❖ CORN SILAGE/ SOFT DOUGH WHEATLAGE/SORGHUM SILAGE or ONE CUT SUMMER ANNUAL/TRITICALE/CORN SILAGE – south of I-80

- These ideas are very specific to geographical regions. They offer high quality forage options in that many of the forages produced are capable of being fed to lactating cows. YieldMax and Triticale forages are high in NDFd 30-hour values which drives rumen microbial protein production allowing for maximum production.

Some of these crops are less expensive to grow than traditional crops, in addition some serve as a break crop for corn acres, lowering rootworm and other pest pressures, and will start to allow beneficial insect population to rebuild. Ultimately these types of crops are key contributors to improving the soil ecosystem and building a fertility bank in your soil for your future crops.

This is a brief synopsis of these concepts of building profitable diets and crop rotation options. Feel free to contact the King's AgriSeeds staff for more information.

ESTIMATING CORN YIELDS

Anticipating your corn yields is exciting, yet daunting. We all pray for a great harvest, and most times we are blessed with one, assuming the corn isn't a late planting or hit by a flood. Here are a few tips on estimating your corn yields for fall harvest, before the combine reaches the field.

A popular method of estimating corn grain yields is the component method. This is easy as estimating how many corn kernels per acre and converting that over to bushels per acre. This can be done from the milk (R3) stage and later. Be sure not to estimate too early as kernels are not fully developed.

Like any average—the more data, the more accurate the estimate will be. We recommend taking samples from 3 separate areas of the field. The more variable the field the more sample locations will be needed. Do not take samples from edges or known problem spots of a field.

Step 1: Measure the length of a single row equal to 1,1000th of an acre. Please see chart below for recommended sample lengths and row spacing.

<i>Row Width</i>	<i>Sample Length</i>
15"	34'10"
20"	26'2"
22"	23'9"
30"	17'5"
36"	14'6"
38"	13'9"

Table 1

Step 2: Count the number of harvestable ears on the plants in the 1/1000th acre of a row. Don't count the ears too low for the combine head.

Step 3: Select at least 3 areas to collect samples from. To be fair, select ears by a sequence, like every 5th, 10th, 15th ear or 3rd, 8th, 12th ear. This helps selections to be fair and accurate. Remove outliers unless they are on par for the area of the field you are sampling.

Step 4: Count the number of kernel rows and the average length of rows and multiply the two to get the number of kernels per ear. Do not include the butt or tip kernels, only the complete number of rows around the cob. If kernel numbers are uneven among the rows of an ear, estimate the average value for kernel number per row. Average the kernels per ear at each sampling point.

Step 5: Estimate the yield at each sampling point, by multiplying the number of ears per 1/1000th acre of row (step 2) by the average number of kernels per ear (step 4). Next, divide that result by the seed size factor, (table 2), which is the number of kernels in a bushel, to obtain the estimate in bushels. Finally, average the calculated yields from all of the sampled points to get an estimate for the entire field.

<i>Crop Condition</i>	<i>Kernels/bu.</i>	<i>Seed size factor</i>
Excellent	75,000-80,000	75
Average	85,000-90,000	85
Poor	95,000-105,000	95

Table 2

Determining the seed size factor is one of the most subjective parts of the equation... Kernel weight from year to year can vary by the thousands, tens of thousands per bushel or more due to the growing conditions and seasons, during grain fill. (table 2). Sampling during the same stage, year after year will create comparable data. Dent to Black layer stage will increase the accuracy of the seed size factor. This is a great way to estimate the yield of your harvest, but knowing the real yield will not be confirmed until harvest. This method is estimated to get you within 20 bushels of the actual yield. This method does not account for field edges, wildlife damage, so please keep that in mind when using this method.



RECLAIMING YOUR LAND

By David Hunsberger

Reclaiming land to put into production is a multistep process. You have a valuable resource at your fingertips, but you have to be able to harness its potential and manage it to your advantage. If the land was forest or meadow for many years, it's likely to be rich in organic matter and both above and below ground biodiversity. The most likely points of weakness, though, will be soil acidity and perennial weed pressure. Depending on how woody the prior vegetation was, you may also need to contend with shrub, tree and stump removal and using tillage to get soil to the point where it's a clean, even seedbed.

Even after rounds of full tillage, disking and herbicides, the first crop you establish should not be a fragile species – don't invest in a slow-starting, small, seeded perennial, for example. The best bet will be a quick growing annual that will offer rapid canopy closure and tolerate less-than-ideal soil conditions (which is what you're likely to have for the first season or two), while still building up soil. In other words, a solid transition crop.

Clearing the land

Even if you plan to keep some of the trees and shrubs to build a silvopasture, you will likely need to cull some trees. Stump removal is a process all its own, and there are a variety of ways to go about it. It will be necessary if you plan to run equipment over the land. The age and size of the trees determine how difficult the removal will be.

There are a few options for accomplishing this. You can rent a grinder to grind the stump down yourself (be sure to use protective goggles). Grind down about 4 inches in one spot and move the grinder and repeat this until the stump surface is leveled off below ground. To maximize root growth of your new seeding, it's best to grind it down to 12-16 inches below the soil surface and fill it with topsoil.

There are some alternative techniques out there as well. One is to burn the stump out. Drill holes about 8 inches deep into the top of the stump,

clean out debris, and sprinkle potassium nitrate into each hole. Pour hot water into each hole. Pile scrap wood on top of the stump, light the scrap wood, and wait for it to ignite. Use a shovel to break up any large roots that are left over after the stump burns out.

If you have a longer time to wait for decomposition, you can simply opt to cover the stump with fertilizer, soil, and/or mulch, which will foster bacteria and fungi that cause decay. Once the stump becomes soft and mulchy, it can be dug out more easily.

Fill the hole left by the stump with topsoil as needed. It's important to fill it a few inches above ground level, as air pockets in added soil and leftover wood fragments will cause soil to settle into the hole. It can help to compact the added soil after every 2-4 inches added.

Be sure to remove as many of the wood chips from the area as possible after the stump has been removed. Woody material takes a long time to break down, and with its high carbon content can tie up valuable nitrogen that you will need to get the crop established. Applying nitrogen fertilizer to the area occupied by the stump can help speed decomposition.

Understand the forest services you may be compromising

Whenever you remove the vegetation from an area, you run the risk of increasing nutrient leaching and pollution of groundwater and streams, a process that also robs your ground of its quality and nutrients. It's important to give some thought to how dramatically the land-clearing process alters the ecosystem and potentially affects the watershed, and plan to offset this at least a little bit. Excess nutrients from lawns and farm fields are one of the largest sources of non-point pollution to waterways.

One of the most critical services trees provide is water management. Trees capture, filter, and

retain excess water and the contaminants that are often transported with it. Removing vegetation also creates more opportunity for lateral flow across the surface and runoff – funneling pollutants into waterways and leading to stream sedimentation, stream bank erosion and stream widening, loss of fish habitat and decline in water quality.

The leafy canopy in wooded areas slows the fall of rainwater and distributes the rainfall more evenly over the forest floor. The forest floor in turn is rich in organic matter and rotting wood and behaves like an absorbent sponge. The mean soil infiltration rate in a forested area has been observed to drop from 12 inches per hour to about 4 inches per hour when converted to turf. Consider also that a mature evergreen can intercept 4,000 gallons of water per year.

Trees also consume stormwater and many of the harmful pollutants and contaminants it picks up. One of the most important services forests contribute to a watershed is cleaner drinking water. Other ecosystem services include carbon sequestration (helping remediate excess carbon pollution in the air), flood control, wildlife habitat, and forest products.

So how do we keep the watershed happy when renovating land? Although some tillage will likely be needed to start fresh with the field, keep it planted in living cover as soon as possible. We recommend annual mixes in the intermediate stages before the land is ready for permanent pasture. Take advantage of fast-growing summer species such as cowpeas, sorghum, sorghum-sudan, and buckwheat: fall crops like oats, radish, and other brassicas, and winter annual mixes that include triticale, annual ryegrass, hairy vetch, and winter peas. Establishing a mix, even a simple 2-3 species one, provides root diversity – different roots that take up different nutrients from various soil regions. Looking at deep- and extensive rooted crops, whether they have a large taproot or a complex fibrous root system, will help in building soil, uptaking nutrients and water, and replacing some of the role once played by trees.

Also be sure that you are planting or maintaining the required riparian buffers (according to your

state regulations) between your new fields and any waterways. Restoring and adding to native species plantings and additional wooded areas surrounding these fields can also help. Farmscaping select buffer areas with perennial pollinator mixes can help you play double duty with soil building and attracting beneficial insects to adjoining fields.

Thoroughly control what's there

Don't underestimate the importance of controlling the native vegetation before planting. You will not be able to go into this field full "organic no-till". If you have a grassy area where woody plants were removed, the tenacious perennial vegetation probably has formed a dense sod that will be naturally inhospitable to new plantings and has to be carefully controlled before any seeds go in, either with burndown or full inversion tillage. Otherwise, it can bounce back and compete heavily with new seedlings. If you still have some weed pressure even after your control measures, keep in mind that **annuals you plant are much faster out of the ground and therefore more competitive against weed pressure.**

Animals can help renovate, too

Sheep and goats can help with clearing shrubs and trees. Goats kill trees by girdling them, and their browsing habits lead them to eat more woody plants and bushy, small trees. Pigs can root up problem vegetation if left to an area long enough, and can also help with tilling in grass seed. Most animals can be used to "hoof in" seed in bare or wet areas, but be sure to remove animals before soil is damaged. Mob grazing of the area with cattle or other livestock can help correct any weed problems, since it leaves them little opportunity to select the most palatable species, but be sure you are using the right class of animal to graze down this less-than-optimal quality forage.

Making the best of acidic soils

What do you do when you find that your major obstacle on your newly cleared land is low pH?

Aside from spreading lime as soon as possible, there are a variety of acid-tolerant cropping options out there. But it's important to understand

the effect of pH on soils, and the effect of your management on pH.

Acidity itself does not harm plant growth, but it creates conditions in soil that make it more difficult for plants to perform at their best. All pasture species can grow at pH 6.5. Most forage crops prefer slightly acidic soils, but soil that falls below the optimum range can have serious consequences that include decreased soil nutrient availability, increased impact of toxic elements in soil, diminished microbial functions like nutrient cycling and nitrogen fixation, and overall reduced plant uptake of water and nutrients. Raising the pH limits the solubility of toxic elements in soil, such as aluminum, hydrogen, and manganese. Below 5.5, soluble aluminum can reach levels toxic to plants, and below pH 5.2, manganese can become toxic. The combination of increased toxicity of aluminum and manganese and the lower nutrient availability at low pH harms soil microbes and lowers the biological activity level in soils. On the flip side, above pH 7.5, most micronutrients won't be available to plants.

Keep in mind also that both N fertilization and crop harvest have acidifying effects, so soil testing (and probably liming) will be an ongoing process. Crops uptake basic elements during their growth – calcium, magnesium, and potassium – and these lime-like (basic) materials are removed from the field when hay or grain is harvested.

Once you apply lime, it will take at least a year for it to take effect in the soil. For neutralization to happen, there needs to be a reaction between lime and soil particles, which is greatly enhanced by incorporating the lime (otherwise lime moves down through the soil profile at the rate of about 0.5 – 1 cm per year).

In the meantime, emphasize acid-tolerant crops. Many cool season perennial grasses tolerate acid conditions well, especially tall fescue, Kentucky bluegrass and reed canarygrass. Some legumes do better than others. In general, lower pH inhibits microbial activity, which includes nitrogen-fixing rhizobium bacteria. Legumes also tend to rely on more basic elements from the soil, such as calcium, magnesium, and potassium. Good legumes to try on more acid soils include

cowpeas, lespedeza, hairy vetch, white clover, and alsike clover.

Annuals like crabgrass, **millet**s, **oats**, and **triticale** can tolerate pH of down to 5.5, and **rye** can go down to 5.0.

Plan a successional rotation to set the stage for the pasture

Choose the species that are best for your goals based on winter hardiness, drainage, pH, fertility, and harvest management plans.

The first few seasons you will want to rotate with annuals, taking advantage of their short lifecycles and fast growth.

Example rotation:

- Early Spring, Year 1: Pea-Oat Mix
- Summer, Year 1: Buckwheat and/or sorghum-sudan
- Fall, Year 1: Triticale, crimson clover and annual ryegrass
- Summer, Year 2: Buckwheat
- Fall, Year 2: Double Play (oats, annual ryegrass and triticale)
- Summer, Year 3: Ray's Crazy Mix (sorghum sudans, millet, sunflower, cowpeas, radish)
- Fall, Year 3: Southern Beefmaster pasture mix

Don't just look at your cover crop, use it!

Your transition crop does not have to be merely a sacrificial ground cover, and in fact can go far beyond a soil builder. Get a few harvests out of it or get the animals out there to graze it! While these hard-working covers outcompete weeds and build up organic matter with their root masses and plant canopy, they are also producing mounds of highly digestible forage. Cool season annual small grains like **triticale**, **rye**, **spelt** or **oats** can be grazed in fall or spring, or cut and wilted for baleage. If mixed with **annual ryegrass**, the stand can produce multiple cuttings of dairy-quality forage. Diverse summer annual mixes like summer **Ray's Crazy Mix** or **King's Soil Builder**

Plus contain grasses, legumes and forbs and are also great dual-purpose products for soil building and feed. If you choose to graze, animal impact and nutrient cycling through manure and urine and trampling material will also deposit organic matter into the soil. Grazing must be closely managed, however. Rotational or strip grazing is ideal, with animals moved at least once or twice a day and stocked at high enough densities that they don't have a chance to overgraze the most palatable species. Uniform grazing, taking half and leaving half, promotes the best regrowth and soil cover, not to mention weed management (if they can't select, animals will graze down and trample some of the weeds.)

Pea-oat mix is a simple but effective soil renovator for early spring or late summer. An **Oats-Daikon radish mix** is also quite elegantly simple, and radish scavenges nitrogen, potassium, and phosphorus while breaking up soil compaction. Neither of these mixes can be expected to overwinter in Northern climates, but they produce several tons of dry matter in about 60 days.

Plug into pollinators

What other dual role can the transition crop play? Think beyond the four-legged foragers. While building soil, you can also bring in the beneficial insects with quick-growing, nectar-producing crops. **Buckwheat** blooms in about 40 days, attracting bees, pollinators and other beneficials, and also tolerates mildly acidic and low-fertility soils. It scavenges phosphorus, and is also an excellent soil conditioner. A mix may be even better, such as **Summer Solar Mix** – which contains buckwheat, cowpeas, sunflower, and sunn hemp. Each species blooms at a different time, creating a succession of blooms over the course of the season – extending the productivity window of your bee and pollinator forage.

Don't leave out **legumes** – peas, vetches, annual and perennial clovers, etc. – which fix nitrogen and build soil fertility. The catch is that legumes often can't be your first line of defense on virgin land because most do not tolerate acidic soils. The bacterial strains that colonize their roots

and fix atmospheric nitrogen can't survive in an acidic environment. There are a few exceptions, including summer annuals cowpeas and sunn hemp, and the cool season perennials birdsfoot trefoil and alsike clover. Legumes are often slightly slower starters, as well, so you will often find that you have to rely on other species in the mix (forbs and grasses) to outcompete weeds.

Soil organic matter

Building soil organic matter is really the key to creating a productive field, and should be the focus of your transition time. Almost any type of crop can do this, given enough time and the right conditions, as well as a dedication to leaving some crop residue in the field – whether left as no-till surface residue or plowed under as green manure (many crops regrow after cutting or grazing, allowing you the flexibility to still get some cover crop-only growth after your harvest). Organic matter stimulates biological activity in the soil and improves a number of soil properties like moisture retention and aggregate stability. This is another reason for planning a succession of annual crops – they are high-producing in a short time, leaving several tons of dry matter in the field. Using a full rotation of annuals not only builds up organic matter but helps condition soil to the point where it's friable enough for a fine, firm, clean seedbed where perennials can get their start.

Once you have a successfully established pasture...

Protect it! Practice good pasture management, including rotational grazing, soil testing and regular fertilization, and mowing or clipping when needed to control weeds. When grazing, remember to take half, leave half for best regrowth. Allow paddocks to rest and recover properly, and adjust stocking rates to get more even distribution of manure and urine. Don't forget to continue to practice pasture renovation to build the field's resilience and biodiversity – cycle into annuals every few years, followed by reseeding.

Speak to an expert at King's AgriSeeds now at 1-717-687-6224 or email us at info@kingsagriseeds.com.

THE IMPORTANCE OF SOIL HEALTH FOR A PROFITABLE FARM

By Harold Schrock



Worm in healthy soil.

There is a documented direct correlation between soil health, particulate organic matter concentrations and field/farm profitability as explained in a university level study recently completed by Claire LaCanne and Jon Lundgren. This study, “Regenerative agriculture: merging farming and natural resource conservation profitably”, is now in the peer review process and lends some scientific documentation to observations that have been widely observed and discussed among my regenerative farming friends. This published paper documents several interesting observations on soil health, the organic matter accumulation characteristic of regenerative agriculture, and the absence of insect pests in spite of no insecticide applications.

PARTICULATE ORGANIC MATTER & SOIL HEALTH

Particulate organic matter, as I understand it from their references, refers to the portion of organic matter that is biologically alive and cycling relatively rapidly between plants and soil. This is separate from the total organic matter in any given soil.

Although more organic matter is typically better than less, organic matter by itself does not equate to soil health. Total organic matter correlates fairly well with the soil’s water holding capacity and nutrient holding capacity, but does not directly correlate with a soil’s ability to feed plants.

The particulate organic matter does directly correspond with soil’s ability to host healthy plant production. The laboratory test to document these levels is not available at most agricultural laboratories but I doubt if that is a practical concern, because these soil conditions are fairly easy to observe in the field and the path to achieve higher levels is well understood.

THE VALUE OF SOIL AGGREGATION

Soil aggregation is the visible indicator of higher levels of particulate organic matter. It’s easy to observe the crumb structure of a soil and it is also easy to do a slake test, (place a clump of soil in a transparent container of water and watch how long it takes to dissolve; the longer time it takes to turn into sludge in the bottom of the container, typically the better the soil aggregation).

The real question is, what is the value of this soil aggregation and how do we achieve more of it?

The value of soil aggregation and particulate organic matter can hardly be over estimated. Soil gas exchange is one of the most important functions of soil and is largely dependent on soil aggregation. Contrary to the expectations of many farmers, nitrogen is not the number one plant nutrient needed.

By a huge margin, the number one plant nutrient needed by volume is carbon. The great majority of the carbon used by plants in their growth comes from atmospheric CO₂ (carbon dioxide). While atmospheric CO₂ levels have been increasing in recent history and are now high enough to cause concern in some scientific communities, the concentration in the atmosphere at large is not nearly high enough to maximize plant growth. The CO₂ concentration in the first couple of feet above healthy soil can be 10 times or more normal atmospheric levels. CO₂ level variation is the primary reason we can often observe a growth response immediately following row cultivation. It is also a good portion of the growth response observed from a soil nitrogen application.

Nitrogen interacts with soil carbon, releasing higher levels of carbon dioxide and causing additional plant growth. This is one reason why side-dress nitrogen is typically much more efficient than pre-plant applications.

HOW TO ACHIEVE HIGHER LEVELS OF SOIL AGGREGATION

So how do we achieve higher levels of soil aggregation and particulate matter? There are some chemical interactions that have a small effect. Perhaps the strongest of these is the calcium/magnesium balance. Calcium tends to flocculate clays, spreading the layers for a looser chemical bond. Magnesium has the opposite chemical action, relaxing chemical soil structure and causing a tightening effect. These chemical effects in soil are real but they pale in significance compared to biological construction. By far the greater portion of healthy soil aggregation comes from the biological life within the system.

Achieving healthy biology in the soil starts with drainage; aggregation is responsible for most of good soil drainage but aggregate-building biology functions very poorly or not at all in saturated conditions. If the field has a naturally high water table, tile and/or ditch drainage is the only way forward. If this is not done it is nearly impossible to achieve profitability with high-value crops. Fields that are impossible to drain are likely best utilized for Reeds Canary or similar perennial bedding/biomass production. Some soils are waterlogged because they are tight but do not have a high water table. These can often be worked with from the top down, feeding the biology and strategically ripping to overcome compaction issues.

MINERALS & SOIL HEALTH

Minerals, whether naturally occurring or provided by fertilizer, are an important part of building soil biology. Both plants and biological life are very dependent on sufficient quantities of mineral nutrition in the soil profile. This is well known and understood but sometimes the fact is missed that any mineral essential for plant production can be a limiting factor in the overall system.

Ordinary soil tests certainly have value but they do a very poor job at measuring metallic element availability for plant growth. If our soils are less than optimally healthy, measuring nutrient levels in the crops themselves is very important for understanding weak links. A forage test including wet chemistry micronutrient analysis is of at least equal value to soil tests for understanding where fertilizer dollars are best spent. Foliar feeding, based on forage analysis, is often the most cost effective way to supply needed plant nutrients for optimal sugar production.

SUGAR PRODUCTION & SOIL AGGREGATION

Sugar production is easily the most important factor of all in building biological aggregation. Sugar is the food for microbes that produce glomalin and other glue-like substances that bind the particles together. Microbes also mine soil minerals to complete their diet requirements, creating additional plant-available minerals.

Excessive tillage, as well as some herbicide and fertilizer formulations, are known to disrupt soil biology and aggregation, but most soil destruction happening all across North America today is a direct result of low sugar production. This is either from lack of plants or from lack of plant health and photosynthesis production.

We get the first situation in the case of summer cropping with no corresponding winter cover/cash crop. A healthy corn crop in the height of the growing season will push as much as 70% of its sugar production into the soil in the form of root exudates. This can be a very significant amount of sugar, as much as 8-9000 pounds per acre, but is in itself not enough to keep robust biology functional all year around. Biological feast and famine will not build stable soil structures.

Great sugar production is equally dependent on the health of the crops growing. Plants struggling from environmental stress such as flooding or drought will not produce significant levels of root exudates. Neither will plants limited by mineral nutrition needs.

To summarize: Keeping the soil covered as much as possible with green growing plants and fertilizing for optimal photosynthesis and sugar production are the primary keys for building soil aggregation. Interestingly, these same two factors are primary keys to farm profitability on multiple fronts. Producing more and better quality crops not only improves cash flow; it should ultimately also produce healthier soil and reduce input requirements, leading to higher profits.



Sugar-laden root exudates coming from a corn plant.

SOIL INDICATORS

Soil productivity, usually measured in terms of crop yield, is influenced by physical, biological, and chemical components that all interact.

Visual indicators include exposure of the subsoil, change in soil color, gullies, ponding, runoff, plant condition, blowing soil and deposition.

Physical indicators involve the arrangement of the soil particles and pores; we can understand these factors by observing topsoil depth, bulk density, porosity, aggregate stability, texture, crusting and compaction. Physical indicators affect root growth, seedling emergence, water infiltration and movement within the soil profile.

Chemical Indicators

A soil test will be needed to give you a chemical profile of your soil. Critical chemical soil characteristics to look for are pH, major nutrients (nitrogen, phosphorus, potassium), secondary nutrients (sulfur, calcium, magnesium), and micronutrients (especially boron, copper, manganese, zinc; but also iron, molybdenum, chlorine, selenium, and cobalt). PH is important to know because it influences the availability of most nutrients.

Biological indicators of soil health include the effects of the micro and macro-organisms, their activity and/ or their byproducts, which contribute to the formation and stability of the organic matter portion of the soil. Many are also critical to supplying nutrients to the living plants, as their population is greatly concentrated in the rhizosphere (or growing root zone of the living plants).

Several important soil indicators include:

- **Aggregate Stability** - the ability of soil aggregates to resist disruption when outside forces (usually associated with water) are applied.
- **Infiltration** - Water movement in the soil as a result of soil texture, crusts, compaction, aggregation and structure, water content, frozen surfaces, organic matter, and pores.
- **Bulk Density** - The ratio of dry soil mass to bulk soil volume (including pore spaces). This can be measured and expressed in grams per cubic centimeter, and is largely a function of relative pore space and organic matter content. Bulk density influences water infiltration and plant root health, and reflects the degree of soil compaction.

- **pH** - Negative logarithmic scale that measures the “Potential of Hydrogen” concentrations in aqueous solutions. Soil pH influences the solubility, and therefore the availability, of several plant nutrients. It also affects the activity of microorganisms responsible for breaking down organic matter, as well as chemical transformations in the soil. The type and population densities of soil microorganisms change with pH. A pH of 6.6 to 7.3 is favorable for microbial activities that contribute to the availability of nitrogen, sulfur, and phosphorus in soils.
- **Soil Crusts** - Created by the breakdown of soil structural units by flowing water or raindrops, or through freeze-thaw action, crusts reduce water infiltration and increase runoff, restrict seedling emergence, reduce surface water evaporation, and increase wind erosion in sandy soils. Heavier clay soils and surface-applied manure are particularly prone to crusting.
- **Organic Matter** - Soil organic matter is the fraction of the soil composed of anything that once lived. Organic matter gives soil a sponge-like quality that allows it to soak up about twelve times its weight in moisture, which helps prevent nutrients from leaching out and makes your system less “leaky.” Soil food web organisms derive their energy from organic matter inputs.
- **Available Water Capacity** - Available water near the surface is especially important at the seedling and transplant stage when the roots are very shallow and not yet fully developed.
- **Soil Biodiversity** - The mix of living organisms in the soil that comprise the “soil food web,” such as insects, worms, and microorganisms, whose interaction and biological activity influence many soil processes, such as nutrient cycling, residue decomposition, and the entry and storage of water into the soil and resistance to erosion.



SOIL FERTILITY FOR FORAGE PRODUCTION

Calcium is the foundation of the whole fertility program. If this is not in balance, many of the nutrients and minerals may not be available for the plant to use. Once in balance, your pH will be in the correct range also. This increases nitrogen utilization, which in turn increases the protein content of the forage.

Nitrogen is directly linked to increasing the protein level in forages. Lack of nitrogen affects chlorophyll production and results in lower energy absorption from the sun. Plants low in nitrogen mature earlier. Nitrogen is also essential for the production of vitamins and energy systems in the forage. It is an essential component of amino acids, which form plant proteins.

Phosphorus plays an important role in photosynthesis and respiration, influencing energy storage and transfer, cell division and cell enlargement. Phosphorus improves the overall quality of the forage by building a store house for the plant's energy, protein, minerals and nutrients.

Potassium is essential for protein synthesis. It is important in breaking down carbohydrates, a process which provides energy for plant growth. It aids the plant in overcoming the effects of diseases. Potassium is involved in the activation of more than 60 enzyme systems which regulate the rates of major plant reactions. Legumes utilize more potassium than grasses. When potassium is too high, it can affect palatability and digestibility of the forage.

Sulfur increases forage quality and affects the quantity and quality of protein. It releases energy in the cells and is part of Vitamin B1 and biotin. (Since air quality has been improved, we need more sulfur.)

Zinc builds chlorophyll, helps enzymes function correctly, affects growth hormones in the plant, and affects elongation of internodes.

Boron is needed in only small amounts, but most soils are low as boron is not easily stored in soil. It is very important in the plant's nutrient intake of calcium and other minerals. It aids in cell wall formation, sugar transfer, energy release in cells, protein production and improves overall forage quality.

Copper helps control molds and fungi, aids in chlorophyll production and photosynthesis, helps enzymes function properly, and helps with the immune system of the plants.

In summary, we need to build adequate, balanced levels of nutrients and minerals in the soil to produce high-energy, high-quality pastures and forages. In grazing dairies, cows will have a higher dry matter intake if the pastures have adequate levels of calcium, phosphorus, sulfur and trace minerals. These same forages will have higher sugar levels, which help to improve their digestibility, since this energy is readily available energy for rumen microbes. With higher sugars, less starch is needed and fiber levels are maintained for rumen functions.

Points to Remember

- Every time grasses are cut or grazed, roots will slough off. This fast cycle of root growth and die off is why grass has the capability to build organic matter.
- Clover and other legumes have the ability to produce lots of nitrogen, improving soil fertility.
- Fertility has tremendous influence on tillering and persistence.
- Having lots of tillering going into summer will extend grazing longer into a drought due to the fact of the aggressive new life in the tillers.
- Fertility is a big factor in a stand's ability to thrive under various pressures.
- It is much cheaper to stay ahead with fertility than to try playing catch-up, and yield will improve dramatically.

FOR IDEAL RANGES FOR VARIOUS AMENDMENTS VISIT

kingsagriseeds.com > Resources > Forage Technical Reference Encyclopedia > Soil Soil Fertility Management for Forage Crops: Maintenance (Penn State)

OR request a copy of Penn State's article Soil Fertility Management for Forage Crops; Maintenance

THE ART AND SCIENCE OF CREATING MIXTURES

By Tim Fritz

There has been a lot of attention in the soil health world regarding the benefits of mixtures. There are indeed lots of benefits for mixtures in cover crops, and of course forage crops. King's has been creating and evaluating mixtures for over twenty years. When creating a mix, King's considers factors such as seed size which impacts both planting depth requirements and the amount of seed needed. Other factors include the establishment speed of the species being considered. For example, the brassica and mustard families tend to be small-seeded and very quick to establish and become very competitive; therefore, the amount of brassica used must be kept to a minimum. $\frac{1}{2}$ to 1 lb per acre is plenty of brassica. Increasing the amount to 3 lb per acre or higher in a mix will typically result in the brassica outcompeting the other components, resulting in a lack of the intended diversity. Another factor to consider is what type of growth habit does the plant exhibit. Daikon radish, although the seed size is not small, grows in a rosette that smothers its neighboring seedlings, hence the percentage needs to be kept low in the mixture. Small grains are mid-size seeds but grow upright and the percentages tend to be higher. Also, species that are slower to establish should have increased percentages. There are way too many species in the cover crop arena to go into all the details, but rest assured that King's not only has lots of experience in creating mixtures but we also evaluate the mixtures on our research farm. We have learned that the species included in your mix planted before the following crop can have a huge impact on the following crop.

Each species and the resulting combination included in a mix can have either a positive, neutral, or negative impact on the following crop. We have coined the name forecrop when used for cover cropping. A forecrop is designed to significantly improve the following economic crop. To achieve these positive impacts a forecrop is designed for the specific crop that follows its planting. We have several mixes designed to be planted before corn that increase corn yield and improve soil health. King's has also created a few specialty forecrop programs. These include a mix specific for tobacco and another mix for no-till pumpkins. In addition, we are finetuning a hemp forecrop program. Most of these forecrops take at least 3 years to develop.



UNDERSTANDING ALFALFA

By Kody Umble, CCA

FALL DORMANCY

Very Dormant: 1
Dormant: 2-3
Intermediate Fall Dormancy: 4-6
Non Dormant: 7-9
Very Non-Dormant: 10-11

The lower the dormancy number the sooner the plant will go into dormancy with reduced daylight. June 21 is the longest day of the year. After that the days get shorter. Varieties with low fall dormancy numbers will begin dormancy and slow down in growth sooner in the fall compared to varieties with high fall dormancy numbers. Less dormant varieties (higher number) generally have higher yield potential, earlier maturity and increased rates of recovery after harvest.

DISEASE RATING

Disease Rating Index is very important, as most quality varieties are resistant to most common alfalfa diseases. There are six major alfalfa diseases, and each disease gets a resistance rating from 1 to 5, with 5 being the most resistant. If a variety has the highest level of resistance to all six diseases, it would have a rating of 30:30. Some of our alfalfa varieties are rated out of a 35 point scale which includes aphanomyces race 2. Also, our alfalfas are now listed with their level of resistance to nematodes (SN- Stem Nematode, NRKN- Northern Root-knot Nematode, SRKN- Southern Root-knot Nematode). They are rated as R-Resistant, HR-Highly Resistant, MR- Mild Resistance, NA- Not Available, NR- Not Rated.

EMPHASIZING WEED CONTROL DURING ALFALFA ESTABLISHMENT

Weed control in alfalfa is more critical during the seedling stage and the first year than any other period of the alfalfa's life cycle. In many cases, alfalfa seedlings establish at a slower rate and can be overtaken by weeds, if they are present. If planting into a field with established weed pressure, alfalfa seedlings are out-competed for nutrients, water and eventually sunlight; resulting in stand reduction. Since alfalfa stands naturally decline with age, it is very important to begin with the strongest stand possible to improve overall productivity and longevity.

KNOW THE WEED HISTORY

The field history and the current weed pressure will determine the time frame in which alfalfa can be seeded. For example, fields infested with perennial weeds may not be well suited for alfalfa without multiple years of crop rotation to eradicate the weed.

UTILIZE CROP ROTATION

It is best to utilize crop rotation for 2 or 3 years after terminating an alfalfa stand to reduce disease, weeds and insect pressure. Planting alfalfa after only 1 year of rotation often results in a shorter stand life and greater expense in managing pest pressures. A 2 year rotation using crops that allow good weed control is best for staging a productive alfalfa stand. In the case of perennial weeds, using crops such as barley and corn to smother the perennial weed for multiple seasons is an effective method of control.

WINTER HARDINESS

Score: 1 Superior (No injury)
Score: 2 Very good
Score: 3 Good
Score: 4 Adequate
Score: 5 Low
Score: 6 None (Plant Death)

Winter hardiness is a measure of the plants' ability to survive the winter without injury. Winter-injured plants may survive, but buds formed in the fall for spring regrowth may be killed. Such plants have fewer shoots for first cutting and produce lower yield.

MANAGED GRAZING

When properly managed, grazing can be a very profitable system for livestock farming. While we have seen many successes, we have also seen failures caused by poor management. We recommend that those who wish to be graziers attend pasture walks, grazing seminars and subscribe to Graze Magazine; a monthly publication written by graziers for graziers. (608-455-3311 or <http://www.grazeonline.com/>).

Our recommendation for farms that are trying to learn grazing is to start with an easy class of animals. For example, on a dairy farm, heifers from 6 months to freshening are very easy to learn on. We recommend starting with about 50,000 lbs of animals per acre per day. For 1,000 lb heifers this would be 50 heifers per acre.

Perennial pasture should be about 8"-15" in height on average when turning the livestock into the paddock. The animals should be removed when around 4"-6" of pasture residue is still in the pasture. Adjust paddock size ideally until you get the time on individual paddock to close to one day.

The biggest mistakes made are not waiting until the pasture has reached 8" and leaving the livestock in the paddock too long. Putting livestock into the paddock too soon drops yield and quality is actually too rich. Leaving the livestock in too long will slow down regrowth substantially, and this will reduce the productivity of the pasture.

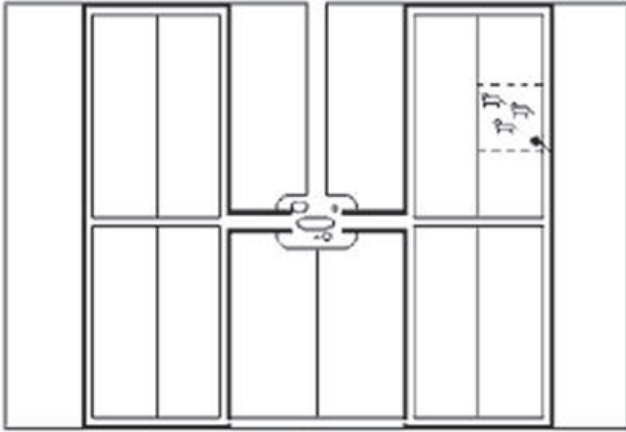
The difference between good management and poor management is around 3 tons of dry matter. How much is that worth? The value of pasture is worth at least \$150 per ton times 3 tons is equal to \$450 per acre loss by poor management. Please take the time to learn managed grazing. We have many forage mixtures designed for managed grazing, but without proper management they will not be productive.

ABC'S OF GRAZING

- A) Have plenty of dense high-quality pastures! If you can see bare ground between the grass and clover, you are not getting maximum milk production per acre or per cow.
- B) Maintain pasture quality! Graze it when it's young, from 8"-15" down to 3"-4". Young grass is 84% digestible, while old grass is only 50% digestible!
- C) Do not overgraze! If the cows have it down to three inches, move on to fresh pasture, move to a sacrifice lot, or move into a barn and feed them. A good rule to follow is "Take Half - Leave Half." Overgrazed pastures will be very slow in growing back. Unlike alfalfa and clover, grass stores its food reserves in the bottom 3 inches of the stem.
- D) Question: What about the grass around the manure patties?
- Clip your pastures on a regular basis. This way new grass can grow, which the cows will favor. Clipping also keeps down weeds and unpalatable seedheads and greatly improves the appearance of the farm!
 - Make hay or baleage off each paddock once or more per year (cut it young). When the grass grows back, the cows eat it almost like a new seeding.
 - Put the horses, goats or other species in after the cows are out, but not for long, or they will graze it too short. They will eat some of the grass that the cows won't.
- E) Fertilize appropriately for your system. Soil test just like a crop as needed.
- F) Keep cows off paddocks until you have 8"-10" of regrowth. In springtime under good conditions this may be 12 to 16 days. In summer it may take well over 3 weeks. Livestock should only be in a paddock for three days. After about three days, the grass starts to grow back and they start eating that tender regrowth. That is really hard on grass.
- G) Feed your cows accordingly. Cut back or eliminate protein and top-dress, as well as grain. It may be necessary to feed hay or corn silage to keep fiber levels adequate. Corn silage works great because it's high in non-structural carbohydrates (NSC), which is important in working off the excess protein in that rich pasture.
- H) Hybrid Farming: You can graze approximately ½ acre or more per cow and still grow your own crops. A couple notes of caution:
- #1 It takes a lot of management. Pastures need to be managed with the same care as field crops.
 - #2 The new farmer just getting started has less investment if he does all grazing and hay instead of buying corn growing equipment.

PASTURE LAYOUT DESIGN

The diagram below is an aerial view of an ideal grazing layout with relatively level land. In reality, this situation is hard to find in our region, but many ideas can be taken from it.



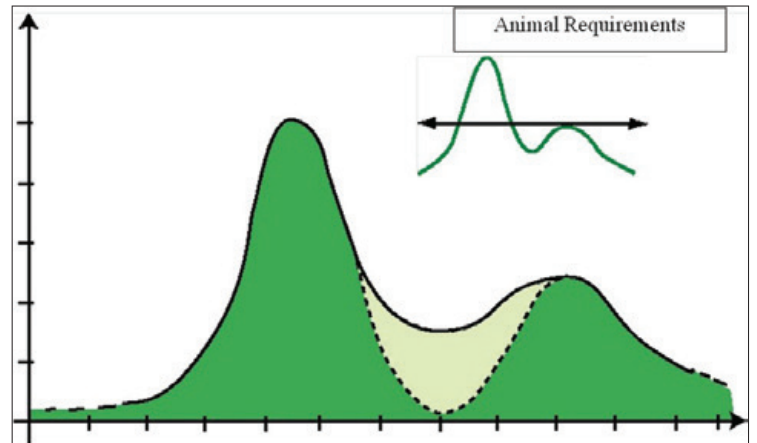
- The farm buildings ideally should be located in the center of the grazing land base, which reduces the amount of walking by the herd and you.
- The lane network creates major paddocks that are rectangular for field work but can easily be subdivided with polywire (dashed lines) to make daily grazing paddocks.
- Either the lane wire can be propped up with a notched PVC pipe to let cows go under, or gates can be installed. Animals should not stay on any paddock longer than 3 days.
- With this system it is possible to keep leap frogging polywire fences to get animals on and off a section of grass very quickly. The main purpose of the fence is to keep livestock off the paddock until it is ready to be grazed.
- Lanes away from barn should be kept narrow, with improvement made in heavy traffic areas and wetter areas. Design the fence to be dropped easily to move farm equipment in and out of paddocks without using the cow lanes.
- The bold line represents a looped water line that will provide water to the entire farm. Looping allows the water to flow from two directions, reducing the amount of friction. Insert quick couplers and shut off valves in the line as needed. Pipe burial is usually not necessary, but the portable water tank needs to be in with the cows.

HOW MANY ANIMALS PER ACRE?

Stocking rate is a critical factor in profitability and depends on many factors. Those factors include:

- How much of the ration will come from pasture?
- Productivity of the pasture?
- Breed and size of the cattle?
- Do you want to make surplus forage in the spring or supplement forage in the summer?
- Manure management details.

A quick rule of thumb is to stock pastures at around 45-50,000 lbs. of animal per acre per day, if most forages are coming from pasture, and make adjustments from that point. Understocked farms tend to have the lowest profit potential, but overstocked farms can run into nutrient balance problems and other issues.



Forage Grazing Rotation Example
Balancing Perennials and Annuals

Winter		Spring			Summer			Fall			Winter	
J	F	M	A	M	J	J	A	S	O	N	D	
Perennial Pastures Grass Clover Mixes or Alfalfa Grass Mixes												
		Triticale Plus			BMR Sorghum Sudans			Triticale Plus				
					Mastergraze							
					Oats							
High Quality Baleage & Hay					High Quality Baleage & Hay						High Quality Baleage & Hay	

TOOLS FOR MAKING A PROFITABLE MILK PRODUCING FORAGE SYSTEM FOR YOUR FARM

By Tim Fritz & Doug Hering

Feed costs are a huge financial cost to all dairy farms (and other livestock farms). Forages are the key to making milk. Low quality forages cannot be overcome by grains and feed additives. Soil, climate, planting, harvest and storage systems along with feeding systems, milk production goals, nutrient and soil health management, and risk management factors should all be evaluated to determine what crop rotation and forage system are best for your unique farming operation. In the mid-Atlantic and Northeast, there are incredible differences from region to region and farm to farm. But one factor remains the same, for a cow to produce sustainable profitable milk production it cannot be done without high quality forages that are properly balanced. One of our foundational goals at King's AgriSeeds is to provide the forage tools and know how to create a forage program that works on your soils and your cows. We trust that if you have a balanced high quality forage system that fits your land base, that your nutritionist will use it to your advantage. We have come a long way in making milk.

A little history on cow rations. In the beginning, cows were on pasture and when the pasture was rich in quality so was the relative milk production. When the grass was poor, milk was reduced and the herd lost weight. Before the 1950's, pasture and hay were the predominate ration of the dairy herd. After World War 2, nitrogen and pesticides encouraged corn to be king. Soon corn silage and supplemental grains were added to the ration. Corn silage and starch based grains are low in protein but rich in starch energy. To increase protein in the ration, alfalfa became the queen of the dairy forage program as it is a great source of protein and maintains a good harvest window. In addition, alfalfa is a reliable drought tolerant crop with excellent yield and fixes large amount of nitrogen which dramatically lower nitrogen needs when the crop is taken out. The problem: both corn silage and alfalfa have higher levels of undigestible fiber that limit the cows ration intake and can lack effective long fiber for the rumen mat. Since, NDFd and now uNDFd 240 became understood and now can be modeled with confidence into rations many well managed farms with the support of their nutritionist are now including more vegetative grasses back into the ration.

Vegetative grasses whether annual or perennial species when harvested properly create higher NDFd's and can be used in balancing the ration to create a proper level of uNDFd. This combination enables forage dry matter intake to increase creating both a healthier rumen (less starch needed) and a healthy rumen mat both of which increase cow longevity. Another benefit of using vegetative grasses is that they have medium protein levels using proper fertility management. When examining the financial impact of including vegetative grasses into the ration, ration costs (including home grown forages) are lowered and quite often the entire forage program will result in healthier soils, less production inputs and increased overall yield. Strong crop rotations that include three or more crops increase land productivity and lower input costs.

As we aspire to higher levels of productivity, we need to create a forage program that brings balance to the ration and the cropping program. King's AgriSeeds has many customers that have developed forage systems that not only make milk but also increase yield per acre across many soils. Each farm is unique on what system is best. Create a crop rotation that will provide high tonnage of digestible fiber, starch (plus sugars and fats), and protein based on soil resources and other farm objectives. It is very rare that a one crop program will meet the big picture goals of a farm over time. Success can be measured in many ways. Increases that can be measured are yield per acre, milk per cow and milk per farm over time. Decreases that can be measured are reduced forage costs, reduced ration costs and culling costs (longer cow longevity through healthier rations can be very large and quite often overlooked).

The modeling of various forage system alternatives can be done but it should include a forage agronomist, a nutritionist, and a financial advisor to pull it all together.

FORAGE QUALITY BY FORAGE TYPE.

Below are the results of our testing program. Samples include both higher grazing heights and aggressive cutting heights. Most were sampled in mid to late spring and mid-summer. Most products have average, maximums and minimums. Remember, a lot of these samples were aggressively managed. We advise you to look at the data in terms of trends and potentials. Always test your own forage. The samples were wet chemistry for NDF and 24 hr NDFd. Protein, ADF, lignin and mineral were NIR. Kd rate is a calculated number that evaluates how fast a forage is digested in the rumen fluid. The higher the number the more digestible the fiber. The numbers listed are averages.

	Crop	DM Tons	Crude Protein	aNDFom	Traditional NDFd as % of NDF-30HR	uNDF240	TTNDFD	Starch	in situ Rumen Starch D, % of Starch - 7hr	Dynamic Starch Kd (using 3,7 hr) (%/hr)
Direct Harvest High Starch Forages	Corn Silage Non-BMR	7.68	7.53	34.47	59.51	10.03	42.62	38.39	74.99	19.31
	Corn Silage BMR	7.28	7.89	37.11	61.89	10.08	44.01	34.03	70.66	17.08
	BMR Forage Sorghum	8.67	8.20	41.04	48.80	10.38	38.95	22.67	N/A	N/A
Cut and Wilt Harvest Vegetative Forages Higher Protein Grasses can increase rumen health	Alfalfa*	6 to 8	21.26	38.21	44.88	18.26	42.42			
	Perennial Grasses**	3 to 6***	14.51	57.21	51.68	18.92	46.59			
	Sorghum Sudan	2.95	15.33	53.11	59.38	10.60	57.70			
	Sudangrass	2.66	17.74	51.18	60.24	8.90	59.46			
	Millet	2.80	15.38	54.34	61.06	8.57	61.68			
	Triticale	4.56	15.24	41.24	60.09	10.62	61.60			
	Annual Rye. First cut.	2.75	14.54	34.57	64.89	3.4	72.13			

* Alfalfa Quality data from across all alfalfa samples in Rock River Labs (east) (Not King's AgriSeeds)
 ** First cut data. Large variations between species

A NOTE ABOUT FORAGE MIXTURES

By Tim Fritz

Forage mixtures can increase yields and total farm productivity. Soils, climate, harvest methods and goals of the farm are essential to understand what mixture options are appropriate for each individual operation. One of the main benefits for using mixtures is reducing risk from the time the crop is planted until it is terminated. Each species and variety have strengths and weaknesses that can be used across different soil types. It is also very difficult to know what individual product will perform best in the upcoming growing seasons. What I have observed over the last 20 years, is that the individual components of a mixture will be dominant at certain times. This can even vary across soil types within the same field. That same species that was dominant a week or two earlier may become less dominant or even go dormant while other components take their turn being dominant. This synergy between products is the primary reason for productivity increases. Mixtures also tend to have less pest pressures. For example, if a disease comes into a field, it may only impact one or two of the components. Consequently, little production is lost.

Balancing yield performance and nutritional quality is certainly a primary goal as we develop our mixtures. Quite often different species bring a nutritional benefit to the feed bunk, but it is not always practical to grow, harvest, store and mix these separate components into the ration on the farm. This is why it is crucial to actually plant it in

the field as a mixture, so it can be harvested and stored in its own bunk, bag, or silo. For example, Performance Max, a less diverse mixture by species contains alfalfa and tall fescue (designed for growing zones 6 to 8). Within this mix, we typically have two varieties of alfalfa and 3 varieties of tall fescue. Because of how it is formulated, this mix does not require ideal alfalfa soils as at least one of the alfalfas included in the mix will have branched roots and the tall fescue will perform well across drier to wetter soils better than most other grasses. Nutritionally, the alfalfa provides primarily protein and the tall fescue provides digestible effective fiber with mid-protein levels. Our NutraMax Mix, designed by a dairy nutritionist, is a great example of a complex mixture of alfalfa, clovers, & grasses that is ideal for growing zones 4 and 5. The red clover in this mix helps reduce protein storage losses, therefore improving protein utilization. These mixture concepts also apply to annual mixtures such as the Ray's Crazy Mix series (in zones 4-8), & Yield Max (in zones 4-5). Mixtures offer excellent soil health benefits as well!

At King's AgriSeeds, we offer a wide range of mixtures for various soils, growing zones and nutritional needs. We encourage you to explore the many forage options for your farm. Every situation is different. Always forage test and feed appropriately in a balanced ration.



NutraMax Hay Mix

A NOTE ABOUT BMR CORN SILAGE

By Tim Fritz & Leland Miller

BMR corn silage has been gaining popularity in certain regions. Why? It's a proven milk making forage! The BMR corn hybrids have a higher NDFd compared to conventional non-BMR corn silage hybrids. This in turn can increase the dry matter intake of the herd and milk production. Today, many farms are able to fine tune diets to target different groups of cows, consequently the efficiency of the higher priced BMR can be increased. Cow groups that get the most cost-effective response are high producing cows; cows early in the lactation from 2 weeks pre-fresh to 3 weeks post-fresh. Feeding BMR to transition cows can improve DMI just before and after calving. This increase in DMI and resulting milk increase can carry on into the lactation, even after being switched back to non BMR silage.

From an agronomic perspective, BMR hybrids yield less than conventional corn hybrids and tend to be more disease susceptible and have standability issues. The best use of BMR hybrids is on dairies that have a strong land base that consists of mostly productive soil. BMR hybrids respond very well to crop rotation. The costs not often talked about in utilizing BMR hybrid corn is reduced land productivity due to lower genetic yield potential, higher input costs, and higher purchased protein costs usually in the form of soybean meal assuming a high percentage of the ration is corn silage.

There are two BMR genes used in commercial hybrids: BM1 and BM3. Of the two genes, BM3 hybrids consistently have the highest NDFd which are best differentiated using wet chemistry. King's AgriSeeds currently has two KingFisher BM3 gene hybrids that are very exciting! They have both good agronomics and the added benefit of having higher starch content and starch digestibility. If you currently use BMR and can utilize non-traited hybrids, we encourage you to give our products a try! KF 59B70 performed exceptionally well in the Forage Superbowl at the World Dairy Expo (2 of the 3 top winners in 2022). Also, if you are using competitor BMR products- do a double check to find out which BMR gene is being used. If they skirt the issue, it is most likely a BM1 gene hybrid.



FORAGE YIELD PROJECTIONS ON 120 ACRE LAND BASE

(Based on productive soils, adjust accordingly)

Corn Silage (Dense Energy Forage)

8 tons of Dry Matter (24 tons @ 67% moisture)

X 40 acres

320 Tons of Dry Matter (480 tons @ 67% moisture)

Legume Grass Mixture

(Protein & vegetative grass Fiber Energy)

6 tons of Dry Matter (18 tons @ 67% moisture)

X 60 acres

160 Tons of Dry Matter (540 tons @ 67% moisture)

Annual Grass Forage (Fiber Energy and Protein)

10 tons of Dry Matter (30 tons @ 67% moisture)

X 20 acres

200 Tons of Dry Matter (300 tons @ 67% moisture)

Forage needs for a 120 cow dairy on 120 acres

104 Milk Cows

764 tons corn silage

570 tons haylage

284 tons annuals

76 tons dry hay

28 Large Heifers

76 tons corn silage

140 tons haylage

140 tons annuals

10 tons dry hay

16 Dry Cows

62 tons corn silage

32 tons annuals

12 tons dry hay

28 Small Heifers

4 ton hay

14-18 tons annuals

No to little corn silage

Total forage needs for all livestock

Total corn silage

814 tons

Total haylage

570-710 tons
(depending large heifer ration)

Total annuals

332-472 tons
(depending large heifer ration)

Total dry hay

102 tons
(246ton wet hay equivalent)

Note: Heifer replacements based on a 23% cull rate, which is very achievable when feeding a high forage ration. Using the above rotation and yield assumptions there would be surplus forage to sell to purchase grains. An alternative would be to alter the rotation to grow some grain instead of forage.

CROP ROTATION

When used properly, crop rotation results in increased yields, better soil health, and fewer pests. A good crop rotation is planned in advanced and includes more than just two species (ex. corn and alfalfa). Below is a productive six year forage rotation. This rotation can include grains as well.

Example Rotation:

Year 1-3: legume/grass mixture that is adapted to your area

Year 4: KingFisher corn for silage

Year 4 (late summer/early fall): seed a winter annual such as Triticale Plus

Year 5 (spring): harvest winter annuals

(mid spring): plant summer annuals

(mid summer): plant oats (if timing does not allow, substitute a winter annual)

Year 6: KingFisher Corn for silage

Year 7-12: repeat previous 6 year rotation

To further illustrate this rotation, imagine a 120 acre tract with six 20 acre fields (ideal scenario). Each year there would be 60 acres of legume grass mix, 40 acres of corn silage and 20 acres of intensely managed annual grasses.

Perennial Forage (Legume grass mixtures)

Three 20 acre tracts will be in a legume grass mixture.

One field will be 1st year production (Year 1)

One field will be 2nd year production (Year 2)

One field will be 3rd year production to go into corn the following year. (Year 3)

Corn for Silage

Two 20 acre tracts

One field after legume grass mixture (Year 4)

One field after oats or winter annual (Year 6)

Vegetative Grass Annual Forages

One 20 acre field that is double or triple cropped (Year 5)

INSTRUCTIONS AND REFERENCE INFORMATION

1. Begin by assessing the current ration. (Each feeding group can be done separately.)
2. Dry Matter (DM) or "as fed" (AF)
To figure pounds as fed from DM lbs. (Divide lbs. DM by % DM as decimal.)
(eg. 25 lbs. / .35 DM = 71.43 lbs.)
To figure DM lbs. from "as fed" lbs. (Multiply lbs. "as fed" by the %DM as a decimal.)
(eg. 25 lbs. x .35 DM = 8.75 lbs.)
3. To figure the % forage in the diet, divide total lbs. (DM) forage by the total lbs. fed (DM).
4. Where would the producer like to be compared to what he's feeding now?
5. Begin to fill in the desired ration and figure the number of acres of each crop needed.
Acres needed = total lbs. fed / day x # days fed / 2,000 / yield / acre
(eg: 1,000 lbs fed / day x 240 days fed / 2,000 lbs. / 9 tons / acre yield = 13.3 acres needed)

Typical Dry Matter Needs BF 4.0, Pro 3.3, BW=1400	
Lbs of milk	DM needs
100	54-56
90	52-53
80	49-51
70	46-48
60	43-45
50	40-42
40	37-39
dry cows	25-28
heifers	15-23

Typical Dry Matter Values	
Crop	% DM
Corn Silage	28-35 %
Baleage	40-60 %
Haylage	35-40 %
BMR S/S	33-38 %
Dry Hay	82-88 %
Forage Sorghum	28-32 %
Triticale Forage	30-38 %
Corn Grain	84.5 %
Protein Mix	90 %
Energy Mix	90 %

Note: A high forage ration starts when 60% of diet comes from forage. Limit each type of forage to less than 2/3 of forage fed (DM basis). Include vegetative grasses in the system. (Annuals or perennial grasses).

BASIC RECOMMENDATIONS & RELATIVE COMPARISON OF KING'S AGRISEEDS FORAGES

Product	Life Span	Best Uses	Maturity	Full Seeding Rate	Seed Box	Seeding Depth
Perennial Grasses						
Bluegrass, Ky	6+ years	G	Early	10 to 15 lbs	Small	up to 1/4"
Brome, Meadow	6+ years	G, WH, H	Early	25 to 35 lbs	Large	1/4" to 1/2"
Brome, Smooth	6+ years	H	Late	30 to 40 lbs	Large	1/4" to 1/2"
Fescue, Meadow	3+ years	G, WH, H	Medium	35 to 45 lbs	Large	1/8" to 3/8"
Fescue, Tall	3+ years	WH, H	Variety Dependent	35 to 40 lbs	Large	1/8" to 3/8"
Festolium	1 to 3 years	G, WH	Medium	30 to 40 lbs	Large	1/4" to 1/2"
Orchardgrass	3 to 6 years	G, WH, H	Variety Dependent	20 lbs	Large	up to 1/4"
Reed Canary Grass	6+ years	H, WH	Medium	12 to 18 lbs	Small	1/8" to 1/4"
Ryegrass, Perennial	2 to 6 years	G, WH	Variety Dependent	40 to 50 lbs	Large	1/8" to 3/8"
Timothy	1 to 6 years	WH, H	Late	10 to 15 lbs	Small	up to 1/4"
Perennial Mixtures						
Highland Hay	3 to 6 years	H, WH	Late	25lbs	Large	1/8" to 3/8"
Nutramax Hay	3 to 4 years	WH, H, G	Late	25 lbs	Large	1/8" to 3/8"
Organic Hayboss	3 to 4 years	H, WH, G	Late	25 lbs	Large	Surface to 1/4"
Organic Star	2 to 3 years	WH, G	Medium	25 to 30 lbs	Large	1/8" to 3/8"
Organic Dairy Green	2 to 3 years	WH, G	Late	25 to 35 lbs	Large	Surface to 1/4"
Organic Partner	3+ years	H, WH	Medium	20 to 30 lbs	Large	Surface to 1/4"
Balancer	3 to 6 years	WH, G	Early	25 to 35 lbs	Large	1/8" to 3/8"
Beefmaster	5 to 10 years	H, WH, G	Late	30 to 35 lbs	Large	Surface to 1/4"
Browsemaster	2 to 3 years	G	Late	22 lbs	Large	Surface to 1/4"
Equiflex Forage	3 to 5 years	H, WH, G	Early	25 to 30 lbs	Large	1/8" to 3/8"
Grass Maxx	5 to 10 years	WH, G	Early	20 to 30 lbs	Large	1/8" to 3/8"
Milkway	5 to 10 years	H, WH	Late	35 to 40 lbs	Large	Surface to 1/4"
Southern Brawn	5 to 10 years	H, WH, G	Early	20 to 30 lbs	Large	1/8" to 3/8"
E-Z Dry Hay	3 to 6 years	H, WH	Medium	20 to 30 lbs	Large	1/8" to 3/8"
EasyKeeper Hay Mix	3 to 6 years	H, WH	Ultra Late	35 to 40 lbs	Large	1/8" to 3/8"
Paddock Ex	5 to 10 years	Ex Lots	Early	50 to 75 lbs	Large	Surface to 1/4"
Creekside	4 to 7 years	G, WH	Late	25 to 35 lbs	Large	1/8" to 3/8"
GrassPro	4 to 7 years	WH, H	Late	20 to 30 lbs	Large	1/8" to 3/8"
Greenfast	2 to 4 years	G, WH	Medium Late	30 to 40 lbs	Large	1/8" to 3/8"
King's Hay Pro	3 to 6 years	H, WH, G	Medium	20 to 30 lbs	Large	1/8" to 3/8"
King's Grazing	3 to 5 years	G, WH	Late	25 to 35 lbs	Large	1/8" to 3/8"
Hillside	3 to 6 years	G, WH	Mixed	25 lbs	Large	1/8" to 3/8"
Horse Supreme	4 to 7 years	G	Mixed	25 lbs	Large	1/8" to 3/8"
Lowland Hay	4 to 7 years	WH, H	Late	20 to 25 lbs	Large	1/8" to 3/8"
Sale Topper	3 to 5 years	H	Late	15 to 20 lbs	Large	1/8" to 3/8"
Versa	4 to 7 years	WH, H	Mixed	15 to 30 lbs	Large	1/8" to 3/8"
Perennial Legume						
Alfafa	3 to 5 years	WH, H		18 to 22 lbs	Small	up to 1/4"
Red Clover	2 years	G, WH		4 to 20 lbs	Small	up to 1/4"
White Clover	3 to 5 years	G, WH		2 to 8 lbs	Small	up to 1/4"
Birdsfoot Trefoil	3 to 10+ years	G		8 to 12 lbs	Small	up to 1/4"
Product	Seeding Dates	Best Uses	Normal Harvest Dates	Full Seeding Rate	Seed Box	Seeding Depth
Winter Annuals						
Cereal Rye	Fall	G, WH	Early small grain	170lbs	Large	1" to 2"
Ryegrass	Barley to Mid Wheat Dates	G, WH	Earlier than wheat	30 to 50 lbs	Large	1/8" to 3/8"
Wheat	Wheat dates	G, WH	Varies	150-180lbs	Large	1" to 2"
Triticale	Barley to Mid Wheat	G, WH	Earlier than wheat	125- 150lbs	Large	1" to 2"
Triticale Plus	Barley to Mid Wheat dates	G, WH	Earlier than wheat	80 to 100 lbs	Large	1/2" to 3/4"
Crimson Clover	Late Summer	G, WH	Earlier than wheat	20 lbs	Small	1/4" to 3/4"
Hairy Vetch	Up to Barley Planting	G, WH	Later than wheat	20 to 30 lbs	Large	1/2" to 1 1/2"
Soil Builder	Barley to Mid Wheat	G, WH	Earlier than wheat	120 to 140lbs	Large	1/4" to 3/4"
Winter Peas	Up to Early Wheat	WH	Earlier than wheat	35 to 50 lbs	Large	1" to 2"
DART	Barley to Mid Wheat planting dates	WH	Earlier than wheat	125 lbs	Large	1/2" to 3/4"
Summer Annuals						
Sudangrass	After Soils >60° and Rising	G, WH, H	30 to 40 days	30 to 40 lbs	Large	1/2" to 3/4"
Sorghum Sudans	After Soils >60° and Rising	G, WH	30 to 40 days	50 to 60 lbs	Large	3/4" to 1 1/2"
Forage Sorghums	After Soils >60° and Rising	S, WH	90 to 110 days	80 to 100 lbs	Planter	1" to 1 1/2"
Crabgrass	After Soils >65° and Rising	G	30 to 40 days	5 to 8 lbs	Small	Surface to 1/4"
Millet	After Soils >65° and Rising	G, WH	35 to 45 days	10 to 20 lbs	Large	1/2" to 3/4"
Teff	After Soils >60° and Rising	WH, H	45 to 55 days	4 to 5 lbs	Small	Surfaced to 1/4"
Other Annuals						
Brassicas, Turnips & Hybrid	E. Spring through Summer	G	30 to 70 days	3 to 5lbs	Small	1/8" to 3/8"
Oats, Everleaf	E. Spring or Summer	G, WH	55 to 65 days	80 to 100 lbs	Large	1" to 1 1/2"

Scale: 1 Not Desirable to 5 Extremely Desirable

This overview of basic is our best estimate of product guidelines and comparisons. Variations will occur due to location and year. Consult your local dealer for more local recommendations and local experience.

Product	Residual Height	Spring Productivity	Summer Productivity	Fall Productivity	Wetter Soils	Drier Soils	Winter Hardiness	Heat Tolerance	Thicken Alfalfa	Thicken Grass	Grazing Palatability	Traffic Tolerant
Perennial Grasses												
Bluegrass, Ky	2"	4	2	3	4	2	5	2	1	1	3	5
Brome, Meadow	3" to 4"	3	4	4	2	4	5	4	1		5	4
Brome, Smooth	3" to 4"	5	2	3	2	4	5	2	1	1	3	5
Fescue, Meadow	3" to 4"	4	3	4	4	3	5	3	2	2	4	5
Fescue, Tall	3" to 4"	5	4	5	4	4	4	5	4	4	2	5
Festolium	3" to 4"	5	3	4	4	2	3	3	5	5	5	3
Orchardgrass	4"	5	3	3	2	4	4	4	4	5	3	3
Reed Canary Grass	2" to 4"	5	4	2	5	5	5	3	1	1	2	5
Ryegrass, Perennial	2" to 3"	5	1	4	4	1	3	2	3	5	5	3
Timothy	3"	5	1	2	4	1	5	2	2	1	5	3
Perennial Mixtures												
Highland Hay	3" to 4"	5	5	4	2	5	4	4	1	1	3	3
Nutramax Hay	3" to 4"	5	4	4	3	4	4	4	1	2	3	3
Organic Hayboss	3" to 4"	5	5	4	2	5	4	5	1	2	3	3
Organic Star	3" to 4"	4	3	3	3	3	4	3	3	3	4	4
Organic Dairy Green	3" to 4"	4	3	3	4	3	4	3	4	3	5	4
Organic Partner	3" to 4"	5	4	4	4	4	4	4	4	4	2	4
Balancer	3" to 4"	5	4	5	4	4	4	4	4	4	2	5
Beefmaster	3" to 4"	5	4	4	4	4	4	4	4	4	2	5
Browsemaster	3" to 4"	5	4	3	2	5	3	5	1	1	3	3
Equiflex Forage	3" to 4"	5	3	3	3	4	5	4	3	3	4	3
Grass Maxx	3" to 4"	5	4	5	4	4	4	4	4	4	2	5
Milkway	3" to 4"	4	3	4	4	4	5	3	4	3	3	5
Southern Brawn	3" to 4"	5	4	4	4	4	4	4	4	4	2	4
E-Z Dry Hay	4"	5	4	3	2	4	4	4	1	2	4	3
EasyKeeper Hay Mix	3 to 4"	5	2	3	3	5	5	2	1	1	4	3
Paddock Ex	3 to 4"	4	3	4	4	3	4	3	1	3	3	5
Creekside	3"	4	4	4	4	3	5	3	2	2	5	5
GrassPro	3" to 4"	4	4	4	4	4	4	4	4	3	2	4
Greenfast	3" to 4"	5	3	4	4	2	3	2	5	5	4	3
King's Hay Pro	4"	5	4	4	3	4	4	4	1	2	2	3
King's Grazing	3"	5	3	4	3	3	3	2	3	3	5	4
Hillside	3" to 4"	4	4	4	1	4	4	4	3	3	4	3
Horse Supreme	3"	4	3	4	3	3	3	3	1	3	5	4
Lowland Hay	3" to 4"	5	4	5	5	3	5	4	4	3	2	5
Sale Topper	3" to 4"	5	3	3	3	3	4	3	3	2	3	3
Versa	3" to 4"	5	3	4	3	3	3	4	5	3	3	4
Perennial Legume												
Alfafa	3"	5	5	4	2	5	3	5	1	1	3	2
Red Clover	3"	5	3	4	3	4	5	4	5	5	4	3
White Clover	2" to 3"	4	3	3	4	3	4	4	3	5	5	5
Birdsfoot Trefoil	3"	3	3	3	4	3	5	3	1	1	5	2
Product	Residual Height											
Winter Annuals												
Cereal Rye	2" to 4"	5	N/A	3	3	4	5	N/A	1	1	5	3
Ryegrass	2" to 4"	5	1	4	5	3	3	1	3	4	5	3
Wheat	2" to 4"	5	N/A	3	3	4	5	N/A	5	3	5	3
Triticale	2" to 4"	5	N/A	3	3	4	5	N/A	5	3	5	3
Triticale Plus	2" to 4"	5	1	4	4	3	4	N/A	5	4	5	3
Crimson Clover	N/A	5	N/A	2	3	3	3	N/A	3	1	4	N/A
Hairy Vetch	N/A	5	N/A	1	3	4	4	N/A	2	1	4	N/A
Soil Builder	2" to 4"	5	N/A	2	3	4	5	N/A	3	3	5	3
Winter Peas	N/A	5	N/A	1	3	3	4	N/A	1	1	5	N/A
DART	2" to 4"	5	N/A	3	3	4	5	N/A	5	3	5	N/A
Summer Annuals												
Sudangrass	5" to 6"	3	5	N/A	1	5	N/A	5	5	1	5	3
Sorghum Sudans	5" to 6"	3	5	N/A	1	5	N/A	5	5	1	5	2
Forage Sorghums	N/A	2	5	N/A	1	5	N/A	5	2	1	3	N/A
Crabgrass	2" to 3"	1	5	3	4	5	N/A	5	N/A	5	4	5
Millet	4" to 6"	1	4	N/A	3	4	N/A	5	2	1	3	3
Teff	4" to 5"	2	5	N/A	4	5	N/A	5	4		4	4
Other Annuals												
Brassicas, Turnips & Hybrid	3" to 4"	4	4	5	1	3	N/A	4	1	1	3	3
Oats, Everleaf	3" to 4"	5	3	4	3	3	N/A	3	3	2	3	3

Scale: 1 Not Desirable to 5 Extremely Desirable

FIELD NOTES:

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NEW LONDON COUNTY

V-Town Ag Supply..... Voluntown..... (860) 564-5733

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Pleasant View Farms, Inc..... Somers..... (860) 803-0675

DELAWARE

KENT COUNTY

*Dixon Seeds, LLC Dover..... (302) 632-6460

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*B & W Ag Enterprises, Inc..... Greenwood..... (302) 398-3059

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KENNEBEC

Fedco Seeds Inc..... Clinton..... (207) 426-8247

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Paris Farmer's Union..... Oxford (800) 639-3603

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*Keith Hines..... Bradford (207) 717-9558

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Hopkins Family Farm, LLC..... Lothian (443) 871-5420

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*GVF, LLC..... Forest Hill..... (443) 619-1119

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Shore Seeds..... Denton..... (410) 310-5821

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*Giffords Farm, Feed & Seed ... Rising Sun..... (410) 658-6527

FREDERICK COUNTY

*Alley Apple Ag, LLC..... Jefferson (310) 676-1050

Rights of Man Farm, LLC Ijamsville (240) 674-2733

GARRETT COUNTY

Blue Ribbon Seed & Supply Oakland..... (301) 616-9663

HARFORD COUNTY

*GVF, LLC..... Forest Hill..... (443) 619-1119

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Millwood Seeds.....36680 Millwood Lane, Mechanicsville, MD 20659

WASHINGTON COUNTY

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Southcoast Agri Services Dartmouth (774) 263-0017

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CHESHIRE COUNTY

*Thomas Beaudry, CCA..... Walpole (603) 504-5991

NEW JERSEY

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Summer Harvest Farms Southampton..... (609) 410-4827

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*Maple Crest Farm Lebanon (908) 246-1404

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Jon Pinhas..... Millstone..... (732) 890-1863

OCEAN COUNTY

Timothy Bradway..... Salem (856) 498-6250

SALEM COUNTY

Timothy Bradway..... Salem (856) 498-6250

Sickler's Circle View Farm Monroeville..... (609) 202-2724

SOMERSET COUNTY

Lima Family Farms Hillsborough (267) 784-6999

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*Vander Groef Family Farm..... Sussex (862) 266-5843

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ALLEGANY

Country Crossroads Feed & Seed..Andover (607) 478-8858

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*Wild Acres Family Farm Great Valley..... (716) 969-4386

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Eldred Hay, Grain & Seed, LLC Auburn..... (315) 246-9574

*Scenic Vista Seeds Moravia (315) 515-8484

*Wilmer Horning Seeds Port Byron (315) 952-2276

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*NYP Ag Services, Inc Cherry Creek..... (716) 296-5531

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*John Kemmerman..... Bainbridge (607) 967-7440

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Valley Seed..... Cuyler (607) 745-9223

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*Van Orden's Riverview Farm, LLC . Catskill..... (518) 943-2894

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High Falls Farm, LLC..... Croghan (315) 359-7392

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Maxwell Farms Geneseo..... (585) 447-8430

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Meadow Springs Farm Canastota..... (315) 697-9589

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*Hillside Meadows Farm..... Vernon Center (315) 796-7733

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Scott Michel Valley Falls (518) 269-2222

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*Cayuga Ag Enterprises, Inc..... Trumansburg..... (607) 319-6092

*Lynford Wise Romulus (315) 952-7461

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*Ward & Vanscoy Inc.....Owego..... (607) 687-2721

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*Cayuga Ag.....Trumansburg..... (607) 319-6092

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*Kehr Ag Solutions.....Littlestown..... (717) 359-5456

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*Mervin Marin.....Hopewell..... (814) 494-7184

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*Charlie Marsch.....Gilbertsville..... (267) 718-0601
*Productive Farm Products.....Pine Grove..... (484) 561-5250

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*Mill Hill Farm Supply.....Williamsburg..... (814) 832-3458

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*Morgan Davis Seed Sales.....Troy..... (570) 529-2439

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Brian Moyer, Lake Edge Nursery .Towanda..... (570) 265-0470
*Stanley Stahl.....Granville Summit.... (570) 274-3650

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*Hougar Farms, LLC.....Coatesville..... (610) 656-7327
*Hougar Farms, LLC.....Spring City..... (610) 469-9238
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*Reinford Farms.....New Bethlehem..... (814) 229-2096

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*Horstdale Farm Supply, LLC...Greencastle..... (717) 597-5151
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*Lebanon Valley Ag Products ...Myerstown..... (717) 949-2486

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*Metz's Seed.....Mill Creek..... (717) 348-1264

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*Hougar Farms.....Gilbertsville..... (610) 942-4657

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*Norm's Farm Store, LLC.....Watsontown..... (570) 649-6765

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 *Union Agro Services, LLC Mifflinburg..... (570) 412-3250

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*Southern States Coop. Luray Service...Luray..... (540) 743-6518

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 *Sunny Ridge Supply..... Dayton..... (540) 879-3944

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Rockingham Coop..... Strasburg..... (540) 465-5182
 Rockingham Coop..... Woodstock (540) 459-2171

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Ag Wholesale, LLC..... Weston (304) 269-6000

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Neal & Luke Boggess, Boggess Dairy...Peterstown. (304) 646-3697

TAYLOR COUNTY

Triple L Farms..... Thornton..... (304) 376-3862

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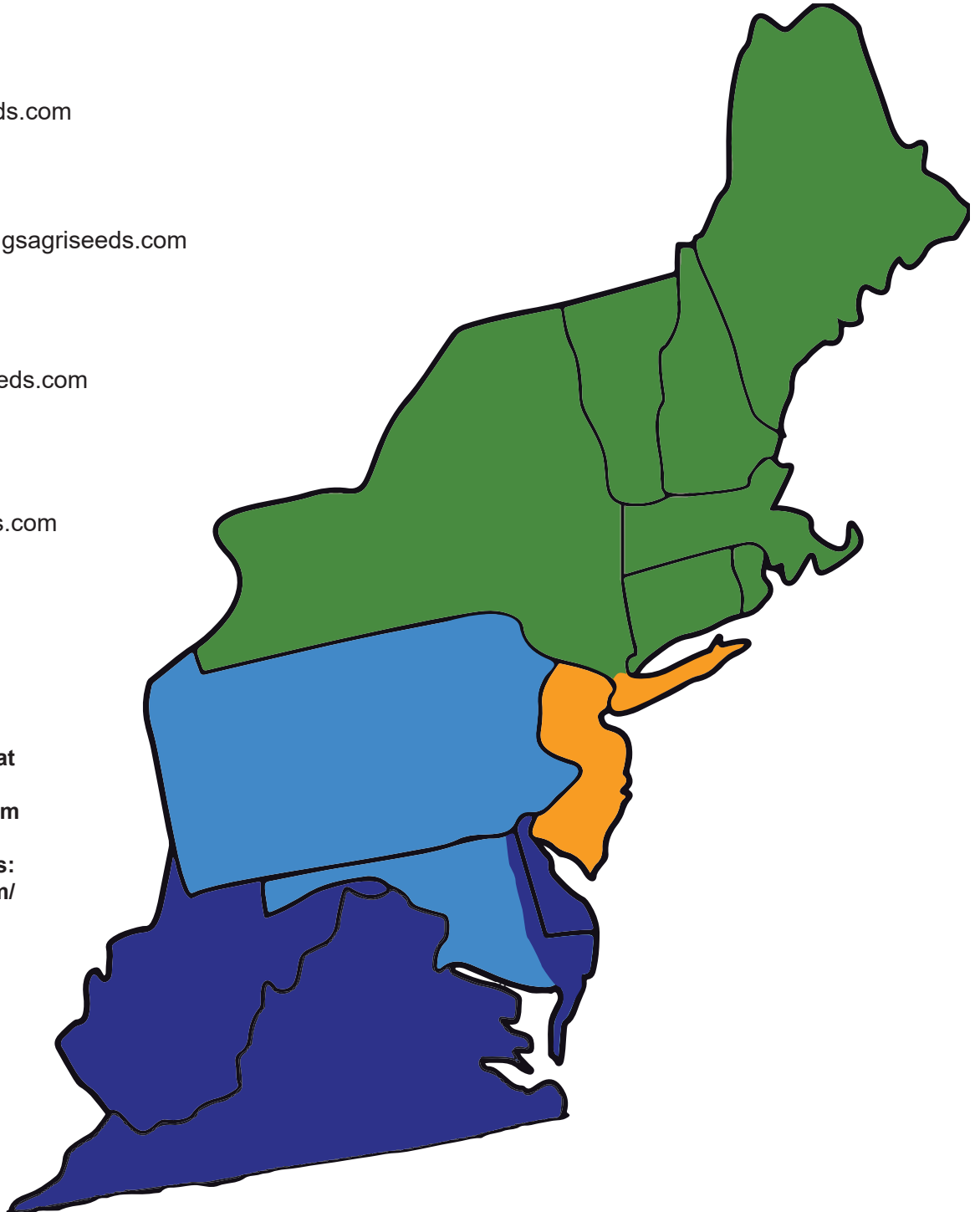
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