
King's AgriSeeds Inc.
FEEDING YOUR FARM'S FUTURE.
2021
PRODUCT INFORMATION GUIDE

Warm Greetings,

Agriculture is constantly changing, and an increase of advancements seem to be occurring more frequently. While these advancement help us move forward, we still have many challenges before us and we must continually evaluate our businesses from all aspects, including our cropping practices. Here at King's AgriSeeds, we are here to help you choose your cropping system and make your seed selections well. In reality, every year is different and different crops have their own strengths and weaknesses and that should be taken into consideration.

Weather patterns appear to be shifting and adverse weather extremes are very real. Due to this, we have actually seen some shifts in the adaption of our perennial varieties and mixtures. In 2021, we have made some changes to our perennial line up to enhance product performance. Throughout this guide, many products now have zone adaption references to help best place them. If you are unsure of your zone, please refer to page 51 for the USDA Plant Hardiness Zone Map. Additionally, our very popular King's Grazing Mix and Creekside Mix now have a northern version (best adapted to zones 4 and 5) and a southern version (best adapted to zones 6 and 7a). These recommendations and changes to our mixtures are based on observations over the last many years, whether that be on our own research farm, at one of our satellite plots, or valuable feedback from both our dealer & customer network… or maybe even from you! Our goal with becoming more zone specific is to help you get the most out of your product, as perennial forages are a very valuable asset in providing high quality forage, improving soil health, and have a fit on most farm operations, whether it is fed to your own ruminant livestock or is sold as hay for horses or other livestock.

We are constantly seeking to improve our entire seed line up including corn, summer annuals, winter annuals, and perennial forages. In addition to seed, we have also expanded our biologicals for both seed inoculation and forage preservation. We thank you for your business and look forward to partnering with you in 2021.

Best wishes this upcoming year!
~Tim Fritz, President

King's AgriSeeds Inc.
FEEDING YOUR FARM'S FUTURE.

## 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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## PRODUCTS




King's AgriSeeds Inc.
FEEDING YOUR FARM'S FUTURE.

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# COOL SEASON PERENNIALS

# ADAPTED TO GOOD-TO-DRIER SOILS

## HIGHLAND HAY OC
**NEW FORMULATION!**

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

An alternative to King's Haymaster that includes soft-leaf tall fescue in place of Hakari Alaska Brome. Hay Pro is 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

## 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

### 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.

**Highland Hay's new formulation is designed to keep the leaf hoppers at bay!**

## HILLSIDE

A highly palatable mixture of drought tolerant species and varieties that tolerate managed grazing well. Contains three 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% Grazing Tolerant Orchardgrass
22% Meadow Brome
18% Tetraploid Perennial Ryegrass
5% Freedom Red Clover
5% Regalgraze Ladino Clover

## NORTH STAR CT

This mixture contains strong alfalfa varieties with modest amounts of later maturing grass for improved nutrition. It's designed primarily for central PA and North, where grasses will provide consistent yield and quality for several years. Now with meadow fescue to increase energy fiber digestibility and quality. Meadow Fescue is both higher quality than Fojtan and less competitive, allowing the alfalfas to perform well.

***Best Uses:*** Fermented Forages, Dry Hay
***Seeding Rate:*** 18 to 25 lbs/acre
***Product Formula:*** 85% KingFisher Alfalfas
8% Meadow Fescue
7% Tall Fescue Type Festulolium

## 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

## PERFORMANCE MAX OC/CT

An alfalfa-tall fescue mixture that will excel in both agronomic and nutritional performance. The alfalfa adds drought productivity, protein, and high NSC. The tall fescue adds consistent high fiber digestibility, superb yields, traffic tolerance and wet soil tolerance.

***Best Uses:*** Fermented Forages, Dry Hay
***Seeding Rate:*** 20 to 25 lbs/acre
***Product Formula:*** 70% Kingfisher Alfalfas
30% Kora and STF 43 Tall Fescue

## 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

# ADAPTED TO GOOD-TO-WETTER SOILS

## NORTHERN CREEKSIDE
### NEW FORMULATION!

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 mixed is based on meadow fescue, which is both high quality and palatable. Meadow Fescue does not contain detrimental endophytes. 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% Wellington Birdsfoot Trefoil
10% Medium Maturing Timothy
7% White Clover

## SOUTHERN CREEKSIDE
### NEW FORMULATION!

A mixture of varieties and species designed for wetter soils. It will form a nice sod to handle hoof traffic. Its quality will also hold well if conditions are too wet to graze or harvest. Best suited for USDA Hardiness Zones 6 & 7.

***Best Uses:*** Managed Grazing, Fermented Forages
***Seeding Rate:*** 25 lbs/acre
***Product Formula:*** 45% Tall Fescue type Festulolium
30% Perennial Ryegrass
10% Balin Kentucky Bluegrass
5% Clifford Red Clover
5% Early Maturing Timothy
5% 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

World Dairy Expo Winner

## 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

USDA ORGANIC


Greenfast

# 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 northeastern 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 Uses:*** Fermented Forages, Grazing
***Seeding Rate:*** 25 to 5 lbs/acre
***Product Formula:*** 65% Martin II Protek
10% Inavale Orchardgrass
10% Olathe Orchardgrass
10% Freedom Red Clover OC
5% RegalGraze Ladino Clover OC

## BEEFMASTER

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

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

## EQUINEMASTER PADDOCK

This mixture is designed specifically for exercise areas as it is rugged and will not get clumpy. EquineMaster is slower growing and is endophyte free.

***Best Uses:*** Exercise lot
***Seeding Rate:*** 30 to 100 lbs/acre
***Product Formula:*** 50% Soft Leaf Tall Fescue
35% Kentucky Bluegrass
15% Perennial Ryegrass

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

## GRASSPRO

An easy to dry all grass mix that is great for stored forage. Similar to our popular Alfamate but based on premium endophyte free 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 novel endophyte tall fescue with early new-release 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 II Novel Endophyte Tall Fescue
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

### NEW FORMULATION!

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

### NEW FORMULATION!

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. Barfleo, a very late heading timothy, dries easily and does not absorb high potassium levels. Freedom! MR Red Clover is easier to dry than other red clovers due to reduced stem hair. 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.
***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

## VERSA

An all grass mixture with very good drought and heat tolerance. Featuring Fojtan Festulolium, it maintains the durability of fescue, but is high in nutritional quality. Great for southern zones.

***Best Uses:*** Dry Hay, Fermented Forages
***Seeding Rate:*** 15 to 30 lbs/acre straight seeding,
2 to 10 lbs/acre with legumes.
***Product Formula:*** 70% Tall Fescue type Festulolium
30% Orchardgrass

**3RD PLACE** in Grass Hay at World Dairy Expo

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

# SEED ESTABLISHMENT

## 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. 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 |

# LEGUMES - ALFALFA

DIGESTIBLE ENERGY
KingFisher®

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.***

## KING'S ECONO ALFALFA CT/OC
A solid alfalfa that is priced very competitively. Good agronomics and quality.

## KINGFISHER 406AP2 CT/OC
This variety is an exceptionally high yielding, persistent alfalfa with a branch root structure and excellent plant health. KF 406AP2 has an excellent agronomic package that has resistance to multiple strains of Aphanomyces Root Rot 2. Its forage quality is similar to other high quality varieties. The strong disease resistance in combination with its branch root characteristic will allow KF 406AP2 to establish and persist well in areas that are challenged by disease or soils that are a little wet.

- Fall Dormancy: 4.0
- Winter Hardiness: 2.0
- Disease Rating: 35/35

## KINGFISHER 425HD CT/OC
This multi-foliate alfalfa has high yield and exceptional quality including fiber digestibility. KF 425 HD (highly digestible) delivers high NDFD and TTNDFD values and has comparable lignin ratings to the non-GMO low lignin alfalfas. HD is a registered trademark of Legacy Seeds.

- Fall Dormancy: 4.5
- Winter Hardiness: 2.0
- Disease Rating: 30/30

World Dairy Expo Winner

## LOW-LIGNIN FOR 2021?
KingFisher 425 HD & 435HDis a highly digestible alfalfa that is marked by reduced lignin. Enhance your alfalfa production in 2020 by reducing lignin and improving quality.

- ☑ **Reduced lignin**
- ☑ **Agronomic strength**
- ☑ **Non GMO**
- ☑ **No trait technology cost**

## KING'S 429 ORG
High-yielding, fast recovery. Deeper crown to tolerate hoof traffic.

- Fall Dormancy: 4.0
- Disease Rating: 29/30

## KINGFISHER 435HD NEW
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 519 CT
A blend of 2 high yielding, fall dormancy 5 alfalfas. Both alfalfas feature multifoliate leaf structures, which means a high leaf to stem ratio and a higher feed value for your livestock

- Fall Dormancy: 5.0
- Winter Hardiness: 1.9
- Disease Rating: 30/30

## KINGFISHER PLH 422 OC
A new 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

# LEGUMES - ALFALFA

## KING'S 544 PLH OC NEW

A new high yielding fall dormancy 5 PLH resistant variety of alfalfa, than can rival elite conventional varieties even when leaf hopper pressure is low.

- Fall Dormancy: 5.0
- Winter Hardiness: 2.0
- Disease Rating: 35/35

## KINGFISHER PROFUSION 2-HX CT/OC

As a third generation hybrid, Profusion 2 HX delivers the aggressiveness of the hybrid alfalfa with top end yield potential. Later growth in plant cycle extends harvest window.

- Fall Dormancy: 4.0
- Winter Hardiness: 1.6
- Disease Rating: 30/30

## KINGFISHER SECURE BR CT/OC

Combines high resistance to the pathogens that inhabit wet soils, which include Aphanomyces root rot (Race 2), with the branch rooted feature. This feature helps keep more of the root system above the water table and better secures the plant in the ground when freezing and thawing occur. The branch-rooted trait will adjust as moisture stresses intensify.

- Fall Dormancy: 3.8
- Winter Hardiness: 1.6
- Disease Rating: 34/35

## 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

## KINGFISHER TRAFFIC PRO CT/OC

Highly traffic tolerant with a deep set crown. The deep set crown helps protect the plant from wheel and animal damage, as well as providing additional winter protection during conditions with lack of snow cover. Good aphanomyces resistance as well. Great for field edges.

- Fall Dormancy: 3.7
- Winter Hardiness: 1.5
- Disease Rating: 34/35

Consistent performance - KingFisher 425HD was crowned champion at the World Dairy Expo. In addition, KingFisher alfalfa performed very well in local and regional alfalfa trials. After all these years, KingFisher alfalfa is still hard to beat!

**ASK US ABOUT ORGANIC ALFALFAS FOR 2021!**

CT= Conventional Coating
OC= OMRI Approved Organic Coating
Coating includes inoculant.

# LEGUMES - RED, WHITE CLOVER

**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

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. ***OC/YJ.***

## ALSIKE

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.
**Not appropriate for equine feed.**

## KAKARIKI NEW

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.

## REGALGRAZE

A high yielding ladino clover that has been selected under tight grazing pressure by University of Georgia researchers. This clover will excel in the South but will also perform extremely well in Northern areas. ***OC.***

## RENOVATION

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. ***OC.***

## RIVENDEL

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

**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 NEW

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. ***OC.***

## COMMON MEDIUM VNS

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

## FREEDOM!MR

Freedom!MR is bred for yield and persistence. It is a selection with exceptional resistance to mildew (MR). Great overall palatability and forage quality. ***OC/YJ.***

## HARMONIE

A high yielding variety with good late season cuts. It's high in disease resistance and persistence.
***OC. Only available in organic.***

## RENEGADE

Renegade is an erect, early flowering, double cut red clover with improved resistance to southern anthracnose and downy mildew. Renegade is classified as semi-dormant in winter growth habit, and provides more grazing than Ladino clover during hot summer months.
***OC. Only available in organic.***

### 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.

Within each species we have varieties available in Conventional Coating (CT) and Organic Coating (OC) form.

Our **CLOVER MIXTURES** 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

### NEW FORMULATION!

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:***
23% White Sweet Clover
23% Yellow Blossom Sweet Clover
18% Crimson Clover
9% Kakariki White Clover
9% Ladino Clover
9% Balansa Clover
9% Alsike Clover

## PREMIUM CLOVER MIX

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.
***OC/CT. Also available in organic.***

**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

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.
***Available in OC.***
***Seed 2 to 5 lbs/acre.***

# MISC.

## WELLINGTON BIRDSFOOT TREFOIL

A high yielding hay-type trefoil variety. Tolerant of lower pH and wetter soils.
***OC coated.***
***Seed 20 to 25 lbs/acre.***

# GRASSES - BROME, FESTULOLIUM

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

## 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.
***OC.***
***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.
***OC.***
***Seed 35 to 45 lbs/acre.***

## CACHE MEADOW BROME NEW
Developed by USDA-ARS for improved seedling establishment and increased forage yields. It is widely used for hay, pasture and forage production.
***OC.***
***Seed 25 to 30 lbs/acre.***

## CARLTON SMOOTH
A leafy, slower starting, sod forming cool season grass that spreads by rhizomes (underground stems). It is commonly used for dry hay and once established produces a drought tolerant, long lasting stand. Smooth brome should not be harvested before early heading stage or stand loss will occur. Allowing smooth brome to mature to early heading before cutting allows the rhizomes to recharge its reserves for re-growth. Plan to harvest once in the spring, and with favorable summer weather, a fall harvest is possible.
***Seed 30 to 40 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
A long lived festulolium that tolerates heat and drought well. 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. The main difference is the higher feeding value in Fojtan.
***Also available in organic.***

## HIPAST
Hipast is persistent tall fescue type festulolium with later maturity.

## 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.

# INTERMEDIATE RYEGRASSES

## ASTONCRUSADER
AstonCrusader is a certified organic, intermediate tetraploid variety that produces a very high total annual yield with extraordinary early spring growth. Combined with excellent disease resistance, AstonCrusader is a top ryegrass variety.
***Also available in organic.***

# GRASSES - KY BLUEGRASS, MEADOW FESCUE

## 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.
***Seed 35 to 45 lbs/acre.***

## HDR BLEND

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

## LAURA

LAURA establishes very quickly which makes it very competitive with perennial ryegrass. The first cut yields are very high combined with an excellent leafy regrowth in the aftermath. Therefore LAURA has high yields of very digestible dry matter in all cuts. Because of the very leafy regrowth of this variety it is also very suitable for grazing or a combination of cut and grazing managements.
***Only available in organic.***

## 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. ***OC.***

## TETRAX MEADOW FESCUE

A tetraploid variety that excels in digestibility and is less aggressive than traditional improved diploid varieties. It also has excellent winter hardiness and disease tolerance. These combined attributes make Tetrax ideal to seed with alfalfa in areas that many grasses compete too heavily with alfalfa. (Good summer rainfall areas that are north of I-80 or areas further south with high elevation).

**Finishing beef on forage requires high energy grasses.**

# GRASSES - ORCHARDGRASS

## ORCHARDGRASS

**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

A very late heading and high yielding variety. This is a newer orchardgrass that is showing fantastic yields and good quality.
***Also available in organic.***

## HLR BLEND

A mixture of Barenbrug leafy late maturing varieties. Stands for High Leaf Ratio.
***UT/YJ.***

## INAVALE

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 screen heavily in northern Kentucky and also looked strong in our Lancaster plots.
***UT/OC.***

## OLATHE

A new earlier 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 now included in many of our grazing mixes.

## PERSIST NP

A southern orchardgrass bred by University of Tennessee for persistence under hot, humid conditions and abusive grazing management. Its maturity is similar to Pennlate and is not recommended to be seeded with alfalfa. Its quality is similar to other US bred orchardgrasses. **This year Persist will be offered with NitroNP.**

HLR Orchardgrass Blend

# GRASSES - RYEGRASS - TALL FESCUE

**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.***

### 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 out-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 non harmful to the animal.** ***Seed 35 to 40 lbs/acre.***

### BAROPTIMA PLUS E34

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.

### 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.

### KORA

A late, very high yielding hay type tall fescue with improved digestibility. Kora has impressed us with very high yields about everywhere we put it. Great on less than ideal soils. Kora works well mixed with alfalfa and helps it dry easier.
***Also available in organic.***

### MARTIN II PROTEK

A new novel endophyte fescue, combining the proven genetics of Martin II with the innovative Protek endophyte. Expect increased longevity and animal performance.

### 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.

# GRASSES - TIMOTHY, MISC.

**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.***

## CLIMAX
The old standard variety.
***Also available in organic.***

## 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.***
***Seed10 to 15 lbs/acre.***

## GLACIER
An improved high-yielding early timothy with high yield potential and excellent regrowth.

## KY EARLY
An improved selection from Clair timothy bred for earlier heading, high yields, improved vigor and regrowth.

## TENHO
A late maturity timothy that adds palatability, spring growth, health, and winter hardiness to the stand. Bred for its high performance, strong range of characteristics, Tenho works great for haying and is equally suited for pasture mixes and straight plantings.

## ZENYATTA
A new exciting hay product. We had this timothy in our research plots in Lancaster County and it was the standout in both early production and regrowth. Zenyatta was bred in the U.S. and is an improved Clair-type timothy. It is appropriately named after a thoroughbred champion race horse that won 29 of 30 major races.

# TURF AND INTER-ROW GRASS MIXTURES

## COMPANION MIX
A slow growing red fescue mix for orchards, vineyards or around buildings that requires less mowing. Great for seeding between vegetable rows.
***Seed 50 lbs/acre.***

## SUN & SHADE MIX
A multi purpose lawn grass for both sunny and shady areas.
***Yellow Jacket Coated.***
***Seed 175 lbs/acre.***

## TURF STAR
Turf Star® is the best quality three way perennial ryegrass blend available. Fast to germinate & quick to establish, Turf Star® is ideal for full sun & light shade.
***Seed 300lbs/acre.***

## WATER SAVER PRO
Turf-type tall fescue blend. Excellent for durability and low maintenance.
***Seed 300 lbs/acre.***

# 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.***


Low growing grasses can prevent erosion between plastic rows.


# COOL SEASON ANNUAL FORAGES

# FORAGE MIXTURES

## 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. 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.***

## DART815

DART815 is designed for a one cut system and features a mixture of TriCal 815i blend, annual ryegrass and daikon radish. The added daikon radish stores available nutrients in the fall, which will then be slowly released to the triticale and ryegrass in the spring after the daikon radish winter kills.

***Seed 150 lbs/acre.***

- 1 cut system
- Better balance than triticale alone
- Great forage for double cropping

## 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 versions.

***Seed 40 to 60 lbs/acre.***

## SMALL BOX BOOSTER NEW

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.***

## TRITICAL 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

**FOR COVER CROP FOCUSED MIXTURES, SEE PAGE 45.**

Dart 815

## KINGS PEA OAT

50/50 mixture of peas and oats. Can be used for both forage and grain.
***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 new 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.***

Ray's Crazy Spring at the King's AgriSeeds Research Farm

# GRASSES - RYEGRASS, SPRING GRAINS

## ANNUAL RYEGRASS
has 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.***

## KODIAK
A new release 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 make it ideal for cover crop use, not for forage.

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

## ITALIAN RYEGRASS
is quite similar to perennial ryegrass except it is an annual or biennial, depending on climate and/or length of growing season.
***Seed 35 to 45 lbs/acre.***

## KF ALLEGRO BLEND
A blend of European bred Italian Ryegrasses. If seeded in the spring in cooler climates it will make several cuttings per year of very high quality forage. Avoid droughty and/or low fertility soils.
***Also available in organic.***

## GREEN SPIRIT
NutriFiber

This is a premium, late-maturing blend of tetraploid and diploid Italian Ryegrass. It benefits from the diversity of the two, and has performed well in our trials over the last 5 years. Less headiness in summer.

Grand Champion Overall at World Dairy Expo

## SPRING BARLEY
***Seed 150 to 200 lbs/acre.***

## A/C KINGS SPRING BARLEY
A 2 row spring barley that is excellent for quick forage and nurse crop.

## 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 is similar to wheat – about 2 weeks after rye.
***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.

## SURGE NEW
This high sugar awnless variety is facultative, meaning that it does not need to go through a cold period to be productive. Can be planted in either the fall or the spring. Produces a high yield of quality silage.

## TRICAL 815i BLEND
The 815 you know and love with the added bonus of a harvest indicator variety. The small portion of Gainer 154 will head out approximately one week before the 815, giving a clear indicator when it is time to harvest for optimal quality.

## VNS SPRING TRITICALE
Forage spring triticale. Tall-awned, forage type.
Also available in organic

**ASK US ABOUT ADDITIONAL ORGANIC OAT VARIETIES!**

# GRASSES - RYEGRASS, SPRING GRAINS

**OATS** are leafier and higher in forage quality than typical grain type oats. They are versatile in mixtures and add the option of a fall cutting to an otherwise spring only harvested mixture.
***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, decent 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. Forage quality is extremely high 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 (FORAGE)

A medium-early maturity, high yielding oat variety. 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.

**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 100-150 lbs/acre.***

## ERISMAN WHEAT

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.

Evaluating Cool Season Annuals at the Research Farm

# LEGUMES - CLOVER, PEAS, VETCH

With nitrogen prices going up in recent years, 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.

## DIXIE CRIMSON CLOVER

A high quality cool season annual that can be used for both forage (usually mixed with a small grain or annual ryegrass) or as a nitrogen fixing cover crop. Ready to plow down 2 to 3 weeks earlier in spring than hairy vetch.
***Available in CT/UT. Seed 15 to 25 lbs/acre.***

## VIPER BALANSA

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

**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

Quick growth, single cut variety. Best used as a cover crop. Not winter hardy in the north. ***OC.***

## FROSTY BERSEEM CLOVER

An improved late maturing berseem clover that was bred for cold tolerance and multi-cut systems. ***OC.***

**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 in the fall growth and more spring growth than other 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.
***Seed 25 to 30 lbs/acre.***

## AU MERIT

Au Merit is ideal for grazing, hay and cover crops. It is a proven producer of enormous amounts of forage that is ready early in the year. It is also a massive nitrogen producer and perfect for supporting pollinators and wildlife.

## PATAGONIA

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

Clovers planted with a nurse crop of oats

# WARM SEASON ANNUALS.

# FORAGE MIXTURES

## 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 brassicas. There is also a cool season/ winter version of this mix available. p.47. Seeding rate varies depending on use and goals.

***Seed 40 to 60 lbs/acre.***

## SUMMER 2020 MIX

A white mid-rib version of Ray's Crazy Summer Mix with added Sunn Hemp for additional legume diversity. As a grazing mixture, this would be best suited for heifers, or beef cattle.

***Seed 50 to 60 lbs/acre.***

## SUMMER FEAST

This summer annual mix of Wonderleaf Millet and forage brassica will give your herds and flock lots of summer feasting. As with Wonderleaf there is no worry about prussic acid.

***Seed 10 to 20 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.

***Seed 30 to 40 lbs/acre.***

**FOR COVER CROP FOCUSED MIXTURES, SEE PAGE 45.**

## 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, GRAIN SORGHUM

## FORAGE SORGHUM 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 10 or 11%. Sugar levels are also very high. See page 60 for management information.
***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 lineu: 85-89 days. Can be direct chopped in soft dough OR harvested in a cut and wilt system following frost. The dwarf characteristic helps reduces lodging and improves the leaf:stem ratio.

### AF7201

A shorter season hybrid that has very good standability and dry down. Very sweet stalks. A good choice for seeding with corn. 85-89 days to soft dough stage.

### ADV F7232

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

### AF7401

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.

### AF8301

A non-BMR forage sorghum that works very well on dry soils for the producer that needs a high starch, high tonnage silage for less than ideal soils. It has a very leafy, dwarf type plant structure with a tremendous grain head (white), providing a very high grain to stover silage. Approximately 100 days to soft dough stage.

Many of the Forage Sorghum, Grain Sorghum and Sorghum Sudans have the available option of Concep III treatment. Concep III is safener applied as a seed treatment to protect grain or forage sorghum to allow the use of alachlor, metolachlor and acetochlor herbicides. These are found in many common brands. Consult your herbicide specialist.

## 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.***

### ADV G1142IG

A short season, non-GMO red grain variety with Imi herbicide resistance featuring igrowth technology, pending government approval.

### ADV G2106

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

### AG1203

63 day (mid bloom) hybrid with bronze grain and red plant color. Has very good aphid tolerance for high pressure areas. ***Now offered in UT.***

### AG1401

60 day (mid bloom) hybrid with white grain and tan plant color. ***Now offered in UT.***

All of our summer annuals are evaluated for quality and yield at our research farm.

# SUDANGRASS, SORGHUM SUDAN, SOYBEANS

**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.***

## KING'S 200PS BMR NEW

A widely adapted photoperiod sensitive BMR sudangrass hybrid. Excellent for grazing and baleage

## AS9301

A very exciting gene 6 BMR sudangrass that has great vigor and extremely high quality. Because of the dry stalk characteristic, AS9301 dries easier than sorghum sudangrass, which makes it possible to dry for hay. Excellent for grazing, baleage and dry hay.
***Also available in organic.***

## AS9302

A gene 6 medium maturity sudangrass. It has the Brachytic dwarf trait which provides ideal standability and regrowth without sacrificing yield. Excellent for dry hay and rotational grazing. Like 9301, 9302 has the dry stalk characteristic for quick dry down.

**SORGHUM SUDANS** typically reach a height of six to eight feet, 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 50 to 70 lbs/acre.***

## KF SUGAR PRO 55

This new exclusive KingFisher hybrid is very quick growing and high yielding with a dry stalk for ease of dry down. Stems are finer and sweeter than many sorghum-sudans. The higher leaf to stem ratio ensures quality grazing or feed. Digestibility of this hybrid is increased due to the reduction in lignin from the BMR trait, increasing daily gains or milk production significantly. ***Seed 40 to 50 lbs/acre.***
***Also available in organic.***

## KING'S 150 SS BMR NEW

A versatile BMR Sorghum Sudan. Has good leaf to stem ratio that provides good quality feed with proper management.

## ADV 6504

A new, photo-period sensitive variety with higher sugar content. Excellent drought tolerance, extended harvest window with improved regrowth after cutting.

## AS6201

An easy-to-manage medium maturing sorghum-sudangrass product featuring the BMR-6 characteristics.
***Only available in organic.***

## AS6401

AS6401 has improved disease resistance and better regrowth. We have observed occasional fields of other hybrids where regrowth was a problem due to disease pressure (fusarium). This usually manifests only when cutting while soil conditions are moist and humidity is high. AS6401 has been developed with disease resistant tropical parentage, and our observations have been very positive.

## S275 WITH APHIDAXE NEW

An Aphid resistant non-BMR Sorghum sudan that is also Male Sterile. This variety can still produces quality forage with timely harvest. The Male Sterile attribute prevents grain/seed formation.

## TRICAL HYBRID SORGHUM SUDAN

A high yielding and very good quality white mid-rib sorghum sudan.

**SOYBEANS** (GRAIN)

## 360 SB (Untreated)

3.6 Maturity. High end conventional soybean with great agronomics and overall yield. Great performance throughout PA.
***Also available in organic.***

**SOYBEANS** (FORAGE)
Are selected for late maturity and leafy tendancys.
***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.

# MILLET, CRABGRASS, TEFF

**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. Frost kills it, but 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.

## 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 Exceed.

## LEAFY T NEW

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 is self re-seeding if allowed to go to seed.
***Seed 5 to 8 lbs/acre.***

## MOJO

An improved crabgrass variety coated for improved germination and seedling vigor.
***Available in OC and Yellow Jacket.***

## RED RIVER

An improved crabgrass variety, coated for improved germination. ***CT.***

**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.
***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.***

KingFisher Prime 360 BMR Millet

# LEGUMES, BRASSICAS

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.***


Ray's Crazy Summer Mix

## BRASSICAS

**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 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 8 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.

## BARSICA RAPE

A fast maturing, single or multiple-graze forage crop that can be sown for summer, autumn or winter feed. It has a higher protein content than typical turnips, and a greater degree of winter hardiness. This variety is intended to overwinter.

## T-RAPTOR

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


Root boxes show the true tap root potential of these brassica crops.

# FEEDING TYPE HYBRID CORN

# KingFisher & Red Tail Corn Hybrids

When it comes to growing feed for livestock, your best return on investment is nutrient-dense forage. Good genetics are essential for the production of a high-quality forage, which is what we offer with our KingFisher and Red Tail program. We selected these quality hybrids for their above-average fiber and starch digestibility. We source the top genetics and make hybrid varieties available for a variety of soil conditions and regional climate differences and concerns. So you're sure to find a KingFisher or Red Tail corn hybrid that's just right for

Every KingFisher and Red Tail corn hybrid is ranked and rated using two key concepts to livestock feed efficiency: SofStarch™ and FiberGest™.

## SofStarch™:

SofStarch corn has 10-15% higher starch availability than normal flint corns, reducing fed starch in the diet for KingFisher producers. Studies have shown that SofStarch type corn stays twice as long in a cow's rumen as normal flint corns. Slower passage through the rumen and faster digestion combine to increase the efficiency of the starch and other nutrients.

## FiberGest™:

To make hybrid selection easier, our lineup is also ranked and rated for fiber digestibility, based on TTNDFD. FiberGest rates hybrids on a scale of 1 to 10, with 5 the industry average. Only selections with top tier fiber digestibility are advanced.

### Plant a Winner!

KF Hybrids have won the 2018, 2019 & 2020 Forage Superbowl! This sustained success is a testament to our focus on quality, a unique selection process and the quality of farmers that trust us with their seed needs!

DIGESTIBLE ENERGY

KingFisher®

# KingFisher Corn

| Hybrid | Relative Maturity | Conventional (CV), Organic (OR), High Oil (HO), Male Sterile (MS) | Red Tail Hybrid (if any) | Seedling Vigor | Plant Height | Ear Height | Ear Flex | Cob Color | Stalk Strength | Root Strength | Stay Green | Dry Down | Test Weight | Gray Leaf Spot Tolerance | Northern Leaf Blight Tolerance | Goss's Wilt Tolerance | FiberGest (NDFd 30 hr) | SofStarch (IVSD7) | Milk Per Ton | Milk Per Acre |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KF 34C30 | 84 | CV, OR | | Great | Med.-Tall | Medium | V. Good | Light Red | Great | Great | Great | V. Good | Great | Great | V. Good | V. Good | Great | Great | Great | Great |
| KF 40C30 | 90 | OR | | Great | Med.-Tall | Medium | Great | Red | Great | Great | Excellent | Great | Great | Great | Great | Excellent | V. Good | V. Good | V. Good | V. Good |
| KF 42C20 | 92 | CV, OR | | Excellent | Med.-Tall | Med.-High | Excellent | Pink | V. Good | V. Good | V. Good | V. Good | Great | V. Good | V. Good | Good | Great | Great | Great | Excellent |
| KF 43C40 | 93 | CV | | Great | Med.-Tall | Medium | Excellent | Pink | V. Good | V. Good | V. Good | V. Good | V. Good | Great | Excellent | V. Good | Great | Great | V. Good | Great |
| KF 45C30 | 95 | CV | | V. Good | Med.-Tall | Medium | Great | Red | Great | Great | Great | V. Good | Great | Excellent | V. Good | Excellent | Great | V. Good | Great | Excellent |
| KF 48C90 | 98 | OR | | Excellent | Medium | Medium | Great | Red | Great | Excellent | V. Good | Excellent | Excellent | Great | Great | Great | V. Good | V. Good | Great | Excellent |
| KF 49C60 | 99 | CV | | Great | Med.-Tall | Medium | V. Good | Light Red | V. Good | V. Good | Good | V. Good | V. Good | Great | V. Good | V. Good | V. Good | Great | V. Good | Great |
| KF 51C50 | 101 | CV | 51T51, 51T57 | Great | Med.-Tall | Med.-High | V. Good | Pink | Great | V. Good | Great | V. Good | Great | Great | V. Good | Great | Great | Great | Great | Excellent |
| KF 52C20 | 102 | CV | | Great | Tall | Medium | Excellent | White | Great | Excellent | Great | V. Good | V. Good | Great | Great | V. Good | Excellent | Excellent | Excellent | Excellent |
| KF 52C60 | 102 | OR | | Great | Medium | Low-Med. | Excellent | White | Great | Great | V. Good | V. Good | V. Good | V. Good | V. Good | V. Good | Great | Excellent | Great | V. Good |
| KF 53C60 | 103 | | | Great | Medium | Medium | V. Good | Pink | Excellent | Excellent | Great | V. Good | V. Good | Great | Great | V. Good | Excellent | Great | Excellent | Excellent |
| KF 54C10 | 104 | CV | 54T11, 54T13 | Great | Tall | Medium | Excellent | Pink | Great | Great | Great | Great | Great | Great | Great | V. Good | Excellent | Excellent | Excellent | Excellent |
| KF 54C50 | 104 | OR | | Excellent | Med.-Tall | Medium | Great | Pink | V. Good | Great | V. Good | Great | Great | V. Good | V. Good. | Great | Great | Great | Great | Excellent |
| KF 56C30 | 106 | OR | | Great | Med.-Tall | Med.-High | V. Good | Pink | Excellent | Excellent | Great | V. Good | V. Good | Great | V. Good | V. Good | V. Good | V. Good | V. Good | Great |
| KF 57C80 | 107 | CV | 57T85 | Excellent | Tall | Medium | Excellent | Red | Great | Excellent | Great | Great | Great | Great | Great | V. Good | Great | Great | Great | Excellent |
| KF 58C80 | 108 | CV | 58T81 | Excellent | Tall | Medium | Excellent | Pink | V. Good | Good | V. Good | V. Good | Good | V. Good | V. Good | Good | Great | Great | Great | Great |
| KF 60C30 | 110 | OR | | Excellent | Med.-Tall | Medium | Great | Red | Excellent | Excellent | Excellent | Great | Great | Great | Great | V. Good | Great | Great | Great | Great |
| KF 60C50 | 110 | CV | | Great | Med.-Tall | Medium | Great | Red | Great | Great | Great | N/A | N/A | Excellent | V. Good | Excellent | Great | N/A | V. Good | V. Good |
| KF 61C40 | 111 | CV | | Great | Med.-Tall | Med.-High | V. Good | Red | Great | V. Good | Excellent | V. Good | V. Good | Great | Great | Excellent | Great | Great | Excellent | Excellent |
| KF 63C10 | 113 | CV | 63T11, 63T13 | Great | Med.-Tall | Med.-High | Excellent | Pink | Great | Great | V. Good | V. Good | V. Good | Excellent | V. Good | Excellent | Great | Great | Excellent | Excellent |
| KF 64C40 | 114 | OR | | Excellent | Med.-Tall | Med.-High | Great | Red | Great | V. Good | Excellent | V. Good | V. Good | Great | Great | Great | Great | Great | Great | Great |
| KF 65C00 | 115 | CV | 65T09-D1 | Excellent | Med.-Tall | Med.-High | V. Good | Pink | Great | Great | V. Good | V. Good | V. Good | Great | V. Good | Great | Great | Great | Great | Great |
| KF 67C20 | 117 | CV | 67T21, 67T23 | Great | Tall | Med.-High | Excellent | Light Red | Great | V. Good | Great | V. Good | Great | Great | Great | V. Good | Great | V. Good | Great | Excellent |
| KF 57H50 | 107 | HO | | Great | Med.-Tall | Medium | V. Good | Pink | V. Good | Great | Great | V. Good | V. Good | Great | V. Good | V. Good | Great | Excellent | Great | Great |
| KF 58H60 | 108 | HO | | Great | Tall | Med.-High | Excellent | Pink | Great | Great | Great | V. Good | V. Good | Great | V. Good | V. Good | Great | Excellent | Great | Great |
| KF 60S60 | 110 | MS | | V. Good | Med.-Tall | N/A | N/A | Red | Great | Good | V. Good | Good | N/A | Great | Great | V. Good | Good | N/A | | N/A |

# Red Tail Corn

| Hybrid | Relative Maturity | Trait | Seedling Vigor | Plant Height | Ear Height | Ear Flex | Cob Color | Stalk Strength | Root Strength | Stay Green | Dry Down | Test Weight | Gray Leaf Spot Tolerance | Northern Leaf Blight Tolerance | Goss's Wilt Tolerance | FiberGest (NDFd 30 hr) | SofStarch (IVSD7) | Milk Per Ton | Milk Per Acre |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RT 35T11 | 85 | GT | Great | Med.-Tall | Med.-High | V. Good | Pink | Great | Great | V. Good | V. Good | V. Good | Great | V. Good | Good | V. Good | V. Good | V. Good | Great |
| 43T48 | 93 | VIP 3220 | Great | Med.-Tall | Medium | Excellent | Pink | Great | Great | Great | V. Good | V. Good | Great | Excellent | V. Good | Great | Great | Great | Excellent |
| RT 45T09-D2 | 95 | 5222 E-Z | Excellent | Tall | Med.-High | Good | Red | Great | V. Good | Great | Excellent | Great | Great | Great | Excellent | Great | Great | Excellent | Excellent |
| RT 51T51 | 101 | GT | Great | Med.-Tall | Med.-High | V. Good | Pink | Great | V. Good | Great | V. Good | Great | Great | V. Good | Great | Great | Great | Great | Excellent |
| RT 51T57 | 101 | VIP 3122 E-Z | Great | Med.-Tall | Med.-High | V. Good | Pink | Great | V. Good | Great | V. Good | Great | Great | V. Good | Great | Great | Great | Great | Excellent |
| RT 54T11 | 104 | GT | Great | Tall | Medium | Excellent | Pink | Great | Great | Great | Great | Great | Great | Great | V. Good | Excellent | Excellent | Excellent | Excellent |
| RT 54T13 | 104 | 3000 GT | Great | Tall | Medium | Excellent | Pink | Great | Great | Great | Great | Great | Great | Great | V. Good | Excellent | Excellent | Excellent | Excellent |
| RT 57T85 | 107 | VIP 3111 | Excellent | Tall | Med.-High | Great | Pink | Excellent | Excellent | Excellent | Great | Great | Great | Excellent | Excellent | Great | Excellent | Great | Excellent |
| RT 58T81 | 108 | GT | Great | Tall | Medium | Great | Pink | V. Good | Great | V. Good | V. Good | Good | V. Good | V. Good | Good | Great | Great | Great | Great |
| RT 63T11 | 113 | GT | Great | Med.-Tall | Med.-High | Excellent | Pink | Great | Great | V. Good | V. Good | V. Good | Excellent | Great | Excellent | Great | Great | Excellent | Excellent |
| RT 63T13 | 113 | 3000 GT | Great | Med.-Tall | Med.-High | Excellent | Pink | Great | Great | V. Good | V. Good | V. Good | Excellent | Great | Excellent | Great | Great | Excellent | Excellent |
| 65T06 | 115 | VIP 3120 | Excellent | Med.-Tall | Med.-High | V. Good | Pink | Great | Great | V. Good | V. Good | V. Good | Great | V. Good | Great | Great | Great | Great | Great |
| RT 65T09-D1 | 115 | 5122 E-Z | Excellent | Med.-Tall | Med.-High | V. Good | Pink | Great | Great | V. Good | V. Good | V. Good | Great | V. Good | Great | Great | Great | Great | Great |
| RT 67T21 | 117 | GT | Great | Tall | Med.-High | Excellent | Light Red | Great | V. Good | Great | V. Good | Great | Great | Great | V. Good | Great | V. Good | Great | Excellent |
| RT 67T23 | 117 | 3000 GT | Great | Tall | Med.-High | Excellent | Light Red | Great | V. Good | Great | V. Good | Great | Great | Great | V. Good | Great | V. Good | Great | Excellent |

MASTERSCHOICE
SEEDCORN.COM

| Variety No. | RM | Conventional (CV), Organic (OR) | Kernel Texture | Planting Population | Silage Yield | Milk Per Ton | Sugars | Fiber Digestibility | Grain Yield | Test Weight | Dry Down | Starch Digestibility | Emergence | Plant Height | Stalk Strength | Ear Height | Root Strength | Disease Tolerance | Drought Tolerance |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MC3221 | 82 | GT | Medium | 28K-34K | 9 | 8 | 8 | 8 | 8 | 6 | 7 | 8 | 9 | 8 | 8 | 7 | 9 | 8 | 8 |
| MC3220 | 82 | CV, OR | Medium | 28K-34K | 9 | 8 | 8 | 8 | 8 | 6 | 7 | 8 | 9 | 8 | 8 | 7 | 9 | 8 | 8 |
| MC4050 | 90 | CV, OR | Semi-Floury | 28K-34K | 9 | 8 | 9 | 8 | 8 | 7 | 9 | 9 | 8 | 10 | 9 | 8 | 8 | 8 | 7 |
| MC4570 | 95 | CV, OR | Semi-Floury | 28K-32K | 9 | 8 | 8 | 7 | 8 | 7 | 8 | 8 | 8 | 9 | 8 | 9 | 8 | 9 | 8 |
| MC4630 | 96 | OR | Semi-Floury | 27K-32K | 8 | 9 | 8 | 9 | 9 | 7 | 8 | 8 | 10 | 8 | 8 | 8 | 7 | 8 | 8 |
| MC4930 | 96 | CV | Semi-Floury | 28K-34K | 9 | 8 | 9 | 9 | 8 | 7 | 7 | 9 | 7 | 7 | 7 | 7 | 7 | 8 | 8 |
| MC4931 | 99 | GT | Semi-Flow | 28K-34K | 9 | 8 | 9 | 9 | 8 | 7 | 7 | 9 | 7 | 7 | 7 | 7 | 7 | 8 | 8 |
| MC5250 | 102 | CV, OR | Floury | 26K-32K | 9 | 9 | 9 | 9 | 8 | 7 | 7 | 9 | 7 | 7 | 8 | 7 | 9 | 8 | 8 |
| MC5370 | 103 | CV | Semi-Floury | 26K-32K | 9 | 10 | 8 | 9 | 9 | 6 | 7 | 10 | 9 | 10 | 9 | 8 | 8 | 7 | 9 |
| MC5660 | 106 | CV | Semi-Floury | 28K-34K | 9 | 8 | 9 | 8 | 9 | 6 | 8 | 9 | 9 | 10 | 9 | 7 | 7 | 8 | 9 |
| MC5790 | 107 | CV, OR | Semi-Floury | 28K-32K | 9 | 9 | 9 | 9 | 8 | 7 | 8 | 8 | 10 | 8 | 8 | 7 | 8 | 9 | 8 |
| MC6150 | 111 | OR | Semi-Floury | 26K-34K | 10 | 9 | 8 | 9 | 8 | 7 | 8 | 8 | 8 | 8 | 9 | 5 | 8 | 8 | 8 |
| MC6550 | 115 | CV | Semi-Floury | 24K-34K | 9 | 9 | 7 | 8 | 8 | 8 | 7 | 9 | 8 | 8 | 9 | 7 | 9 | 9 | 8 |
| MC590 | 116 | CV | Semi-Floury | 26K-32K | 8 | 9 | 9 | 10 | 8 | 6 | 7 | 9 | 8 | 10 | 8 | 8 | 9 | 7 | 9 |
| MasterGraze | -- | CV | -- | 28K-36K | 6 | 9 | 9 | 9 | -- | -- | -- | -- | 9 | 8 | 5 | 7 | 8 | 8 | 8 |

| Variety No. | RM | Trait | Kernel Texture | Planting Population | Silage Yield | Milk Per Ton | Sugars | Fiber Digestibility | Grain Yield | Test Weight | Dry Down | Starch Digestibility | Emergence | Plant Height | Stalk Strength | Ear Height | Root Strength | Disease Tolerance | Drought Tolerance |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MCT2552 | 75 | VIP 3110 | Medium | 26K-32K | 8 | 7 | 8 | 8 | 9 | 7 | 8 | 7 | 8 | 7 | 8 | 8 | 7 | 8 | 7 |
| MCT4058 | 90 | 5222 E-Z | Semi-Floury | 28K-34K | 9 | 8 | 9 | 8 | 8 | 7 | 9 | 9 | 8 | 10 | 9 | 8 | 8 | 8 | 7 |
| MCT4576 | 95 | 3220 E-Z | Semi-Floury | 28K-32K | 9 | 8 | 8 | 7 | 8 | 7 | 8 | 8 | 8 | 9 | 8 | 9 | 8 | 9 | 8 |
| MCT4938 | 99 | 5222 E-Z | Semi-Floury | 28K-34K | 9 | 8 | 9 | 9 | 8 | 7 | 7 | 9 | 7 | 7 | 7 | 7 | 7 | 8 | 8 |
| MCT5375 | 103 | 3122 E-Z | Semi-Floury | 26K-32K | 9 | 10 | 8 | 9 | 9 | 6 | 7 | 10 | 9 | 10 | 9 | 8 | 8 | 7 | 9 |
| MCT5663 | 106 | 3000 GT | Semi-Floury | 28K-34K | 9 | 8 | 9 | 8 | 9 | 6 | 8 | 9 | 9 | 10 | 9 | 7 | 7 | 8 | 9 |
| MCT6365 | 113 | 3122 E-Z | Semi-Floury | 30K-36K | 9 | 10 | 9 | 10 | 9 | 7 | 7 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| MCT6556 | 115 | 3220 E-Z | Semi-Floury | 24K-34K | 9 | 9 | 7 | 8 | 8 | 8 | 7 | 9 | 8 | 8 | 9 | 7 | 9 | 9 | 8 |

# KING'S AGRISEEDS' ORGANIC AVAILABLE!

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** | ***Custom mixes are available but arrangements must be made in advance.*** | |
| Dairy Green | 25 to 35 | A mix that will thrive on good to moist soil. |
| 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** | | |
| 429 Alfalfa | 18 to 22 | High-yielding, fast recovery. Deeper crown to tolerate hoof traffic. DRI 29/30, FD 4 |
| **Clovers** | Best for grazing & silage. For better establishment & more productive stands, inoculate before seeding. | |
| Premium Org. Clover Mix | 4 to 6 | A mixture of premium red, white and ladino clovers. Seed alone or with grass. |
| Common Medium Red Clover | 4 to 8 | A short lived, lower cost red clover. |
| Harmonie Red Clover | 4 to 8 | A European red clover. |
| Klondike Ladino Clover | 2 to 4 | A quick growing, large leaf clover. Include with pasture seeding or overseed into pastures. |
| Renegade Red Clover | 4 to 8 | 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** | | |
| Laura | 35 to 45 | High yielding and high quality. Doesn't get heady in the summer. |

| | | |
|---|---|---|
| **Orchardgrass** | | |
| Echelon | 20 | A very late heading and high yielding orchardgrass variety. |
| **Ryegrass** | | |
| VNS Annual Ryegrass | 40 to 150 | A fast starting grass for patching up abuse areas. |
| **Ryegrass - Italian & Intermediate** | | |
| Kingfisher Allegro Blend | 35 to 45 | A Kingfisher tetraploid, diploid Italian ryegrass blend. |
| Astoncrusader | 35 to 45 | A high-yielding intermediate 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. |
| Polim | 40 to 50 | A late-maturing tetraploid with excellent quality & productivity. |
| **Tall Fescue** | ***Tolerates drought, heat, wet soil and traffic. Very long lived.*** | |
| Kora Tall Fescue | 35 to 45 | Extremely productive, hay type, very digestible. |
| **Timothy** | ***A very palatable grass.*** | |
| Dolina Timothy | 10 to 15 | A high yielding, persistent hay type European variety. |
| **Spring & Summer Seasonal** | | |
| Badger Oats | 100 | An early high-yielding grain oat with high test weight. For short season forage sow 150 lbs/acre. |
| Deon Oats | 100 | A high-yielding early to medium oat with high test weight. Can also be used for forage at 130 lbs/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. |
| Reins Oats | 100 | An early maturing, shorter oat. Excellent high yielding grain oat. |
| AC Morgan Oats | 100 | A high-yielding early to medium oat with high test weight. Can also be used for forage at 130 lbs/acre. |
| VNS Spring Triticale | 125-150 | Forage spring triticale. Tall-awned, forage type. Medium maturity. |
| 40-10 Spring Peas + | 80 to 100 | A high quality purple flower forage pea. Can be planted Spring or Fall. Small seed size. |
| Buckwheat 'VNS' | 50 to 70 | Cool season or summer quick soil cover, weed suppressor, nectar for pollinators, loosens topsoil. |
| Lifago Buckwheat | 25 to 35 | Small seeded buckwheat for cover crop programs. Not for grain or attracting pollinators. |
| 360 SB Soybeans + | 150 to 180 | Organic 3.6 maturity. |
| AS 9301 BMR Sudangrass | 25 to 30 | Exciting sudangrass that dries down quickly with superb quality & yield. |
| AS 6201 BMR SSX | 40 to 50 | A fast starting variety. |
| KF Sugar-Pro 55 BMR SSX | 40 to 50 | A high-yielding dry-stalk BMR sorghum sudan. Dries easier than other sorghum sudans. |

T=Treated, CT=Conventional Coating, YJ=Yellow Jacket Coating, OC=OMRI-Listed Coating (Organic approved coating), UT=Untreated

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

# INOCULANTS

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

### 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 does rate of lacto buchneri for maximum feedout stability and minimum spoilage.

***OMRI Formulation available.***

***Previously Biotal Buchneri 500.***

### 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.

***OMRI Formulation available.***

***Previously Biotal Plus II.***

### MAGNIVA CLASSIC

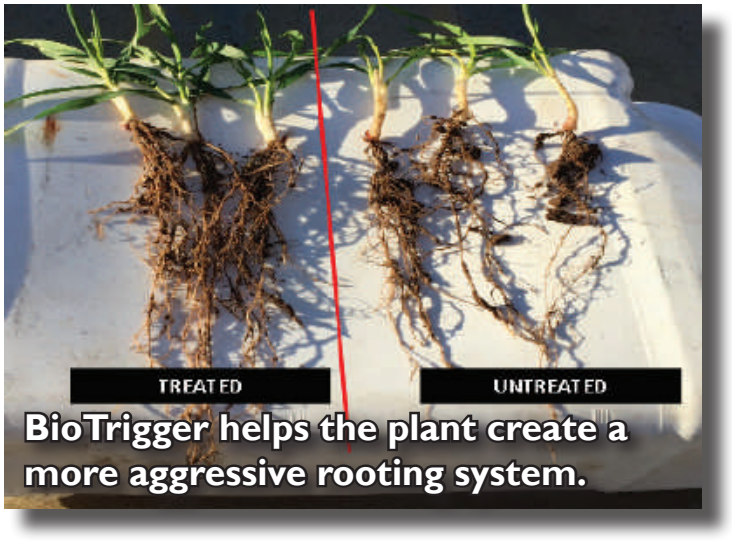
Combines bacteria and enzymes to help drive a fast efficient fermentation and supports the lactic acid production for a stable, low final pH to put you in control of silage quality.

***Previously Sil-All.***

### MAGNIVA HAY

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

***Previously Biotal Hay.***




## SEED INOCULANTS/ TREATMENTS help to ensure your seed gets off to a great start.

### KF BIOTRIGGER CORN

BioTrigger for corn stimulates root growth, enhances nutrient utilization and increases stress tolerances in corn by introducing specific strains of Trichoderma along with a nutrient package.

### KF BIOTRIGGER PERENNIAL GRASSES

Provides trichoderma fungi and a micronutrient package selected specifically for perennial grasses to get the long term stands started right. The Trichoderma takes up residence in the roots of the plants and enhances root growth, which improves yield and stress-tolerance.

### KF BIOTRIGGER ANNUAL GRASSES / CEREALS

A Trichoderma fungi and micro nutrient package that encourages additional tillering, larger yields and efficient use of nutrients in the soil.

### KF BIOTRIGGER ALFALFA/CLOVER

This formulation of BioTrigger brings the benefits of nitrogen producing rhizobia, along with root enhancing tricoderma AND it replaces talc graphite in the planterbox.

### KF BIOTRIGGER COVER CROPS

BioTrigger for Cover Crops is your go to solution for a complex cover crop mix. It provides a wide array of rhizobia that will treat virtually every legume you can think of! This product also includes Trichoderma and replaces talc graphite in the planterbox.

### GROWPAK SB

Uniquely formulated soybean inoculant and seed lubricant that contains both rhizobia and trichoerma.

### MYCO SEED TREATMENT

MST provides mycorrhizal fungi, which helps the plants develop greater rooting systems, and assists release nutrients. Excellent for perennial stands.

# INDUSTRIAL HEMP


# INDUSTRIAL HEMP SEED

Industrial hemp is a promising segment in agriculture, adding new farm income opportunities as well as a unique crop rotation that promotes soil health. To ease our growers' learning curve, we grew research plots on our farm in Lancaster County for the past two years. Along with comparing direct sow and transplants, we tested different weed control strategies, monitored the effects of cover crops, and performed five emergence trials. Best of all, we screened 15 varieties in our hot, humid growing conditions before they were introduced to our market.

King's is partnering with industry leaders to bring high quality hemp varieties to the east coast. Hemp Genetics International, a recognized breeder in Canada has been developing dual purpose grain and fiber varieties since 1998. For CBD varieties, we are working with Phylos Biosciences and FLURA. Phylos is known for DNA mapping and sex testing of the cannabis plant. They use this expertise to breed F1 hybrids rapidly without genetic modification. Based in Michigan, FLURA is focused on photosensitive varieties suitable for smokable flower and high CBD yield.

**GRAIN HEMP** is a nutritious oilseed crop, distinct from CBD oil. The grain can be consumed as "hemp hearts" and pressed for its oil. It contains many essential nutrients and vitamins. Hemp cake, like soy cake, shows potential for animal feed, but further research must be completed before it is approved for this use. Taller varieties help control weeds.
***Equipment Needed:*** Grain drill, Combine, Grain drying equipment & Storage
***Seed 25 to 30 lbs/acre.***

## CRS-1

The tallest grain variety in our offering. It grows to approximately 60 inches tall, and is a high yielding variety. It produces a large seed size. Can also be used for fiber.

## CFX-2

This grain variety reaches approximately 55 inches tall. It is a high yielding variety with a large seed size. Can also used for fiber.

**FIBER HEMP** has many potential applications including textiles, construction materials and animal bedding.
***Equipment Needed:*** Grain drill, mower, tedder, bailer
***Seed 35 to 40 lbs/acre.***

## JOEY

This fiber variety reaches approximately 60 inches in height. It is monoecious, therefore the stand density and total fiber content per acre remains strong after pollen shed, unlike the dioecious grain varieties. Can also be used for grain.

**CBD Variety Pollination Warning**

When a hemp plant is pollinated, its CBD content is greatly diminished. It is important to cull all males (and hermaphrodites). Since Grain and Fiber varieties do not cull males, it is important to know if these varieties are growing nearby. Currently, hemp pollen is estimated to travel up to 3 miles. Further research is needed in the East.

# CBD HEMP

CBD Hemp is grown for its flowers. CBD oil, which is extracted from the flowers, is reputed to have beneficial health effects including reduced inflammation, improved mental clarity, reduced anxiety and more. CBD is non-psychoactive and cannot cause a "high."

***Equipment Needed:*** Precision seeder or transplanter, cultivation equipment, irrigation (recommended), harvest, drying, shucking/bucking (may depend on processor).

## AUTOFLOWER

**AUTOFLOWER** are fast, efficient, and less expensive to grow than typical photosensitive varieties. Since they are day-length neutral, these varieties can be planted and harvested weekly from mid-summer through fall, similar to a sweet corn planting schedule. Crop timing is only about 10 weeks for all of our varieties, which reduces overall risks of disease, insects and weather. Predictable scheduling plus mechanized planting and harvesting make labor efficient. Autoflowers are perfect for high tunnel and greenhouse production. Feminization rate 99.00%+.

## AUTOCBD

High density planting makes our flagship AutoCBD a cost effective option for mechanized planting and harvesting.
***CBD Flower:*** 11% +/- Biomass: 7% +/-
***Terpene Profile:*** Musky, Citrus, Pepper, Spicy
***Plant Population:*** 22 k/a

## AUTOCBD ALPHA EXPLORER

With 52% bucked flower vs leaves and stems, this F1 hybrid has smokable flower and extraction versatility. High yield.
***CBD Flower:*** 13% +/- Biomass: 8%+/-
***Terpene Profile:*** Musky, Citrus, Pepper, Spicy
***Plant Population:*** 17 k/a

## AUTOCBD ALPHA NEBULA

Perfect for CBD extraction, Alpha Nebula is a vigorous F1 hybrid with an 85% biomass harvest index. This variety offers early season vigor, harvest efficiency and oil production.
***CBD Flower:*** 14% +/- Biomass: 9% +/-
***Terpene Profile:*** Musky, Citrus, Pepper, Spicy
***Plant Population:*** 17 k/a

## PHOTOPERIOD SENSITIVE

Photosensitive CBD varieties are triggered to flower by daylength. Our product list includes varieties that mature for harvest from late August through October. They are large, robust plants that produce hefty colas suitable for biomass or smokable flower. Plant population per acre depends on planting date. Earlier transplanting gives more time to develop a larger plant scaffold that supports large flowers. Later transplant with higher density results in smaller plants that compete with weeds in fewer weeks. Overall yield per acre may vary.

## PHOTOCBD QUIK SPECTRUM

Larger than Autoflowers and smaller than Photos, this Auto-Photo cross offers the best of both types plus F1 hybrid vigor. Capitalize on short crop time, compact plants with strong yield -- even at high density. Harvest mechanically or quickly by hand with loppers.
***CBD Flower:*** 17.5% +/- Biomass: 12.5 +/-
***Terpene Profile:*** Sweet, Berry, Musky
***Plant Population:*** 4800 plants/acre

## BRUTUS

Stable, early maturing variety with large dense flowers especially for smokable flower. High yield.
***CBD:*** 9% - 18%
***Terpene Profile:*** Fruity, Evergreen, Grassy
***Plant Population:*** 2,700 – 3,100 plants/acre (4' x 4' early planting)

## EARLY ABACUS 2

Consistent, early finisher. Superb stability with large yield up to 1 lb per plant. Flowers tend to be medium density.
***CBD:*** 8% - 15%
***Terpene Profile:*** Grassy
***Plant Population:*** 4800 – 8,000 plants/acre (3' x 3' early planting)

## JULIUS 1

Extremely vigorous F1 hybrid that can produce 1-3 pounds per plant. October harvest.
***CBD:*** 15% - 22%
***Terpene Profile:*** Citrus, Evergreen
***Plant Population:*** 2,700 – 3,100 plants/acre (4' x 4' early planting)

Submit a baseline sample for COA testing at minimum of 4 weeks prior to expected harvest. The earlier you test, the better you can schedule your compliance COA sample and eventual harvest. Federal guidelines for compliance approval are to test within 15 days of actual harvest date. Your state regulations may be different.

## King's AgriSeeds AutoCBD Trials Show Obvious Upgrades for 2021

Since 1993, King's AgriSeeds has independently researched varieties and crop culture. Northeast and Mid-Atlantic growers can have confidence when choosing our seed varieties and planning best cultural practices. This photo shows pre-introduction AutoCBD hemp varieties from Phylos in late July at King's AgriSeeds research farm in Christiana, PA. With F1 hybrids, more promising varieties are in the pipeline.

**Results: Bright Future for Autoflower varieties!**

Breeding improvements are obvious! The flagship variety, AutoCBD NBS CBD-1 (left) and AutoCBD Alpha Explorer (right) next to a 36-inch measuring stick. Phylos' new day neutral F1 hybrids are robust, increasing yield by more than 30% in the same crop time of 9 to 11 weeks.

For 2021, day-neutral varieties are even more efficient to grow with higher yield per acre. Just 9 weeks from a June sow date, eight autoflower varieties were nearly ready for harvest in Mid August.

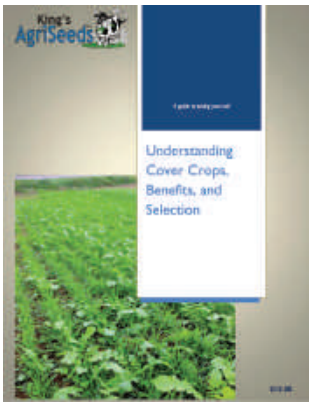
Compared to variety selections, the F1 hybrids boasted much higher vigor and stockier plant architecture, heavy with dense flower buds. Growers will harvest big returns with little waste. At less than 15% of overall weight, stems and branches were a fraction of the biomass. The CBD to THC ratios for Phylos' 2021 autoflower varieties range from 26:1 to 30:1, a respectable improvement.

King's AgriSeeds can recommend several cover crops to prepare next year's hemp fields for high yield and better weed control. For seed and cultural information, contact King's AgriSeeds.

Sarah Mitchell is King's AgriSeeds Industrial Hemp Specialist. She had first-hand experience with this variety trial from sowing through harvest. For more information, contact Sarah at SMitchell@KingsAgriseeds.com

# COVER CROPS


Ask about our cover crop manual.



# 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, 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 25-30 lbs/acre.***

## CARGO

A mixture of crimson clover, annual ryegrass, and oats. It is a superb cover crop for USDA Zones 5 and south. 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.***

## GREEN N LOW NEW

A simple 2 species cover crop mix, featuring low growing annual ryegrass and crimson clover. These two species combined are a great combo for improving soil health and fertility. Works well for planting green, traditional burndown or full till program.

***Seed 20 to 25 lbs/acre.***

## 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.***

# COVER CROP COCKTAILS

## LARGE BOX BOOSTER NEW

Our new 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.***

## 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 new 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.

***Pre Inoculated. 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 NEW

Our new Booster mixes are designed to help you add diversity to your small grain cover crop program.
This fives species mix (plus the small grain of your choice makes it 6) features AU Merit hairy vetch, an early maturing vetch. 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 mixtures 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.***

## VITAMAXX DT NEW

A fast-growing, legume-free cover crop mix which is very suitable for use in nutrient management. This mix produces plenty of biomass, which serves a long-term food source for earthworms and other soil inhabitants and preserves the nutrients over winter. The fast growing components enable the latest sowing dates of the TerraLife mixtures.

***Seed 18 to 20 lbs/acre.***

Small Box Booster planted without small grain, one month after planting.

# 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 2020 MIX NEW

A white mid-rib version of Ray's Crazy Summer Mix with added Sunn Hemp for additional legume diversity. As a grazing mixture, this would be best suited for heifers, or beef cattle.
***Seed 50-60 lbs/acre.***

## SUMMER SOLAR

A diverse legume-forb cover crop mix of aggressively growing summer annuals, with possible dual use for wildlife food plots. The mix includes four very different components - buckwheat, cowpeas, sunflower, and sunn 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.***

**Summer Solar contains four species that bloom during the summer months. Great mixture to "Bring in the bees"!**

# LEGUMES - CLOVER, PEAS, HEMP, TREFOIL

## PERENNIALS

### BIRDSFOOT TREFOIL
A high yielding hay type trefoil that tolerates low pH and wet soils.
***Seed 20 to 25 lbs/acre.***

### RED CLOVERS
Freedom!MR, Medium Red Clover "VNS", Mammoth Red, Renegade, Clifford. 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
Alice White Clover, Liflex, RegalGraze Ladino Clover, Ladino White Clover "VNS", Dutch White, Alsike, Kakariki.
***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 N/A 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. ***Seed15 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

# NON-LEGUMES

## 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. Also available in organic.***

### 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 7 and south, when planted in barley/wheat dates.

### 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

Quick grower 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.***

### 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.***

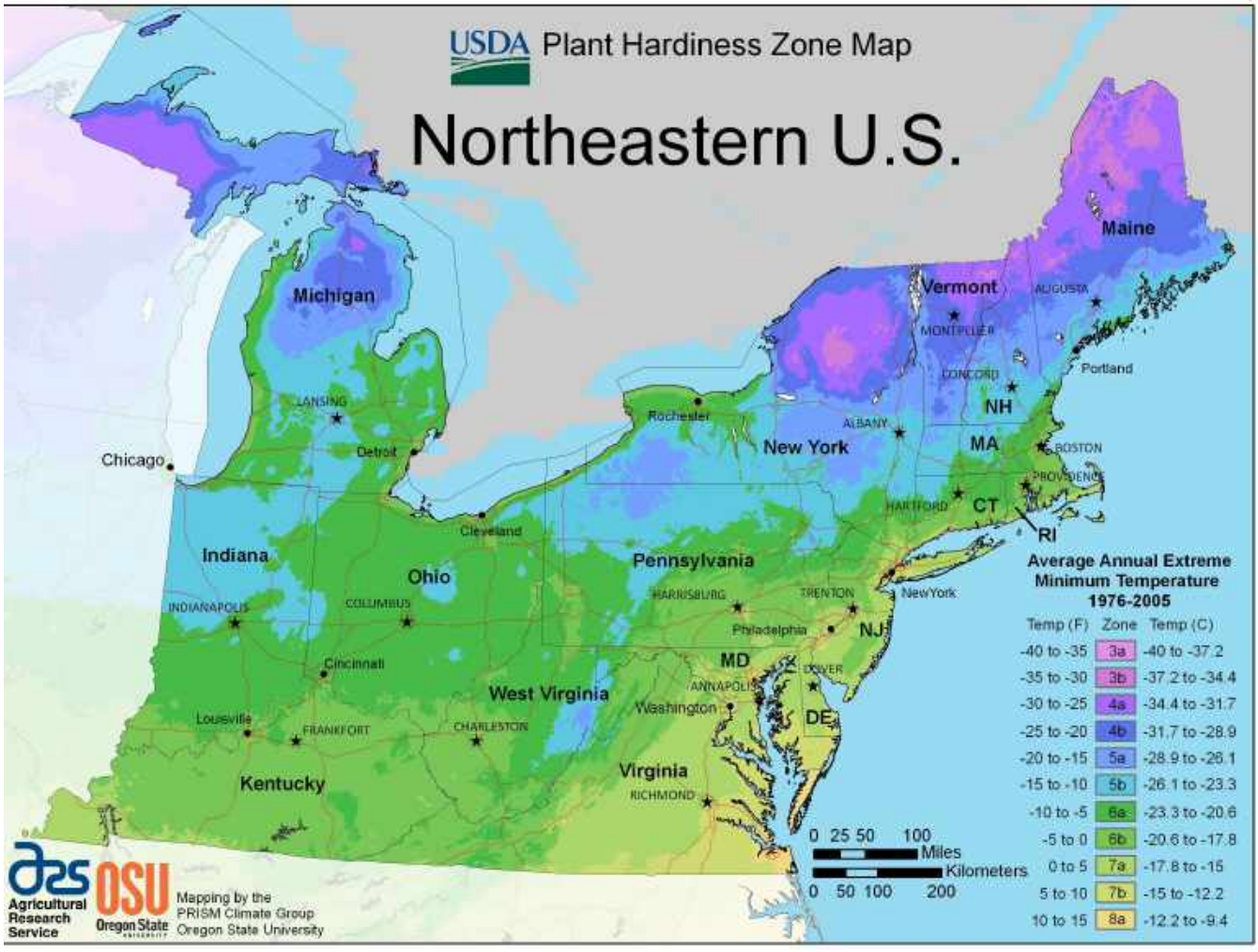
### PURPLE TOP TURNIPS

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

Individual species cover crop options are very extensive. Contact your King's dealer if you are wondering what other options are available to you.

# FORAGE MANAGEMENT





## RUMINANT NUTRITION

Whether you milk cows, produce beef, lamb or other ruminants, the principles remain the same. The basics are that ruminants have a four compartment stomach system that is designed to turn forages into energy. The rumen acts as a large oxygen free fermentation vat, in which fiber is broken down by fungi, bacteria, and numerous other microscopic organisms into volatile fatty acids (VFA's). The higher the digestibility (NDFd) the more forage is converted into these VFA's and less manure is produced. The VFA's are used by the ruminant as the major energy source. These VFA's are moved from the rumen through the blood of the animal and converted to usable energy in the animal's liver. Several different types of VFA's are produced in the rumen depending on feed source. These include: acetic acid, propionic acid, butyric acid and others. When digested, forages produce mostly acetic acid, a weak acid with a pH closer to neutral compared to propionic acid, which is produced mostly by starch and sugar. Ruminants fed high forage rations rarely have a condition called acidosis, which causes multiple health problems. However, if forage quality is low (woody fiber or high in lignin), the animal has a challenge getting enough energy out of the forage to make milk or meat. Grain is used to make up for poor quality forage, but can have a negative impact on animal health if fed at too high a level.

## FORAGES FOR DAIRY

Your nutritionist has the task of putting together rations for your livestock. However, your nutritionist is working with forages that you make. To make a high forage diet work, you must make high quality forages. This process starts with a good forage program and includes the best seed genetics available. A high forage diet, based on average quality forages, simply will not meet the demands of milk production. Forage that is marginal in quality must be supplemented with high cost grain. Forages must be digestible and fed in high enough quantity to provide effective fiber to maintain milk production and cow health. During the past 40 years, forages on most dairies have been based on corn silage and alfalfa. Corn silage provides energy in the form of starch, and alfalfa provides protein. However, for high forage diets, this forage base simply does not provide enough highly digestible fiber. NDF digestibilities over a 24 hour time period for corn silage and alfalfa are usually in the 40s. To increase fiber digestibility, add vegetative grasses to the ration. The 24 hour NDFds of our premium grass genetics tend to run in the high 60s up to almost 80%. These grasses will complement your current forage program by improving field production and decreasing ration costs. Adding high quality grasses to your forage system is not difficult and improves your crop rotation and yields. If alfalfa is included in the system, simply add our leafy late heading grasses to your alfalfa. For corn acreage, follow with a winter annual crop. Our favorite is Triticale Plus, which is TriCal 815 plus Annual Ryegrass. This mix is winning over dairymen and nutritionists. Also, instead of putting an extreme emphasis on corn as your summer annual, consider adding a gene 6 BMR sorghum product to break up continuous corn acreage. Need effective fiber that is digestible? High quality dry grass hay has lots to offer in a dairy ration. Not only is the fiber effective and more digestible, it is also lower in soluble protein. Our favorite sources of dry hay are our easy to dry perennial hay mixtures and easy to dry summer annuals (teff, millet, and sudangrass) which are planted after our high yielding winter annual crops are harvested.

## THE BENEFITS OF HIGH FORAGE DIETS

### Lower Feeding Costs

- Forages cost less than grain
- Less purchased protein
- With balanced diets that include vegetative grasses and/or legumes, less soybean meal is needed

### Healthier Cows

A balanced diet high in forages decreases

- Displaced abomasums (twisted stomach)
- Acidosis
- Sore feet

### Better Nutrient Management

If home grown, high yielding, digestible forages are fed

- Less feed imports, including soybean meal, which is high in protein
- Less manure from cattle (better feed efficiency)
- More yield, which means more nutrients removed from soil.

### Higher Farm Profits

- Reduced purchased feed bill
- Reduced veterinary bill
- Reduced cow turnover rate
- With double and triple cropping, better utilization of land and equipment

# UNDERSTANDING YOUR FEED ANALYSIS REPORT

**Dry Matter (DM)** - Feed free of moisture of 100% DM. Feeds are expressed on a DM basis due to the large variation in moisture or DM content of feeds fed to cattle.

**Crude Protein (CP)** - Total protein equivalent including nitrogen from both protein and non-protein sources.

**Unavailable Protein (Heat Damage)** - Bound protein in the fiber of feed material. Normally about 1% protein (on a DM basis) is found. Values >1% indicate heat damage.

**Digestible Protein Estimate** - An estimate of the amount of protein digested and absorbed by the animal.

**Acid Detergent Fiber (ADF)** - The percentage of highly indigestible plant material in a feed or forage. The lower the ADF the more digestible a feed is to the animal.

**Neutral Detergent Fiber (NDF)** - The percentage of cell wall material or plant structure in a feed. The lower the NDF percentage, the more an animal will eat. NDF includes acid detergent fiber and is inversely related to intake, therefore, a low percentage of NDF is desirable.

**Total Digestible Nutrients (TDN)** - The sum of the digestible protein, digestible nitrogen free extract, digestible crude fiber and the digestible fat. TDN accounts for the fecal loss of digestion and to a large extent the urinary energy loss.

**Net Energy of Lactation (NEL)** - An estimate of the energy in feed available for body maintenance and milk secretion.

**Net Energy of Gain (NEG)** - An estimate of the energy of feed available for the deposition of body tissue in non-lactating animals (the term "non-lactating animals" refers to growing males and females, and mature bulls).

**Net Energy Maintenance (NEM)** - An estimate of the energy of feed available for the maintenance of non-lactating animals.

**Relative Feed Value (RFV)** - A measure of feed value compared to full bloom pure alfalfa where 100 is equal to full bloom alfalfa. An RFV above 100 is better quality forage than an RFV below 100.

**Macro Minerals** - Minerals required in greater quantities and are present in animal tissue at higher levels. These include phosphorus, calcium, potassium, magnesium, sulfur sodium and chlorine.

**Trace Minerals** - Minerals required in smaller amounts and are generally present in animal tissue at lower levels. These include copper, iron, manganese and zinc.

**TTNDFD** - Total Tract Neutral Detergent Fiber Digestibility is a measure of the extent and speed of fiber digestion throughout the entire tract of a high-producing dairy cow, taking into account the overall rate of passage of fiber through the digestive tract.

**NDFD-30** - Neutral Detergent Fiber Digestibility-30 hr. or Cell Wall Digestibility (CWD) -- is an excellent in-vitro test to determine the NDF digestibility (NDFD), as a percent of total NDF. In-vitro means the feed is digested in rumen fluids (simulating a rumen) in the laboratory. This is a good indicator as to what the animal will actually digest in the "real world" The NDFD-30 will range 40 to 50%. The higher the better.

**7 Hour Starch Digestibility** - Measures the rate and amount of starch digestion in order to compare corn hybrids in terms of starch availability.

**uNDF240** - Stands for undigested neutral detergent fiber (uNDF). NDF, commonly referred to as "cell wall," is comprised of cellulose, hemicellulose, and lignin. The number "240" refers to the amount of NDF remaining after 10 days (240 hours) in the rumen.

# FORAGE QUALITY NUMBERS

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.

| | CP | ADF | NDF | LIGNIN | NDFd24 | Kd | Nel | Sugars |
|---|---|---|---|---|---|---|---|---|
| **ALFALFA** | 22.6 | 29.1 | 33.4 | 6.1 | 49.5 | 4.3 | 0.63 | 8.0 |
| **ALFALFA GRASS MIXES** | 21.4 | 30.1 | 38.8 | 5.16 | 56.3 | 4.6 | 0.63 | 7.17 |
| **RED CLOVER** | 21.0 | 29.5 | 33.5 | 6.5 | 49.5 | 4.5 | 0.61 | 10.0 |
| **WHITE CLOVER** | 31.1 | 22.2 | 26.2 | 3.2 | 67.7 | 8.44 | 0.74 | 10.1 |
| **ARG + IT** | 18.0 | 24.0 | 48.7 | 3.1 | 67.6 | 7.75 | 0.72 | 14.3 |
| **PERENNIAL RYEGRASS** | 17.2 | 31.0 | 44.0 | 4.0 | 63.0 | 5.20 | 0.7 | 10.8 |
| **FESTULOLIUM** | 19.0 | 29.5 | 47.0 | 3.6 | 69.0 | 5.0 | 0.67 | 9.3 |
| **MEADOW FESCUE** | 16.5 | 29.8 | 46.0 | 3.30 | 71.0 | 6.0 | 0.7 | 8.3 |
| **TALL FESCUE** | 15.0 | 32.0 | 50.0 | 3.2 | 75.0 | 6.10 | 0.70 | 9.3 |
| **ORCHARDGRASS** | 15.3 | 33.5 | 55.0 | 4.0 | 68.3 | 5.6 | 0.7 | 7.7 |
| **SORGHUM SUDAN** | 14.8 | 31.0 | 54.5 | 2.8 | 71.0 | 6.0 | 0.65 | 10.8 |
| **FORAGE SORGHUM SOFT DOUGH** | 9.5 | 24.3 | 40.5 | 3.8 | 56.7 | 4.95 | 0.72 | 4.4 |
| **FORAGE SORGHUM BOOT STAGE** | 10.9 | 30.1 | 49.2 | 3.42 | 71.2 | 5.68 | 0.68 | 12.3 |
| **OATS** | 17.0 | 30.0 | 45.5 | 2.7 | 73.0 | 5.42 | 0.68 | 9.8 |
| **WINTER TRITICALE** | 15.5 | 32.1 | 50.2 | 3.09 | 71.08 | 5.24 | 0.67 | 5.4 |
| **TEFF** | 17.6 | 33.8 | 45.1 | 2.84 | 63.9 | 4.3 | 0.61 | 8.8 |

## FORAGE YIELD PROJECTIONS ON 60 ACRE LAND BASE

(Based on productive soils, adjust accordingly)

**Corn Silage** (Dense Energy Forage)
8 tons of Dry Matter (24 tons @ 67% moisture)
X 20 acres
160 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 30 acres
80 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 10 acres
100 Tons of Dry Matter (300 tons @ 67% moisture)

### Forage needs for a 60 cow dairy on 60 acres

| 52 Milk Cows | 14 Large Heifers |
|---|---|
| 382 tons corn silage | 38 tons corn silage |
| 285 tons haylage | 70 tons haylage |
| 142 tons annuals | 70 tons annuals |
| 38 tons dry hay | 5 tons dry hay |

| 8 Dry Cows | 14 Small Heifers |
|---|---|
| 31 tons corn silage | 2 ton hay |
| 16 tons annuals | 7-9 tons annuals |
| 6 tons dry hay | No to little corn silage |

### Total forage needs for all livestock

| | |
|---|---|
| Total corn silage | 407 tons |
| Total haylage | 285-355 tons (depending large heifer ration) |
| Total annuals | 166-236 tons (depending large heifer ration) |
| Total dry hay | 51 tons (123 ton 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: Masters Choice 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: Masters Choice corn for silage

Year 7-12: repeat previous 6 year rotation

To further illustrate this rotation, imagine a 60 acre tract with six 10 acre fields (ideal scenario). Each year there would be 30 acres of legume grass mix, 20 acres of corn silage and 10 acres of intensely managed annual grasses.

**Perennial Forage** (Legume grass mixtures)
Three 10 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 10 acre tracts
One field after legume grass mixture (Year 4)
One field after oats or winter annual (Year 6)

**Vegetative Grass Annual Forages**
One 10 acre field that is double or triple cropped (Year 5)

# CROP ACREAGE PLANNER

## 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).

**Call our office for a digital copy of the crop acre planner!**

# 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 re-growth 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 four or more times a year, but only a little at a time. Grass uses a LOT of nutrients, especially nitrogen.

F) Keep cows off paddocks until you have 8"-10" of regrowth. In springtime under good conditions this may be 12 to16 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.

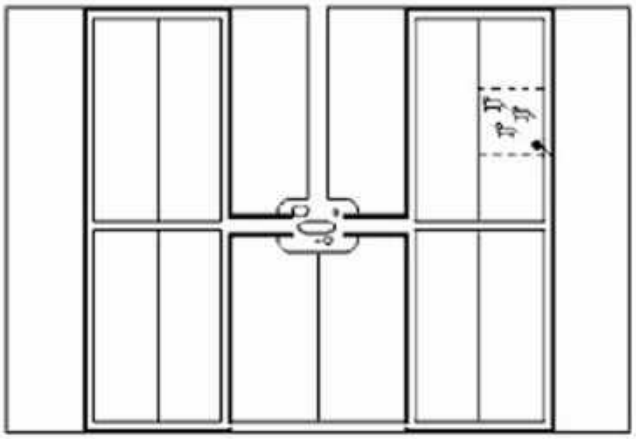
H) Hybrid Farming: You can graze approximately ½ acre or more per cow and still grow your own crops. A couple notes of caution:

#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.



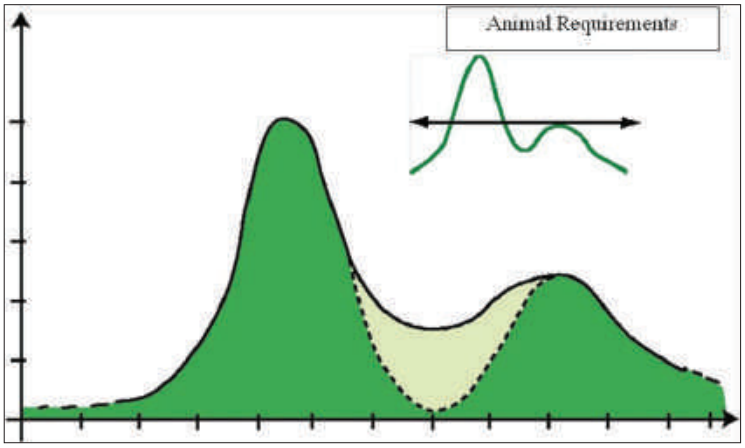
- The farm buildings ideally should be located in the center of the grazing land base, which reduces the amount of walking by the herd and you.
- The lane network creates major paddocks that are rectangular for field work but can easily be subdivided with polywire (dashed lines) to make daily grazing 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:

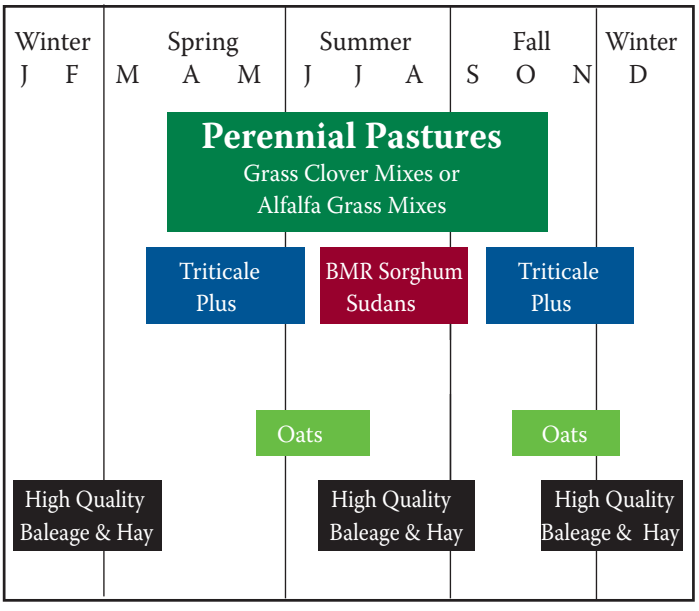
- How much of the ration will come from pasture?
- Productivity of the pasture?
- Breed and size of the cattle?
- Do you want to make surplus forage in the spring or supplement forage in the summer?
- Manure management details.

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



# PASTURE PRUNING

*By David Hunsberger, Central Regional Coordinator*

What is pasture pruning? Isn't that just another way to say clipping? No, according to Cliff Hawbaker, an innovative grazer near Chamberburg PA, the two should not be confused. Hawbaker has been on the leading edge of many practices to improve dairy margins over the years. We took the opportunity to check in with him this spring to go over the details of the protocol.

Pruning is proactive; it is managing the process at the beginning. Clipping is more reactive, mitigating an error or cleaning things up. By pruning, we wish to set the stage for the remaining season. We want our pastures to be vibrant, thick and productive. Pruning correctly can help us achieve those multiple goals. Pruning is best viewed as an early spring management intervention. We all know that early spring pasture is very palatable and cattle will consume it readily. We also know that grazing is selective by nature and not all grasses, clovers, and forbs are consumed uniformly. Pruning can help us reset the pasture after the first rotation, or in areas that cannot be grazed early, pruning can give us "early April growth into May without a stored forage harvest," according to Hawbaker.

First of all, we need to have the equipment set up to perform. Most mowers will not cut at 4-6 inches of residual height without some modification. To the right are pictures of Evan Beidler of Beidler Ag Liverpool, Pa helping a customer get set up to leave a 6-inch stubble. First the parts to modify, secondly the install.

And now finally, the end result: A successful cut with 6 inches of residual!

We desire to leave a 4-6 inch residual post graze or post prune to promote shade of soil, season long moisture holding capacity, cool soil temperatures even in midst of summer, and a "bumper" so that ensuing grazing events will encourage the cows to leave that higher stubble. This will enable the grasses to recover from grazing much faster as they always have their primary starch reserves intact following future grazings. Grass kept in this state should thicken and be prolific farther into the summer slump when rains are sparse. Thick swards are also better for improving grazing efficiencies as cows can get a larger mouthful with each bite.

If you are through the first grazing cycle and cows have left some plants ungrazed, we know it is unlikely for them to be grazed on a second rotation. However, if we cut that growth prior to the next turn, the cattle will readily consume that biomass. If we want to reset grass that is a bit too tall for grazing the first time, we can prune the growth before they enter the paddock for the first graze and that will also have them eating it readily, and provide a uniform sward for the second and subsequent passes. This 4-6 inch "stubble " or old growth will cause the cows to resist grazing below that height as they are most interested in new growth. Hawbaker affirms that if they clean off the new growth, they will begin to vocalize their desire to find some new succulent pasture.

The grazing manager that prunes ahead sets themselves up for season long success with boosting good grass growth management, good soil stewardship, and productive digestible NDF for cows. For further discussion contact me, David Hunsberger, at 814-880-5186 or catch up with Cliff Hawbaker at a grazing event and ask him if he clips his pasture. I guarantee you will hear a passionate answer to that question.

Happy Pasturing!

## 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.

## 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.

## 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.

# DIVERSIFYING YOUR HAY PORTFOLIO

*By Joy Beam, Eastern Regional Coordinator*

Have you ever considered the depth of your hay portfolio? Just as diversity in business helps limit risk, diversifying your hay fields helps you weather the all-too-familiar challenges that come with making hay. With many different forage species available, hay programs can easily be diversified by strategically taking advantage of differing maturities of various cultivars.

By incorporating early and later maturities onto your acres, the harvest window can be widened as early maturing fields can be harvested with ample time before later maturing fields are ready to harvest. On operations with many acres to cut, this can be vital in maximizing both the quality and quantity of hay produced. Similarly, if rain keeps one maturity group from being cut at peak time, it is more than likely that the other maturity class will have better weather when it is ready to be harvested. Below is a summary of maturity patterns for straight common hay cultivars to aid in developing your hay portfolio:

**Orchardgrass:** Early, medium, and late maturing orchardgrasses are available on the market with up to two weeks' difference between early and late maturity dates. Late maturing orchardgrasses pair well with alfalfa. Some southern producers prefer early maturing orchardgrasses as they can put on most of their first cutting growth and replenish resources before it gets hot.

**Tall Fescue:** As a whole, tall fescue matures later than orchardgrass. However, later maturing varieties such as Kora and STF 43 still pair well with late heading orchardgrasses.

**Timothy:** There is a wide difference in maturity dates between early and late timothy. Early timothy varieties, like Zenyatta, can be paired with alfalfa or late orchardgrasses while late varieties will mature after fescue.

**Smooth Brome:** Smooth brome grass matures very late. As a high yielder that is very persistent if left go to seed, brome grass works very well on fields that are hard to get to and are not first priority. Even if harvested after the ideal date, brome grass holds its quality better compared to other hay varieties. Since it is similar to timothy in that most of its production comes in the spring, smooth brome can be paired with timothy if limited management is desired.

Incorporating different maturities will diversify your hay business across fields, but diversifying your stands within fields is also recommended by planting mixes of grass species. Depending on weather patterns, one variety may excel one year while another grass species will shine another year. This will also help combat against varying soil types within one field. King's AgriSeeds has designed multiple mixes with this concept in mind that include species of similar maturity to diversify your business.

| | Early | Medium | Late |
|---|---|---|---|
| **Equiflex Forage** | X | | |
| **Hay Pro** | | | X |
| **Highland Hay** | | | X |
| **Hillside** | X | | |
| **North Star** | | | X |
| **Performance Max** | | | X |
| **Sale Topper** | | | X |
| **Balancer** | X | | |
| **Grass Pro** | | | X |
| **GrassMaxx** | X | | |
| **Lowland Hay** | | | X |
| **Milkway** | | | X |
| **Versa** | | X | |
| **Organic Partner** | | | X |

# WHICH ALTERNATIVE FORAGE IS RIGHT FOR YOU?

*By Tim Fritz, President, King's AgriSeeds*

Affordable high quality forages are one of the key factors for success on a dairy farm. Quality can be thought of in various ways. Energy derived from Neutral Detergent Fiber (NDF) and Non-Structural Carbohydrate (NSC), protein and effective fiber are major talking points when it comes to forage quality. The reality is that if the ration is put together properly, just about any high quality forage can be fed to high producing livestock. But what are quality forages and what makes quality alternative forage? Prior to 1950, corn silage and alfalfa would have been classified as alternative forages. At that time grass/clover mixtures were considered the normal, mainstream forage. We have access to numerous plant species from around the world that have been identified and bred for forage use. Weather, soils, crop rotation, technology, economics, harvest system, storage system, and livestock nutritional needs all have major impacts on which forage species are most appropriate for your farm.

**Major questions to consider in making forage choices.**

1. Is the crop adapted to your farm's soils and expected weather?
2. Do the planting and harvest dates work for your farm?
3. How will the crop impact crop rotation and total farm productivity?
4. Do you have adequate storage capacity?
5. What nutritional value does the crop bring to the ration?

**Most forage crops can be placed into three major categories:**

**Energy Crops** – These crops develop starch and are close to full maturity when harvested. They are typically low in protein and have lower fiber digestibility. Examples include: Corn silage, soft dough forage sorghum and soft dough small grains.

**Balanced Energy and Protein Crops** – These crops are cut and wilt just prior to flag leaf. Small grains, annual and Italian ryegrass, perennial grasses and many mixtures. The timing of the harvest needs to be aggressive to ensure excellent fiber digestibility and good protein. This type of forage is more balanced to the cow's needs as energy through fiber digestibility is high and protein content is close to the cow's needs. If grown and made properly these feeds are typically around 16% protein; NDFd 30 around 70%; and Kd rates around 6.

**Protein Crops** – These crops are generally legumes with very little grass harvested close to bud stage. Crops include Alfalfa, Red Clover, White Clover, Crimson Clover, Peas, Cowpeas. Protein content is typically in the low 20's but digestible fiber is lower depending on the species.

Below are major forages that can be used to develop a balanced forage system for your farm. Do research before seeding including herbicide crop rotation restrictions prior to making decisions. Walk before you run by planting limited acreage the first year. A balanced crop rotation using a few of these crops can reduce your forage risk and increase farm productivity dramatically.

**Summer Forages** – Seed in spring and harvest in summer.

- Corn Silage – Highest starch forage with high yield. Plant on productive soils.
- BMR Forage Sorghum harvested at soft dough – Best used on droughty soils and is good source of starch, sugar and digestible fiber.
- BMR Forage Sorghum harvested at flag leaf – High forage yield in about two months. High fiber digestibility and moderate protein. Excellent component of double and triple cropping programs. Very water efficient.
- BMR Sudangrass – A multi-cut and wilt crop that is easier to dry. Has moderate protein and high fiber digestibility.
- BMR Sorghum sudan crosses – A multi-cut and wilt crop with high fiber digestibility and moderate protein.
- Millet- A multi-cut and wilt crop that is easier to dry. Has moderate protein and high fiber digestibility.
- Cowpeas – A summer legume crop that can be mixed with forage sorghum to be harvested at flag leaf. Increases protein content in summer mixes and has improved fiber digestibility over soybeans.

**Winter Forages** – Seed in late summer to early fall and harvest in spring.

- Small Grains harvested at flag leaf – These crops have high fiber digestibility and moderate protein content. The harvest window is different for each crop.
    - Triticale, Rye, Wheat, Barley and Spelt

- Small Grains harvested at soft dough – These crops have moderate levels of starch but fiber digestibility and protein are relatively low.
    - Barley is most suited for this harvest method and is in closer quality compared to corn silage than the other species.
- Annual and Italian Ryegrasses – These crops are low in cost but high in forage quality and soil building attributes. Can be harvested up to three times in the spring. High fiber digestibility and moderate protein content. From an agronomic perspective these ryegrasses increased soil organic matter more than the other winter annuals. Annual ryegrass can also break up compacted soil layers over time. The increased soil health improves yields of summer annual crops used in rotation. Ideal to mix with small grains and crimson clover.
- Crimson Clover – This winter annual legume can be seeded with triticale, wheat and ryegrass very successfully and will increase the protein content of the forage.
- Hairy Vetch – This winter annual is not typically used as a forage but is planted as a cover crop frequently to increase nitrogen in the soil. For forage, it is best mixed with wheat or spelt as it is slower to come to bud stage.
- Winter Peas – A newer high protein crop to our area that is still being researched. Newer varieties have improved winter hardiness. Mixing with a small grain is desirable in improving winter hardiness. Seed during barley to early wheat dates.
- Mixtures of the above.

**Cool Season Forages** – Seed in March or August and harvest in about 60 days.

- Spring Oats, Barley, Triticale – Note: There are a lot of differences in these products by species and variety. As a general rule they will feed similar to winter small grains.
- Spring Peas – Seed with the small grains to increase protein content by about two points. Peas will also dry on the slower side.
- Mixtures of the above.

**Perennials** – Seed in March or August and harvest several cuts per year for a few years.

- Alfalfa – A drought tolerant high protein cut and wilt crop.
- Clovers – Red Clover has high protein quality that is more stable than protein from alfalfa during fermentation. White clover and ladino clover have high protein and fiber digestibility as the stem is not harvested. (The stem, a stolon, runs on the soil surface).
- Various grasses – Superb quality if harvested prior to heading. If mixing with legumes choose species and varieties that mature with the legume crop. European breeders have made dramatic improvements in perennial grasses and the differences among products can be quite pronounced.

## How To Start Incorporating Alternative Forages Into Your Rotation

Below are a few examples of where to start adding forage diversity to your farm depending on your starting point. We suggest just making one change per year and start with limited acreage until confidence in growing, harvesting, storing and feeding is gained.

**Example Farm 1**. Corn silage and alfalfa on productive soils. Suggested addition: Add a double crop small grain such as rye or triticale. Typically this crop is planted after corn silage harvest but could also be no-tilled into thinning alfalfa stands. Corn planting is typically delayed by the winter annual small grain. The small grain also acts as a cover crop. The corn hybrid should be shortened in maturity by a week or so. Total yield and quality harvested from farm typically increases. When feeding, add all three crops to the dairy ration if properly made.

**Example Farm 2A**. Corn silage and small grains on droughty soils. Suggested addition: Replace part of the corn silage acreage with BMR forage sorghum. This will reduce drought risk and lower forage costs. When feeding, add all three crops to the dairy ration if properly made.

**Example Farm 2B**. Corn silage and small grains on productive soils. Suggested addition: Add an alfalfa grass mix to the crop rotation. This will increase corn yields and lower protein costs. When feeding, add all three crops to the dairy ration if properly made.

**Example Farm 3**. Corn silage and grass clover hay on wetter soils with a cooler climate. Suggested addition: Break continuous corn acres with a spring seeding of Italian Ryegrass. This crop will stay vegetative and very productive. If weather does not get hot and dry, Italian Ryegrass will make a cutting every 30 days or so. The fiber digestibility and protein levels will be excellent. Requires crop fertility but will reap dramatic rewards. The following corn crop typically will increase productivity due to improved soil organic matter and health from the ryegrass root system. When feeding, add all three crops to the dairy ration if properly made.

# INNOVATIVE ANNUAL FORAGE MIXTURES

*By Rod Porter, Northern Region*

Livestock operations are increasingly challenged with producing large quantities of high quality forage to economically fulfill dry-matter requirements of their animals while maintaining productivity and minimizing the need for purchased feed stuffs. Producers consequently are becoming more interested in non-traditional annual forages to fill their needs. Annual forages can provide rapid growth, high yields, high quality and flexibility in managing manure applications and forage supplies. Either cool season annuals like cereal grains, annual ryegrass and brassicas or warm season annuals like sorghums, millets and cow peas are able to thrive in their respective seasons with normal or predicted weather. The problem with recent climate patterns is that seasons are rarely "average" or "normal" and weather is less predictable.

In conjunction with forage experts across the US, we have introduced an innovative alternative forage cocktail mix to the Northeast, called YieldMax which has the ability to combat variable weather conditions. YieldMax utilizes both warm and cool season species. The pairing of warm and cool season annuals lowers the risk that could come with a cool/wet or a hot/dry summer. The mix gives multiple cuts through the season with the components expressing themselves alternately as the season progresses and/or weather conditions change. In most cases sorghum-sudan will dominant in the first two summer cuts while the ryegrass and legumes express themselves as moisture increases and temperatures cool, typically dominating in a third fall cut. And there's another benefit: The ryegrass, vetch and clover grow later into the fall and are able to act as a cover crop for the winter and a potential bonus spring cut. This alternative forage cocktail mix also provides windows of opportunity for manure application outside of the traditional spring and fall time frames.

We believe the future of alternative forage cocktail mixes that can increase production and resiliency is bright and that is why we are continuing our pursuit of more combinations and varieties that meet your increasing challenges of quality forage production. Our research, trials and consultation with breeders and experts is on-going. Keep looking forward!

# FOOD PLOTS

*By Kody Umble, CCA*

Whether you are an avid hunter or an outdoor enthusiast looking to attract wildlife onto your property, wildlife food plots are a great way to accomplish your goal. Adding a food plot to your property not only attracts wildlife, but also supplies them with beneficial nutrition. The added nutrition from high quality forages can benefit wildlife in many ways including weight gain, winter survival, offspring survival, and antler growth. But what makes up a great food plot?

Location, fertility, and types of forages to be planted are some of the key things to consider when creating a food plot. When choosing a location for your food plot, it is important to take the surrounding terrain into consideration. For example, if you are planning on using heavy equipment, choosing a flat location with easy access is key. Another thing to keep in mind is the surrounding vegetation. Wildlife like to feel safe, so planting a plot near cover would be advised. Finally, when choosing a location, (unless you are looking to attract wildlife for the public to see), keeping your plot in a private location, out of public view is something to keep in mind.

When choosing what type of forage to plant, there is no right or wrong answer. However, there are a few things to consider, such as what the current surrounding food sources are and the growth habit desired. Adding diversity to the current food sources would be very beneficial. For example, if you are located in the heart of farmland, surrounded by acres of corn and soybeans, planting more corn and soybeans would not be the best option. Also, when choosing a forage, the growing season should be considered. Planting a winter annual in late summer will give you good growth early to late fall and possibly into the following spring. Planting a summer annual late spring will give you good growth through the summer and early fall with no winter growth. Perennials are also another option to consider. These are planted in either spring or late summer and if maintained properly, can last many years. Whether you decide to plant an annual or perennial, consider using diversity to increase the nutritional properties and reduce your risk portfolio.

And lastly, know that the fertility of your plot is key to getting top production from your forages. A soil test is the best way to learn the fertility needs. Consult your local agronomist on how to properly collect a soil sample and how to interpret the results. Food plots can be a lot of fun, and if done properly can have benefits that will last for years to come.

**COMMONLY RECOMMENDED FOOD PLOTS**

| PERENNIAL | ANNUAL |
|---|---|
| King's Grazing Mix | Ray's Crazy Mix |
| Browsmaster Mix | Large Box Booster Mix |
| Forbfeast Chicory | Summer Feast Mix |
| Premium Clover Mix | Pea-Oat Mix |
| Alfalfa | Derry & Titan Forage Soybeans |
| Alfalfa/Grass Mixtures | Buckwheat |
| | Corn |
| | Small Grains |

# 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.

Sugar-laden root exudates coming from a corn plant.

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.

# 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.

**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 Encyclopeda > 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

## 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.

# WHY WE COAT SEED


King's AgriSeeds uses a variety of seed coatings, both Conventional (CT) and OMRI-approved (OC), to improve seedling establishment and growth. They help the seed get a head start using water absorbing coating materials, nutrients, and biological inoculants in various combinations. Conventionally treated seeds may also include a fungicide and/or insecticide.

Coating does reduce the total number of seeds per pound, but it is a cost-effective tool because it ultimately helps more seeds germinate and grow, and makes for a more uniform stand. In many cases, it also makes the individual seeds denser, improving rate of flow through the drill. Since coating technologies improve both seed germination and plant establishment, the seeding rates for most forages do not need to be increased. (See King's seeding rate recommendations.)

***The following are a few coatings commonly used in King's AgriSeeds products.***

### KingFisher Surestand Hydro Brand

For both conventional and OMRI-approved grasses and legumes, these coatings improve the seed germination, early growth, and lifelong stand.

The Super Hydrating polymer holds water around the seed and keeps the micronutrients in concentration around the growing root, giving maximum benefit for germination and early growth.

Larger seed size helps with more even seed distribution and improved seed to soil contact.

**KingFisher Surestand Hydro CT Contains -**

- Hydroloc, a water absorbent technology that helps the seed hold on to water and establish in the presence of less moisture. Can also help the seed hold onto fungicide applications.
- Myco Seed Treat - blend of plant-beneficial bacteria and fungi (including Mycorrhizae) accompanied by a nutrient package to support them during their initial stages of growth. These microorganisms contribute to increased soil nutrient cycling, as well as improved productivity, giving the new seedling a lifelong benefit.
- Quickstart Micronutrient package (0.03 oz/lb of coating) - 1% Iron, 10% Manganese, 40% Zinc
- Apron XL Fungicide (mefenoxam) - For protection against systemic downy mildews and diseases caused by soilborne Pythium and Phytophthera pp.
- Nitrogen-fixing Rhizobium bacteria (legumes only)
- Not approved for organic use.

**KingFisher Surestand Hydro Green OC (OMRI-Approved) Contains -**

- Hydroloc hydration component to help the seed hold onto moisture.
- Myco Seed Treat - blend of plant-beneficial bacteria and fungi.
- Nitrogen-fixing Rhizobium bacteria (legumes only).

**Yellow-Jacket (Barenbrug brand legumes and grasses)**

A spongy, water-absorbing layer around the seed that also increases seeds' density and weight, helping with flow through a drill and establishment through growing crop canopy or crop residue when interseeded. *Note: Not approved for organic use.*

# WHY WE COAT SEED

University trials show that superabsorbants can absorb and hold fungicides and protect seedlings up to three weeks after seeding. Fungicide on uncoated seed washes off, quickly limiting its benefit.

The Yellow Jacket formulation also contains Apron XL® (metalaxyl). A new technology turf fungicide that specifically helps prevent Pythium infestation in newly seeded areas, Apron XL preserves root development and significantly increases the survival rate of seedling turf during higher temperatures.

Research trials at the University of New Mexico also show that Yellow Jacket enhanced seed establishes faster and requires less water. Yellow Jacket simultaneously helps the seed thrive while conserving water.

**Nitro-NP™ for Grasses:**

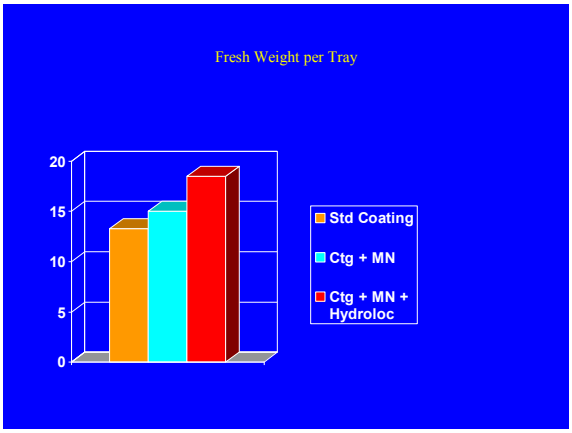
- Water absorbing coating increases seedling germination.
- Phosphorus quickens root hair development. Healthier roots mean more vigorous and competitive plant growth.
- Slow-release nitrogen feeds new shoots and leaves.
- Not approved for organic use.

**Nitro-Coat® for Legumes (OMRI-approved)**
Rhizobium inoculant for legumes, physical seed protection, moisture absorption aid, and fungicide retention.

A key to any successful establishment and early seed development is moisture. Nitro-Coat® is both naturally hydrophobic and hydroscopic. The protective coating prevents seeds from suddenly germinating during a brief single moisture event, while at the same time naturally absorbing water during sufficient moisture events and helps attract soil moisture to the seed for better stand establishment.

With Nitro-Coat® each seed is also inoculated with the correct Rhizobium strains and coated through a proven process that ensures a very high level of successful inoculation for each plant.

Fungicide Retention: Fungicides have been proven protections against diseases like root-rot and pythium. When requested and applied, Nitro-Coat® is designed to keep these valuable protectors near the seed through early seedling development.




Std Coating = Summit Seeds Apex Coating for Legumes;
MN = Micronutrient Package
Hydroloc = Hydration Component

**Test Proven: More Plants Per Bag**
**Coated vs. Uncoated Seed**

| SEED | 3 WEEKS AFTER PLANTING | | | FALL | |
|---|---|---|---|---|---|
| | SEEDLING RATE LBS/ACRE | PLANTS/ SQ.FT. | % SEED TO PLANTS | PLANTS/ SQ.FT. | % SEED TO PLANTS |
| Uncoated | 15 | 29.9 | 40.4 | 24.2 | 32.7 |
| Coated | 15 | 40.2 | 85.5 | 29.3 | 62.3 |
| Uncoated | 20 | 39.3 | 40.1 | 29.4 | 30.0 |
| Coated | 20 | 45.2 | 71.7 | 29.8 | 47.3 |

Source: Cornell University

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**Eastern Region**
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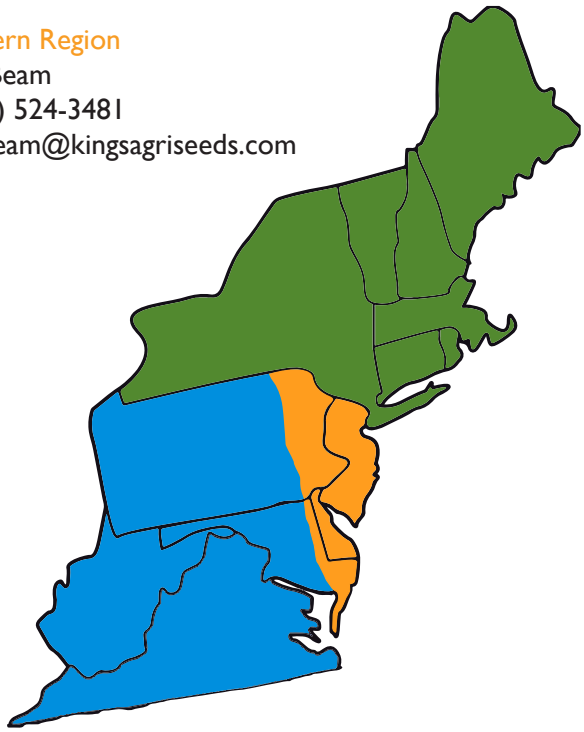

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