King's AgriSeeds Inc.

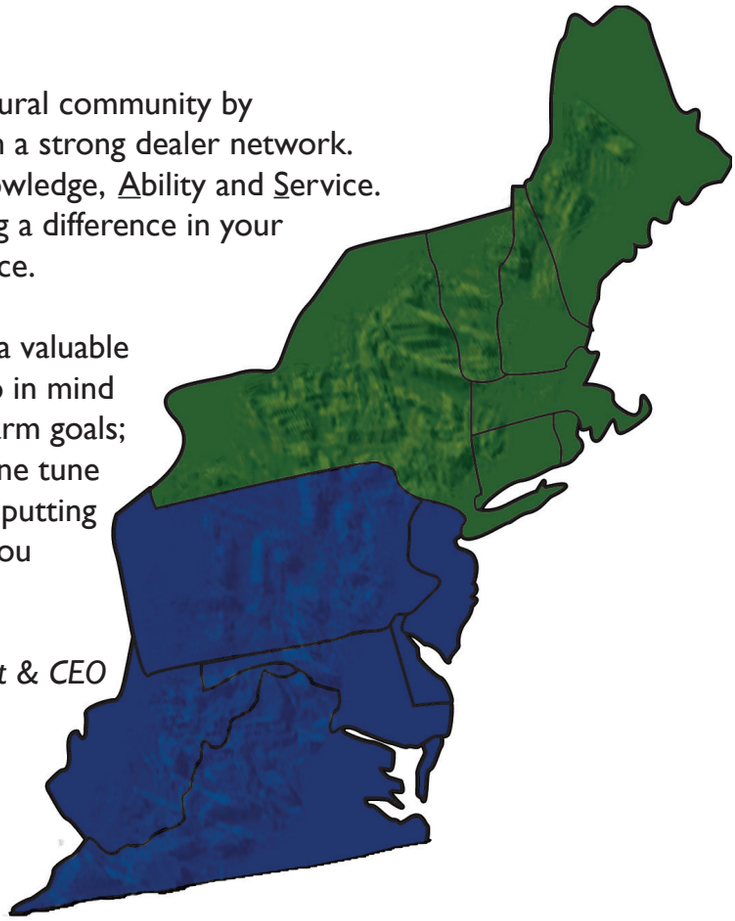
HIGH ENERGY FORAGES AND SOIL BUILDING COVER CROPS

THANKS FOR CHOOSING KING'S AGRISEEDS

At King's AgriSeeds our mission is to serve the agricultural community by providing premium forage and cover crop seed through a strong dealer network. We train our dealer network with an emphasis on Knowledge, Ability and Service. Our goal is to be set apart from competitors by making a difference in your operation with great products and management guidance.

We hope this 2017 Product Information Guide will be a valuable resource for you and your farm operation. Please keep in mind that not all the products will be appropriate for your farm goals; we trust that you will work with your local dealer to fine tune your forage or cover crop program. We thank you for putting your trust in King's AgriSeeds and allowing us to help you meet your goals of improving the stewardship of your farming operation.

~ Tim Fritz, *President & CEO*



OUR MISSION

To serve the agricultural community by providing premium forage and cover crop seed along with relevant information for our seed dealers and their customers to develop productive cropping systems. We also strive for a God honoring workplace in that the gifts and talents of team members are used for His Kingdom.

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PRODUCTS

MANAGEMENT

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KING'S DEALERS

Look for management boxes throughout the Product Information Guide

King's AgriSeeds Inc.
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Ronks, PA 17572
(717) 687-6224
KingsAgriSeeds.com

2017 NEW PRODUCTS

BALADY 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 100-200lbs 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. Page 27.

GAINER 154 TRITICALE

A new high-yielding variety. It 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. Page 26.

HAY PRO PERENNIAL MIX

An alternative to King's Haymaster that includes soft-leaf tall fescue in place of Hakari Alaska Brome. 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 quality. The hay from this mixture dries very easily. Page 6.

HUSAR ORCHARDGRASS

Husar is an intermediate to late maturity orchardgrass, similar to Niva. It is very persistent, winter hardy and a top yielder in forage trials. Productivity is strong from the outset. Rust resistance is moderate. Husar's medium to late heading coincides well with alfalfa maturity. Page 20.
Only available in organic.

ILLINI SOYBEANS

Top performing conventional soybeans for the Northeast and Mid Atlantic. Page 39.

JAPANESE MILLET

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. Page 32.
Only available in organic.

KINGFISHER CORN

New for 2017, the KingFisher corn program, a non-GMO brand brought to you by King's AgriSeeds and Byron Seeds, promises to bring you the same quality, performance, and value that you already are familiar with from the KingFisher Alfalfa program. These hybrids have been selected with an emphasis on high energy and digestibility without sacrificing yield. You will find KingFisher pricing very competitive. We encourage you to try two or three hybrids to complement your current non-GMO corn program. Page 36.

KINGFISHER 406AP2 ALFALFA

This new 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. Page 13.
Fall Dormancy 4.0
Winter hardiness 2.0
Disease rating 35/35

KINGFISHER 425HD ALFALFA

This new multi-foliate alfalfa has high yield and exceptional quality including fiber digestibility. KF 425 HD delivers high NDFD and TTNDFD values and has comparable lignin ratings to the non-GMO low lignin alfalfas. Page 13.
Fall Dormancy 4.5
Winter hardiness 2.0
Disease rating 30/30

KLONDIKE WHITE CLOVER

Klondike is medium to large leaved with an erect growth habit. This allows Klondike to compete well with taller growing grasses in mixtures. White clover is often a bit slow in spring growth, but Klondike has proven to be faster than most other varieties. This is also one of the big advantages in keeping up competition with early starting grasses. Page 16.
Only available in organic.

2017 NEW PRODUCTS

LIPALMA TALL FESCUE

Lipalma is second to none in sward density and rust resistance. This tall fescue variety shows good yield distribution over multiple cuts and is suited for heavy use and dry areas. Page 21.

Only available in organic.

NIAGARA OATS

Niagara is a medium maturity Canadian forage oat, very similar to Foragemaker 50 with improved rust resistance. At boot stage, Niagara is high in crude protein and in percent digestible fiber. Page 25.

NUTRAMAX HAY MIX CT

An alfalfa, clover and highly digestible grass mix that is primarily adapted to central PA and north. Best use is haylage and baleage as it will dry a little slow for dry hay. Both protein and energy levels are superb. Page 7.

OLATHE ORCHARDGRASS

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. Page 20.

REMINGTON NEA2 PERENNIAL RYEGRASS

The most durable perennial ryegrass in the lineup, Remington is complete with the NEA2 endophyte for improved longevity and stress tolerance. Page 21.

SONIC SPELT

Sonic is primarily a forage variety but is not limited to forage production. It is similar to Oberkulmer. Sonic is expected to equal or out yield Oberkulmer in forage production due to its equal height, more vigorous growth habit and much improved disease resistance and yield. During development and testing trials, Sonic averaged 10% higher grain yield than Oberkulmer. Page 26.

SUMMER SOLAR MIX

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. Page 45.

TRICAL 2700 TRITICALE

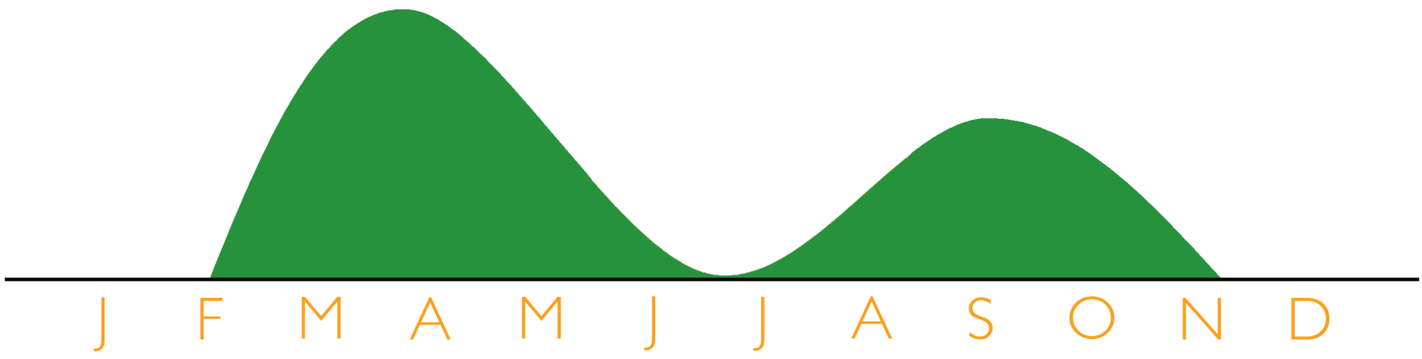
2700 is a facultative triticale. It is widely adapted and can be planted in spring or fall. It works well as a straight product or blended with a legume such as spring peas. Page 26.

Only available in organic.

COOL SEASON PERENNIALS

"I am always amazed by the number of people who buy the cheapest alfalfa or grass seed they can get. That is a little like saying that you want the cheapest cow and don't care whether it's an Angus or Holstein. The difference among alfalfa varieties or grass varieties of any species is greater than the difference between an Angus and Holstein cow."

Dr. Dan Undersander
Forage Extension Specialist
University of Wisonsin Madison



ADAPTED TO GOOD-TO-DRIER SOILS

ALFAMATE

An all grass mix that can be used either alone or with legumes such as alfalfa. This mix makes a very soft, palatable hay.

Best Uses: Dry Hay, Fermented Forages
Seeding Rate: 25 to 35 lbs/acre without legumes
5 to 10 lbs/acre with legumes
Product Formula: 48% Late heading Orchardgrass
42% Hakari Alaska Brome
10% European / Premium Timothy

HAYMASTER

A well balanced mixture of leafy, late heading grasses and 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. Easy drying mixture.

Best Uses: Dry Hay, Fermented Forages, Managed Grazing
Seeding Rate: 20 to 30 lbs/acre
Product Formula: 35% Kingfisher Alfalfas
(Secure BR, Traffic Pro)
35% Late Heading Orchardgrass
20% Hakari Alaska Brome
10% European / Premuim Timothy

HIGHLAND HAY

An excellent Mid-Atlantic alfalfa-grass mix that will also perform well in the northern climates. Will make a very nice mixed auction hay that will feed very well.

Best Uses: Dry Hay, Fermented Forages
Seeding Rate: 25 lbs/acre
Product Formula: 60% Kingfisher Alfalfas
(525, Enhancer, Traffic Pro)
25% STF and Kora Tall Fescues
15% Late Heading Orchardgrass

NEW KING'S HAY PRO

An alternative to King's Haymaster that includes soft-leaf tall fescue in place of Hakari Alaska Brome. 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
(a combination of at least 2)
25% Soft Leaf Tall Fescue
10% High Yielding Timothy

NEW NUTRAMAX HAY MIX CT

This mix was balanced by a seasoned nutritionist for super high quality! An alfalfa, clover and highly digestible grass mix that is primarily adapted to central PA and north. Best use is haylage and baleage as it will dry a little slow for dry hay. Both protein and energy levels are superb.

Best Uses: Fermented Forages
Seeding Rate: 20 to 30 lbs/acre
Product Formula: 65% KF Alfalfa
8% Liherold Meadow Fescue
8% Perseus Festulolium
7% Fojtan Festulolium
6% Alice White Clover
6% Freedom Red Clover

MIXTURES

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 Orchardgrasses
22% Montana Meadow Brome
18% Tetraploid Perennial Ryegrass
5% Freedom! MR Red Clover
5% Regalgraze Ladino Clover

NORTH STAR

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. This should improve the mix in the north as grasses can become too competitive. Meadow Fescue is both higher quality than Fojtan and less competitive.

Best Uses: Fermented Forages, Dry Hay
Seeding Rate: 18 to 25 lbs/acre
Product Formula: 85% Kingfisher Alfalfas
8% Meadow Fescue
7% Soft Leaf Tall Fescue

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

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
(Secure BR, Enhancer, Traffic Pro)
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.

Also available in organic.

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

CREEKSIDE

A very palatable mixture of varieties and species designed for wetter soils and colder climates. Will form a nice sod to handle hoof traffic. Its quality will also hold well if conditions are too wet to graze or harvest. This mix is based on meadow fescue, which is both high quality and highly palatable. Meadow fescue does not contain detrimental endophytes. Now with Birdsfoot Trefoil added to the mix to improve protein efficiency in livestock. The high tannins in birdsfoot trefoil has a protein efficiency improvement impact to livestock.

Best Uses: Managed Grazing, Fermented Forages
Seeding Rate: 25 lbs/acre
Product Formula: 33% Diploid Perennial Ryegrass
32% Meadow Fescue
10% Wellington Birdsfood Trefoil
10% Balin KY Bluegrass
8% Barfleo Timothy
7% Alice 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.

USDA ORGANIC

Best Uses: Grazing, Fermented Forages
Seeding Rate: 25 to 35 lbs/acre
Product Formula: 42% Meadow Fescue
31% Perennial Ryegrass
13% Premium Timothy
8% Red Clover
6% White Clover

ADAPTED TO VARIABLE SOILS

BEEFMASTER

A premium pasture mix that consists of Barenbrug'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.

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.
Note: Too high of a seeding rate will lower the chances of fescue establishment.
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

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. Will work very well on most soils, including fields with lots of variability. Compatible with nurse crops.

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

GRAZEALL

An all grass long lived mixture designed for grazing of multiple livestock species. If legumes are desired choose one from our selection that meets your needs.

Best Uses: Grazing
Seeding Rate: 25 lbs/acre
Product Formula: 30% Ryegrass
30% HDR Meadow Fescue
25% Orchardgrass
15% Balin Kentucky Bluegrass

HORSE SUPREME

If you want a mixture that is productive and palatable enough for dairy cows, but need lots of flexibility in your grazing management, then try Horse Supreme. All varieties in this mix tolerate shorter grazing heights. 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% Montana Meadow Brome
20% Diploid Perennial Ryegrasses
15% Balin Kentucky Bluegrass
6% European / Premium Timothy
2% Dutch White Clover

KING'S GRAZING

A highly palatable mixture of late heading winter hardy perennial ryegrasses, orchardgrasses, 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.

Best Uses: Managed Grazing, Fermented Forages
Seeding Rate: 25 to 35 lbs/acre
Product Formula: 34% Grazing Tolerant Orchardgrass
33% Perennial Ryegrass
19% Meadow Fescue
7% Freedom MR! Red Clover
5% Alice 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! MR Red Clover

MILKWAY

NutriFiber

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: 60% Meadow Fescue
40% 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.

USDA ORGANIC

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

SOUTHERN BEEFMASTER

Our best grazing mixture for south of the Mason-Dixon line. This new mixture is designed specifically for the south and features 45% Baroptima Plus E34, Barenbrug's very palatable tall fescue with a beneficial endophyte that gives it more tolerance to heat and other stresses.

Best Uses: Grazing, Fermented Forages (hotter, drier climates)
Seeding Rate: 30 to 35 lbs/acre
Product Formula: 45% BarOptima Plus E34
30% HLR Orchardgrass
15% Remington NEA2 Ryegrass
5% Barblanca Clover
5% Freedom Clover

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% Fojtan Festulolium
17% Orchardgrass
13% HLR

3RD PLACE in Grass Hay at World Dairy Expo

Forage Heading Dates; Southeastern PA These should be adjusted for your location and are meant to be taken as relative to one another.	
Rye	4-24
Kentucky Bluegrass	4-29
Persist Orchardgrass	4-30
Triticale 815	5-6
Marshall Annual Ryegrass	5-7
Malabar Wheat	5-7
Crimson Clover	5-8
Green Spirit Italian Ryegrass	5-8
Niva Orchardgrass	5-10
Athos Orchardgrass	5-15
Alfalfa Bud Stage	5-16
Hakari Alaska Brome	5-17
Perseus Festulolium	5-17
Kora Tall Fescue	5-20
Oberkulmer Spelt	5-20
BG 34 Ryegrass	5-22
Tivoli Ryegrass	6-1
Barpenta Timothy	6-1
Everleaf Forage Oat	2 weeks later than most

MAKE YOUR OWN MIX

While we stock many mixtures, we do realize there are times when our mixtures may not fit your specific needs. In these instances we invite you create your own custom mix. Our state of the art mixing facilities enable us to mix efficiently and ensure the quality and consistency you need. Each mixture will be tagged correctly according the exact ingredients and labeled as you specify. To be reassured that the mixture percentages are balanced correctly, work with your local dealer to develop your mixture. Dealers and King's staff are well equipped to help you find the right balance with the inputs of your choosing.

PERENNIAL MIXTURES

Whether for grazing, dry hay or fermented forages, chose from our selection of perennials to create the long lived mixture just for you.

COVER CROP MIXTURES

Our commitment to soil health and cover crops is apparent in our extensive lineup of cover crop products. Select the species and varieties that suit your needs and your soil health plan.

ANNUAL MIXTURES

Whether for summer or winter, choose the mixture of species and varieties that provide high yielding, high quality forage for your livestock.

LEGUMES - ALFALFA

PREMIUM SEEDS 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.***

KINGFISHER 101 CT/OC

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

NEW KINGFISHER 406AP2 ALFALFA CT/OC

This new 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

NEW KINGFISHER 425HD ALFALFA CT/OC

This new 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.

- Fall Dormancy 4.5
- Winter hardiness 2.0
- Disease rating 30/30

KINGFISHER 525 CT

A high yielding, robust, multifoliate alfalfa with excellent quality. Well adapted for a wide geography. Penn State Alfalfa Trials showed 525 was statistically equal to the highest yielder.

- 5 Fall Dormancy
- 2 Winter Hardiness
- 34/35 Disease Rating

KINGFISHER ENHANCER II CT/OC

A top yielder with excellent feed quality. This variety is eyecatching and is statistically equal to the highest yielder in the Penn State Alfalfa Trials.

- 4 Fall Dormancy
- 1.6 Winter Hardiness
- 30/30 Disease Rating

KINGFISHER PLH 322 CT/OC

A newer leaf hopper resistant variety that has exceptional quality. It maintains high forage quality in a delayed harvest regime, and it's highly resistant to six major diseases.

- 3.0 Fall Dormancy
- 2.2 Winter Hardiness
- 30/30 Disease Rating

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.

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

1st in 2015 and 2016 Penn State Alfalfa Trials. 1st in 2016 Cornell Alfalfa Trials!

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.

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

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.

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

Alfalfa Nematode Ratings			
Variety	**SN**	**NRKN**	**SRKN**
Secure-BR	R	HR	HR
Profusion 2-HX	HR	HR	R
Enhancer II	R	HR	NA
Traffic Pro	HR	HR	R
PLH 322	HR	NA	NA
KF525	NR	HR	NA

R=Resistant (31-50%)
HR= High Resistant (>50%)
NA=Information Not Available
SN=Stem Nematode
NRKN=Northern Root-knot Nematode
SRKN=Southern Root-knot Nematode

Due to circumstances beyond our control, we will not be offering certified organic alfalfas for 2017. However, we do have many strong varieties that are coated with an OMRI approved coating (OC).

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

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 outcompeted 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.

LEGUMES - RED, WHITE CLOVER

WHITE CLOVER is the backbone legume of grazing systems and can be mixed with other species in wet hay systems. It spreads by rhizomes, stems that run beneath the soil surface. The quality of white clover is very high. It will not lignify in hot weather like alfalfa, red clover and grasses.
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.

NEW

KLONDIKE

Klondike is medium to large leaved with an erect growth habit. This helps Klondike compete well with taller growing grasses in mixtures. Klondike is a medium to large leaf white clover with an erect growth habit. White clover is often a bit slow in spring growth, but Klondike has proven to be faster than most other varieties. This is also one of the big advantages in keeping up competition with early starting grasses.
Only available in organic.

LIFLEX

A very winter hardy white clover with good sward density and plant health. Liflex is rated medium in both leaf size and height. For 2017 it will be included in many of King's grazing mixtures. ***Only available in organic.***

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.

RIVENDEL

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

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.

COMMON MEDIUM

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

YELLOWJACKET ENHANCED SEED COATING

MAMMOTH

A taller, quick growing clover with a deep tap root. It grows aggressively and is good for boosting nitrogen in pastures. Two year clover. Great for cover crop use.
Only available in organic.

LEGUMES - CLOVER, MISC.

MILVUS

A strong European Red Clover bred for persistence. Second year productivity is remarkably high. Milvus belongs to the "Mattenklee" family which can be described as "mat clovers" that produce stolons (runners). Milvus has the ability to fill in gaps, a major advantage compared to other varieties.
Also 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.
Only available in organic.

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 clover stand.
Seed 4 to 6 lbs/acre.

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.
Also 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.
For more technical details visit:
www.uwex.edu/ces/forage/wfc/proceedings2000/smith.htm.

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 dryland pastures. It's very high in mineral content and digestibility, low in lignin, and high in protein.

FORAGE FEAST CHICORY

Forage Feast Chicory is included in King's Grazing Mix and also works well with red clover and alfalfa for mid summer grazing. Forage Feast is low bolting.
Seed 2 to 5 lbs/acre.

GRASSES - BROME, FESTULOLIUM

BROMEGRASS is primarily used as forage and in some areas as erosion control. Some brome grasses can be used alone or in mixes with other grasses and legumes. We carry four different types of brome and they are all quite different from each other in their use and areas of adaptation. Brome grasses have larger seed size than other grasses, so attention to drill calibration is important.

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 smooth brome once in the spring, and with favorable summer weather, a fall harvest is possible.
Seed 30 to 40 lbs/acre.

HAKARI ALASKA

A very fast starting brome that is short lived. It works well as a cool season grass mixed with other grasses and legumes like alfalfa. Hakari complements alfalfa because of its late heading; later than orchardgrass. It has excellent quality and holds its quality better than orchardgrass. It will not dominate stands when used in mixes.
Seed 35 to 45 lbs/acre.

MATUA PRAIRIE

A short lived perennial that works well in southern grazing systems. Allowing Matua to re-seed itself will help stand longevity. It is highly palatable and holds its palatability through maturity. Usually sold treated with a fungicide.
Seed 25 to 35 lbs/acre.

MONTANA MEADOW

An early heading pasture grass with a slower establishment. But once established it is drought tolerant, persistent and has excellent quality. It does best as a component of mixes with other grasses and legumes. It is also very winter hardy and will persist well in northern climates.
Seed 25 to 35 lbs/acre.

FESTULOLIUMS are crosses between ryegrass and fescue. The variety differences can range from short lived to perennial. They also range in their agronomic traits from ryegrass-like to tall fescue-like.
Seed 30 to 40 lbs/acre.

FOJTAN

A new 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.

PERUN

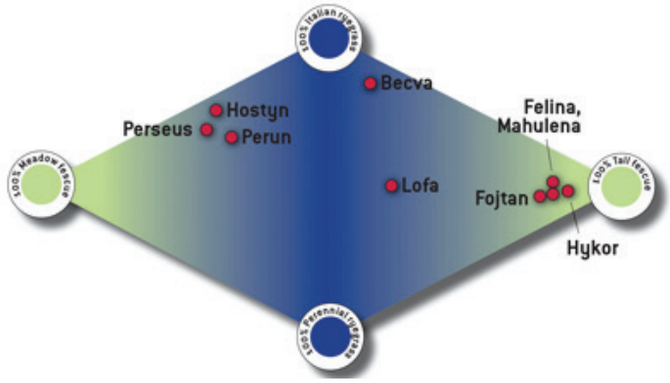
A 2 to 3 year high yielding hybrid with very high sugar.
Only available in organic. USDA ORGANIC

PERSEUS

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

FESTULOLIUM DIAMOND

The Festulolium Diamond is a visual aid to help you understand the distribution of these varieties. It shows the relationship between the genetic makeup and the morphological expression of the various festulolium varieties. More blue means more ryegrass genetics, thus more ryegrass characteristics. Within the blue section there is transgression from Lolium multiflorum to Lolium hybridum to Lolium perenne. Less blue means more genetic background from either fescue parent and associated morphological expression.



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 blugrasses 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 cooler climates.
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 is a fast starting, leafy meadow fescue with great regrowth for grazing or hay.
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. For 2017 Liherold will be included in many of King's grazing mixtures.

PREVAL

Preval is a medium maturity fescue that was developed from ecotypes from Switzerland and France. Preval combines good forage yield with improved resistance to diseases, and exhibits good winter hardiness and excellent summer production. Preval will produce long, wide leaves, making it an excellent choice for hay or pasture.
Only available in organic.

GRASSES - ORCHARDGRASS, RYEGRASS

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 3 to 4 inches. Our later heading orchardgrass varieties work great seeded with alfalfa.
Seed 20 to 25 lbs/acre.

ATHOS

Athos is one of the latest maturing varieties available on the market, with a heading date that is usually at least one week later than Pennlate. In addition to high yield, Athos is noted for having good fall growth, which translates to an even yield distribution over the entire growing season.

ECHELON

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

HLR BLEND

A mixture of Barenbrug leafy late maturing varieties. Stands for High Leaf Ratio.

NEW

HUSAR

Husar is an intermediate to late maturity orchardgrass, similar to Niva. It is very persistent, winter hardy and a top yielder in forage trials. Productivity is strong from the outset. Rust resistance is moderate. Husar's medium to late heading coincides well with alfalfa maturity.
Only available in organic.

NIVA

Niva is a late heading orchardgrass that seems to take lower fertility well and has few disease problems. We recommend Niva to be used in Pennsylvania and further north.
Only available in organic.

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.

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.

Managing Perennial Ryegrass

Some of the keys to ryegrass grazing management are as follows: Graze when tillers are at the 3-leaf stage. Ryegrass will only have 3 living leaves per tiller. As new leaves are formed, older leaves die off. By waiting too long, dead matter accumulates, which is low in quality and palatability. Allowing ryegrass to get too tall can actually thin the stand, since the tillers at the base of the plant are not getting enough sunlight. During droughts, take care not to abuse or overgraze paddocks when grazing. All perennial ryegrasses should be grazed down to 3 or 4 inches prior to overwintering.

Diploid Vs. Tetraploid

Diploids have two sets of chromosomes (one set from each parent just like some animals). Diploid ryegrasses have smaller features compared to tetraploids (4 sets of chromosomes). They have smaller cells, finer leaves, smaller seeds and a shorter, more tillering plant. Diploids in general persist longer under grazing than tetraploids. Tetraploids have four sets of chromosomes. They have larger cells which increases the proportion of cell contents, thereby increasing sugar, quality and palatability. They also have wide leaves and excellent seedling vigor.

GRASSES - RYEGRASS, TALL FESCUE

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.

KingFisher® 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

BG 34

A Barenbrug blend of late maturing European varieties of diploid ryegrasses. This blend produces a very dense sward; the yield is higher than it looks. Excellent winter hardiness is a key component in King's grazing mixes. As newer, better varieties are developed, Barenbrug incorporates them into the blend.

NEW 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.

NEW REMINGTON PLUS NEA2

The most durable perennial ryegrass in the lineup, Remington is complete with the NEA2 endophyte for improved longevity and stress tolerance.

TIVOLI

A late heading winter hardy European variety with high sugars. This variety has been in our test plots and looks super. It has early production even though it is late heading.
Also available in organic.

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 outwintering. 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 contain 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.

NEW LIPALMA

Lipalma is second to none in sward density and rust resistance. This tall variety shows good yield distribution over multiple cuts and is suited for heavy use and dry areas.
Only available in organic.

MARTIN II PROTEK

A new novel endophyte fescue, combining the proven genetics of Martin II with the innovative Protek endophyte. Best suited for the transition zone. 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.***

BARFLEO

Barfleo has a later maturity and is leafier and higher yielding than other varieties. It has a good ability to compete with other species in a pasture and high resistance to diseases.

BARPENTA

A very late-heading variety that is a high dry matter yielder. Barpenta is a very persistent variety with high yields under grazing or when frequently cut. Best in Northern PA and farther north.

CLAIR

An early maturing timothy that is more resistant to foliar diseases when grown in the South.

CLIMAX

The old standard variety.
Also available in organic.

DOLINA

A strong late-maturing timothy that has good regrowth potential and high yields.
Only available in organic.

LISCHKA

An early maturity European bred timothy that has better yield distribution throughout the year, given adequate rainfall. Heading date is earlier than Climax and Barfleo.
Only available in organic.

TURF TYPE 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 N SHADE MIX

A multi purpose lawn grass for both sunny and shady areas.
Seed 175 lbs/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.

WELLINGTON BIRDSFOOT TREFOIL

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

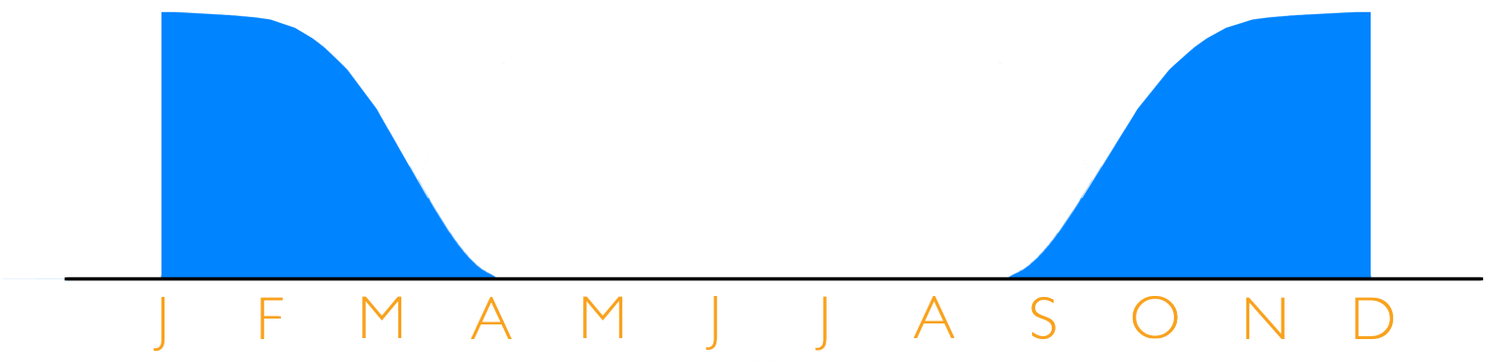
The Highly Digestible Fiber for Dairy Rations

NutriFiber was developed by Barenbrug for today's modern dairy farmer. Designated Nutrifiber forage grasses have been developed for on-farm nutritional performance. NutriFiber provides the highly digestible effective fiber today's cows need. NutriFiber forages are ideal components for balancing the rations of high producing dairy cows. Typically Total Mixed Ration diets that are designed for maximum milk production are high in Non Fiber Carbohydrates (starches and sugars) which can lead to Sub-Acute Rumen Acidosis. Look for NutriFiber products throughout our guide!

COOL SEASON ANNUALS

"I no tilled the Triticale Plus in sorghum-sudan stubble (no spray or tillage) the second week of last September. We got good rain around the first of October, and were able to graze once in November. It was lush and very high quality at that time. The area (15 acres) was then not touched until the middle of March, when we had good regrowth. I did put 50 lbs of nitrogen and 50 lbs of potash on around the end of February. We have been able to run the cows through three times, running around 50 cows per acre per day. I give them a 2 acre strip for two days. **I wish I had a 100 acres to put Triticale Plus on; I would need no hay or other winter feed.** Annuals have become an important component in extending nearly year round grazing for me. It also lets us keep our numbers up knowing we will have extra high quality grazing. The advantage is in quality of feed combined with cost as well as low labor, as compared to feeding hay or other stored feed. "

~ Chuck Benhoff, *Beef Producer, Farmville, VA*



SMALL GRAIN BASED 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.
Seed 110 to 130 lbs/acre.

DOUBLE PLAY

A mixture of oats, TriCal 815 and annual ryegrass. This mix is designed to be planted in late summer and harvested in the fall and spring. Oats and annual ryegrass will provide strong fall yields. Over winter, oats will freeze out, leaving room for the TriCal 815 and annual ryegrass to give 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

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 our popular Forage Maker 50 Oats (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 MIX

A diverse mixture of legumes, grasses and brassicas. The goal is to improve soil health by incorporating extreme diversity. This mix is often additionally used for high-protein summer grazing by grass-fed beef operations. ***This is available in both a summer and fall formulation.***
Seed 40 to 60 lbs/acre.

SOIL BUILDER PLUS

A mix of TriCal 815 Triticale, crimson clover, hairy vetch, ryegrass, and daikon radish. An excellent spring forage and/or cover crop. Clovers and vetch provide protein in a forage application, and triticale and ryegrass contribute effective fiber and bulk. Plant in late summer for a late fall grazing.
Seed 120 to 140 lbs/acre.

TRITICALE PLUS

A mixture of triticale and annual ryegrass. Designed for one or two spring cuts of haylage. This mixture will have excellent NDFd when harvested prior to boot stage. Even more tonnage than triticale by itself. Works great to thicken old alfalfa fields in the fall for one huge cutting the following spring. The triticale will add some bulk to the forage for easier silo unloading.
Seed 90 to 140 lbs/acre.

- Great forage for double cropping
- Utilizes lots of nutrients
- Great for baleage or grazing
- Higher sugars for better fermentation and VFA profile
- More energy than triticale
- Cut approximately May 5 in Lancaster Co., PA.

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 that has exhibited superior cold tolerance, equal to that of MO-1, and great early spring forage yield over other diploids. Kodiak showed very strong performance in the Penn State trials over the past few years.

MO1
This is a diploid annual ryegrass that was bred in Missouri and selected for improved winter hardiness and forage yield. Winter hardiness is a major consideration of annual ryegrasses.

SPRING BARLEY does not require exposure to winter temperatures and can be sown in spring.
Seed 150 to 200 lbs/acre.

A/C KINGS SPRING BARLEY
A 2 row spring barley that performs well in the north east. Excellent for quick forage and nurse crop.

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.

ALLEGRO BLEND
A tetraploid-diploid 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
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

STORM (Intermediate)
A 2-3 year intermediate that is similar to festulolium.
Only available in organic.

FORAGE 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
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. For forage use it is a bit on the short side, but will work well in late summer seedings.

BAY OATS
A tall, leafy forage oat. Mid maturity. Good grain yield also. ***Only available in organic.***

CDC HAYMAKER
An exciting new spring forage oat out of Canada. Haymaker showed big in our plots with wide leaves and great yield. With a leaf as wide as Everleaf and a good leaf to stem ratio, it has fantastic quality and overall yield. It is later maturing, but slightly earlier than Everleaf.

EVERLEAF 126
Our top pick for spring seedings of straight oats. 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 were the highest forage quality of all the small grains we have ever tested. The leaves may get to 1.25 inches wide.

FORAGE MAKER 50
A high yielding Canadian oat variety. This is a true forage variety that has wide leaves and produces high quality forage.

NEW
NIAGARA OATS
Niagara is a medium maturity Canadian forage oat, very similar to Foragemaker 50 with improved rust resistance. At boot stage, Niagara is high in crude protein and in percent digestible fiber.

PROLEAF 234
Proleaf 234 is very leafy with excellent forage quality. It is a medium maturity oat with very good disease resistance. Not a good choice for grain production. 2-3 days later than Reeves.

REEVES
A medium-early maturity, high yielding oat variety. This South Dakota bred oat is a medium tall oat. For forage it is best suited for late summer to early fall seeding as it gives fast fall forage growth.

GRASSES - WINTER GRAINS

Ask your local dealer about **WINTER BARLEY** varieties.

Ask your local dealer about **WINTER RYE** varieties.

SPELT is emerging as a solid option for high quality forage, as well as grain. In our trials, spelt averaged three tons DM with great digestibility and protein values.
Seed 125 lbs/acre.

COMET
A shorter variety with high grain yield and less lodging, due to its height. Ideal for feeding grain to livestock.

OBERKULMER
A true spelt containing no wheat germplasm. This variety is tall and robust which makes it a great variety for forage harvest prior to flag leaf emergence. Oberkulmer forage quality is very good and it can also be used for grain and straw. Very late heading date with a very wide harvest window.

NEW
SONIC
Sonic is primarily a forage variety but is not limited to forage production. It is similar to Oberkulmer. Sonic is expected to equal or out yield Oberkulmer in forage production due to its equal height, more vigorous growth habit and much improved disease resistance and yield. During development and testing trials, Sonic averaged 10% higher grain yield than Oberkulmer.

SUNGOLD
Sungold is a food grade spelt with excellent baking qualities. It is 2-3 days later maturing than Maverick, exhibiting better standability and winter survival. It is slightly taller than Maverick. Sungold is easily distinguishable from Oberkulmer, Champ, and Maverick as it has medium brown chaff.

Heading / Maturity of small grains in order from earliest to latest
Barley
Rye
Triticale
Wheat
Spelt

TRITICALE is a cross between wheat and rye. There are many differences among varieties in both their 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 two weeks after rye.
Seed 100 to 150 lbs/acre.

NEW
GAINER 154
A new high-yielding variety. It 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.

TRICAL® 815
This leafy winter triticale was bred for high forage yield and quality. 815 consistently has the superior NDF digestibility in our test plots! Its maturity date is similar to most winter wheats. Very wide harvest window allows you flexibility in attaining both forage quantity and quality. Harvest before head emergence. Can be no-tilled into thin alfalfa stands to increase first cut tonnage. Also a great grain and straw product.
Also available in organic.

BOLT
Bolt is the latest in forage triticale development utilizing unique double haploid breeding technology (non-GMO). This technology improves crop uniformity, meaning all plants mature at a similar time, enabling consistent yields and ease of harvest. In the fall, Bolt is more erect and faster growing than 815. In the spring, Bolt is ready to harvest about 3 days sooner than 815. At harvest time (stage 9, flagleaf) Bolt is about 2 to 3 inches taller than 815. This is a new variety and we recommend seeding it as a complement to 815 to spread harvest risk.

NEW
TRICAL 2700
2700 is a facultative triticale. It is widely adapted and can be planted in spring or fall. It works well as a straight product or blended with a legume such as spring peas.
Only available in organic.

Ask your local dealer about **WINTER WHEAT** varieties.

LEGUMES - CLOVER, PEAS, VETCH

With nitrogen prices going up in recent years, interest in winter 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.

Winter annual **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.

NEW

BALADY BERSEEM

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.
Seed 15 to 20 lbs/acre.

CRIMSON

A high quality winter 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.
Seed 15 to 25 lbs/acre.

FIXATION BALANSA

Fixation is a winter annual clover that is capable of high performance over a wide array of soils including both acidic and alkaline soils. It has a very wide leaf and can be used for forage or for an aggressive biomass and nitrogen producing cover crop.
Seed 3 to 8 lbs/acre.

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.

ARVIKA SPRING

A high yielding pea with lavender flowers. Very tall.
Only available in organic.

AUSTRIAN WINTER

Winter pea most suited for southern zones. Fairly low cold tolerance; may not overwinter well north of zone 6. Purple flowers.

Ask about in season **SPRING GRAIN PEA** varieties.
Also available in organic.

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

HAIRY

A winter annual that can provide both a cover crop and fix nitrogen for a late spring-planted summer annual Do not plant where small grains are to be used as a grain crop, as it can become a weed. Plant in mid fall.
Seed 25 to 30 lbs/acre.

WARM SEASON ANNUALS

"Cheap seed is rarely a bargain. Cheap seed is cheap because it's not worth much."

~ Dr. Don Ball

Professor Emeritus, Auburn University

The price difference in the best varieties on the market and the others is marginal compared to the potential benefit. In many cases it equates to only a few dollars per acre in additional cost, but could result in a few hundred dollars in added value.

MIXTURES

RAY'S CRAZY SUMMER MIX

This diverse mixture was created for dual purpose grazing and soil health improvement. It contains 7-10 various species including grasses, legumes and brassicas. There is also a cool season/winter version of this mix available. Seeding rate varies depending on use and goals.
Seed 40 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.

SUMMER SOLAR MIX

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 50 to 70 lbs/acre.

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.

AF7101
AF 7101 is an early season gene 6 BMR forage sorghum with good standibility and dry down. It is a little earlier than AF 7201 in maturity but with similar plant height. It has very sweet stalks and is a good choice for boot stage or soft dough harvests. Dry stalk characteristic. 82-85 days to soft dough stage.
Also available in organic.

AF7102
A short season brachytic dwarf with improved agronomics. 85-89 days to soft dough stage.

AF7201
A shorter season hybrid that has very good standability and drydown. Very sweet stalks. A good choice for seeding with corn. 85-89 days to soft dough stage.

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.

SILO PRO
A newer, brachytic dwarf, BMR 6 forage sorghum. It has great standability and solid agronomics as well as the nutritional advantages we typically see with a BMR 6. 105-110 days to soft dough.

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.

AG1203
63 day (mid bloom) hybrid with bronze grain and red plant color. Has very good aphid tolerance for high pressure areas.

AG1401
60 day (mid bloom) hybrid with white grain and tan plant color.

AG2103
65 day (mid bloom) hybrid with intense red grain and red plant color.

SUDANGRASS, SORGHUM SUDAN

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

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.

Prussic Acid Warning

Prussic acid toxicity is possible in sudangrass, forage sorghums and sorghum-sudan crosses. The concern for prussic acid is real, and it only takes a small amount for an animal to die within half an hour of consuming forage that contains high levels of prussic acid. Prussic acid can form when sorghums are frosted and the plant cells are ruptured by freezing. Prussic acid can also be a concern when the plants are young and short and immediately after rain that follows a droughty period.

As dangerous as frosted sorghums can be to animals, there is a simple rule to remember that can just about eliminate concerns of prussic acid toxicity….Wait 10 days after the last frost event. However, if you are ensiling sorghum products and you have a concern of prussic acid, it's best to wait 30 days before feeding in order for the acid to dissipate.

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.

AS5201 (QUICKCOVER)

High yielding, non BMR sorghum sudan. Great agronomics, disease tolerance and drought tolerance.

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.

AS6501

This is a wide leafed, photo period sensitive hybrid with delayed maturity. Forage quality will remain high even if the crop gets taller than recommended cutting height because it stays vegetative in response to day length. AS6501 has the best drought tolerance of our entire sorghum sudan line up and improved disease tolerance.

SWEET 6

A new, high yielding, dry stalk, BMR 6 sorghum sudan. Sweet 6 shows very strong in research plots and in the field from a yield standpoint. Great disease resistance.

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.

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.

EXCEED BMR PEARL

A new BMR (improved digestibility) dwarf millet that has excellent regrowth and overall yield. This product yielded well in our test plots and performed well across all regions.

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.
Only available organic. USDA ORGANIC

WONDERLEAF PEARL

Wonderleaf will grow a little bushier and not as tall as sudangrass. Wonderleaf is a leafy forage millet that is well proven in the east.

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 with the Yellow Jacket for improved germination and seedling vigor.

YELLOW JACKET® ENHANCED SEED COATING

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.

CORVALLIS

Corvallis is a medium maturing variety well suited to hay production or grazing in the hot summer months. It is a tried and true teff variety.

MOXIE

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

YELLOW JACKET® ENHANCED SEED COATING

PREMIUM SEEDS
KingFisher®

Kingfisher high energy summer annuals coming soon! Look for exciting new millets!

LEGUMES, BRASSICAS

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

BALADY BERSEEM

An annual clover that resembles alfalfa. Winter annual in South. 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 N/ acre as a stand alone crop. Works great in mixtures as well and can produce a very high protein forage for grazing or hay.

Seed 15 to 20 lbs/acre.

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, as it becomes woody while still in the vegetative stage. Only recommended for vegetative grazing as seeds and pods may contain toxic alkaloids.

Seed 20 to 40 lbs/acre.

Ray's Crazy Summer Mix

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.

APPIN TURNIP

A forage turnip that was bred for fast, vigorous establishment and quick maturity (60-100 days). It is firmly anchored in the ground for minimum waste. Appin has a significantly higher proportion of leaf yield compared to other turnips, and is multi-crowned for improved re-growth potential. The high leaf-to-bulb ratio results in a very leafy crop with high digestibility.

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.

DWARF ESSEX RAPE

A short, fine stemmed forage rape that is widely adapted with tolerance to cold, heat and drought. The highly palatable forage produces up to 20% protein and can be grazed 6-8 weeks after planting, typically. Overwinters in all regions.

PURPLE TOP TURNIP

An older turnip variety that is good for grazing and has a distinct purple bulb.

T-RAPTOR

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

For info on Grazing Brassicas, see page 74.

FEEDING TYPE HYBRID CORN

"We started using Masters Choice hybrids 3 years ago and now we are basically all Masters Choice. We also appreciate the quality and yields of the King's forage products. The products do not disappoint us. It makes farming a little more pleasant when you can deal and work with people who care about you. This year, our MC 5250 yielded over 20 tons in spite of the dry year."

~ The Hayes family, *Whitney Point, NY*

MASTERSCHOICE

The story of Masters Choice goes back over thirty years, starting with founder John Rucker and his passion for breeding the highest quality corn plants in the industry. A plant breeder, educated at the University of Missouri, John spent a lifetime devoted to building the MC hybrid lineup through a base of proprietary genetic material. Maintaining a regional sales network, John sought a next generation of ownership that could turn his dynamic hybrid lineup into national recognition and presence. In 2004 he sold the business to current Masters Choice owners, the Crabtree family: Lyn and Paula, and their two sons Andrew and Caleb.

Humbled by this opportunity, we have spent the last decade working hard and seeking the Lord's will for our business. Our sales network, spanning from coast to coast, is made up of a wonderful group of people we are proud to consider our friends. Our staff, which started out as just Lyn and Paula, has now grown to over 30 full time employees. They are truly an amazing group; we consider them our second family of sorts. As we move into the future, Masters Choice seeks to continue solidifying our place in the silage and digestible grain marketplaces. We are building a lineup of floury hybrids that we feel make a difference to livestock feeding operations.

Of all corn sold in the United States 40% ultimately turns into livestock feed. Our goal is to position ourselves on the cutting edge of research that improves feed efficiency for livestock operations. As such an important part of American agriculture, we believe that it is unfairly ignored by the major players in our industry. We believe livestock feeding operations deserve hybrids bred with the end use in mind. With that said, Masters Choice pledges to continue diligently researching all those things that we feel can have a positive impact on America's farm families and their futures.

Request a copy of the 2017 MC Hybrid Guide for more information.

FEED FIRST™
MASTERS CHOICE

NY Dairy runs on 5250...

"We started using Master's Choice hybrids 3 years ago and now we are basically all Master's Choice. We also appreciate the quality and yields of the King's forage products. The products do not disappoint us. It makes farming a little more pleasant when you can deal and work with people who care about you. This year, our 5250 yielded over 20 tons in spite of the dry year"

~ The Hayes family, Whitney Point, NY

PREMIUM SEEDS

KingFisher®

NEW line of conventional corn seed - only at King's AgriSeeds and Byron Seeds.

Request a copy of the 2017 KingFisher Hybrid Guide for more information.

THE KINGFISHER COMMITMENT

For more than two decades, our families at Byron Seeds and King's AgriSeeds have worked closely with farming systems that work with nature. We believe in keeping the land fertile and crops flourishing with strong crop rotation, cover crops and double cropping. Kingfisher® has always been and will always be, non-GMO.

THE KINGFISHER PARTNERSHIP

Byron Seeds and King's AgriSeeds, two of the major premium forage companies in the industry, are now combining efforts to share research, varieties, crop management strategies, and worldwide seed sourcing so that we can provide the best opportunities and benefits to the livestock farming industry. It seems only natural that the two industry leaders who share similar values and history should work together to expand and extend our shared vision and basic business model.

KingFisher® is poised to be the leader of premium livestock and cover crop seed in the industry. The KingFisher® brand is owned and managed by committed agriculturalists and suported by a web of over 400 dealers networking, sharing and learning from each other to raise the bar for livestock agriculture and cover cropping. Our ultimate goal is to improve the level of sustainability and productivity of our agricultural community.

KF CONVENTIONAL	
HYBRID	RELATIVE MATURITY
KF 35C10	85 days
KF 43C40	93 days
KF 49C60	99 days
KF 52C20	102 days
KF 53C60	103 days
KF 58C80	108 days
KF 61C40	111 days
KF 63C10	113 days

KF HIGH OIL	
HYBRID	RELATIVE MATURITY
KF 56H91	106 days
KF 58H82	108 days

THE KINGFISHER CORN PROGRAM

We are eager to share the exciting ideas and plans we have for our new KingFisher® Corn Program. Our corn hybrids are developed intentionally with non-GMO genetics. We'll have ten KingFisher® corn varieties available in limited supply in 2017 and we are testing many more for future releases. All are selected with an emphasis on high energy and digestibility without sacrificing yield. All are available exclusively through King's AgriSeeds and Byron Seeds dealers under the KingFisher® premium brand.

Congratulations to ALL WINNERS at the

WDE Forage Superbowl!

In the World Forage Analysis Superbowl Contest, forage producers enter their highest quality forages in seven different categories to compete for more than $25,000 in cash prizes. Forages are judged on appearance and sample quality.

PRODUCT: VERSA MIX

Angelrose Dairy (pictured below) placed third in Grand Champion Grass Hay with **Versa Mix**. Versa is a simple but high-quality mix that makes excellent hay. An all-grass mix with very good drought and heat tolerance, it features festulolium and maintains the durability of fescue.

PRODUCT: GREEN SPIRIT

Green Spirit Italian Ryegrass and Alfalfa (grass hay division) submitted by Tom Leubke of Mayer, MN won the **Overall Grand Champion.** This was over all categories including corn silage. **Barenbrug was represented in 5 of the top 10 finalists in the grass hay division.**

SOYBEANS

SOYBEANS

Our wide selection of high yielding soybeans offers top performing varieties for both the conventional and traited markets. Whether you're looking for high quality livestock feed or striving for high yields, we have a soybean variety that is right for you. The genetics offered are tried and true for the Northeast and Mid Atlantic market!

CONVENTIONAL

Seed 140-175K seeds/acre.

360 SB (Untreated)

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

ILLINI 2880NA (Untreated)

2.8 Maturity. Soybean aphid resistance.

ILLINI 3279NA (Untreated)

3.2 Maturity. Soybean aphid resistance.

ILLINI 3849N (Untreated)

3.8 Maturity

TECH/ROUNDUP READY

Seed 140-175K seeds/acre.

SP 31R22

3.1 Maturity. Roundup Ready

SP 36R24

3.6 Maturity. Roundup Ready

SP 39R22

3.9 Maturity. Roundup Ready

SEED INOCULATION

We stress the importance of inoculating legume seeds. This is especially true if the products are being planted on ground where inoculation has not occurred in the past. When you inoculate seeds you introduce a small amount of beneficial bacteria to the soil that forms nodules on the roots. This bacteria helps the plant fix atmospheric nitrogen, boosting plant health as well as nitrogen production. Some of our legumes are offered pre-inoculated while others are not. For more on seed inoculants, contact your King's dealer.

N-Dure Alfalfa/Clover- Treats 50# of clover or alfalfa seed per packet.

Prevail Alfalfa/Clover- Treats 100# of clover or alfalfa seed per packet.

N-Dure Pea/Vetch- Treats 100# of pea or vetch seed per packet.

N-Dure Peanut- For use on cow peas, sunn hemp and lespedeza. Treats 100# of seed per packet.

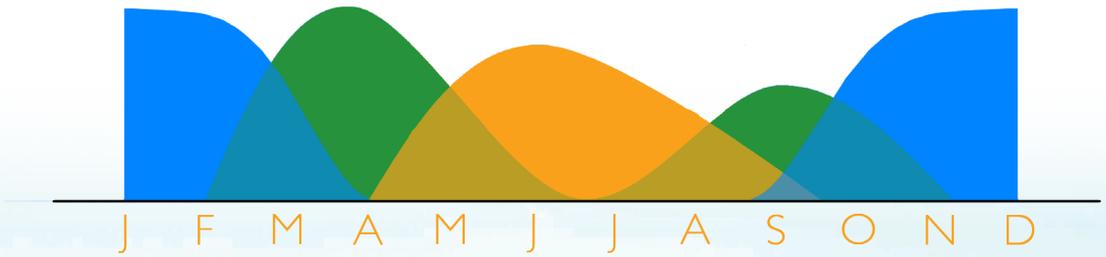
N-Dure Soybean- Treats 300# of soybeans per packet.

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**



Organic Dairy in Virginia

ORGANIC

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. Page 9
Sale Topper	15 to 20	An easy to dry orchardgrass, timothy mixture. Combine with your favorite alfalfa! Page 8
Organic Star	25 to 30	Grass/clover mixture for grazing and baleage. Page 8
Partner	20 to 30	An all grass hay mix to seed with alfalfa or alone. Page 11
Alfalfa		
See page 13 for our OC coated alfalfas		
Clovers		
Klondike White Clover	4 to 6	Medium to large leaved with an erect structure. Page 16
Premium Clover Mix	4 to 6	A balanced mixture of red and white clovers. Page 17
Liflex White Clover	4 to 8	A new, very winter hardy white clover with good density and health. Page 16
Renegade Red Clover	4 to 8	An improved red clover. Page 17
Rivendel White Clover	4 to 8	A small leaved white clover that is very persistent in pastures. Page 16
Common Medium Red Clover	4 to 8	A short lived, lower cost red clover. Page 16
Mammoth Red Clover	4 to 8	A single cut red clover that is best for cover cropping applications. Page 16
Milvus Red Clover	4 to 8	A new red clover that is long lived and has some spreading tendancies. Page 17
Yellow Blossom Sweet Clover	15 to 25	Deep tap root. Helps break up compacted soils. Better used as a cover crop than a forage. Page 46
Meadow Fescue		
Laura	35 to 45	High yielding and high quality. Does not get heady in summer. Page 19
Preval	35 to 45	Medium maturity with longer, wider leaves. Winter and summer productive. Page 19
Orchardgrass		
Husar	20 to 25	Intermediate to late maturity similar to Niva. Page 20
Niva	20 to 25	An attractive leafy late heading variety. Page 20
Ryegrass	***Highest energy grass. Great spring and fall production. Needs high fertility and moisture.***	
Storm Intermediate	30 to 40	An intermediate 2 to 3 year high yielding ryegrass similar to a festulolium. Page 25
Premium	30 to 50	A later diploid with superior winter and summer hardiness. Page 21
Allegro Blend Italian	40 to 50	A new European tetraploid-diploid blend. Page 25
TD Blend Perennial	40 to 50	A new European tetraploid-diploid blend. Excellent for overseeding. Page 21
Tivoli Perennial	40 to 50	High sugar, late maturing tetraploid with excellent productivity. Page 21
Tall Fescue	***Tolerates drought, heat, wet soil and traffic. Very long lived.***	
Kora	35 to 45	Extremely productive, hay type, very digestible. Page 21
Lipalma	35 to 45	Even yielding, traffic tolerant Tall Fescue. Page 21
Timothy		
Climax	10 to 15	The old standard variety for the Northeast USA mid maturity. Page 22
Dolina	10 to 15	A high yielding and persistent hay-type European variety. Page 22
Lischka	10 to 15	A new early maturity European type with better yield distribution. Page 22
Seasonal Annuals		
AF 7101 Forage Sorghum	80k/acre	Direct harvest - 82-85 days to soft dough. Cut & wilt - 25#/acre. 50-60 days to boot stage. Page 30
AS 9301 Sudangrass	25 to 30	Exciting newer sudangrass that dries down quickly with superb quality and yield. Page 31
Japanese Millet	10 to 20	A fast growing, finer stemmed millet for cover crop or forage. Page 4
TriCal 815	125 to 150	Very leafy, highly digestible variety. Page 26
TriCal 2700	125 to 150	High yielding, facultative variety. Page 6
Cereal Rye	168	High yielding forage and cover crop. Page 47
Bay Oats	100 to 125	A tall, leafy forage oat. Page 25

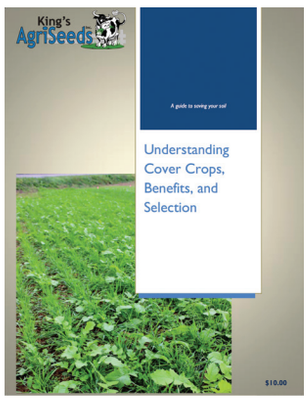
See Masters Choice Hybrid Guide for complete listing of Organic Hybrids

COVER CROPS

"I get a lot out of your guide, I wouldn't throw it away for anything"

~ King's Customer, *Spotsylvania, VA*

Ask about our cover crop manual.



COVER CROPS

Cover crops can improve soil health and water quality while meeting a variety of other needs on the farm. The plant material builds soil organic matter and provides a habitat for microorganisms which, in return, help to cycle nutrients. These functions mean greater resilience in the face of many risks, including droughts and flooding. If soil is covered year-round it is also less vulnerable to erosion and runoff. Anchoring and shielding the soil with cover crops is a simple step to preserve topsoil, the most important resource on any farm – renewable, but one that regenerates at a glacial pace if lost. By covering the soil and reducing runoff, cover crops can also improve the water quality in nearby waterways and for all those living and farming downstream.

SCAVENGE NUTRIENTS

Cover crops also utilize valuable plant nutrients that may otherwise leach from the soil. Cover crops preserve the nutrients in their tissues, making them available to subsequent crops as they decompose. Using the extensive root systems of a variety of nutrient-hungry cover crops is an excellent way to uptake and preserve valuable excess nitrogen and other macro- and micro-nutrients that have not been used by the main crop. Without a living crop to scavenge them, the costly fertility you have spent time and money to apply and build can leach through the soil over the late fall, winter and early spring.

PEST AND WEED SUPPRESSION

Many cover crops also secrete pest and weed suppressing chemical compounds known as root exudates, help break up compaction with thick or deep taproots, and add organic matter, which greatly improves soil aggregation, structure, and beneficial microbial activity. Whatever cover crop you choose, the added diversity in your rotation can be used to combat pest, disease, and weed pressure as a break crop.

HARVESTING COVER CROPS

Most cover crops can be grazed or harvested for forage. When harvesting or grazing cover crops, the same rules apply as for growing any forage. Manage for fertility and weed control. Treat your cover crop as you would treat your main crop. Make sure to harvest before bloom or heading, when quality is optimal. For small grains, this is frequently flag leaf or boot stage. Some crops have a far narrower harvest window than others, and should be watched carefully. It's best to plan ahead, but most cover crops can also be used as emergency forage in a dry year, or to extend pasture acreage if needed. If planted solely as a cover crop and not for forage or grazing, the crop can be established at a lower seeding rate, and either incorporated as a green manure or chemically killed. Alternatively if the cover crop is intended as a rolled down weed-suppressing mat or as a mowed mulch cover in the spring, then higher seeding rates are recommended to produce heavy amounts of biomass for this purpose. Small grains, brassicas, legumes, or grass can serve many benefits for the soil before providing high quality forage in the spring. When grown as a double crop, however, additional fertility and a higher seeding rate are usually needed. In addition, keep in mind that nitrogen credits are minimized greatly from legumes if they are harvested or grazed instead of being incorporated into the soil.

MAKING A DIVERSE MIX

How to balance species, and how many species do I need?

By: Dave Wilson, Research Agronomist

Multi-Species cover crop mixtures, also known as cover crop cocktails are continuing to gain a lot of attention among farmers.

At King's we've taken a proactive step in creating diverse cover crop mixes by putting mixes of crop species together to grow advantageously at different times of the year, depending on the season and your rotation. For diverse cover crop mixes, our typical recommendations are to include three to five different crop species in a mix that have different functional root and above ground physiological growing patterns. With this mix of root and above ground growth architecture we can penetrate and improve more of the soil growing zone, and above ground we capture more sunlight with a diverse leaf area index from the various types of plants.

For winter annual mixes we can look at winter annual small grain grasses including winter barley, winter wheat, winter triticale, winter spelt and winter cereal rye, as well as Italian and annual ryegrass. These grasses can be mixed with winter annual legumes such as crimson clover, hairy vetch or balansa clover. We can also mix in perennial legumes such as medium red clover and ladino white clover, as well as biennial clover such as yellow blossom sweet clover. On top of this, we can also mix in both annual and winter annual brassicas.

During the summer months we can look at various broadleaves like buckwheat and sunflower in combination with summer legumes cowpeas, sunn hemp and soybeans combined with summer annual grasses such as millet, sudangrass, sorghum-sudangrass or teff.

You can gain benefit from complex mixes of four, five or more species but also from simple mixes of two or three species put together in complementary combinations that maximize root zone growth and above ground biomass.

TERMINATING COVER CROPS

Do not apply either glyphosate or Gramoxone unless daytime temperatures exceed 55-60°F. The higher the temperature the better. Cold nights (<40°F) will reduce activity, particularly for glyphosate. Sunny weather is important for Gramoxone as sunlight causes greater plant activity. Be sure to include AMS at 8.5 to 17 lb/100 gallon or equivalent with glyphosate and add a good quality NIS at a 0.25% v/v to Gramoxone. Of course, if the glyphosate doesn't come fully loaded, add good quality NIS as well. Always add the AMS first as it also conditions hard water.

Nitrogen solutions (UAN) may be used as the carrier with either herbicide. UAN can increase Gramoxone activity and reduce Glyphosate activity (especially for perennials and difficult to control weeds). Adding AMS also reduces the antagonism. Tank mixing a triazine such as atrazine with Gramoxone increases the activity; tank mixing any other herbicide and especially a clay-based herbicide (DF, F, WP) reduces glyphosate activity. You can overcome the antagonism by increasing the glyphosate rate by 20 to 25%. Use flat fan tips with both (not floods) and apply Gramoxone at a minimum of 20 GPA. Tip selection is less important with glyphosate than Gramoxone. Spraying in late afternoon is not as effective as mid morning. Finally, spray weeds that are actively growing and the smaller, the better for annuals.

Bill Curran, Penn State University Extension

COCKTAILS

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 MIX

A red, ladino, and 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, the white and red clover 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.

BROADCASTER

A mixture of annual ryegrass, clover and daikon radish. 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.
Seed 25 to 30 lbs/acre.

CARGO

A mixture of crimson clover, annual ryegrass, and oats. 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.
Seed 60 lbs/acre.

RAY'S CRAZY MIX

A diverse mixture of legumes, grasses and brassicas. The goal is to improve soil health by incorporating extreme diversity. This mix is often additionally used for high-protein summer grazing by grass-fed beef operations. ***This is available in both a summer and fall formulation.***
Seed 40 to 60 lbs/acre.

SOIL BUILDER PLUS

A mix of TriCal 815 Triticale, crimson clover, hairy vetch, annual ryegrass, and daikon radish. An excellent spring forage and/or overwintering cover crop. Clovers and vetch provide protein in a forage application, and triticale and ryegrass contribute effective fiber and bulk. This mix is ideal for a spring grazing or cutting when the triticale reaches flag leaf or boot stage.
Seed 60 to 140 lbs/acre.

SPRING CHAMPION

A mixture of spring peas, oats and hairy vetch. Best seeded in late winter to early spring. Once soil warms up, this mix germinates and grows rapidly to produce quick spring nitrogen. The spring oats act as a nurse crop and then provide support for the peas and hairy vetch. This mix, once established, will crowd out weeds and fix nitrogen.
Can also be seeded in the late summer. Seed 125 lbs/acre.

SUMMER SOLAR MIX

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.

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, Milvus, Barduro. 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 cover.
Seed 4 to 20 lbs/acre.

WHITE CLOVERS
Alice White Clover, Liflex, RegalGraze Ladino Clover, Ladino White Clover "VNS", Dutch White.
Seed 2 to 4 lbs/acre.

OTHER
Alsike Clover (hybrid of red and white clovers), Yellow Blossom Sweetclover.

COOL SEASON ANNUALS

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.
Note: Can be spring planted. Broadcast or inter-row seeded during summer under corn or under vegetables. As a winter annual, plant no later than mid-September in Lancaster County.
Seed15 to 25 lbs/acre.

WINTER PEAS
High yielding winter annual legume that makes a great cover crop mixed with small grains.
Seed 60 to 100 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.

SUNN HEMP
Tall-growing summer annual legume, tolerates dryer 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. High lignin content; after 3 to 4 weeks of growth it gets too fibrous and lignified for forage use. Good in mixes to add varying heights to the cover, but keep seeding rate low.
Plant early to mid summer, seed 20 to 40 lbs/acre.

CLOVERS: A VERSATILE CROP OPTION

Clover makes a good long-term cover crop for both soil fertility and weed suppression, and doubles well for hay or grazing use. It has a place in almost any rotation where a longer-term cover is desired. Opportunities for seeding are year-round and it is often broadcast-interseeded or drilled as a relay cover crop into an existing crop. It is ideal for many no-till seeding scenarios and helps extend growing windows, since it is often overlapped with another crop.

- Clover can be frost-seeded on frozen ground from February through April, into a small grain stand that is small enough to have exposed ground.
- It can also be seeded with oats in March or April (small box of the drill).
- Planted at any point throughout the growing season (as a weed-suppressing living mulch between vegetable rows or as borders or buffer strips.
- Interseeded (using interrow seeder equipment) or aerial seeded into corn or soybeans before last cultivation (helps seed-to-soil contact).
- On organic farms the clovers can be spun on or broadcast at last cultivation to establish them as a relay-crop cover crop.
- Drilled into small grain stubble in late summer.

NON-LEGUMES

WARM SEASON

BUCKWHEAT
True "smother crop" since it grows a thick canopy quickly and outcompetes summer weeds. Good quick fill-in 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.***

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.***

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.***

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. It can be grown as a wildlife shelter and forage (bird seed) when left to stand into the fall/winter. ***Note: Plant early summer. Seed 40 lbs/acre.***

NON BMR SORGHUM SUDAN
Our 5201 is a low cost, fast-establishing, non-BMR sorghum-sudangrass. Higher-producing than most BMRs. 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.***

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. Can be seeded with crimson clover and with the winter annual small grains.
Seed 35 to 40 lbs/acre.

CEREAL RYE
A traditional staple cover/forage crop for rotations with corn grain and soybeans, as it is the hardiest cover crop. ***Seed 112 to 168 lbs/acre.***

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. They provide a quick soil cover to prevent erosion. 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.

TRITICALE
With it's aggressive tillering structure, triticale makes a great 'ground cover' crop that suppresses weeds and holds the soil. It's also a high biomass producer for adding organic matter. ***Seed 100 to 150 lbs/acre.***

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. Weed and nematode suppressor. 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.

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

Adjusted Crude Protein - The amount of protein available to the animal. It is an adjustment to crude protein by unavailable protein.

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.

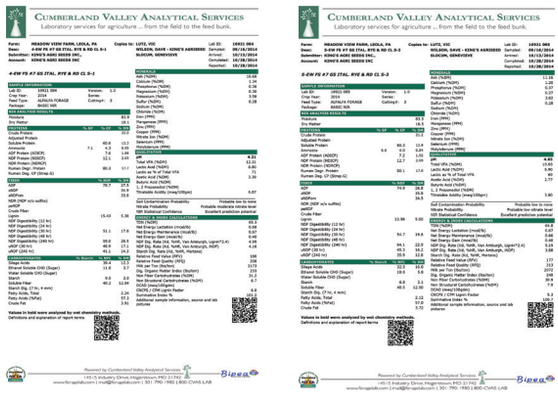
Net Energy of Gain (NEG) - An estimate of the energy of feed available for the deposition of body tissue in non-lactating animals (the term "non-lactating animals" refers to growing males and females, and mature bulls).

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.

NDFD-48 - is the same procedure as NDFD-30 with the exception that the feed is in the simulated rumen for a 48-hour duration. The range for NDFD-48 can be 50 to 60% The higher the better. Be careful not to compare the 30hr with 48hr because we will see higher NDFD in the 48-hour test.

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

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

HIGH FORAGE DAIRY RATIONS

The classic corn silage/alfalfa ration is just one way to make milk, but it has serious limitations when used to feed a high forage ration. Below are examples of several high forage ration options. Adding fiber energy of vegetative grasses is one of the keys to making these rations work. Please understand that the rations that follow should only be used as examples. Use a qualified nutritionist that is familiar with feeding highly digestible forages, including vegetative grasses, to balance your farm's ration.

The following rations were balanced using the below forage samples.

	Oats	Sorg/Sudan	Alfa Silage	Triticale Plus	Corn Silage	Hay	Mixed Alf Silage
CP	18.3	13.5	24.8	19	8.5	19.5	18
ADF	33.6	35.3	34.2	31.6	24	38.1	30.6
NDF	50.6	61.9	41.4	45.4	39.6	49.5	43.3
NDFd 30hr	65.4	70.2	44.3	63.6	59.9	44.2	46.2
Kd Rate	4.7	4.9	4.2	5.3	4.2	3.7	3.8

RATION 1 CORN SILAGE, ALFALFA SILAGE & HAY

Agronomic Comments: This ration is typical of many farms that have 3 or 4 years of continuous corn followed by 3 or 4 years of pure alfalfa. Grass hay is commonly grown on hilly or wetter fields. **Nutritional Comments:** This ration is common among many dairy farms and is pushing the edge of cow health. If dry grass hay is not fed, effective fiber will be low, causing animal health issues.

	DM (lbs)	As Fed (lbs)
Ave Corn Silage	17.0	55.0
Alfalfa Silage	9.2	22.0
Grass Hay	3.5	4.0
Concentrates	18.9	21.0
Total	**48.6**	**102.0**

Ration Stats	% Forage	% CP	% Starch	% Sugar
- 1,334 lb cows - 150 DIM - 80 lb milk - 3.80 fat - 3.20 protein	60.0	16.5	26.0	2.6

RATION 2 DOUBLE CROP CORN / TRITICALE ALONG WITH ALFALFA GRASS MIXTURE.

Agronomic Comments: This program is very good for farms with well drained soils looking for high productivity and quality. BMR Sorghum Sudangrass can also be used to further develop the crop rotation. (See ration 7 and crop rotation example on page 51. **Nutritional Comments:** Very healthy ration.

	DM (lbs)	As Fed (lbs)
MC Corn Silage	12.0	39.0
Triticale Plus	16.0	40.0
Mixed Hay	3.5	4.0
Concentrates	17.0	19.0
Total	**48.5**	**102.0**

Ration Stats	% Forage	% CP	% Starch	% Sugar
- 1,334 lb cows - 150 DIM - 80 lb milk - 3.80 fat - 3.20 protein	64.0	16.5	26.0	3.7

RATION 3 FARM NOT SUITED FOR ALFALFA

Agronomic Comments: This ration is excellent for farms that have high grass productivity. Corn silage can be planted into declining grass fields, resulting in very high yields. Follow corn with a new grass-legume seeding.
Nutritional Comments: Very healthy ration.

	DM (lbs)	As Fed (lbs)
Grass/Legume Silage	17.5	47.0
MC Corn Silage	9.3	30.0
Concentrates	22.2	24.6
Total	**49.0**	**101.6**

Ration Stats	% Forage	% CP	% Starch	% Sugar
- 1,334 lb cows - 150 DIM - 80 lb milk - 3.80 fat - 3.20 protein	60.0	16.5	26.0	4.3

RATION 4

DOMINATED BY MANAGED GRAZING; SUPPLEMENTED WITH CORN SILAGE & DRY HAY

Agronomic Comments: This program is a low cost, high return system. The pasture must be managed as a crop. Choose the appropriate pasture mixture for your soils and type of livestock. **Nutritional Comments:** This is the lowest cost ration. Well managed pasture is very high in protein and digestibility. Rate of passage through the cow should be slowed down by adding hay and corn silage to the ration. Corn silage also adds energy with little protein. The concentrate is mostly finely ground corn.

	DM (lbs)	As Fed (lbs)
Perennial Pasture	22.6	108.0
MC Corn Silage	7.75	25.0
Grass Hay	4.55	5.0
Concentrates	13.34	15.0
Total	48.2	153.0

Ration Stats	% Forage	% CP	% Starch	% Sugar
- 1,334 lb cows - 150 DIM - 80 lb milk - 3.80 fat - 3.20 protein	72.0	16.3	20.8	6.9

RATION 5 MOSTLY ANNUAL FORAGES FOR DROUGHTY SOILS AND CLIMATE

Agronomic Comments: An excellent cropping program for areas that are subject to drought and summer heat. Crop rotation can easily be developed, limiting pest problems. **Nutritional Comments:** The combination of corn silage, BMR forage sorghum and triticale will make a healthy ration that is sweet and palatable.

	DM (lbs)	As Fed (lbs)
MC Corn Silage	13.9	44.7
Triticale Plus	7.1	17.8
BMR Forage Sorghum	9.0	30.0
Grass Hay	2.7	3.0
Concentrates	16.3	18.3
Total	49	113.8

Ration Stats	% Forage	% CP	% Starch	% Sugar
- 1,334 lb cows - 150 DIM - 80 lb milk - 3.80 fat - 3.20 protein	70.0	15.7	23.5	3.6

RATION 6 HIGH CORN SILAGE WITH SOME MIXED ALFALFA GRASS SILAGE.

Agronomic Comments: Ration requires a high amount of the cropping system to be in corn, which sets up a demand for continuous corn on many acres and increases agronomic challenges. We recommend adding additional forages to the rotation. **Nutritional Comments:** This ration is somewhat high in starch, and acidosis could therefore be a health problem with long term use. Effective fiber may be limiting depending on particle length of forages. In addition, the percent forage could be misleading, as corn silage is typically half grain. We recommend adding additional forages with less starch and more fiber digestibility to improve the ration.

	DM (lbs)	As Fed (lbs)
MC Corn Silage	26.4	85.0
Alfalfa/Grass Silage	8.2	19.5
Mixed Hay	1.7	2.0
Concentrates	12.9	14.3
Total	49.2	120.8

Ration Stats	% Forage	% CP	% Starch	% Sugar
- 1,334 lb cows - 150 DIM - 80 lb milk - 3.80 fat - 3.20 protein	73.7	16.9	26.0	2.6

DISCLAIMER

These are only sample rations and should not be used exactly as stated above on your farm. King's accepts no responsibility if a farm uses any of these rations on their operation, as they are based on samples gathered from individual farms. We highly recommend that forage samples be taken from your farm on a regular basis and the ration be properly adjusted. Sample rations were created by C&L Nutrition using CPM-Dairy software for demonstration purposes only.

BMR: HOW A GENE MUTATION BECAME A BREAKTHROUGH IN DIGESTIBILITY

By Genevieve Slocum, King's AgriSeeds Inc.

Over the course of the past decade, Brown Midrib, or BMR forages have become widely familiar as the elite of summer annual forages. The "cream of the crop," these corn hybrids, sorghums, and pearl millets are separated by a genetic makeup that reduces their lignin content and is usually visually evident as a light to dark brown tint in the stalk and leaf midrib. The BMR characteristic is actually caused by a natural genetic mutation discovered in the 1920s that has the effect of increasing whole-plant fiber digestibility (usually expressed as NDFd and TTNDFD).

BMRs do have some drawbacks, but these have been managed with better genetics and handling in the field. For one, the lower lignin content can mean reduced standability, since lignin is what gives structure to the plant to support its weight, and becomes more critical once the plant gets tall and top-heavy with heading. This has been addressed by breeding for a dwarf structure, resulting in a shorter plant with greater amounts of leaf material in proportion to stalk tissue. Shorter, leafier plants can rival traditional sorghums in yield and get the bonus of greater fiber digestibility from a higher leaf-to-stem ratio. A dwarf BMR combines the advantages of lower lignin with a greater leaf to stem ratio.

Lowering nitrogen applications and seeding rates can also help alleviate standability issues.

Yield drag is another concern that sometimes afflicts BMR products. Our trials generally show slightly higher yields for non-BMR forage sorghums and sorghum-sudans, as well as superior and rapid regrowth. But looking closer at the nutritional data makes us question the edge these standard products truly provide. NDFd and TTNDFD are often several points higher for the BMR products, and each percentage point increase in NDFd is linked to an average 0.55 lb increase in milk production per cow/day. It's also linked to a 0.37 lb increase in feed intake/cow/day, which is critical. What's the point of a higher yield if it's less digestible and leads to less feed intake? As Progressive Dairyman puts it, "the true measure of your hybrid is not apparent in the field, but rather when the work is done in the milking parlor."

The following King's AgriSeeds data taken from Mt Joy, PA shows AF 8301, a non-BMR forage sorghum, coming in first for yield against a BMR lineup cut at soft dough stage, but at least 3 percentage points behind all the others for NDFd 30 hr. The differences do not appear stark, but each point lower in digestibility makes a difference in milk production.

Sorted by Yield

Previous Crop - Sorghum / Cover Crop

Fertility - 100 units of N from AMS

	DM Yield Tons/A	Tons @65%	Lodge Rating 1-9 1 is Best	Harvest Date	Day to Harvest	% Moisture	% CP	% ADF	% aNDFom	% Lignin	% NDFd 30hr	% Sugar	% Starch	% NEL	% Kd
AF 8301	8.9	25.5	2.0	30-Sep	104	66.1	8.2	26.4	43.3	4.70	50.4	3.4	28.4	0.72	5.17
EXP BMR	8.9	25.4	1.0	20-Oct	124	66.1	8.3	23.1	37.9	3.42	58.1	3.4	28.4	0.74	4.51
EXP BMR	8.1	23.2	1.0	30-Sep	104	68.6	5.9	30.6	47.9	4.96	53.1	3.1	26.2	0.70	5.23
EXP BMR	7.5	21.4	1.0	20-Oct	124	69.7	9.7	24.0	41.2	3.59	59.2	5.7	19.2	0.72	4.34
AF 7401	7.2	20.6	1.0	30-Sep	124	69.7	8.6	24.4	39.3	3.94	54.7	4.1	28.3	0.72	4.87
AS 6402	7.0	20.1	1.3	20-Oct	124	64.3	9.2	22.6	37.3	3.43	56.0	3.7	29.3	0.75	4.53
AF 7202	6.9	19.7	4.3	24-Sep	98	66.7	9.1	22.3	38.2	3.78	58.4	5.4	26.5	0.74	5.24
AF 7102	6.6	18.9	5.0	24-Sep	98	68.6	8.9	23.9	40.9	3.67	61.6	5.7	21.3	0.73	5.05
EXP BMR	6.1	17.4	6.0	24-Sep	98	63.3	8.8	27.7	44.6	4.05	57.8	4.3	22.7	0.71	5.12
EXP BMR	5.3	15.0	1.0	20-Oct	112	71.8	11.4	22.8	40.5	3.35	57.9	4.9	22.0	0.73	5.03
EXP BMR	5.1	14.7	1.0	20-Oct	112	67.0	10.7	24.5	42.1	3.77	58.4	4.6	21.7	0.72	5.16
EXP BMR	4.6	13.0	1.0	20-Oct	112	67.5	11.4	24.8	40.2	3.72	53.1	4.1	23.5	0.70	4.78
EXP BMR	4.5	12.8	1.0	20-Oct	112	68.0	10.7	23.0	39.3	3.68	56.8	4.5	25.3	0.73	5.09
EXP BMR	4.4	12.5	1.0	20-Oct	112	68.0	12.0	21.5	37.4	3.62	56.5	5.0	24.2	0.73	5.08
EXP BMR	4.2	11.9	1.0	20-Oct	112	69.3	11.7	22.8	39.4	3.43	59.0	4.6	23.1	0.73	5.04
Mean	**6.3**	**18.1**	**1.9**			**67.6**	**9.6**	**24.3**	**40.6**	**3.81**	**56.7**	**4.4**	**24.7**	**0.72**	**4.95**
LSD .05	**1.7**														
cv (%) =	**16.5**														

Hybrids in Blue Font were planted 12 days later on 6/30

Red Font in the Best Value for that Trait

Corn silage has been the traditional standard for combining yield and quality in a forage, but BMR sorghums are now a contender – especially in droughty soils or dry conditions - as these products are more efficient than corn in both water and N use. In ideal soil and weather conditions, corn still wins for energy content (mostly from grain) and yield, and is still considered preferable for lactating dairy cows.

BMR sorghum products and millets can also fit nicely into a rotation where corn would struggle. Since they need to be planted later, in warmer soil temperature, the timeline for harvesting a double crop small grain is more generous. The bonus is that the sorghums handle hotter, drier conditions that might knock corn yield back.

With their lower lignin content, BMR products also generally have improved palatability, so cows eat more of the stem and leave less leaf litter on the ground. It is important to keep in mind, though, that a BMR product is not a guarantee of better quality. The nutritional advantage still varies by variety, and is of course heavily dependent on proper management.

BMR products have seen many breeding and management advances that make improve standability and harvest to allow this high quality product to work hard as a feed.

BMR Gene 6 is prominent in most of our summer annual grasses.

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 roation

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!

SELECTING THE CORRECT SEEDING RATE FOR SORGHUM BASED ON ITS SEEDS PER POUND

By Tracy Neff, Product Development/Genetic Selection, King's AgriSeeds Inc.

Sorghum seed, whether forage sorghum, sorghum sudan or a sudangrass, comes in varying seed size. The size of the seed (seeds per pound) will vary based on variety and/ or the growing conditions where the seed was produced from year to year. Quite often drier conditions during the seed production of sorghum will relate to small seed size. But it is very common to have seed sizes varying among sorghum types by 5000 to 7000 or more seeds per pound. This can then raise questions at the time of seeding for the grower such as how many pounds per acre of seed should I plant?

In the chart below are examples of different types of sorghum and their various seed per pound counts for 2014.

Hybrid	Type	Seeds/Pound
AS6201	Sorghum Sudan	12500
AS6401	Sorghum Sudan	16000
AS6402	Sorghum Sudan	12500
AS6501	Sorghum Sudan	19500
AS9301	Sudangrass	26000
AS9302	Sudangrass	26500
AF8301	Forage Sorghum	14500
AF7401	Forage Sorghum	19000
AF7101	Forage Sorghum	12000
AF7102	Forage Sorghum	18000
AF7201	Forage Sorghum	13000
AF7202	Forage Sorghum	19500

When we talk about planting forage sorghum in rows like corn for a direct harvest like corn silage, we recommend per acre plant populations to be in the 80,000 to 100,000 range. The lower end of the range is recommended for the taller non-dwarf types that have a greater potential for lodging. Planted at lower populations, they often have room to develop thicker, sturdier stalks, which helps standability.

Using the seed per pound numbers for forage sorghum from the above chart, per acre seeding rates for forage sorghum based on seed size can vary from 5 to 8 lbs per acre to get our 80-100,000 plants per acre depending upon the hybrid being grown. And getting forage sorghum planned for a direct harvest at soft dough planted too thick can lead to lodging problems and harvesting headaches.

What is not often considered is the seed size difference of our sorghum sudan and sudangrass hybrids. We recommend a population on a drilled multiple harvest sorghum sudan of about 600-650,000 plants per acre. Quite often we think for a sorghum sudan a bag per acre, or 50 lbs., is fine to achieve that population. And that is correct if our seed size amounts to 13,000 seeds per pound. But what if our sorghum variety is smaller seeded, say 16,000 seeds per pound? If we plant 50 pounds per acre of that variety we have planted 800,000 plants per acre. If we were planting these 2 different varieties on our farm for a comparison we would have very different plant populations, and trying to compare their performance would not be a fair test. The most common result would be that the variety planted at the higher rate (a result of smaller seed size) would yield more, a natural consequence of having more plants per acre. Or we could have too thick of a stand that could lead to lodging problems or lower yields from too many plants per acre for our soil or the fertility levels we planned to apply. Please note that organic growers would normally want to increase their populations by 10% to 15% for better weed suppression on all multi-harvest sorghums.

Sudangrasses can also vary in seed size. With a narrow leaf and a thinner stalk we recommend a bit higher population of 650,000-700,000 plants per acre. As the chart shows, we did not see as much variability among seed sizes in the sudangrasses There are also more growers looking at using a forage sorghum drilled in 12" to 15" rows and harvested as a mow and wilt crop at boot stage prior to head emergence. For this application of forage sorghum we recommend a per acre population of

about 300-350,000 plants per acre.

Considering seed size and seeds per pound when planting sorghums crops can be beneficial in improving performance and yield. It can also help with crop seed costs by ensuring we are using the correct seeding rate and not wasting seed by planting too heavy.

Recommended seeding rates for sorghums based on population and seed size.

	Pounds needed for
Sorghum Sudan	600-650,000 Population
11,000	55-59
12,000	50-54
13,000	46-50
14,000	43-46
15,000	40-43
16,000	38-41
17,000	35-38
18,000	33-36
19,000	32-34
20,000	30-33

	Pounds needed for
Sudangrass	650-700,000 Population
21,000	29-31
22,000	27-30
23,000	26-28
24,000	25-27
25,000	24-26
26,000	23-25
27,000	22-24
28,000	21-23
29,000	21-22
30,000	20-22

Soft Dough	Pounds needed for
Forage Sorghum	80-100,000 Population
11,000	7-9
12,000	7-8
13,000	6-8
14,000	6-7
15,000	5-7
16,000	5-6
17,000	5-6
18,000	4-6
19,000	4-5
20,000	4-5
21,000	4-5

Boot Stage	Pounds needed for
Forage Sorghum	300-350,000 Population
11,000	27-32
12,000	25-29
13,000	23-27
14,000	21-25
15,000	20-23
16,000	19-22
17,000	18-21
18,000	17-19
19,000	16-18
20,000	15-18
21,000	14-17

SORGHUM PRODUCTS

Summer annuals will increase forage production on your acreage, which means better farm profitability and nutrient management when grown as part of a sound crop rotation. Perennial forages still have a place on many farms, but if you are considering moving to more annuals, planting and harvest windows need to be examined and a commitment must be made to the system. The key to annuals is to put them in crop rotation that works for your farm and your management style.

BMR FORAGE SORGHUM AGRONOMIC MANAGEMENT

Soil Adaptation	This crop is best suited for soils that are well drained. Forage sorghum is 30 to 50% more water efficient than corn, making it an excellent choice for soils and regions that are drought prone. Do not plant in poorly drained soils.
Uses	Direct cut silage at soft dough stage. For haylage and baleage, cut and wilt at boot stage. Seed with corn for silage: Can be mixed with corn to help with deer damage. This combination makes excellent silage, but management can be difficult.
Seeding Dates	After soils are 60°F (7:00 AM at 2") and long term forecast is warm.
Seed Rate	For direct cut: Approximately 80,000 to 100,000 seeds per acre. Approximately 6 to 9 lb per acre. Adjusting to seed count is important! For cut and wilt at boot stage: 300,000 seeds per acre or approximately 25 lbs per acre. With corn: Approximately 25,000 seeds per acre. Reduce corn to 2/3 population.
Seeding Depth	1" to 2". Plant to moisture. (Do not plant into dry soil)
Weed Control	Forage sorghum, unlike sorghum sudan, requires weed control beyond tillage or burndown.
Weed Control Options	Pre-emerge: Atrazine, and metalachlor (Dual) if seed is treated with Concep. Post emergence: 2,4-D and dicamba (check labels for proper timing and rates). Cultivation.
Soil Fertility	100 - 120 units combined N contributions. Do not apply too much nitrogen, as lodging and/or high nitrates can be a problem. P, K, Ca and S similar to corn silage.

BMR SORGHUM SUDAN/SUDANGRASS AGRONOMIC MANAGEMENT

Seed Rate	25-30lbs/A Sudangrass, 50-60lbs/A Sorghum Sudan
Seeding Depth	0.5" to 0.75" Sudangrass, 0.75" to 1.5" Sorghum Sudan
Planting Date	After soils have warmed to 65°F and warm weather forecasted.
Fertilizer	Utilizes manure nutrients very well. P, K, and other nutrients similar to corn silage. Apply manure prior to seeding. Commercial nitrogen is best applied between cuttings. Manure applications between cuttings can cause severe stand thinning due to wheel traffic and potential crop disease problems. If crop is light green or yellowish, either not enough nitrogen was available or soil conditions were too wet.
Harvest Height	32" to 44" is ideal. Leave 6" stubble height for regrowth. When mowing make a wide swath to remove water as quickly as possible. Wide swathing makes a huge difference with sorghum sudan. Growth of sorghum sudan is very rapid once it reaches 2 feet tall or so. Rates of 4" a day are common. To avoid missing your harvest window, we recommend putting a post with a bright flag in an area of the field so that crop height can be easily observed on a daily basis.
Harvest Methods	Grazing, baleage, and haylage. For haylage, longer chop length is needed for effective fiber.
Regrowth Management	Sudangrass has the best regrowth. Most regrowth problems on sorghum sudan are due to fusarium. AS 6401 is our most disease tolerant hybrid. Conditions to avoid include: seeding in wetter soils, excessive seeding rates, leaving too little stubble when cutting (2 nodes or 6 inches is best), excessive wheel traffic, manure applications between cuttings, crop harvesting at very tall heights, and laying out for several days before harvest during high humidity/rainy weather. Sharp blades and clean cutting enhances regrowth. Tedding 2-4 hours after mowing is beneficial.

TRITICALE & RYEGRASS MANAGEMENT

MANAGEMENT OF ANNUAL AND ITALIAN RYEGRASS AS A DOUBLE CROP

Seeding Dates	For best results, seed one week before recommended wheat planting dates for spring harvest. In most years, it can be seeded as late as one week into wheat planting dates.
Seeding Rates	30-45 lb/acre (use higher rates for tetraploid varieties); 25 to 30 lbs if seeded with a small grain
Seeding Depth	1/4" to 3/4" is ideal. Do not seed deeper! Ryegrass is not a small grain.
Nitrogen Fertilization	50 lbs at planting (can use manure), 50 lbs during March green up, and 50 lbs after each machine harvest or 2 grazing cycles.
Fall Management	Excessive fall growth (greater than 10 inches) should be harvested, grazed or clipped to 4".
Silage Harvest Dates	Nov., mid to late April, mid May, and late May if not replanting quickly into alternative crop. Silage should be made when crop is about 15 to 20" or if coming into boot stage. Protein begins to drop after heading, but not as severely as with a small grain. Italian varieties typically have the ability to be productive for 2 plus years.
Crop Rotation	Ryegrass should be either moldboard plowed or sprayed with a minimum of 2.0 qt of glyphosate (Roundup) per acre to kill the plant. If not controlled, it may compete with the next crop. Annual and Italian Ryegrass can become a serious weed in small grains and is not recommended where small grains are grown for grain harvest. Paraquat (Gramoxone), chiseling or heavy discing will NOT control ryegrass. BMR Sorghum Sudans, BMR Forage Sorghum and corn are excellent double crops.
Grazing Dates	When plants reach 6 to 10". Under good growing conditions, the first grazing will be ready approximately six weeks after late summer seedings. During the spring a rotation of 10 to 14 days is typical.

TRITICALE AND TRITICALE PLUS HARVEST MANAGEMENT

Split your acreage between TriCal 815 and Triticale Plus (our well proven mixture of TriCal 815 and our winter hardy annual ryegrasses) and reduce your weather risk! Below is our recommended forage harvest guide that gives your farm lots of harvest windows to make superior forage quality and excellent yield. All the options below, except for soft dough stage harvest of TriCal 815, will give great fiber digestibility and moderate levels of protein, which is essential for high forage rations for dairy and great for finishing grass/forage livestock.

Triticale Plus 1st Cut

Start harvesting Triticale Plus when the crop has reached a minimum of 15" and there is a low risk weather forecast. This gives a very long window of opportunity, as the crop quality will remain excellent until flag leaf stage, typically about 2 weeks after 15" has been reached. Assuming a 2nd cut is desired, leave 4" stubble and apply 50 units of N plus some sulfur. The 2nd cut will be ready for harvest in 2 to 3 weeks depending on weather, maturity, and stubble height of 1st cut. (Increased maturity at 1st cut will increase the re-growth time. Shorter stubble heights will also increase re-growth time.)
Yield Range: 1.5 to 3 tons of DM (4.5 to 9 tons at 67% moist.) *(one cut, flag leaf) (SE PA harvest window May 2nd to 6th)*
Harvest around flag leaf stage. If poor harvest conditions do not allow the crop to be cut until the crop is in head, consider delaying harvest until soft dough stage (see Triticale 815 soft dough stage below.).
Yield Range: 2 to 3.5 tons of DM (6 to 10.5 tons at 67% moist.)

Triticale Plus 2nd Cut

Take 2nd cut when adequate yield has been reached, which is typically 3 weeks after 1st cut. Occasionally, a few triticale tillers will go to head before the majority of crop is ready. This is not much of a quality problem as the lush ryegrass in the mix will typically be the dominant component.
Yield Range: 1.5 to 3 tons of DM (4.5 to 9 tons at 67% moist.)

Trical® 815 Triticale

(one cut, soft dough stage) (SE PA harvest window mid-June) This can be a direct harvest system and typically is ready 5 to 6 weeks after heading or 2 to 3 weeks before ripe for combining. This forage will be a high energy forage with the energy coming from starch. It will also provide effective fiber and will be low in protein. It will have similar feeding characteristics to corn silage.

Yield Range: 4 to 7 tons of DM (12 to 21 tons at 67% moist.) If this harvest window is missed, the crop can be let go for grain.

Note: Unauthorized seed production, sales and purchases of unauthorized production of TriCal 815 and practically all other Triticale is illegal through the Plant Variety Protection Act (PVP).

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" in height on average when turning the livestock into the paddock. The animals should be removed when around 3" 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! Cows will perform much better on a dense 8-inch tall pasture than 15 inch tall coarse 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 inches down to 3 inches. 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 inches 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:

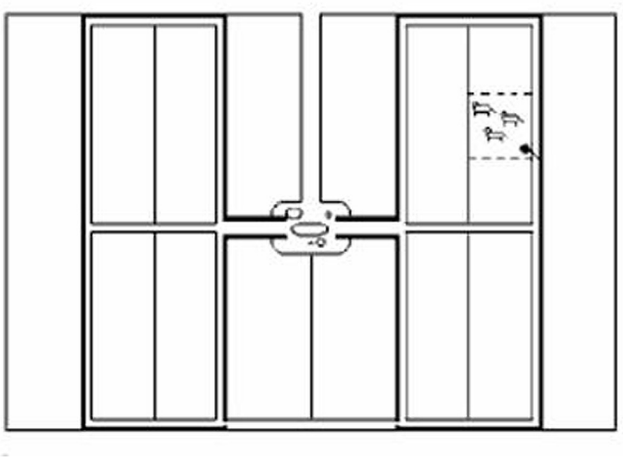
#1 It takes a lot of management. Pastures need to be managed with the same care as field crops.

#2 The new farmer just getting started has less investment if he does all grazing and hay instead of buying corn growing equipment.

GRAZING

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.



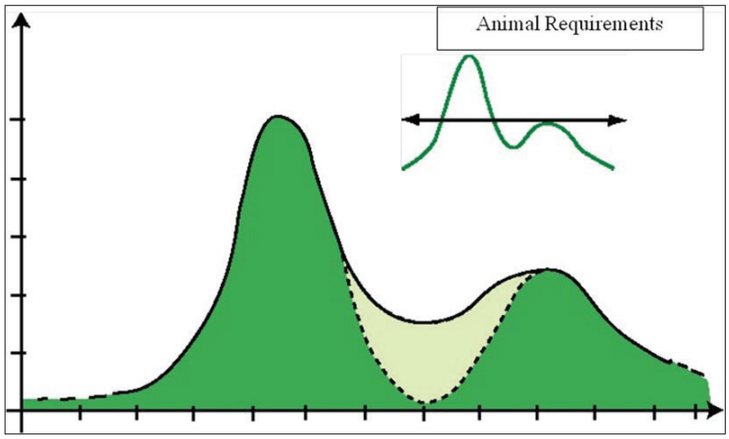
- The farm buildings ideally should be located in the center of the grazing land base, which reduces the amount of walking by the herd and you.
- The lane network creates major paddocks that are rectangular for field work but can easily be subdivided with polywire (dashed lines) to make daily grazing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

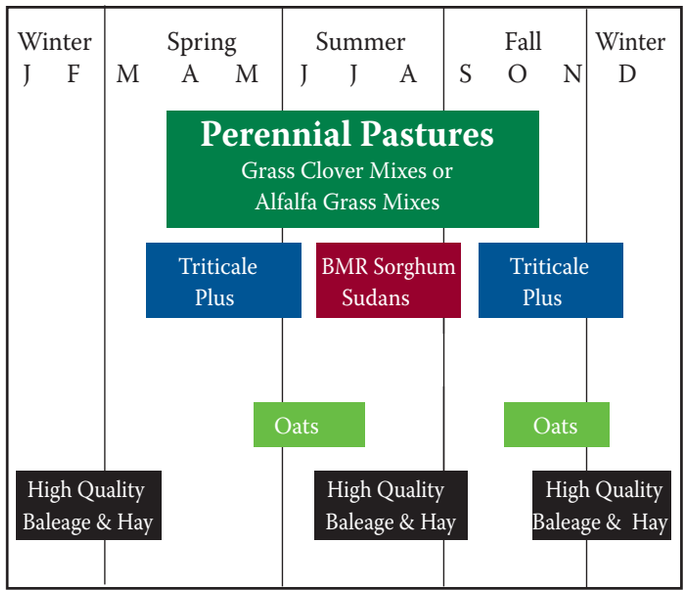
Stocking rate is a critical factor in profitability and depends on many factors. Those factors include:

- 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. This is about 30 holsteins per acre per day, so for a 21 day rotation, you need 21 acres (more in dry summers). Understocked farms tend to have the lowest profit potential, but overstocked farms can run into nutrient balance problems and other problems.



Forage Grazing Rotation Example
Balancing Perennials and Annuals



PASTURE RENOVATION

THE BASICS

The seeding event requires that there is a good amount of soil exposed for proper seed-to-soil contact. The more residue and the longer the remaining stubble, the less chance you have for successful pasture seeding. Tillage not only prepares the seedbed to receive seed, but provides some aeration. See our Seeding Practices section. Three methods of pasture renovation below are listed in order of management intensity:

1. **Full Cycle Rotation with Summer and Winter Annuals**
   The full cycle rotation involves eliminating the perennial pasture in exchange for annual production throughout an entire season. This could involve multiple options (see our Crop Rotation Section), but a basic rotation could include moving perennial pasture to annual production for 2-3 years to break up the perennial rotation. The perennial pasture could be removed in the spring and a summer annual utilized, followed by a winter annual like Triticale Plus, rye, or straight triticale. The following year, rotate into a summer annual, followed a new pasture seeding in the late summer.

2. **Rotation with Summer Annuals**
   Summer annuals grow rapidly in a short time, and can provide the boost in production when you need it. When considering pasture renovation, annuals are a great rotational option to rejuvenate perennial pastures without sacrificing total annual yield. To complete this process, in late spring, eliminate the existing perennial stand with herbicides or tillage. Seed your choice of short season corn, sudangrass, sorghum-sudangrass, millet or a variety of other species. Harvest this crop by late summer to set yourself up for reseeding the perennial pasture.

3. **Close Grazing/Mowing Followed by Interseeding**
   Fill out the pasture with desired perennial species by grazing the existing stand down as short as possible before interseeding. If grazing is not an option, pastures can also be clipped or mowed short. This method is best in late summer, since the existing stand will be slow-growing and less likely to outcompete new seedlings. Depending on multiple variables, various perennials or annuals may be optional candidates. Consult your King's dealer before selecting. For example: Because of alfalfa's autotoxicity, it is inappropriate to seed alfalfa into an existing alfalfa stand unless the stand is less than a year old.

A ONE YEAR PLAN TO RE-ESTABLISH HIGH PRODUCING PASTURE

Step 1 Plow or herbicide control about mid to late spring. This way you can still utilize your spring growth.

Step 2 Drill in BMR Sorghum Sudan and other summer annuals.

Step 3 Graze or cut sorghum sudan at 24-30 in. (Approx. 40 days after seeding and every 30 days thereafter). Start grazing at 18".

Step 4 About early fall plow or disk in manure and plant one of our high quality grass-legume mixes. If there is enough growth, graze lightly in the fall.

PRODUCING BEEF WITH IMPROVED FORAGE SYSTEMS & FORAGE GENETICS

Raising grass-fed beef requires careful pasture management. Though the beef cattle diet can be forgiving on a day-to-day basis, they require a diverse diet of high-energy, high-quality forage in the finishing stage, especially for optimal marbling. Beef cattle will respond to high quality forage production throughout their growth by maturing quicker and exhibiting increased ADG. Grass finishing requires intensive management for high quality forage, especially during the critical period just after the animal has reached maturity and is adding marbling. Grazing grasses such as K-31 fescue will not produce a well-marbled grass finished beef. The cattle will be slower to finish (up to 25 months) and will still not have the same carcass merits as a beef that is finished on high quality forage at 18-20 months.

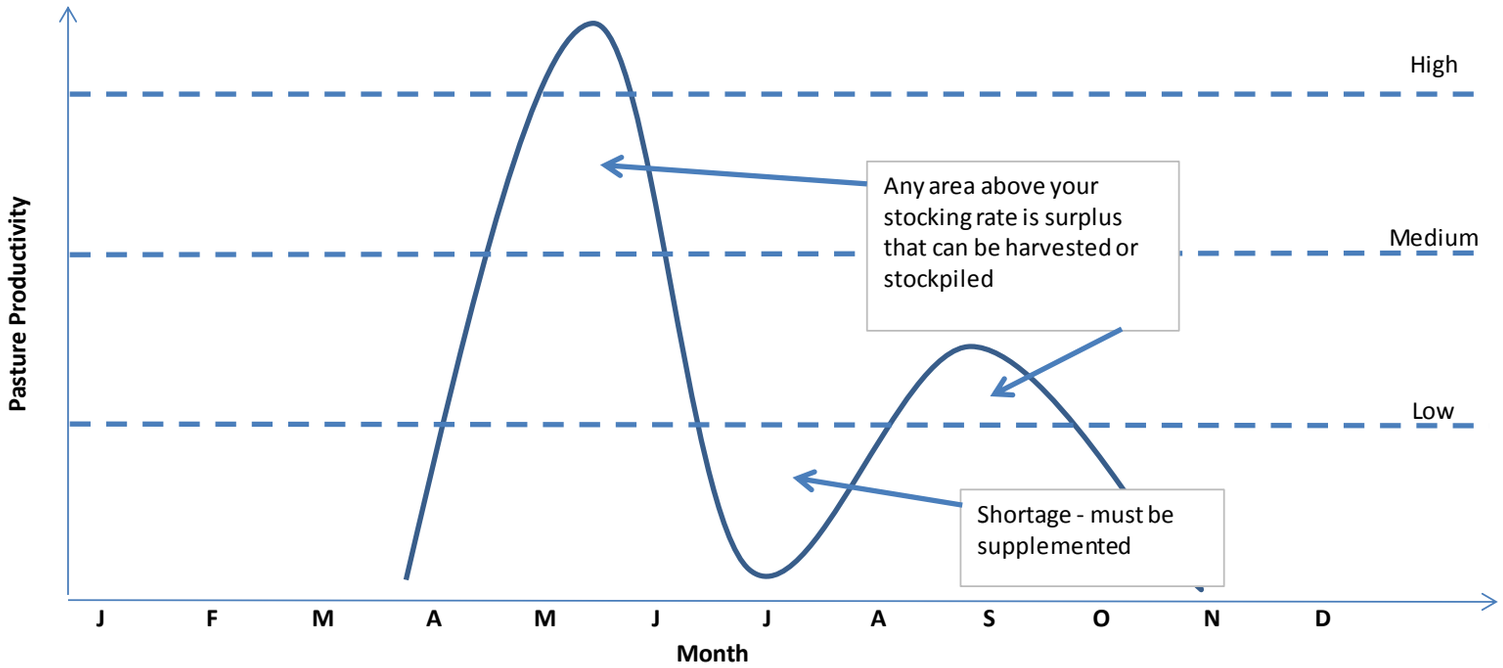
MANAGING PERENNIALS FOR QUALITY

To maximize ADG graze the upper layer of pasture that has not become too mature. Cattle that graze closer are eating more stem, leading to lower ADG. Grass stems contain more lignin, a structural, non-digestible carbohydrate. Leaves contain more digestible fiber. Our improved grass genetics are bred to maximize leafiness in grasses, as well as digestible fiber throughout the plant.

CONSIDER STOCKING RATES

As a general rule, maintain 45,000 to 50,000 lbs of animal weight per acre per day for maximum efficiency. Beef cows will need 3-3.5% of their body weight in dry matter intake each day. As you calculate paddock sizes, use a pasture stick to get a sense of pasture density and height. A mixed perennial pasture in good condition has about 250-350 lbs of dry matter per inch of height per acre. Ideally, your paddocks would be matched well enough with your herd size to be rotating into a fresh paddock every 2-3 days. This ensures that the cattle are accessing high quality forage. This rotation can be shortened even more to ensure that livestock are consuming the highest quality, top growth forage available before moving to a new paddock.

Where to Set Your Stocking Rate? (adapted from Penn State Extension)



PASTURE MANAGEMENT

Know When to Rotate

For regular vegetative grazing, start when grass is 8-10 inches high, and remove cattle when approximately 3-4 inches of residue remain (this is where the food reserves and regrowth potential for grass is stored). Overgrazing will lead to slow regrowth. Top growth is the highest quality, so cattle with the highest nutritional needs should get priority in grazing this. All pastures need to rest after grazing, but rest periods vary greatly depending on the time of year. During hotter and drier months, the rest period may be 30 days, while in cool spring and fall conditions, it may be half that. The important thing is to monitor regrowth and leave cattle off until adequate regrowth has occurred.

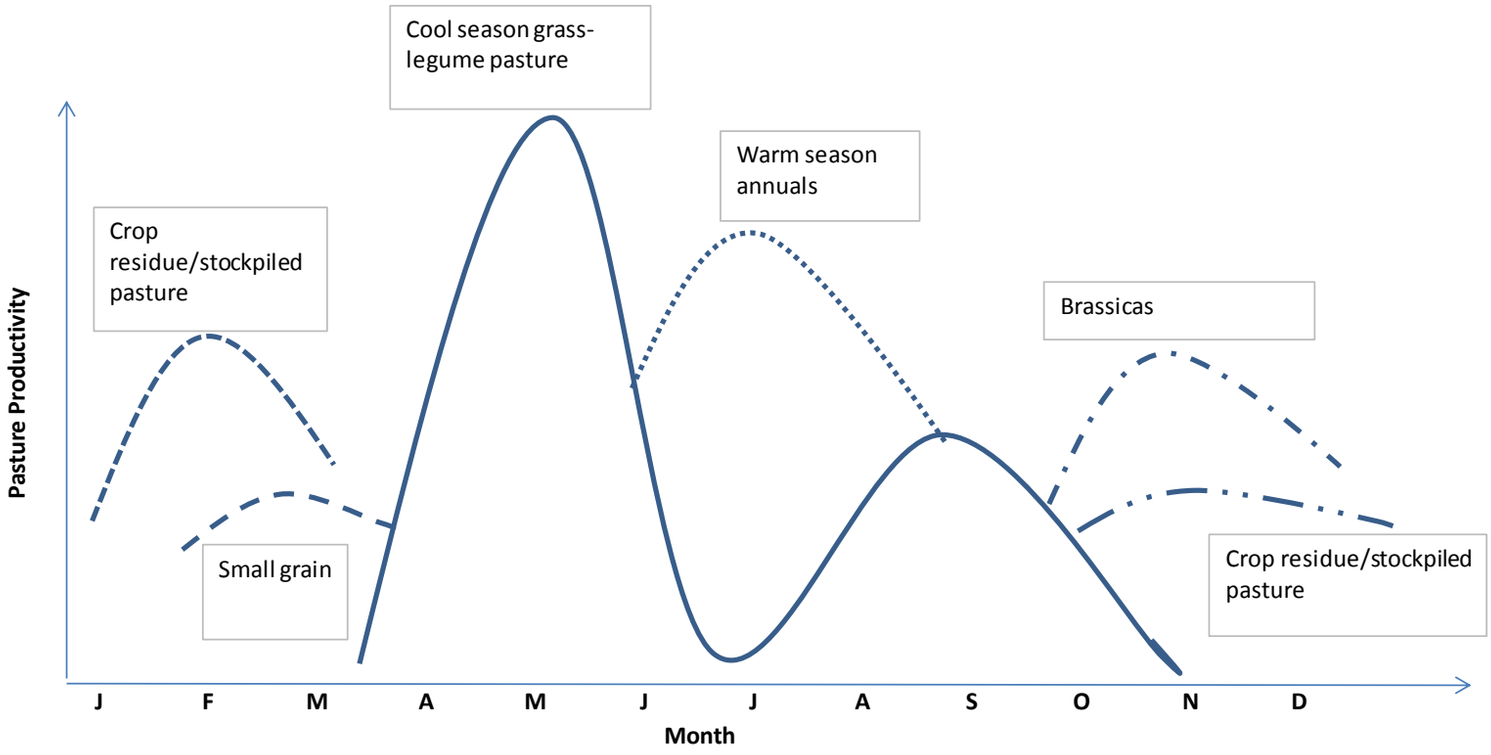
Incorporate Annuals

Annuals provide fast, high quality forage. Their productivity and digestibility make them a must when finishing beef. Nutritionally their quality will allow for rapid ADG. Perennial pastures are most productive in spring, become mostly dormant during summer heat and drought, and resume productivity again in cooler fall weather. The "summer slump" can be filled in with summer annuals that produce a large quantity of forage in a short time. Gene 6 BMR Forage Sorghum, Sorghum Sudan, and Sudangrass, corn for silage, millet (both BMR and traditional types), cowpeas and brassicas, all make wonderful options for high-energy, high-tonnage warm season feeding. Cocktails of two or three of these are often the most beneficial supplement to the high-forage diet.

The "winter slump" can be filled by cool season forages that also produce large quantities of high quality forage in a short amount of time.

Pick a portion of your ground in with annuals will fit best. You MAY be successful at interseeding into existing perennial stands, but results can have extreme variation. The best recommendation is to pick an area where you can terminate the existing stand and rotate into annuals. Often this could be a winter sacrifice area.

Managing Shortage: Diversified Cropping System (adapted from Penn State Extension)



SOIL NUTRIENTS

The following information will help you gain a better understanding of your soil results and the role of primary, secondary and micronutrients.

Primary

NITROGEN	
N	Helps form amino acids which are the building blocks of proteins
PHOSPHOROUS	
P	Is utilized in the formation of nucleic acids and other chemicals which help in the development of healthy root systems, early growth, early maturity and seed production
POTASSIUM	
K	Is similar to phosphorus for root formation and also appears to promote disease resistance. It increases the size and quality of fruits

Secondary

SULFUR	
S	Is sometimes referred to as the "4th primary nutrient" since it must be present to form protein
CALCIUM	
Ca	Is used in root system and leaf development and is combined with other elements to form cell walls. It also helps by activating other enzyme systems
MAGNESIUM	
Mg	Is the central atom of the chlorophyll molecule which makes it absolutely necessary for photosynthesis. It also plays a role in phosphate metabolism, plant respiration and enzyme systems

Micro Nutrients

COPPER	
Cu	Is necessary for chlorophyll formation and also acts as a catalyst for other plant reactions
IRON	
Fe	Acts as a catalyst for chlorophyll formation and also carries oxygen. In addition, it helps form certain respiratory enzyme systems. These functions make it critical to photosynthesis
MANGANESE	
Mn	Activates many metabolic reactions in plants and is directly involved in photosynthesis. It accelerates germination and maturity and increases the availability of phosphorus and calcium
MOLYBDENUM	
Mo	Facilitates a plant's proper use of nitrogen. It is also used to convert inorganic phosphorus to organic forms
ZINC	
Zn	Is necessary for the production of chlorophyll and carbohydrates and aids in the creation of plant growth substances, enzyme systems, and metabolic reactions
BORON	
B	Is essential for germination of pollen grains and growth of pollen tubes and for seed and cell wall formation. Other functions aid in protein formation
CHLORINE	
Cl	Is used in photosynthesis and helps promote a more disease resistant plant

THE IMPORTANCE OF SOIL HEALTH

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, aggregrate stability, texture, crusting and compaction. Physical indicators affect root growth, seedling emergence, water infiltration and movement within the soil profile.

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

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

Several important soil indicators include:

- **Aggregate Stability** - the ability of soil aggregates to resist disruption when outside forces (usually associated with water) are applied.

- **Infiltration** - Water movement in the soil as a result of soil texture, crusts, compaction, aggregation and structure, water content, frozen surfaces, organic matter, and pores.

- **Bulk Density** - The ratio of dry soil mass to bulk soil volume (including pore spaces). This can be measured and expressed in grams per cubic centimeter, and is largely a function of relative pore space and organic matter content. Bulk density influences water infiltration and plant root health, and reflects the degree of soil compaction.

- **pH** - Negative logarithmic scale that measures the "Potential of Hydrogen" concentrations in aqueous solutions. Soil pH influences the solubility, and therefore the availability, of several plant nutrients. It also affects the activity of microorganisms responsible for breaking down organic matter, as well as chemical transformations in the soil. The type and population densities of soil microorganisms change with pH. A pH of 6.6 to 7.3 is favorable for microbial activities that contribute to the availability of nitrogen, sulfur, and phosphorus in soils.

- **Soil Crusts** - Created by the breakdown of soil structural units by flowing water or raindrops, or through freeze-thaw action, crusts reduce water infiltration and increase runoff, restrict seedling emergence, reduce surface water evaporation, and increase wind erosion in sandy soils. Heavier clay soils and surface-applied manure are particularly prone to crusting.

- **Organic Matter** - Soil organic matter is the fraction of the soil composed of anything that once lived. Organic matter gives soil a sponge-like quality that allows it to soak up about twelve times its weight in moisture, which helps prevent nutrients from leaching out and makes your system less "leaky." Soil food web organisms derive their energy from organic matter inputs.

- **Available Water Capacity** - Available water near the surface is especially important at the seedling and transplant stage when the roots are very shallow and not yet fully developed.

- **Soil Biodiversity** - The mix of living organisms in the soil that comprise the "soil food web," such as insects, worms, and microorganisms, whose interaction and biological activity influence many soil processes, such as nutrient cycling, residue decomposition, and the entry and storage of water into the soil and resistance to erosion.

SOIL FERTILITY FOR FORAGE PRODUCTION

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

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

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

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

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

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

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

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

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

Points to Remember

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

FOR IDEAL RANGES FOR VARIOUS AMENDMENTS VISIT -

kingsagriseeds.com > Forage Technical Reference > Soils > 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

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 have an 8 foot seeder, then take the number beside the desired lbs/A and multiply by 8.
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

Take a look at pages 77-78 for Tips on Seeding Individual Products

FERMENTED FORAGES

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.

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.

GRAZING BRASSICAS

Brassicas actually have a higher protein content than many legumes, averaging 24% crude protein in our samples, and make excellent companions for annual grasses. Their high protein content can be well balanced by the highly digestible fiber of the forage grass, helping slow the rate of passage and increase utilization. Brassicas don't lignify as they mature, providing high quality forage for the duration of their growth. Their growing times also match up well up with the grass lifecycle.

These combinations produce lots of forage within a short time, and in many regions, their brief growing window makes room for a double or triple cropping rotation.

"Brassicas actually have a higher protein content than many legumes, averaging 24% crude protein in our samples, and make excellent companions for forage grasses."

Brassicas are also versatile in an agronomic sense. They grow well in cooler weather or heat and drought, and tolerate a range of soil pH conditions. Shallow or waterlogged soils should be avoided. Brassicas come in a range of maturities, ready to graze in 42 to 90 days, and can be grazed twice. Turnips and radishes have a bulb that can be grazed at the last planned grazing (or when no regrowth is needed), while rapes do not have bulbs.

The low, leafy growth of brassicas is excellent for weed suppression, and provides an understory of grazing to complement the high growth of the grass. They also produce chemicals called glucosinolates, which break down in soil to form compounds that kill soil-borne disease-producing organisms.

Strip grazing of a brassica or brassica mix is often the best management practice to prevent loss by trampling. Livestock can graze the lush growth off quickly and then move on. Animals should be introduced to brassicas gradually. It can take them about a week to adjust to the new feed; start by limiting grazing to 1-2 hours per day. Mixing the brassica with a more fibrous companion helps greatly in acclimating them to the new feed, in addition to improving digestion. Don't turn hungry animals that have not been acclimated to brassicas onto a straight brassica pasture.

BASIC RECOMMENDATIONS AND RELATIVE

This overview of basic products is our best estimate of product guidelines and comparisons. Variations will occur due to location and

Product	Life	Best Uses	Maturity	Full Seeding Rate	Seed Box	Seeding Depth	Residual Height
Perennial Grasses							
Bluegrass, Ky	6+	G	Early	10 to 15	Small	up to 1/4"	2"
Brome, Alaska	1 to 3 yr	G,WH,H	Late	35 to 45	Large	1/4" to 1/2"	4"
Brome, Meadow	6+	G,WH,H	Early	25 t o35	Large	1/4" to 1/2"	3" to 4"
Brome, Smooth	6+	H	Late	25 to 35	Large	1/4" to 1/2"	3" to 4"
Brome, Prairie	1 to 3 yr	G,WH,H	Medium	25 to 35	Large	1/4" to 1/2"	3" to 4"
Fescue, Meadow	3+	G,WH,H	Medium	30 to 40	Large	1/8" to 3/8"	3" to 4"
Fescue, Tall	3+	WH,H	Variety Dependent	30 to 40	Large	1/8" to 3/8"	3" to 4"
Festulolium, Perun	1 to 3 yr	WH,G	Medium	30 to 40	Large	1/4" to 1/2"	3" to 4"
Orchardgrass	3 to 6 yr	G,WH,H	Variety Dependent	20	Large	up to 1/4"	4"
Reed Canary Grass	6+	WH,H	Medium	12 to 18	Small	1/8" to 1/4"	2" to 4"
Ryegrass, Perennial	2 to 6 yr	G,WH	Variety Dependent	30 to 50	Large	1/8" to 3/8"	2" to 3"
Timothy	1 to 6 yr	WH,H	Late	8 to 12	Small	up to 1/4"	3"
Perennial Mixtures							
Alfamate	3 to 6 yr	WH,H	Late	25 to 30	Large	1/8" to 3/8"	4"
Creekside	4 to 7 yr	G,WH	Late	25	Large	1/8" to 3/8"	3"
GrassPro	4 to 7 yr	WH,H	Late	25	Large	1/8" to 3/8"	3" to 4"
Greenfast	2 to 4 yr	G,WH	Medium Late	30 to 40	Large	1/8" to 3/8"	3" to 4"
King's Haymaster	3 to 5 yr	WH,H	Late	20 to 30	Large	1/8" to 3/8"	4"
King's Grazing	3 to 5 yr	G,WH	Late	25 to 35	Large	1/8" to 3/8"	3"
Hillside	3 to 6 yr	G,WH	Mixed	25	Large	1/8" to 3/8"	3" to 4"
Horse Supreme	4 to 7 yr	G	Mixed	25	Large	1/8" to 3/8"	3"
Lowland Hay	4 to 7 yr	WH,H	Late	20 to 25	Large	1/8" to 3/8"	3" to 4"
North Star		WH,H	Mixed	18 to 25	Large	1/8" to 3/8"	3" to 4"
Performance Max	3 to 5 yr	WH,H	Late	20 to 25	Large	1/8" to 3/8"	3" to 4"
Sale Topper Grass	3 to 5 yr	H	Late	15	Large	1/8" to 3/8"	3" to 4"
Versa Grass		WH,H	Mixed	15 to 30	Large	1/8" to 3/8"	3" to 4"
Perennial Legume							
Alfalfa	3 to 5 yr	WH,H		12 to 20	Small	up to 1/4"	3"
Red Clover	2 yr	G,WH		12 to 20	Small	up to 1/4"	3"
White Clover	3 to 5 yr	G,WH		4	Small	up to 1/4"	2" to 3"

Product	Seeding Dates	Best Uses	Normal Harvest Dates	Full Seeding Rate	Seed Box	Seeding Depth	Residual Height
Winter Annuals							
Cereal Rye	Fall	G,WH	Early small grain	170 lbs	Large	1" to 1/5"	2" to 4"
Ryegrass, Marshall	Late Summer	G,WH	Earlier than wheat	30 to 50 lbs	Large	1/8" to 3/8"	3" to 4"
Spelt, Oberkulmer	Wheat dates	G,WH,H	Later than wheat	125 lbs	Large	1" to 1/5"	2" to 4"
TriCal 815	Wheat dates	G,WH	Earlier than wheat	125 lbs	Large	1" to 1/5"	2" to 4"
Triticale Plus	Barley & Early dates	G,WH	Earlier than wheat	80 to 100 lbs	Large	1/2" to 3/4"	3" to 4"
Crimson Clover	Late Summer	G,WH	Earlier than wheat	20 lbs	Small	1/8" to 3/8"	N/A
Hairy Vetch	Up to Barley Planting	G,WH	Later than wheat	20 to 30 lbs	Large	1/4" to 3/4"	N/A
Winter Peas	Up to Early Wheat	WH	Earlier than wheat	35 to 50 lbs	Large	3/4" to 1"	N/A
Summer Annuals							
BMR Sudangrass	After soils >60° and rising	G,WH,H	30 to 40 days	30 to 40 lbs	Large	1/2" to 3/4"	5" to 6"
BMR Sorghum Sudans	After soils >60° and rising	G,WH	30 to 40 days	50 to 60 lbs	Large	3/4" to 1.5"	5" to 6"
BMR Forage Sorghums	After soils >60° and rising	S,WH	90 to 110 days	80-100K	Planter	1" to 1.5"	N/A
Grain Sorghum	After soils >60° and rising	N/A	70 to 110 days	80-100K	Planter	2" to 1.5"	N/A
Corn, Vegetative Harvest	After soils >50° and rising	G,WH	50 to 60 days	40,000	Planter	1.5" to 2.5"	N/A
Corn, Silage Harvest	After soils >50° and rising	S	80 to 110 days	25 to 30,000	Planter	1.5" to 2.5"	N/A
Millet	After soils >65° and rising	G,WH	35 to 45 days	10 to 20 lbs	Large	1/2" to 3/4"	4" to 6"
Teff	After soils >60° and rising	WH, H	45 to 55 days	4 to 5 lbs	Small	0 to 1/4"	4" to 5"
Other Annuals							
Brassicas, Turnip & Hybrid	E. Spring through Summer	G	30 to 70 days	3 to 5 lbs	Small	1/8" to 3/8"	3" to 4"
Oats, Everleaf	E. Spring or Summer	G,WH	55 to 65 days	80 to 100 lbs	Large	1" to 1.5"	3" to 4"

G = Grazing WH = Wet Hay, as either Baleage or Haylage H = Dry Hay S = Direct cut silage

COMPARISON OF KING'S AGRISEEDS FORAGES

year. Consult with your local dealer for more local recommendations and local experience.

Spring Productivity	Summer Productivity	Fall Productivity	Wetter Soils	Drier Soils	Winter Hardiness	Heat Tolerance	Thicken Alfalfa	Thicken Grass	Grazing Palatability	Traffic Tolerant
4	2	3	4	2	5	2	1	1	3	5
5	3	4	2	4	5	2	3	2	4	3
3	4	4	2	4	5	4	1		5	4
5	2	3	2	4	5	2	1	1	3	5
4	3	4	2	4	2	3	2	1	3	3
4	3	4	4	3	5	3	2	2	4	5
5	4	5	4	4	4	5	4	4	2	5
5	3	4	4	2	3	3	5	5	5	3
5	3	3	2	4	4	4	4	5	3	3
5	4	2	5	5	5	3	1	1	2	5
5	1	4	4	1	3	2	3	5	5	3
5	1	2	4	1	5	2	2	1	5	3
4	3	3	3	4	4	4	3	2	4	3
4	4	4	4	3	5	3	2	2	5	5
4	4	4	4	4	4	4	4	3	2	4
5	3	4	4	2	3	2	5	5	4	3
5	4	4	2	4	4	4	1	1	3	3
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5	4	5	2	5	4	5	1	1	3	4
5	5	5	2	5	4	5	1	1	3	4
5	3	3	3	3	4	3	3	2	3	3
5	3	4	3	3	3	4	5	3	3	4
5	5	4	2	5	3	5	1	1	3	2
5	3	4	3	3	5	4	5	5	4	3
4	3	3	4	3	4	4	3	5	5	5
Spring Productivity	**Summer Productivity**	**Fall Productivity**	**Wetter Soils**	**Drier Soils**	**Winter Hardiness**	**Heat Tolerance**	**Thicken Alfalfa**	**Thicken Grass**	**Grazing Palatability**	**Traffic Tolerant**
5	NA	3	4	3	5	NA	1	1	3	3
5	1	4	4	3	3	1	3	4	5	3
5	NA	3	3	3	4	NA	5	3	4	3
5	NA	2	4	3	4	NA	3	3	4	3
5	1	3	4	3	4	NA	3	4	5	3
5	NA	3	3	3	3	NA	3	1	5	
5	NA	1	3	3	4	NA	2	1		
5	NA	1	3	3	4	NA	1	1		
3	5	2	1	5	NA	5	5	1	5	3
3	5	2	1	5	NA	5	5	1	5	2
2	5	2	1	5	NA	5	2	1	3	NA
2	5	1	1	5	NA	5	1	1	1	1
3	5	NA	3	3	NA	4	NA	NA	5	NA
NA	5	NA	3	3	NA	4	NA	NA	NA	NA
1	4	2	3	4	NA	5	2	1	4	3
2	5	4	4	5	NA	5	4		4	4
4	4	5	1	3	NA	4	1	1	3	3
5	3	4	3	3	NA	3	3	2	5	3

5 = Best or Highest 1 = Worst or Lowest NA = Not Applicable

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Bill Flockerzi ..... Cooperstown ..... (814) 676-0350
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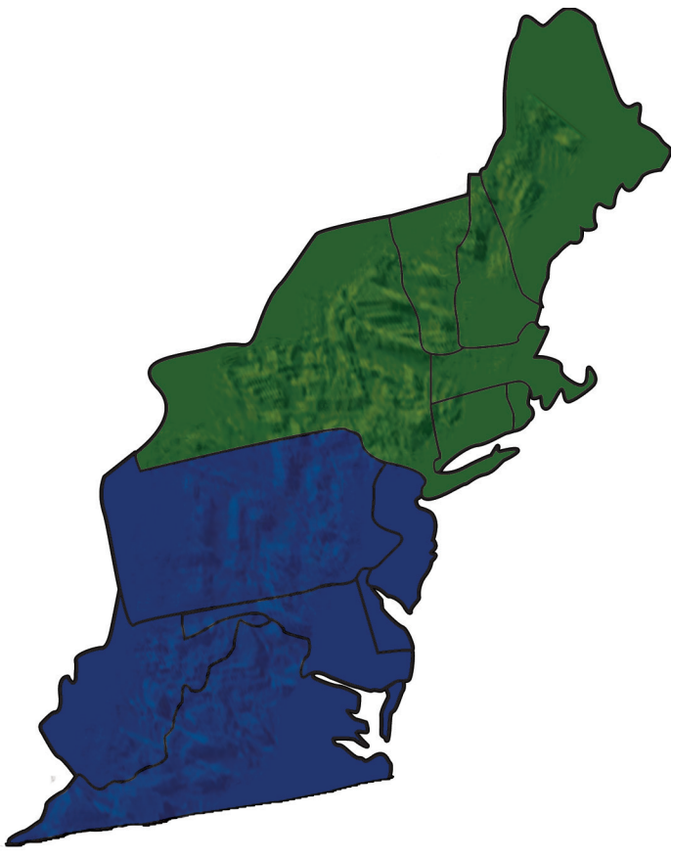

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Tim Fritz - President / General Manager and Forage Agronomist
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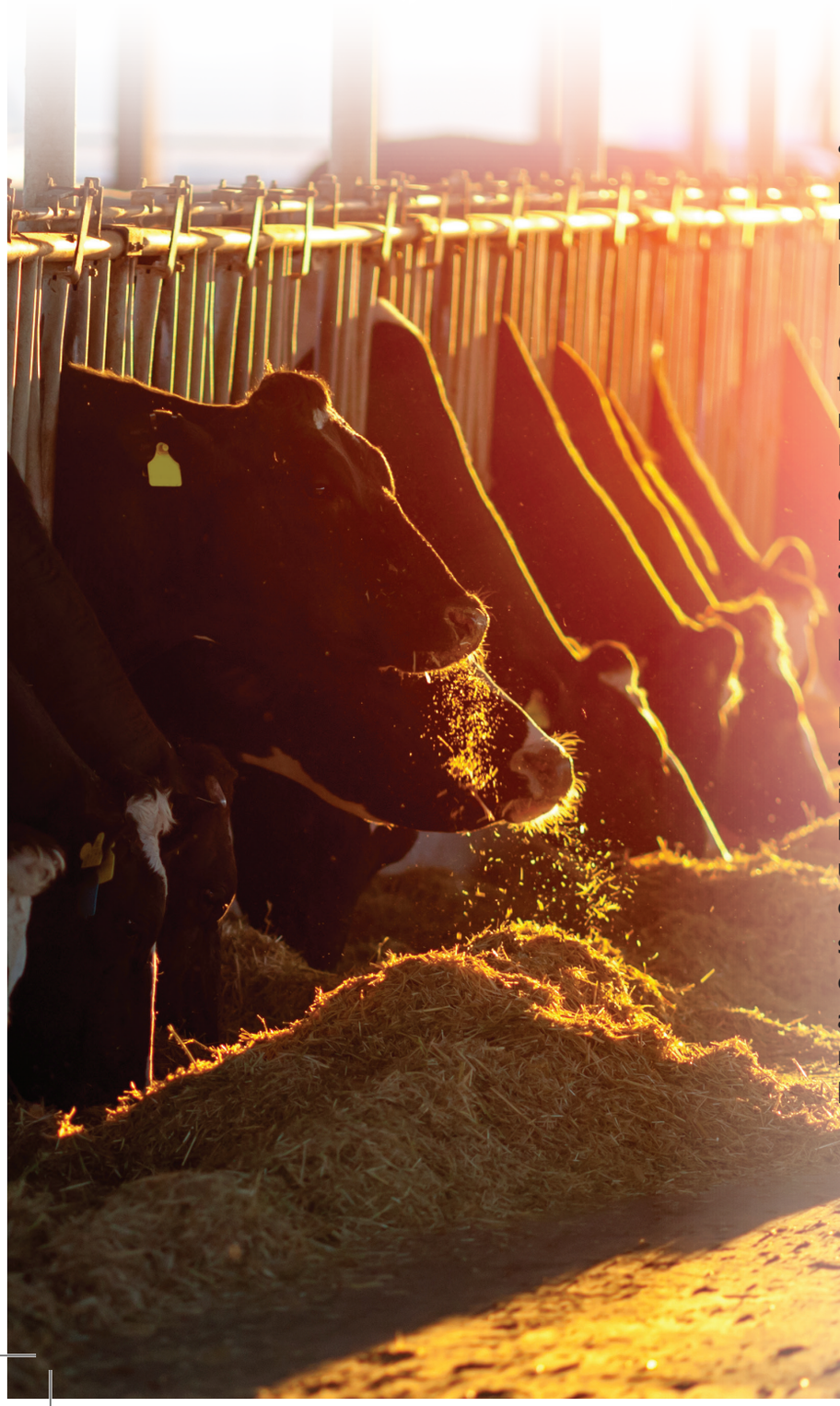

"You can turn a lot more money by putting higher quality forages in front of any cow- beef or dairy! Quality leads to better overall production and better herd health.

One producer I work with is feeding a 65% forage diet balanced for 100lbs of milk, 3X milking - cows are milking at 110lbs, without BST. The only way that happens is high forage quality. This producer says he has never had such good reproductive performance and he has never made more milk than he is currently. Forage digestibility makes dairying profitable even in today's market.

Better forages simplify balancing the diet and allow for more economical rations where inputs costs are more controlled. In ration balancing, when you have to put a cap on uNDF it automatically makes the ration more expensive because this has to be made up by supplementing purchased inputs. The high quality forages that King's AgriSeeds markets allow me to put a package together that is more profitable all while considering the health of the cow."

~ Doug Hering
Dairy Focus Consultant, Cargill
Cochranton, PA