King's AgriSeeds Inc.

GROWING WITH YOU FOR 25 YEARS

Product Information Guide 2018

KNOWLEDGE. ABILITY. SERVICE.

2018 is a milestone year for King's AgriSeeds. We are celebrating our 25th Anniversary!

I am beyond grateful for the opportunity to serve you through King's AgriSeeds, by offering highly digestible forages and cover crop products and by providing a team of knowledgeable staff that are able to share insight on how to best use these products to improve your farming operation. In 1993 Aaron King founded this company, in the quest to find the best genetics in grazing grasses. We have come a long way in the last 25 years- what a journey it has been! When I first started working at King's in 2002, as the forage agronomist, we were based out of a small, one room office with the warehouse being only the 2nd floor of a small barn. Our service area was a 150 mile radius, our product line was mostly grasses, and Masters Choice was just being introduced as a livestock corn at King's AgriSeeds.

Today, King's AgriSeeds is a full service forage and cover crop company that now stocks over 45 species, including many mixtures, serving customers from Maine to Virginia. In November of 2017, we have reached a longtime goal by moving into a new business location with greater capacity. Our new location is a 70,400 square foot facility that includes 60% more warehouse space than where we were previously in Ronks, an improved bagging line, a new, larger, climate-controlled cold room, five docks, expanded office area and a training center. This new warehouse facility, in combination with our Oakley Research Farm in Christiana, PA, increases our capabilities in many areas, which gets us really excited. We hope to have an open house at our new warehouse location in the spring of 2018.

Education goes hand-in-hand with good service. Training our staff and our dealer network is essential to serving you. We offer an advanced KAS dealer training program that focuses on Knowledge, Ability and Service. We believe that good management in combination with proper inputs leads to success on the farm. For years, King's has focused on forages and cover crops to increase your farm's productivity, profitability and sustainability. No matter the size of your operation, we promise to do our best to help you meet your seed needs and provide the relevant information to guide you to your goals. We are always looking for opportunities to help our customers' farms reach their potential. We thank you for allowing us to partner with you.

~ Tim Fritz, *President*

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.

TABLE OF CONTENTS

PRODUCTS

MANAGEMENT

Refer to page 51 for Management table of contents.

KING'S DEALERS

Look for management boxes throughout the Product Information Guide

King's AgriSeeds Inc.
1828 Freedom Rd, Suite 101
Lancaster, PA 17601
(717) 687-6224
KingsAgriSeeds.com

2018 NEW PRODUCTS

PERENNIAL MIXTURES

BALANCER
With balanced energy and protein, this rugged mixture of grasses and legumes is designed specifically to provide livestock the nutrition they need to maintain, gain and produce in the northeastern and mid-Atlantic climate. From its base of Martin II Protek Novel Endophyte Fescue to its complementary blend of clovers, this mixture has the best interest of your herd in mind!

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

NORTHERN ENERGY
Northern Energy Mix is designed to maximize the energy, digestibility, and consistency available in a forage mix. It is ideal for grass-fed and grass-finished meats, and all dairies, including dairies feeding a minimal amount of grain.

SOYBEANS

SP32R25
A solid Roundup Ready 3.2 RM variety with good stress tolerance. Great SCN and Phytophthora resistance; intermediate plant type with very good branching. Adaptable to all soil types and row widths.

SP36R25
A Roundup Ready 3.6 RM variety with high yields from east to west. Great field tolerance to Phytophthora; excellent emergence and early vigor. Also has STS herbicide tolerance.

FORAGE OATS

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

PERENNIAL GRASSES

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

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

MINTO MEADOW FESCUE
Minto Meadow Fescue is an improved European variety. It is late heading with a wide cutting or grazing window. Minto has a high yield potential and great persistence. A top choice for pairing with a KingFisher alfalfa.

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

WINTER PEAS

KEYSTONE WINTER
Keystone has excellent early vigor in the fall growth and more spring growth than other peas that King's has tested. As a white flowered pea, it does not contain the mild anti-nutritional substance (anthocyanin) found in non white flower peas. So without the anthocyanin, this means that Keystone will have better palatability and slightly better digestibility than Austrian winter pea (a vining type with purple flowers).

2018 NEW PRODUCTS

SORGHUM SUDAN

ADV 6504 SSX
A new, photo-period sensitive variety with higher sugar content. Excellent drought tolerance, extended harvest window with improved regrowth after cutting.

KINGFISHER SUGAR PRO 55
This BMR Gene 6 KingFisher hybrid is very quick growing and high yielding with a dry stalk for ease of drydown. Stems are finer and sweeter than many sorghum-sudans. The higher leaf to stem ratio ensures quality grazing or feed.

GRAIN SORGHUM

AG 1203 UT
A 63 day mid bloom hybrid with bronze grain. 34"- 40". Excellent drought tolerance and dryland option. Adaptable across a wide range of growing conditions.

MISCELLANEOUS

BEEHAPPY PHACELIA
Beehappy is a late flowering type. Excellent for beneficial insects and works well as a cool season soil builder. Planted in spring it will bloom in late spring. Planted in late summer it will bloom in the fall. 60 days to bloom. 4-6 week bloom.

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


Phacelia in full bloom

RYEGRASS

POLLANUM ANNUAL
A certified organic European Annual Ryegrass with less winter hardiness than some varieties. High dry matter yield in the first cut.

ASTONCRUSADER INTERMEDIATE
AstonCrusader is a certified organic, tetraploid variety. It produces a very high total annual yield with extraordinary early spring growth and has an interemediate longevity (2-3 years). Combine this with excellent disease resistance, AstonCrusader is a top ryegrass variety.

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

KODIAK ANNUAL
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.

HYBRID BMR PEARL MILLET

KINGFISHER PRIME 180M
A compact and digestible forage for grazing, hay or silage. Improved staygreen for later harvests. As a dwarf, it has a high leaf-to-stem ratio, and its short stature means improved standability. More leafiness means better drydown and the BMR background improves digestibility and feed intake.

KINGFISHER PRIME 360M
A taller, leafy, digestible forage hybrid for grazing, hay, or silage. Improved stay green for later harvests. As a dwarf, its short stature makes for excellent standability, but at maturity it is a little taller and leafier than Prime 180.

COOL SEASON PERENNIALS

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

KING'S HAY PRO

An alternative to King's Haymaster that includes soft-leaf tall fescue in place of Hakari Alaska Brome. Hay Pro is a well balanced mixture of leafy late heading grasses and traffic tolerant alfalfa that makes soft hay that livestock, calves and horses love. Add it to dairy rations for a great source of high quality effective fiber to slow down rate of passage without sacrificing production.

Best Uses: Dry Hay, Fermented Forages, Managed Grazing
Seeding Rate: 20 to 30 lbs/acre
Product Formula: 35% KingFisher Alfalfas
30% Late Heading Orchardgrasses
(a combination of at least 2)
25% Soft Leaf Tall Fescue
10% High Yielding Timothy

NUTRAMAX HAY 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. 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

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. Meadow Fescue is both higher quality than Fojtan and less competitive, allowing the alfalfas to perform well.

Best Uses: Fermented Forages, Dry Hay
Seeding Rate: 18 to 25 lbs/acre
Product Formula: 85% Kingfisher Alfalfas
8% Meadow Fescue
7% 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 have a protein efficiency improvement in ruminants.

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

BALANCER NEW

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

Best Uses: Fermented Forages, Grazing
Seeding Rate: 25-35 lbs/acre
Product Formula: 65% Martin II Protek
10% Endurance Orchardgrass
10% Olathe Orchardgrass
10% Freedom Red Clover OC
5% RegalGraze Ladino Clover OC

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.
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.

Best Uses: Fermented Forages, Dry Hay
Seeding Rate: 20 to 30 lbs/acre without a legume
3 to 8 lbs/acre with legumes.
Note: Reduce legume seeding rate by 25 to 50% from pure stand.
Product Formula: 50% Kora and Soft Leaf Tall Fescue
38% Premium Late Heading Orchardgrass
12% European / Premium Timothy

GRASS MAXX NEW

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

Best Uses: Fermented Forages, Dry Hay, Grazing
Seeding Rate: 20-30 lbs/acre
Product Formula: 60% Martin II Novel Endophyte Tall Fescue
20% Inavale Orchardgrass
20% Olathe Orchardgrass

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

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

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

NORTHERN ENERGY MIX NEW

Northern Energy Mix is designed to maximize the energy, digestibility, and consistency available in a forage mix. It is ideal for grass-fed and grass-finished meats, and all dairies, including dairies feeding a minimal amount of grain.

Best Uses: Fermented Forages, Grazing
Seeding Rate: 30 to 35 lbs/acre
Product Formula: 37.5 % Meadow Fescue
37.5% Soft Leaf Tall Fescue
15% Perennial Ryegrass
5% Freedom RC OC
5% Regalgraze Ladino Clover

ORGANIC PARTNER

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

Best Uses: Dry Hay, Fermented Forages
Seeding Rate: 20 to 30 lbs/acre without a legume
3 to 8 lbs/acre with legumes.
NOTE: Reduce legume seeding rate by 25 to 50% from pure stand.
Product Formula: 60% Kora Tall Fescue
25% Late Maturing Orchardgrass
15% European / Premium Timothy

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
30% Orchardgrass

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
HLR Orchardgrass	5-12
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

WHEN TO GRAZE MIXTURES

By Tim Fritz, President and Owner

Mixtures bring yield stability to a forage field as each species and variety has its own strengths and weaknesses. These factors include: soil adaption, climate adaptation, disease resistance, harvest timing, yield distribution over the seasons, nutrient needs and contributions to soil health, and of course nutrition and fiber for the livestock.

So, when is the proper time to graze? The first two factors to consider are: a) is the sward mature enough? And b) are the soil conditions appropriate to put the animals on the paddock without causing plant and soil damage? For newly established swards, this is critical. For these newly seeded fields, I suggest doing a "yank test" before turning animals into the paddock. A "yank test" is using your hand to mimic your livestock grazing. In the case of a cow, her tongue wraps around the forage and pulls it into her mouth quickly. In this case a yank test is a quick grab of the forage with your hand. If yanking a handful pulls the forage out of the soil by the roots, then the new seeding is not ready for grazing, as the livestock would do severe damage to your newly seeded pasture. It is better to feed hay or graze elsewhere until the paddock is more mature or the soil is drier.

For established pastures, height, density, species in the sward and animal species are other factors to consider. I strongly recommend taller grazing. In rotational systems, mimic a very aggressive hay harvest schedule while leaving four or more inches of residual. Performance of both the sward and livestock will be strong with taller management. Unfortunately, too many pastures are simply too short virtually all the time. Short pastures reduce pasture yield dramatically by limiting the plants' ability to collect sunlight and to grow strong roots. Both sunlight interception and water are essential for photosynthesis, which is the backbone for plant production. Short pastures are also excessively high in protein and lack effective fiber. These two factors combined will cause low animal performance for most classes of livestock.

**Steers on King's Grazng Mix at Oakley Farm-
King's AgriSeeds Research Farm in Christiana, PA**

LEGUMES - ALFALFA

DIGESTIBLE ENERGY
KingFisher®

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

KINGFISHER 101 CT/OC

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

KINGFISHER 406AP2 CT/OC

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

- Fall Dormancy 4.0
- Winter hardiness 2.0
- Disease rating 35/35

KINGFISHER 425HD CT/OC

This multi-foliate alfalfa has high yield and exceptional quality including fiber digestibility. KF 425 HD (highly digestible) delivers high NDFD and TTNDFD values and has comparable lignin ratings to the non-GMO low lignin alfalfas.

- 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

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

Due to circumstances beyond our control, we will not be offering certified organic alfalfas for 2018. 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.

Penn State Trial Highlights

KF Profusion HX (Hybrid)
Landisville, PA - 2013 Planted
- 10.24 DM Tons/Acre, 4 year average.
- Stand Score 85/100 on October 16th.

KF 406 AP2 (Aph. Rt. Rot Race 2)
Landisville, PA - 2016 Planted
- 9.11 DM Tons/Acre. Stand Score 96/100

Rock Springs, PA - 2016 Planted
- 10.37 DM Tons/Acre, Stand Score 97/100

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.

ALFALFA Q & A

Questions from readers of OnPasture.com; answers from Genevieve Slocum and David Hunsberger, King's AgriSeeds

Q. My cows and calves have been on a pasture for about a week with approx. 50% grass 50% alfalfa it has dried down on the stem and we have had -2 degrees C frosts several times. Some of the stand is still green but the majority is dried on the stem. Would the dried alfalfa still have nutritional value for my cows and calves? They are April/May calves. Any info would be appreciated; I am new to grazing hay fields but due to the shortage of hay this year I would like to pasture as long as possible.

It sounds like a succession of these light frosts has taken its toll. The stand still has nutritive value, but the value of any killed tissue will continually decline. Legume quality declines faster than the grass quality, because the legume will drop its leaves as it stands and dries. Protein, TDN, and digestible fiber decrease over time, as the plants leach nutrients and soluble carbohydrates and continue respiration. However, the initial result of a freeze, before the plant dies and begins to dry, is to become richer and more nutritious. As intercellular water freezes, cells are squeezed and ruptured, increasing levels of soluble protein and NSC. NSC has been accumulating throughout the cool conditions of fall in preparation for winter, and becomes more available with the sudden rupturing of cell walls. This can be a problem for horses, as limiting sugar intake is often a prime consideration in their diets.

There's also a challenge with this spike in soluble protein and the increased wetness of a plant that has just weathered a frost. If you graze within about a week of the frosts, there is an increased bloat risk. This risk applies as long as there is green, succulent tissue remaining, so the plant needs about a week for this damaged tissue to either dry down or regenerate from the crown. This time consideration does have to be balanced against the damage done by weathering and leaf loss as the plant stands. Maturity plays a role as well – bloat risk is highest in pre bud stage, and decreases as blooming progresses. Since you have a mixed grass-alfalfa stand, the risk will already be much less. For stand longevity considerations, it was wise that you allowed the frost to send the plant into dormancy before grazing.

Bottom line, there is still nutritional value in the standing hay. To get the most out of the feed, consider strip grazing it with some poly wire. Set up a few, as the calves will no doubt duck under and do some leader grazing. You did not specify which variety of grass you are using, but tall fescue is the best grass for stockpile grazing. Make sure to keep the cattle moving across the field to limit pugging damage, and leave a 4 inch stubble of grass as an energy reserve for spring growth. Early next spring, you may want to use some nitrogen and sulfur to give it a good start at green up.

Q. I'm wondering if anyone has planted or grazed a non bloat alfalfa, such as that from AC Grazeland. I have 30 acres I want to re-seed and am curious how this new variety is performing. I know there are other no bloat legumes such as sainfoin, cicer milkvetch, and birdsfoot trefoil. There are both positive and negatives to each of those and at this time I really am interested in the low/no bloat alfalfas…

The main thing to be aware of is that there is no such thing as zero bloat risk, and legumes like alfalfa aren't the only risk. It's best not to approach any legume, or any fresh forage, for that matter, as "non-bloating." Instead, use the precautionary principle and manage for reduced bloat risk.

The known factors in legumes that can contribute to bloat are soluble proteins, saponins, absence of condensed tannins, and rapid breakdown of plant cells in the rumen. Of these, this last factor is the one addressed by AC Grazeland. It was bred to have thicker cell walls, longer stems and internodes, and higher NDF and ADF. This increased fiber content in the plant reduces the risk – decreasing the frequency and severity of acute bloat – but does not eliminate it. The alternative non-

bloating legumes, on the other hand, such as birdsfoot trefoil and sainfoin, lower risk by means of condensed tannin content. These mitigate bloat by binding to proteins that are rapidly released in the rumen during fermentation.

Bloat usually begins when large amounts of digestible protein enter the rumen, resulting in a rapidly-forming microbial bloom. These microbes release a large quantity of gas and slime, and the cow is unable to burp out the frothy bubbles that form.

Keep in mind that even non-legumes can pose a risk of bloat – any lush pasture, especially when it's a dramatic change in the diet or the animal is turned out hungry – is a risk.

At King's AgriSeeds we do not carry this variety or any similar varieties, we can't personally speak for its performance. Instead, we advocate mixed stands of grasses and legumes – at a maximum of 50 percent alfalfa, bloat risk in a mix is significantly reduced. And we even tend to go in the opposite direction with some varieties, sourcing conventional low-lignin genetics, with the belief that fiber digestibility in a mixed stand will help optimize nutritional value to the animal.

When grazing this variety, we suggest you maintain many of the same precautions you use with many other legumes – don't treat it as no-risk. For example, don't turn out hungry animals on the alfalfa; it's best to feed dry hay first. Avoid grazing it when wet – with dew or just after a frost, which initially increases plant moisture and availability of cell contents. The first few days after a frost are when the bloat danger is highest, and it drops off after this as the plant dries. Also, if you can graze at a later maturity, at least 15- 20 percent bloom, this will increase lignin content and slow digestion and any bloat risk drops substantially. Offering poloxalene for three days prior to grazing is a great preventative tool.

Remember, fiber is your friend. Focus on supplementing hay and mature/dry pasture. And avoid grazing the alfalfa when it's wet or dewy.

Q. One topic I am interested in is upgrading an existing pasture, that has alfalfa which is dwindling. I do not want to kill it or till it. I generally use a no-till planter. Can't plant alfalfa into alfalfa...not sure if other things are also deterred by alfalfa...

Alfalfa autotoxicity is only an issue when planting alfalfa into alfalfa. In the short term, you can thicken up stands with cereal grains in the fall. Grasses like orchardgrass and fescues are not fast starters and are easier to interseed in late summer. The seedlings should have 45 days minimum to get going and reach 5 to 6 inches before a killing frost. If you try a no-till interseeding in spring, use a fast starting grass like festulolium. Another option is to introduce red or ladino clovers by frost seeding in late winter, or with a no-till drill in late summer.

Make sure to reduce the competition from the existing stand before interseeding. You can use a mob grazing at a high stocking rate to graze the stand down and shock it back, or a close mowing. Late summer will be the most advantageous time for the new seedlings, with the cooler, moist weather of fall setting in and the declining weed competition. You will also want to make sure that you have the weight and down pressure needed to cut through any residue and root material to get the seed placed at the proper depth and with the seed-to-soil contact it needs to absorb moisture and germinate.

One last thing to consider: is reseeding the best solution? If the stand is thin as a result of poor soil fertility, management shortfalls, or overgrazing, then the problem will not correct itself just because you add more seed. You may benefit far more from fertilizing according to soil tests or clipping more frequently following grazing. Remember, how you manage the pasture – in terms of grazing management, stocking density, and soil fertility – will actually turn out to be just as important as the seed you put down in determining the type of stand you end up with and the species expression. Rotational grazing that includes more intensive grazing gradually improves species composition.

If an extreme weather event thinned the stand, that makes an even better field for reseeding. Additionally, most pasture mixes are only productive for up to five years before other species start taking over, so renovation is needed periodically to manage a high-producing pasture.

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 stolons, 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.

LIFLEX

A very winter hardy white clover with good sward density and plant health. Liflex is rated medium in both leaf size and height. 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.

RENOVATION

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

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.***

ALSIKE

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

VNS LADINO

Standard ladino. Good for ground cover/cover crop use.

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.
Now offered in CT.
Also available in organic.

FREEDOM!MR

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

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.

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

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 durability clover stand.
Seed 4 to 6 lbs/acre.

PREMIUM CLOVER

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.

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.

FORB FEAST NEW

Forb Feast Chicory is a high quality, reduced bolting chicory blend. Reduced bolting means better feed value throughout the season. An excellent source of digestible energy, protein and minerals, with key anti-parasitic properties in small ruminants.
Available in OC and YJ Coated.
Seed 2-5 lbs/acre.

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.

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.

ARTILLERY SMOOTH NEW

Artillery is a drought-tolerant, productive smooth bromegrass. It is rhizomatous and early-maturing, and was developed from selections from arid regions of Turkey, Iran, Spain and Mongolia. The developed population was then selected in Oklahoma high stress conditions that included no irrigation with low nitrogen input.
Seed 30-40 lbs/acre.

ARSENAL MEADOW NEW

A new release Barenbrug variety selected for drought tolerance. Arsenal's selection focused on plant vigor, seedling emergence from a deep planting depth, forage and seed yield, and seed mass under dryland environments.
Seed 35-45 lbs/acre.

CARLTON SMOOTH

A leafy, slower starting, sod forming cool season grass that spreads by rhizomes (underground stems). It is commonly used for dry hay and once established produces a drought tolerant, long lasting stand. Smooth brome should not be harvested before early heading stage or stand loss will occur. Allowing smooth brome to mature to early heading before cutting allows the rhizomes to recharge its reserves for re-growth. Plan to harvest once in the spring, and with favorable summer weather, a fall harvest is possible.
Seed 30 to 40 lbs/acre.

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.

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

FOJTAN

A 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.

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.

INTERMEDIATE RYEGRASSES

STORM

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

ASTONCRUSADER NEW

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

GRASSES - KY BLUEGRASS, MEADOW FESCUE

KENTUCKY BLUEGRASS is

a shorter-height, sod-forming grass that makes a nice, smooth-looking pasture. Bluegrass spreads by rhizomes and can survive very short grazing. The majority of its forage production is in the spring and fall, with its yields usually being relatively low compared to most other pasture species. Its persistence is excellent, but establishment is slow. Bluegrass seed is very fine, and a little seed goes a long way.
Seed 15 lbs/acre.

BALIN

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

LIHEROLD

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

MINTO NEW

Minto Meadow Fescue is an improved European variety. It is late heading with a wide cutting or grazing window. Minto has a high yield potential and great persistence. A top choice for pairing with a KingFisher alfalfa.
Only available in organic.

TETRAX MEADOW FESCUE NEW

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

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 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.
OC and YJ Coated.

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.

INAVALE

A true medium-maturing leafy orchardgrass with strong disease resistance. Its summer heat tolerance makes it a great choice for grazing or hay. This orchardgrass was screened heavily in northern Kentucky and also looked strong in our Lancaster plots. It is a little too early-maturing to add with alfalfa, but a few days later than the old Pennlate.

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.

DIPLOID / TETRAPLOID BLEND

BG-24T
A unique, innovative blend of early and intermediate maturing diploid and tetraploid varieties. Includes varieties that are both heat and cold tolerant.

TD Blend
A tetraploid-diploid blend of European bred Perennial Ryegrasses. An excellent choice for overseeding pastures as part of a regular maintenance program.
Only available in organic.

DIPLOID

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 blends. As newer, better varieties are developed, Barenbrug incorporates them into the blend.

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.

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
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 use novel endophytes that are beneficial to the plant and non harmful to the animal.** ***Seed 35 to 40 lbs/acre.***

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

CAJUN II
An endophyte free, earlier, very high yielding, hay type tall fescue with improved digestibility. Excellent for stockpiling for fall grazing. Adapted to both the south and the north.

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

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

STF-43 BLEND
A blend of Barenbrug soft leaf, late heading varieties. Produces impressive dry matter yields with exceptional levels of digestible fiber. The varieties used have improved palatability for grazing and are also good for mixing with alfalfa or utilizing straight stands for stored forage.

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.

LISCHKA
An intermediate 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.

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

TURF 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

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 a true forage oat (60%) and annual ryegrass (40%). This mix combines the strength of each product and can be planted in early spring and late summer. It will work well for machine harvest and grazing. Oats and annual ryegrass are quick growing annuals that will make high quality forage. Harvest prior to boot stage of both products for super quality. Harvest oats in fall and get two cuttings of annual ryegrass in spring.
Seed 75 to 90 lbs/acre.

RAY'S CRAZY (Fall) MIX
A diverse mixture of legumes, grasses and brassicas. The goal is to improve soil health by incorporating extreme diversity. ***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

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 NEW

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

MCKINLEY ANNUAL NEW

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

MO1

This is a diploid annual ryegrass that was bred in Missouri and selected for improved winter hardiness and forage yield.

POLLANUM NEW

A certified organic European Annual Ryegrass with less winter hardiness than some varieties. High dry matter yield in the first cut.
Only available in organic.

SPRING BARLEY

Seed 150 to 200 lbs/acre.

A/C KINGS SPRING BARLEY

A 2 row spring barley that is excellent for quick forage and nurse crop.

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

KF ALLEGRO BLEND

A 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

OATS are leafier and higher in forage quality than typical grain type oats. They are versatile in mixtures and add the option of a fall cutting to an otherwise spring only harvested mixture.
Seed 95 to 125 lbs/acre.

BADGER (GRAIN)

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

CANMORE (DUAL PURPOSE)

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

CDC HAYMAKER (FORAGE)

Haymaker has been a performer for us. With leaf width similar to Everleaf, it has great overall quality and yield. Slightly earlier maturing than Everleaf.

EVERLEAF 126 (FORAGE)

A true forage oat with delayed heading (about 2 weeks later). Everleaf is bushy and leafier and has a softer stem. Forage quality is extremely high. Our samples of Everleaf Oats were the highest forage quality of all the small grains we have ever tested.

FORAGE MAKER 50 (FORAGE)

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

NIAGARA (FORAGE)

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

PROLEAF 234 (FORAGE)

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 (FORAGE)

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

GRASSES - WINTER GRAINS

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.

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.

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.

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.

CEREAL RYE
Seed 168 lbs/acre.

VNS (Canadian Type)
Used for forage or cover crop.

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.

BALADY-1 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.
Now available in OC coated.
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. ***Now available in YJ coated.***
Seed 3 to 8 lbs/acre.

FORAGE/GRAIN 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.

KEYSTONE WINTER NEW

Keystone has excellent early vigor in the fall growth and more spring growth than other peas that King's has tested. As a white flowered pea, it does not contain the mild anti-nutritional substance (anthocyanin) found in non white flower peas. So without the anthocyanin, the Keystone will have better palatability and slightly better digestibility than Austrian winter pea (a vining type with purple flowers).

4010 SPRING

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

ARVIKA SPRING

A high yielding pea with lavender flowers. Very tall. Can be planted in spring or fall.
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.

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

VNS HAIRY

A winter annual that can provide both a cover crop and fix nitrogen for a late spring-planted summer annual. Avoid planting where small grains are to be taken for grain harvest; hard seed in vetch can create weed issues. Plant in mid fall.
Seed 25 to 30 lbs/acre.

Iron Clay Cowpeas

WARM SEASON ANNUALS.

THE SUMMER ANNUAL MANUAL

By Genevieve Slocum and Tracy Neff

Summer annuals have unique benefits, like filling a small space in the rotation with multiple cuttings of big yields. They also bring some unique challenges and considerations. Here's what you need to know.

Step 1 is waiting for warm soils. These crops are adapted to hot climates and won't germinate consistently until soil is at least 65 degrees F. For most of the Northeast, this is late May at the very earliest, though there can be great variation across years. Watch out for a false warm-up in May – seeds that are in the ground and tricked into germinating early can die off in the seedling stage.

Harvest summer annuals to optimize not only quality and yield, but also manageability. Many of the most productive summer annuals are grasses – millets, sorghums, sorghum-sudans, sudangrasses, and teff. These grasses are staples in wet hay and grazing scenarios and play a starring role in most summer forage mixes, providing highly digestible fiber. However, remember that they are stars in yield because they grow several inches a day during the peak of summer. You should start harvesting most of these varieties between waist and chest height, or the growth may get ahead of you and become difficult to mow and dry. Grazing can usually start at knee height. If you start the grazing or cutting rotation soon enough, it won't be too tall by the time you reach the end.

Dry hay is possible but the options are limited. Teff is the best choice to dry for hay, but with good management, millet and sudangrass can work too, since they have the next thinnest stems. The more stemmy they become, the harder to dry, so cut millets and sudangrasses by waist height for dry hay. Millet is a little easier to dry than sudangrass, and dwarfs are easier still because they have a greater leaf-to-stem ratio. Sorghum-sudans have thicker stalks and hold moisture in their stalks, so they will typically not dry fast enough to make dry hay. Conditioning and tedding several times will be necessary to make dry hay out of these products. Wide-swathing (at least 80 percent of cutter bar width) is also highly recommended for rapid drying. Optimized rapid drying, especially in sunny weather, keeps sugars high in the plant, because the more it has time for respiration after cutting, the greater its loss of sugars and dry matter.

Dwarf varieties have many unexpected advantages. Brachytic dwarf varieties may look smaller, but they compensate with leafiness – the most digestible part of the plant and also the easiest to dry. Dwarf millets and sudangrasses are especially great for grazing because they can be grazed down a little shorter while still maintaining the excellent regrowth that is characteristic of these crops. Dwarfs also have reduced risk of lodging.

Take advantage of the great strides that have been made in digestibility. BMR, or brown midrib, is a non-GMO trait in sorghums and millets that started as a gene mutation and was incorporated and improved through generations of natural plant breeding. BMR millets have become especially popular in recent years, and even teff, which has not been developed as a BMR, is very high in fiber digestibility (about 8-10 points higher in TTNDFD, translating into 3 lbs of milk) and averages about 16 percent protein.

Decide if multicut is right for you. Multicut or multigraze products include millets, sudangrass, sorghum-sudan, and teff. Whether you want to get all your tonnage at once or spread out the harvest over 2-3 cuttings over the course of the summer depends on your forage needs and equipment availability. There are some excellent single cut forage sorghum products out there, especially long season dwarfs. Earlier non-dwarf sorghums tend to have more issues with standability. Often, these products are used at a higher seeding rate for a boot stage cut and wilt harvest instead of direct cut soft-dough stage harvest. Forage sorghum planted for intended boot stage harvest is advantageous because this is the point in the plant's growth that whole plant sugars are highest. After this point, the plant begins to send its resources into grain head production.

Understand what makes sorghum unique. Unlike corn, sorghums have adapted to extremely hot and dry climates. They have the ability to shut down their growth when conditions get too dry or too cool (their best growing temperatures are 70 degrees F – 90 degrees F). This can throw off your harvest planning, since these delays can cause it to shift its typical maturity dates.

Spoon-feed fertility – Give it about 1 lb of N/A/day, at planting and after every cutting. The goal is to avoid putting down too much at once.

They are luxury N consumers. Use caution during a rain following a drought period. Along with the extra moisture, the plants will pull up extra N, and can't convert all this excess to protein right away, leaving you at risk of high nitrate content. Nitrates do not dissipate during ensiling if you cut too soon after this drought-ending rain, so wait at least a week.

Knowing seed size, planting depth and timing is critical. This is important to seed germination and emergence. A small seed planted too deep is at risk of not emerging. Small seeds are frailer in terms of ability to absorb and retain moisture as well as in energy reserves to spring up out of the soil once they have germinated. With seeds the size of grains of table salt, teff is the smallest seeded summer annual and is very susceptible to being planted too deep (this is its Achilles heel and the major reason for teff complaints). It needs to be seeded just at surface level on very well packed soil – either with a Brillion seeder or broadcast and cultipacked into well-prepped soil. Sorghums and millets also need to be planted according to seed size and timed to get the seed into moisture at the depth it needs to be planted. Sorghum-sudans have an advantage here because they have larger seeds and can be planted 0.75 up to 1.5 inches deep. More caution is needed with the smaller seeded sudangrass, which can go in at 0.5 to 0.75 inches. Millet is the smallest of these, and should be planted ¼" to ½" deep. Because of its shallow depth requirement, millet is among the riskiest for late planting – as the summer progresses, the soil dries out from the surface down.

Most summer annuals prefer well drained soils, but if your soils are a little on the wetter side, millet or teff can handle these conditions the best.

For mechanical harvest, these products need to be crimped for better drying. The stalks are thicker than traditional grasses and need to be crushed to aid in the drying process.

Higher stubble means faster regrowth. Non-dwarf products have their growth point higher than most cool season grasses, so leave at least a 6-8 inch residual. This will ensure that plants regrow from the stalk as opposed to solely from tillers. Dwarfs can be taken down to about 4 inches.

Watch out for prussic acid. As long as there is green tissue, sorghums, sorghum-sudans, and sudangrasses can accumulate prussic acid, or cyanide, with a killing frost. This is toxic to livestock and you should wait at least two weeks before grazing. If you're mechanically harvesting it, two-three weeks before feeding should be enough time for it to dissipate during fermentation. Millet has no prussic acid danger.

Roundup Ready varieties might be a handy idea for the farmer, but they don't exist here. Sorghums would cross-pollinate with their wild relative, johnsongrass, spreading herbicide resistance to a weed – not good.

Start small on products you have not grown before, and understand that mastering summer annual management is a learning curve.

MIXTURES

RAY'S CRAZY SUMMER

This diverse mixture was created for dual purpose grazing and soil health improvement. It contains 7-10 species including grasses, legumes and brassicas. There is also a cool season/winter version of this mix available. p.27. 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

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.

Diverse cover crop/grazing mixture including sunn hemp, cowpeas and millet.

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.

KF FIBER PRO 70

A newer brachytic dwarfBMR 6 forage sorghum. This hybrid will not get taller than 6-7 feet, which gives it superior standability. The BMR trait indicates reduced lignin, which will increase the NDFD and IVTD. It has large leaves and creates a canopy ideal for suppressing weed pressure and evaporation. It will be in the soft dough stage at approximately 110-115 days.

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 NEW

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

AG1401

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

AG2103

65 day (mid bloom) hybrid with intense red grain and red plant color. ***Now offered in UT.***


AF7401

SUDANGRASS, SORGHUM SUDAN

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

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.

ADV 6504 NEW

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

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.

KF SUGAR PRO 55 NEW

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

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.

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.

KF PRIME 180M BMR NEW

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

KF PRIME 360M BMR NEW

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

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.

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.


Mojo Crabgrass

LEGUMES, BRASSICAS

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

BALADY BERSEEM CLOVER

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.
Now offered in OC coated.

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 lignified 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.

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.

T-RAPTOR

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

FEEDING TYPE HYBRID CORN

EXPERIMENTALS

During the 2016 cropping season, Masters Choice tested 56 experimental hybrids in regional plots around the country. These plots, which are the last stop for up-and-coming corn hybrid varieties, allow us to place hybrids that have shown some potential in our internal tests. At this level, experimental varieties are compared to our current lineup of hybrids and other competitive hybrids in the industry. Every year there will be a lot of experimental hybrids that don't make the cut. As new experimental varieties are introduced, existing varieties can either be retested, introduced into the commercial lineup, or discontinued. Of the 56 experimental hybrids, we retested 21 (38%) of those varieties in 2017. Five (9%) of these experimental varieties will become commercial hybrids in 2017. This year we will be testing 28 new experimental varieties. We are excited to see which new varieties will rise to the top in 2017, because with each new hybrid selection our lineup gets stronger.

NUTRITION

Often, the term "floury grain" is associated with products in a Masters Choice bag, but what exactly does that mean? In this context "floury" refers to the soft, white starch texture of the grain that is so different from the hard, flinty industry standard. To you, the producer, this means that these hybrids have greater starch availability and less indigestible, vitreous material that has become the norm for our competitors. When evaluating hybrids, especially those that could have a future in our commercial lineup, we look at many different layers of nutritional testing. There is no singular, magic test that suggests a hybrid will feed exceptionally. But when we look at and combine dozens of different tests, some proprietary, we can begin to gain an understanding of how that hybrid will feed to your animals.

CONVENTIONAL & ORGANICS

Masters Choice believes the key to both feed quality and yield is through plant genetics. We also believe genetic potential can be altered by a number of factors, like weather, disease, and insect pressure. As a seed corn provider, it is our job to provide growers with the highest quality genetics for their operation, with the greatest potential for yield and quality. This is why we make our best genetics available as conventional, and often certified organic, instead of offering those top genetics only as traited varieties. Our goal is to breed and select hybrids that will increase efficiency on any type of operation or management style, putting the tools for success in the hands of the farmer without limiting his available options. This has been our position from day one, and it will continue to be how we operate going forward.

Request a copy of the 2018 MC Hybrid Guide for more information.

KINGFISHER - A STRICTLY NON-GMO BRAND

DIGESTIBLE ENERGY
KingFisher®

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

Request a copy of the 2018 KingFisher Hybrid Guide or visit the website *KingsAgriSeeds.com* 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 42C20	92 days
KF 43C40	93 days
KF 49C60	99 days
KF 52C20	102 days
KF 52C60	102 days
KF 53C60	103 days
KF 56C30	106 days
KF 58C80	108 days
KF 61C40	111 days
KF 63C10	113 days
KF 67C20	117 days
KF HIGH OIL	
HYBRID	RELATIVE MATURITY
KF 56H91	106 days
KF 58H82	108 days
KF 59S30	109 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.

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.

Also available in organic.

ILLINI 2880NA (Untreated)

Late maturity group II conventional soybean variety with aphid and SCN resistance. 2.8 maturity.

ILLINI 3279NA (Untreated)

Early group III conventional soybean variety with SCN Resistance. 3.2 maturity.

ILLINI 3849N (Untreated)

Late Maturity Group III Conventional Soybean Variety with SCN Resistance. 3.8 maturity.

TECH/ROUNDUP READY

Seed 140-175K seeds/acre.

SP 32R25 NEW

3.2 RM maturity bean, Roundup Ready RR2.

SP 36R24

3.6 maturity bean, Roundup Ready RR2.

SP 36R25 NEW

3.6 RM maturity bean, Roundup Ready RR2.

SP 39R22

3.9 maturity bean. Roundup Ready RR2.

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.

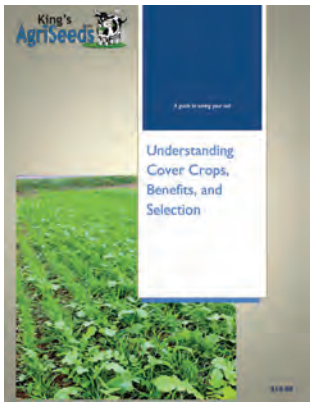
	Seed Rate	Comment
King's Certified Organic Mixtures	***Custom mixes are available but arrangements must be made in advance.***	
Dairy Green	25 to 35	A mix that will thrive on good to moist soil. Page 9
Sale Topper	15 to 20	An easy to dry orchardgrass, timothy mixture. Combine with your favorite alfalfa! Page 8
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 12
Alfalfa		
See page 13 for our OC coated alfalfas		
Clovers		
Premium Clover Mix	4 to 6	A balanced mixture of red and white clovers. Page 19
Liflex White Clover	4 to 8	A new, very winter hardy white clover with good density and health. Page 19
Renegade Red Clover	4 to 8	An improved red clover. Page 20
Rivendel White Clover	4 to 8	A small leaved white clover that is very persistent in pastures. Page 19
Common Medium Red Clover	4 to 8	A short lived, lower cost red clover. Page 19
Mammoth Red Clover	4 to 8	A single cut red clover that is best for cover cropping applications. Page 19
Milvus Red Clover	4 to 8	A new red clover that is long lived and has some spreading tendencies. Page 20
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 49
Meadow Fescue		
Minto	35 to 45	High yielding European type. Page 22
Ryegrass/Intermediate/Festulolium	***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 21
Premium	30 to 50	A later diploid with superior winter and summer hardiness. Page 24
Allegro Blend Italian	40 to 50	A European tetraploid-diploid blend. Page 28
TD Blend Perennial	40 to 50	A European tetraploid-diploid blend. Excellent for overseeding. Page 24
Tivoli Perennial	40 to 50	High sugar, late maturing tetraploid with excellent productivity. Page 24
Pollanum	35 to 40	An annual with less winter hardiness but more early yield. Page 28
Perun (Festulolium)	30 to 40	An Italian ryegrass type festulolium. Very strong spring and fall growth. 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 24
Lipalma	35 to 45	Even yielding, traffic tolerant Tall Fescue. Page 24
Timothy		
Climax	10 to 15	The old standard variety for the Northeast USA mid maturity. Page 25
Lischka	10 to 15	A new early maturity European type with better yield distribution. Page 25
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 35
AS 9301 Sudangrass	25 to 30	Exciting newer sudangrass that dries down quickly with superb quality and yield. Page 36
Japanese Millet	10 to 20	A fast growing, finer stemmed millet for cover crop or forage. Page 37
TriCal 815	125 to 150	Very leafy, highly digestible variety. Page 29
Cereal Rye	168	High yielding forage and cover crop. Page 29
Oats	100 to 125	A tall, leafy forage oat. Page 28
Arvika Peas	80 to 100	A high quality purple flower forage pea. Page 30
KF Sugar Pro 55	40 to 60	A high yielding dry stalk BMR 6 sorghum sudan. Page 36
Lifago Buckwheat	35 to 45	A small seeded buckwheat for cover crop programs. Not for grain or attracting pollinators. Pg 50
360 Soybean	140 to 175K/ acre	3.6 maturity. High end conventional soybean with great agronomics and overall yield. Page 43

See Masters Choice Hybrid Guide for complete listing of Organic Hybrids

Buckwheat

COVER CROPS

Ask about our cover crop manual.



MAKING A DIVERSE MIX

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

By: Dave Wilson, Penn State Extension Educator

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

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

Seed 10 to 15 lbs/acre.

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

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 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

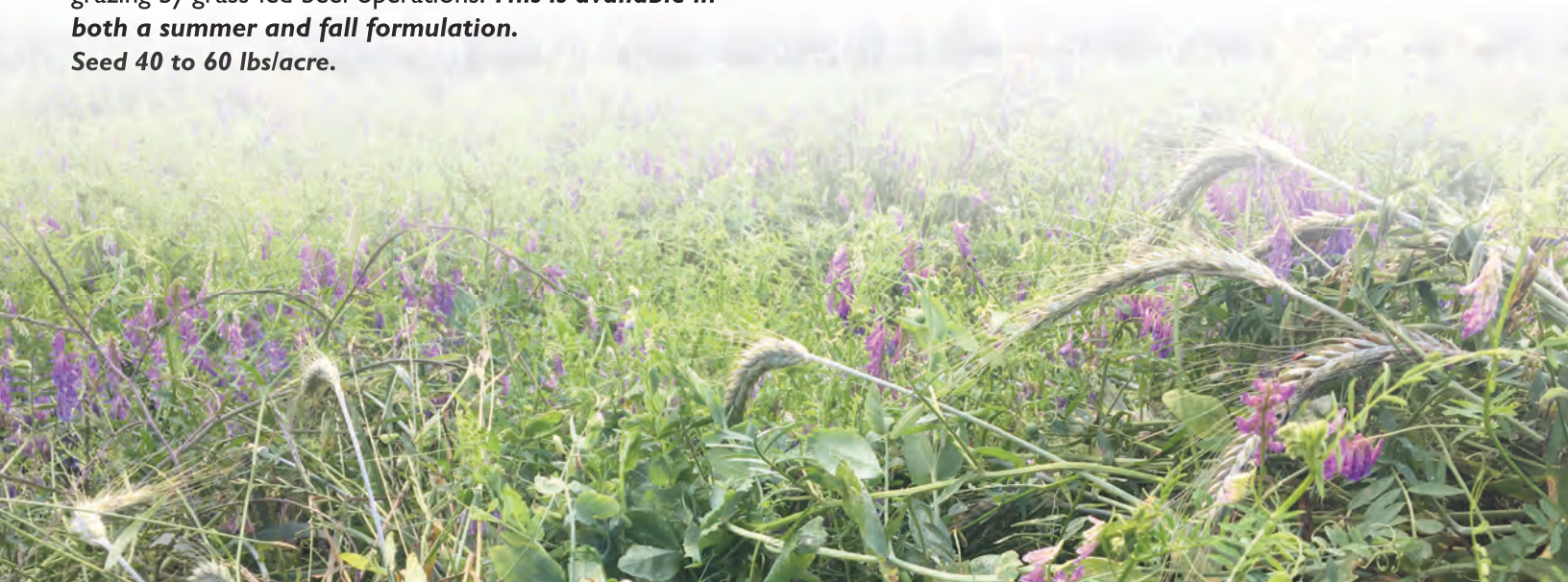
A mixture of spring peas, oats and hairy vetch. Best seeded in late winter to early spring. Once soil warms up, this mix germinates and grows rapidly to produce quick spring nitrogen. The spring oats act as a nurse crop and then provide support for the peas and hairy vetch. This mix, once established,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

Can also be seeded in the late summer. Seed 125 lbs/acre.

SUMMER SOLAR

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 conservation and soil builder.
Seed 4 to 20 lbs/acre.

WHITE CLOVERS
Alice White Clover, Liflex, RegalGraze Ladino Clover, Ladino White Clover "VNS", Dutch White, Alsike.
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. ***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.***

BALANSA
Fixation Balansa 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. ***Now available in YJ coated.***
Seed 3 to 8 lbs/acre.

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

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 drier conditions, high biomass producer, and good smother crop. Use as a green manure/cover crop to provide both organic matter and to fix nitrogen during the period between summer and the winter cash crop. Produces significant biomass in 6-7 weeks. 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.

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.***

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.***

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.***

PEREDOVIK SUNFLOWERS

Sunflowers have many soil benefits that include: strong taproots penetrating vertically downward, widely spreading branch roots; enlarged taproot eventually grows many laterals. High biomass producer, tall growth and beautiful large blooms that attract pollinators and beneficial insects.
Note: Plant early summer. Seed 40 lbs/acre.

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.***

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

COOL SEASON

ANNUAL RYEGRASS

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

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. 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. ***Seed 100 to 150 lbs/acre.***

BEEHAPPY PHACELIA NEW

Beehappy is a late flowering type. Excellent for beneficial insects and works well as a cool season soil builder. Planted in spring it will bloom in late spring. Planted in late summer it will bloom in the fall. 60 days to bloom. 4-6 week bloom. ***Note: Seed 8 to12 lbs/acre at no more than 1/4 inch deep***.

WARM OR COOL SEASON

DAIKON RADISH

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

FORAGE MANAGEMENT

RUMINANT NUTRITION

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

FORAGES FOR DAIRY

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

THE BENEFITS OF HIGH FORAGE DIETS

Lower Feeding Costs

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

Healthier Cows

A balanced diet high in forages decreases

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

Better Nutrient Management

If home grown, high yielding, digestible forages are fed

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

Higher Farm Profits

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

UNDERSTANDING YOUR FEED ANALYSIS REPORT

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

uNDF240- Undigestible NDF.

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.

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!

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.

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.

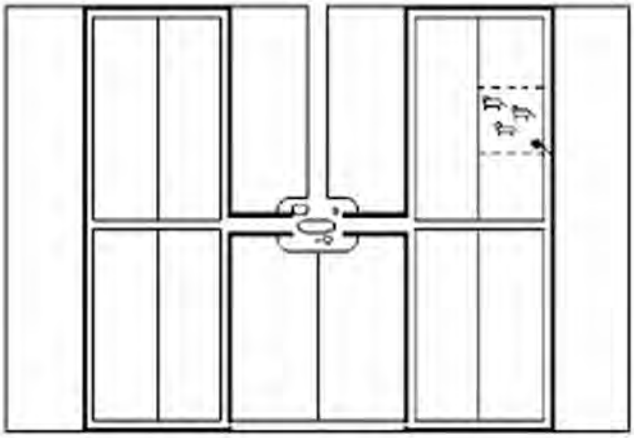
H) Hybrid Farming: You can graze approximately ½ acre or more per cow and still grow your own crops. A couple notes of caution:

#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.

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.



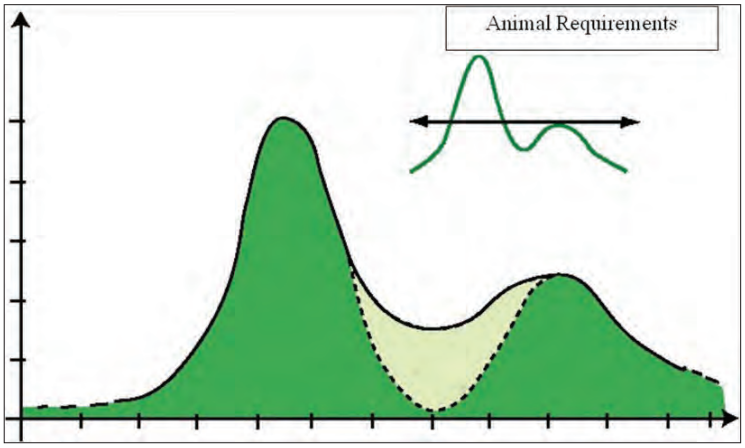
- The farm buildings ideally should be located in the center of the grazing land base, which reduces the amount of walking by the herd and you.
- The lane network creates major paddocks that are rectangular for field work but can easily be subdivided with polywire (dashed lines) to make daily grazing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

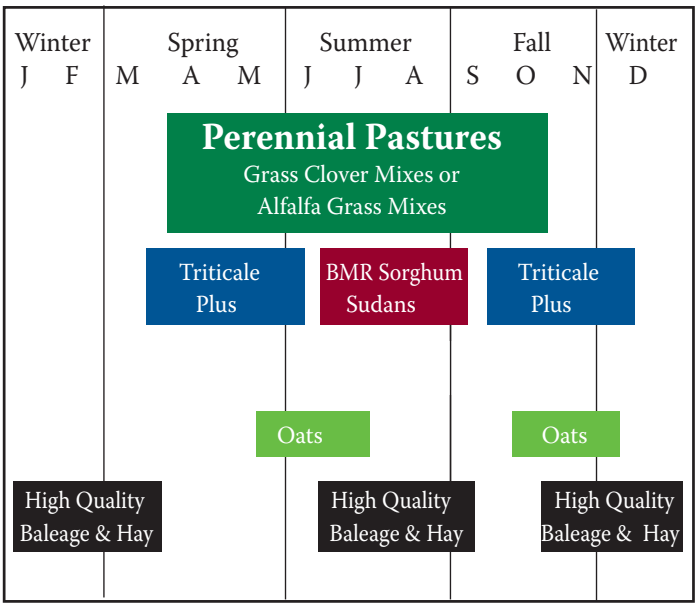
Stocking rate is a critical factor in profitability and depends on many factors. Those factors include:

- 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



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.

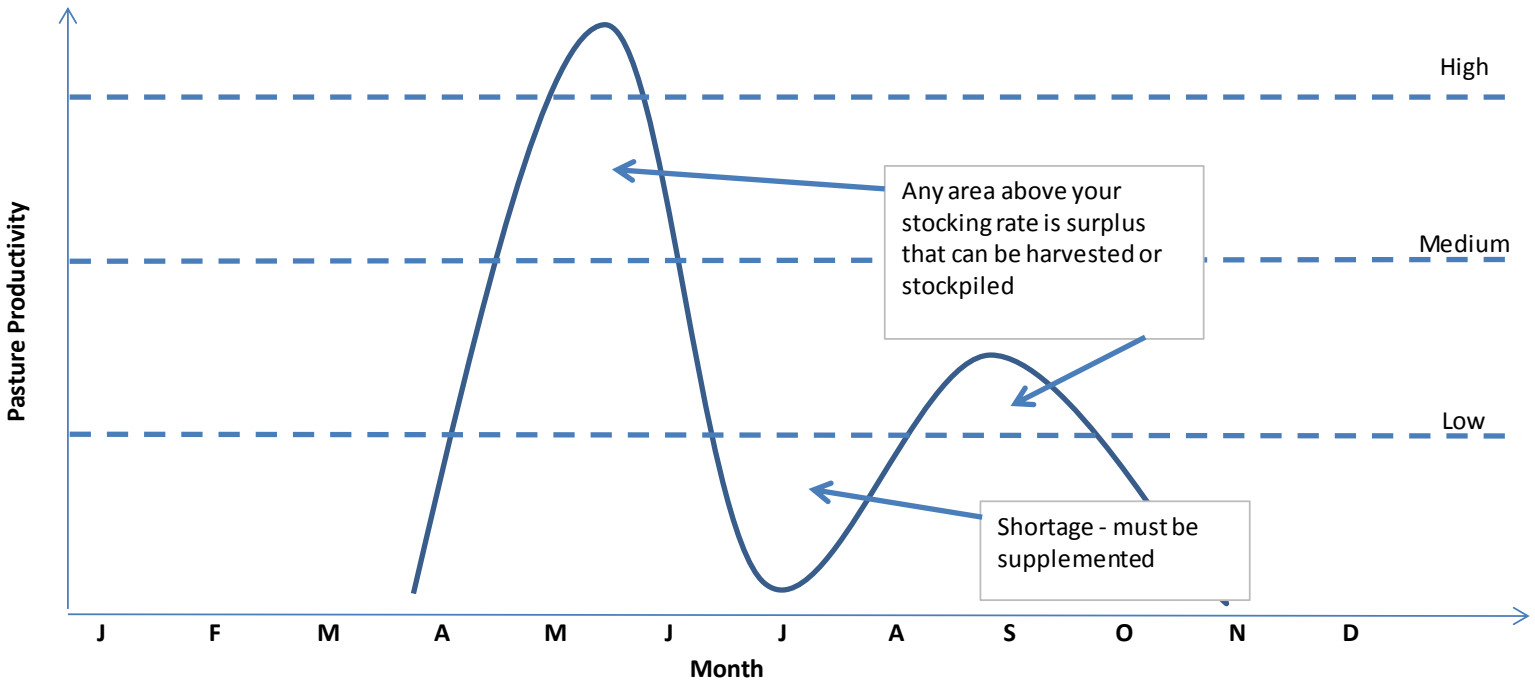
MANAGING PERENNIALS FOR QUALITY

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.

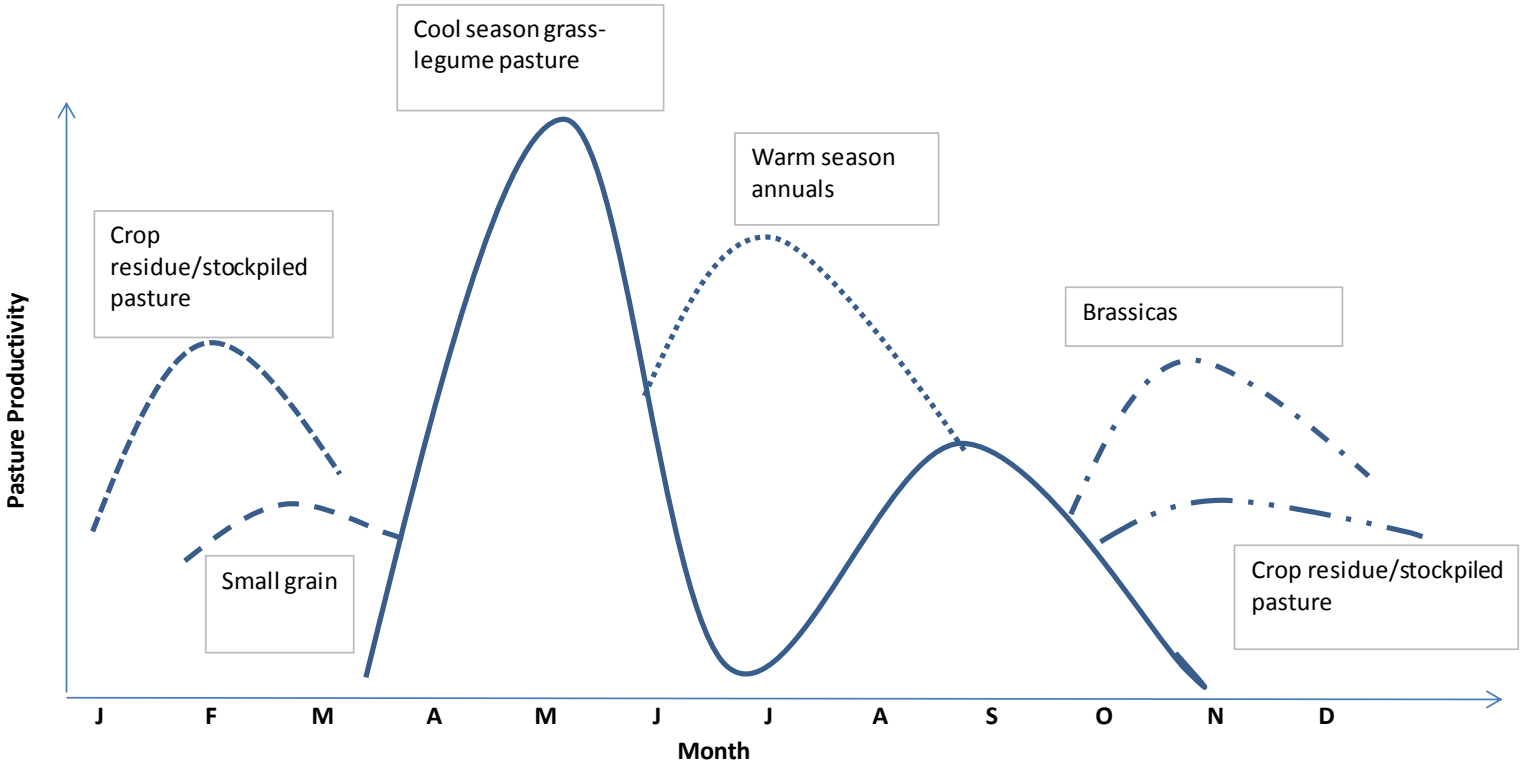
Incorporate Annuals

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)



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.

MANAGING FIELDS IN THE OFF SEASON

By Joy Beam

Regular soil testing followed by liming and fertilizing according to recommendations is arguably the one management practice that will have the greatest long-term effect on production per acre. It should be the first dollar spent when striving to maximize your land's productivity, help your crops reach their potential, and optimize the cost-effectiveness of your fertilizer applications. It is a relatively straight forward practice; however, most pastures and a significant percentage of hay acreage do not receive regular fertilization. When the hustle of the growing season winds down in the fall, you have the perfect opportunity to test your soil and develop a fertility strategy for the next crop year. Please also keep in mind that if your fields need limed, it is critical to test your fields early, so that there is time to lime before the next growing season. It is recommended that perennial pastures, hay fields, and cash crop fields are tested on a three year cycle. Consider testing a third of your fields each year.

The actual art of soil testing requires specific sampling, handling, and shipping practices to ensure that the half-pound sample is an accurate representation of the entire field. If you are not familiar with these, we recommend working with a local business that provides these services. There are many options, including land grant state universities or local private companies that can either run soil tests or have arrangements to have them done. Once you choose a lab, however, stick with that lab so you are working from the same baseline for comparison. Ask your dealer or the King's office for a qualified testing service that can show you the appropriate random and repeatable sampling techniques. Remember to use a plastic pail when collecting and handling samples.

Also remember that unless soil test results are opened and evaluated, they are absolutely worthless. Use your investment to capitalize on the great opportunities for improving forage and crop production that fertilization provides!

Cover crop popping through fodder

SOIL FERTILITY FOR FORAGE PRODUCTION

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

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

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

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

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

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

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

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

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

Points to Remember

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

FOR IDEAL RANGES FOR VARIOUS AMENDMENTS VISIT -

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

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

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 74-75 for Tips on Seeding Individual Products

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.

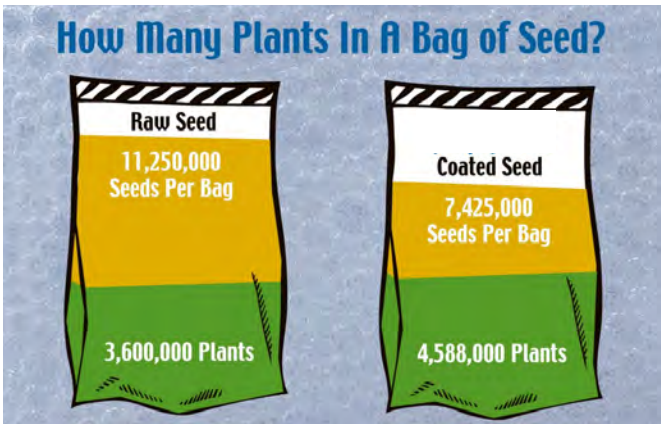
Example Farm 1. Corn silage and alfalfa on productive soils. Suggested addition: Add a double crop small grain such as rye or triticale. Typically this crop is planted after corn silage harvest but could also be no-tilled into thinning alfalfa stands. Corn planting is typically delayed by the winter 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.

WHY WE COAT SEED



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

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

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

KingFisher Surestand Hydro Brand

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

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

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

KingFisher Surestand Hydro CT Contains -

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

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

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

Yellow-Jacket (Barenbrug brand legumes and grasses)

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

WHY WE COAT SEED

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

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

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

Nitro-NP™ for Grasses:

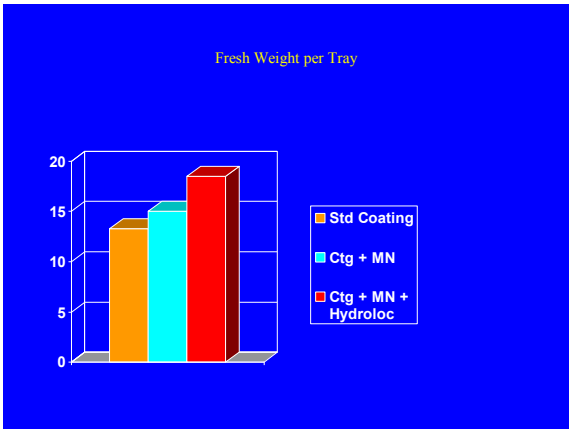
- Water absorbing coating increases seedling germination.
- Phosphorus quickens root hair development. Healthier roots mean more vigorous and competitive plant growth.
- Slow-release nitrogen feeds new shoots and leaves.
- Not approved for organic use.

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

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

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

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



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

Test Proven: More Plants Per Bag

Coated vs. Uncoated Seed

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

Source: Cornell University

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	1/8" to 3/8"	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"
Balancer	4 to 7 yr	G,WH, H	Medium		Large	1/8" to 3/8"	3" to 4"
Creekside	4 to 7 yr	G,WH	Late	25	Large	1/8" to 3/8"	3"
Grass Maxx	4 to 7 yr	WH, H	Late	25	Large	1/8" to 3/8"	3" to 4"
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"
Northern Energy	3 to 6 yr	G,WH, H	Medium	30 to 35	Large		
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
5	5	5	5	4	5	4	4	3	2	5
4	4	4	4	3	5	3	2	2	5	5
4	4	4	4	4	4	4	4	3	2	4
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
5	3	4	3	3	3	2	3	3	5	4
4	4	4	1	4	4	4	2	3	4	3
4	3	4	3	3	3	3	1	4	5	4
5	4	5	5	3	5	4	4	3	2	5
4	3	4	4	4	4	3	3	3	4	3
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	NA
5	NA	1	3	3	4	NA	2	1	3	3
5	NA	1	3	3	4	NA	1	1	NA	NA
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	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

FIND A KING'S DEALER NEAR YOU

CONNECTICUT

NEW LONDON COUNTY

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

TOLLAND COUNTY

Hillside Farms	Mansfield Center	(860) 234-1605
Pleasant View Farms, Inc	Somers	(860) 803-0675

DELAWARE

KENT COUNTY

Millard Dixon	Dover	(302) 632-6460

SUSSEX COUNTY

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

MAINE

KENNEBEC

Fedco Seeds Inc	Clinton	(207) 426-8247

OXFORD COUNTY

Paris Farmer's Union	South Paris	(207) 743-1291

PENOBSCOT COUNTY

Keith Hines	Bradford	(207) 717-9558

MARYLAND

ANNE ARUNDEL COUNTY

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

CARROLL COUNTY

Good Friday Farm	Westminster	(443) 277-8489

FREDERICK COUNTY

Rights of Man Farm, LLC	Ijamsville	(240) 674-2733
Bought The Farm, LLC	Thurmont	(301) 271-3167

GARRETT COUNTY

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

HARFORD COUNTY

Deep Creek Farm	Whiteford	(410) 937-8842

KENT COUNTY

C. Prickett Farms	Kennedyville	(443) 480-1977

ST. MARY'S COUNTY

Millwood Seeds	36680 Millwood Lane, Mechanicsville, MD

WASHINGTON COUNTY

Travis Divelbiss	Clear Spring	(240) 291-8130

MASSACHUSSETTS

BARNSTABLE COUNTY

Southcoast Agri Services	Cataumet	(774) 263-0017

PLYMOUTH COUNTY

Progressive Grower Inc	West Wareham	(774) 678-0097

NEW JERSEY

BURLINGTON COUNTY

Fisher's Farm and Machine	Southampton	(609) 234-8853

GLOUCESTER COUNTY

Pine Entrance Farm	Harrisonville	(856) 207-5943

SALEM COUNTY

Timothy Bradway	Salem	(856) 498-6250
Turkey Creek Farm	Elmer	(856) 498-9583

SOMERSET COUNTY

Lima Family Farms	Hillsborough	(267) 784-6999

SUSSEX COUNTY

Jeff Vander Groef	Sussex	(862) 266-5843

NEW YORK

ALLEGANY

Country Crossroads Feed & Seed	Andover	(607) 478-8858
Enders Supply	Caneadea	(716) 498-2616

CATTARAUGUS COUNTY

Pierce Milling Inc	Delevan	(716) 492-2740
Wild Acres Family Farm	Great Valley	(716) 969-4386

CAYUGA COUNTY

Eldred Hay, Grain & Seed, LLC	Auburn	(315) 784-5035
Dwight Martin	Moravia	(315) 515-8484
Wilmer Horning Seeds	Port Byron	(315) 776-9048

CHAUTAUQUA COUNTY

NYP Ag Services, Inc	Cherry Creek	(716) 296-5555
Raber Farm Supplies	2384 Falconer-Frewsburg Rd, Jamestown, NY	

CHENANGO COUNTY

John Kemmeren	Bainbridge	(607) 967-7440

CORTLAND COUNTY

Mara Seeds Inc	Marathon	(607) 849-7871
Valley Seed	Truxton	(607) 745-9223

DELAWARE COUNTY

Frank Albano Jr	Stamford	(607) 287-8505

ERIE COUNTY

Shamel Milling Inc	East Concord	(716) 592-7700
Gramco, Inc	Springville	(800) 724-1292

FRANKLIN COUNTY

Jake G Stutzman III	Burke	(518) 497-6075
Jacob Hershberger	431 Snell Rd. North Lawrence, NY 12967	

GENESEE COUNTY

Carolina Eastern Crocker, LLC	Pavilion	(585) 584-3036

GREENE COUNTY

Jim Van Orden	Catskill	(518) 943-2894

JEFFERSON COUNTY

Sam Weaver	29841 Herbretch Rd, Watertown, NY

LEWIS COUNTY

Andrew Roggie	Lowville	(315) 376-3298

LIVINGSTON COUNTY

Maxwell Farms	Geneseo	(585) 447-8430

MADISON COUNTY

Steven Hershberger	Canastota	(315) 697-9589

MONTGOMERY COUNTY

Argersinger Road Seeds	568 Argersinger Rd, Fultonville, NY

ONEIDA COUNTY

Harold Schrock	Deansboro	(315) 723-1681
Locust Grove Seeds	Oriskany Falls	(315) 601-7571
Vernon Farm Supply	Vernon	(607) 427-6287

ONONDAGA COUNTY

Tully Ag Center, LLC	Tully	(315) 696-6400

ONTARIO COUNTY

Marlin Horst	Stanley	(585) 509-6487

ORANGE COUNTY

Robert Stap	Pine Bush	(845) 744-5734

ORLEANS COUNTY

Roy Zimmerman	Lyndonville	(716) 559-3089
Reg Overholt Farm Seed	Medina	(585) 798-3490

OTSEGO COUNTY

West Wind Farm	Cherry Valley	(978) 618-3159
David Yoder	Richfield Springs	(315) 858-9971

RENSSELAER COUNTY

Scott Michel	Valley Falls	(518) 269-2222

SCHENECTADY COUNTY

Profitable Ag Concepts, LLC	Schenectady	(518) 929-1734

FIND A KING'S DEALER NEAR YOU

SENECA COUNTY
Lynford Wise — Romulus — (315) 952-7461
Cayuga Ag — Trumansburg — (607) 227-0836
Christy Schmucker — 1190 Whiskey Hill Road, Waterloo
ST. LAWRENCE COUNTY
Jacob Hershberger — 431 Snell Rd. North Lawerence, NY 12967
McMahon's Natural Products — Winthrop — (315) 328-5808
STUEBEN COUNTY
Bovine Supply Plus — Hornell — (717) 991-4516
TIOGA COUNTY
Ward & Vanscoy Inc — Owego — (607) 727-4051
TOMPKINS COUNTY
Cayuga Ag — Trumansburg — (607) 227-0836
WYOMING COUNTY
The Funny Farm — Varysburg — (585) 322-0694
YATES COUNTY
David Geertson — Branchport — (315) 595-2537

PENNSYLVANIA
ADAMS COUNTY
Bruce Detweiler — East Berlin — (717) 259-7361
Profitable Forage Systems — Littlestown — (717) 451-7938
BEDFORD COUNTY
Donald Fair Nutritional Consulting Inc. Bedford — (814) 624-0776
Martin Seeds — Hopewell — (814) 652-6456
BERKS COUNTY
Hillside Consulting — Mohnton — (717) 314-3399
Productive Farm Products — Sinking Springs — (610) 603-6031
BERKS COUNTY (EASTERN)
Charles Marsch — Green Lane — (267) 718-0601
BLAIR COUNTY
Mill Hill Farm Supply — Williamsburg — (814) 832-3458
BRADFORD COUNTY
Brian Moyer — Towanda — (570) 265-0470
BUTLER COUNTY
Kevin Colteryahn — Prospect — (724) 822-2493
CAMBRIA COUNTY
Cresson Feed Mill, Inc. — Cresson — (814) 886-4171
CARBON COUNTY
Hickory Valley Farms — Lehighton — (610) 392-8685
CENTRE COUNTY
Willow Bank Seeds — Howard — (814) 383-4529
Centre Seeds — Rebersburg — (814) 349-8386
CHESTER COUNTY
Glen Valley Farm — Atglen — (484) 678-5707
Hougar Farms, LLC — Coatesville — (610) 656-7327
Cochranville Ag Service, LLC — Cochranville — (610) 869-9640
CLARION COUNTY
Reinford Farms — New Bethlehem — (814) 229-2096
CRAWFORD COUNTY
Lynwood Heagy — Titusville — (814) 827-3371
Milky Way Meadows — Centerville — (814) 795-4788
Westford Milling — Westford — (724) 927-2221
CUMBERLAND/FRANKLIN COUNTY
Harold Sensenig — Shippensburg — (717) 729-8098
DAUPHIN COUNTY
Fisher's Farm Seeds — Elizabethville — (717) 362-9038
Sunshine Farms — Grantville — (717) 571-3711
FAYETTE COUNTY
Kenneth Schrock — Vanderbilt — (724) 366-0199
FOREST COUNTY
Long Acres Farms — Tionesta — (814) 744-8454
FRANKLIN COUNTY
Horstdale Farm Supply — Greencastle — (717) 597-5151
HUNTINGDON COUNTY
Millcreek Consulting — Todd — (609) 760-3030
INDIANA COUNTY
PM Grain — Cherry Tree — (814) 659-4708
JEFFERSON COUNTY
James London — Punxsutawney — (814) 952-9732
JUNIATA COUNTY
Agronomy Center — Thompsontown — (717) 535-5151
Beidler Ag, LLC — Liverpool — (570) 765-6131
LANCASTER COUNTY
Carl Martin — Ephrata — (717) 468-7799
King's Consulting — Gap — (717) 278-9237
Landis Weaver — Kirkwood — (717) 529-2609
Nelson Habecker — Lancaster — (717) 285-5738
Meadow View Seeds — Leola — (717) 656-7993
Farm It Ag, LLC — Manheim — (717) 314-4006
Matt Hess — New Providence — (717) 468-0542
Drumore Seeds — Quarryville — (717) 284-3867
Stephen Aument — Quarryville — (717) 548-2373
Weaver's Seed & Supply, LLC — Quarryville — (717) 587-4640
Lancaster Ag Products — Ronks — (717) 687-9222
LAWRENCE COUNTY
Burns Angus Farm — New Wilmington — (724) 730-0738
Valley View Tack Shop — 404A S. Stone Base Rd, New Wilmington, PA
LEBANON COUNTY
Lebanon Valley Ag Products — Myerstown — (717) 949-2486
MIFFLIN COUNTY
Matt Metz — Mill Creek — (717) 348-1264
MONTGOMERY COUNTY
Charles Marsch — Green Lane — (267) 718-0601
NORTHUMBERLAND COUNTY
Norm's Farm Store — Watsontown — (570) 649-6765
PERRY COUNTY
Green Park Seeds — Loysville — (717) 829-1579
SCHUYLKILL COUNTY
Productive Farm Products — Pine Grove — (717) 943-0457
Productive Farm Products — Schuykill Haven — (717) 222-4116
SNYDER COUNTY
Stanley Stahl — Port Trevorton — (570) 274-3650
SOMERSET COUNTY
Spring Valley Seeds — Salisbury — (814) 662-4183
UNION COUNTY
Lynn S. Martin Feed & Seed — Lewisburg — (570) 412-3250
George Stoltzfus — Millmont — (570) 898-0382
WASHINGTON COUNTY
Contractors Connection — Washington — (725) 228-8865
WESTMORELAND COUNTY
Lone Maple Ag Services, Inc — New Alexandria — (724) 668-7358
YORK COUNTY
Hakes Farm & Seed Service — Red Lion — (717) 244-2754

VERMONT
FRANKLIN COUNTY
G. Boucher Fertilizer Inc — Highgate Center — (802) 868-3939
WINDHAM COUNTY
Miller Farm, Inc — Vernon — (802) 380-3862

FIND A KING'S DEALER NEAR YOU

VIRGINIA

CAMPBELL COUNTY
Long's Farm Supply ..... Brookneal..... (434) 376-5901

CLARKE COUNTY
CFC Farm & Home Center ..... Marshall ..... (540) 364-1533

CULPEPER COUNTY
CFC Farm & Home Center ..... Culpeper ..... (540) 825-2200

DINWIDDIE COUNTY
B.T. Hargrave & Co. ..... Dinwiddie..... (804) 469-3221

FAUQUIER COUNTY
CFC Farm & Home Center..... Warrenton..... (540) 347-7100

FLOYD COUNTY
Seven Springs Farm ..... Check..... (800) 540-9181

FRANKLIN COUNTY
Green Sprig Ag Services ..... Rocky Mount..... (540) 420-1639

FREDERICK COUNTY
Shenandoah Seed ..... Winchester..... (540) 327-9326
Clearbrook Feed and Supply Inc. .. Clearbrook ..... (540) 662-2749

KING & QUEEN COUNTY
PA Country Equipment..... St. Stephens Church... (804) 769-4137

PULASKI COUNTY
Blair Sanders..... Dublin ..... (540) 994-0085

RAPPAHANNOCK COUNTY
CFC Farm & Home Center ..... Washington..... (540) 987-8555

ROCKBRIDGE COUNTY
Rockbridge Farmers Coop, Inc. Lexington ..... (540) 463-7381

ROCKINGHAM COUNTY
Sunny Ridge Supply..... Dayton ..... (540) 879-3944

STAFFORD COUNTY
Agri Service LLC..... Stafford..... (540) 752-2667
CFC Morrisville..... Bealeton ..... (540) 439-3254

WARREN COUNTY
SS Front Royal Coop, Inc..... Front Royal ..... (540) 635-3118

WASHINGTON COUNTY
Clayton Thompson..... Abingdon..... (423) 335-8265

WEST VIRGINIA

GREENBRIER COUNTY
Heritage Equipment..... Beckley..... (304) 254-7827
Perk Farm Organic Dairy..... Frankford..... (304) 667-3529

HARDY COUNTY
Mountainview Veterinary Services Inc..Moorefield..... (304) 530-5757

Northern Region
Cayuga Ag Enterprises - Rod Porter
(607) 227-0836
rodporter@kingsagriseeds.com

Central Region
David Hunsberger
(814) 880-5186
davidhunsberger@kingsagriseeds.com

For additional support, please contact King's AgriSeeds Office at (717) 687-6224 or Office@KingsAgriSeeds.com

MYCO SEED TREAT (MST)

- Organic, non-GMO microbial seed stimulant that includes beneficial bacteria and fungi
- Microbes live in symbiosis with the plant root and improve soil nutrient cycling
- Mycorrhizal fungi extend the reach of the plant's roots for nutrient uptake
- Boosts initial growth and works throughout the season to improve nutrient uptake, while colonizing existing root system
- Enhanced seedling vigor
- Uniform stands

Myco Seed Treat sets the plant up with robust root growth, a benefit that carries through to increased yield. Across the board, Myco Seed Treat applications consistently offer farmers a substantial ROI.

MYCO SEED TREAT: (commonly referred to as MST) is a dry blend of plant-beneficial bacteria and fungi (including Mycorrhizae) accompanied by a nutrient package to support them during their initial stages of growth. These microorganisms contribute to increased soil nutrient cycling, as well as increased productivity.

SUGGESTED USES: May be used on all crops. Commonly mixed into seed box on planter.

RECOMMENDED RATE: 4 – 8 oz / 100# seed

STORAGE AND HANDLING: Keep product dry. Store out of direct sunlight. Store below 90°F. When using dry products, always use proper safety equipment (dust masks, goggles, gloves, etc.) Myco Seed Treat meets National Organic Program requirements for organic production. Myco Seed Treat contains NO Genetically Modified Organisms. This product is intended for use according to an approved organic system plan. It is each certified organic grower's responsibility to get approval from his/her certifying agency before using this product. Because of differences among the various certifying agencies, and differences between NOP/EU/JAS/COR ingredient lists, AgriEnergy Resources cannot guarantee that our products will be allowed by your certifier on your farm.

When using dry products, always use proper safety equipment (dust masks, goggles, gloves, etc.) Myco Seed Treat meets National Organic Program requirements for organic production. Myco Seed Treat contains NO Genetically Modified Organisms. This product is intended for use according to an approved organic system plan.

AgriEnergy Resources®

Photos and material courtesy of AgriEnergy Resources.

King's AgriSeeds Inc.

1828 Freedom Rd, Suite 101
Lancaster, PA 17601
(717) 687-6224
KingsAgriSeeds.com

High Energy Forages and Soil Building Crops

King's AgriSeeds, Inc. is now headquartered at 1828 Freedom Rd, Suite 101, Lancaster PA
We are open for business and ready to serve!