



Future-Proof Your Farm

Resources for Successful Cover Cropping

Training for Farmers & Agronomists

Steve Groff



NFWF



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Steve Groff





Steve Groff Fast Facts:

- Designed the first cover crop Roller-Crimper in North America.
- Developed the Tillage Radish.
- Started the first company in the world exclusively selling cover crop seed.
- First commercial vegetable farm to no-till transplant tomatoes.

Consulting for:

- Wrangler
- Stroud Water Research
- Chesapeake Bay Foundation
- NRCS
- Rodale Institute
- Penn State University
- University of MD
- Bonduelle

Writing for:

- American Agriculturalist
- Lancaster Farming

International speaking & consulting:

- Bulgaria, Hungary, Australia, Romania, Belgium, France, Germany, South Africa, Uruguay, Argentina

I love helping:

- Farmers, with their cropping systems
- Agronomists, with their training
- Seed companies, with new mix formulation
- Educators, in the field & within institutions

Core Philosophies:

- Soil is meant to be covered.
- Planning and understanding are essential to farming success.
- "Why" and "How" are essential ... Concepts plus practical instruction.
- Treat your cover crops like your cash crops!

We have fields at our farm that have not seen tillage equipment in 37 years. My interest in cover crops started with knowing that soil left uncovered easily erodes into places like our nearby Chesapeake Bay.

Working with university researchers like Dr. Ray Weil from the University of Maryland, however, gave me an even greater respect for what good management can mean in terms of the soil's response to practical, common sense approaches to building soil health.

Cover Cropping Approach

My basic philosophy and their outcomes are simple.

1. Soil is meant to be covered. There must be ground cover and living roots in the soil to maximize ecological benefits.
2. Strategic planning and understanding tactical options is paramount for a farmer's success.
3. Once a farmer is committed to the "why"– the concepts of using cover crops, he immediately needs the "how"–the practical insights to make cover crops work in his specific operation.
4. Treat your cover crops like your cash crops! There is no mindset more powerful when it comes to making cover crops pay for a farmer.

The Bigger Picture

The trajectory of agriculture has already been set. Food suppliers are already being mandated to source food from farms that operate with sustainable and environmentally safe practices.

And that begins with successful cover cropping and soil health practices.

Excelling in this field is no longer an option. It is essential for positioning yourself as an indispensable part of the agricultural supply chain.

Your confident future and long-term security is rooted in expert education from those who are effectively doing what you want to accomplish.

Knowing how to cover crop well will have incredible down-stream effects on your soil, your crops and your ability to sell to the market.

Steve Groff

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10% COVER CROP CHALLENGE

*Increase your cover crop acreage by 10%
WITHOUT costly mistakes!*



There is no magic recipe for your cash crops. They require trial, error and a great deal of attention.

Cover crops are the same way! There is not a prescription.

*But once you understand the **guiding principles and strategic mindset** for your cover cropping plan, you'll achieve much greater success!*

Our 10% challenge is for:

- farmers trying cover crops *for the first time*.
- farmers looking to take their cover crops *to the next level*.
- consultants, trainers or educators seeking *a specific plan for their clients*.

Mindset Matters

Treat your cover crops like your cash crops™. It is absolutely PARAMOUNT to have this mindset for success! Think about EVERYTHING you do to prioritize your cash crops: planted on time, proper seeding equipment, and the consistent observation that you do throughout the growing season.

Cash cropping knowledge has been distilled over generations. Cover crop management is brand new for many, so grasping the proper perspective is essential. You are NOT yet a cover crop farmer when you buy a bag of cover crop seed! You need to have an “all-in” attitude. A casual application is doomed to fail.

Prepare to Fall Short (at least a little)

In all candor, recognize that just as cash crops occasionally do not meet expectations, so also cover crops may not perform to your goals in some years. Cover crop management needs to be thought of in the context of a 10-year plan. This is an investment. *You are building long-term value into your soil.*

Now, with the most important part laid out, *are you ready to commit to the following 10 strategies for increasing your cover cropping acres by 10%?*

10 Strategies to Increase your Cover Crops by 10%

- 1. Determine the objectives** you are trying to accomplish by planting cover crops.
- 2. Define your planting window.** What can you do to create a wider planting window? (Interseeding, short season corn, or other?) Which species can be planted in your cover cropping window? Check with experienced local university extension/ NRCS, or SUCCESSFUL cover cropping farmers in your area.
- 3. Check with NRCS offices** for CSP, EQIP or other cover crop programs available. Most of these programs require sign-up months in advance.
- 4. Develop a cover crop establishment plan.** Drill and precision planting has the most consistent success. Aerial and broadcast can work if weather cooperates. *Use the detailed form to fill out for your own farm on page 7 in this notebook.*
- 5. Consider adjusting your herbicide program** to accommodate cover crops.

Consult with local herbicide reps or refer to Google: *Penn State University Corn Herbicides and Rotation to Cover Crops*
- 6. Ensure a proper setup on cash crop planter** when planting into cover crop residue. Can your planter handle cover crop residue? If planting green, is your planter set up correctly?
- 7. Set up a cash crop fertility plan.** For nitrogen-loving cash crops like corn, planted after cover crop grasses like cereal rye, triticale or annual ryegrass, you will need sufficient nitrogen on or very near the seed at planting. Legume cover crops can allow lower rates of nitrogen in corn but be cautious in adjusting fertility too quickly. Doing your own research in fertility rates is ideal and not hard to do with a little time and effort.

8. Set up a management/scouting plan. As with any new practice, intentional scouting is critical. It's the best way to learn and tweak strategies for the years to come. Use a narrow shovel to dig, observe and compare your soil characteristics where cover crops are planted vs. where they are not. Discuss your intentions with your crop scout or consultant. If they do not value the use of cover crops or do not demonstrate a commitment to your increased cover crop acres, you will have to make a decision on the role they play in your operation.

9. Set up a termination plan: Do you understand how to control the species you planted? Some require special attention. Ask local chemical rep or farmer who is experienced with terminating cover crops. Annual ryegrass requires special attention. What is your Plan B in case initial termination is not effective the first time?

If termination is planned to be winterkilled, have a backup plan in case of no winter kill.

Tillage: If tilling living cover crops in the spring, be sure to factor in the clumps of root mass that may not allow the soil to level out and be plantable as expected. Although moldboard plowing would eliminate this issue, there needs to be a VERY compelling reason to employ this soil destructive practice!

10. Become a student of cover cropping! We've made it VERY EASY by collecting the best cover cropping articles and listing them on our website blog for free!

Bonus Tip!

On leased land, have a conversation with the landowner explaining the added value you are creating for their investment. They may even offer to help you out with additional costs related to cover cropping!



Following these strategies will give you a solid foundation for success and you will be well on the way to *increase your cover crop acres by 10% OR more!*

Cover Crop Management Plan

From
Steve Groff

Cover Crop Plan for: _____

Farm/Field: _____ Acres: _____

Season: Summer Fall Post-Harvest

Previous Crop: _____ Next Crop: _____

What are you trying to accomplish? _____

Resource Considerations:

- Manure spreading
- Residue after harvest
- Adjacent water/wells
- Field slope
- _____
- _____

Program Considerations:

- CSP contract until _____
- EQIP contract until _____
- Winter manure spreading needs
- _____
- _____
- _____

Previous Herbicides:

Grasses:

- Cereal Rye _____ #/Ac
- Annual Ryegrass _____ #/Ac
- Triticale _____ #/Ac
- Sorghum Sudan _____ #/Ac
- Spring Oats _____ #/Ac
- Winter Oats _____ #/Ac

Legumes:

- Crimson Clover _____ #/Ac
- Winter Pea _____ #/Ac
- Hairy Vetch _____ #/Ac
- _____ Clover _____ #/Ac
- _____ #/Ac

Notes

Brassicas:

- Radish _____ #/Ac
- Canola/Rapeseed _____ #/Ac
- Turnips _____ #/Ac
- Forage Hybrid _____ #/Ac
- Kale _____ #/Ac
- _____ #/Ac

Others:

- Sunflowers _____ #/Ac
- Buckwheat _____ #/Ac
- _____ #/Ac
- _____ #/Ac
- _____ #/Ac
- _____ #/Ac

Seeding Plan Date Range: _____ Drill/Planter Aerial

- Broadcast High Clearance w/Fertilizer Incorporation

Plan B (Backup): _____

Nutrient Plan N P K Broadcast Band/Incorporate Herbicide Application

- Other: _____

Plan B (Backup): _____

Management/Scouting Plan

Plan B (Backup): _____

Termination Plan Winter-kill Herbicide Tillage Roller/Crimper Natural

- Other: _____

Plan B (Backup): _____



COVER CROP

DECISION GUIDE

Finding Good Cover Crop Options

Like most things in agriculture, there is no one universal “best” cover crop. This comprehensive Cover Crop Decision Guide was made for some of the more common crop rotations, along with some additional applications.

It provides a reasonable starting point for those new to cover cropping and offers some ideas for those who want to take cover cropping to a new level.

There are indeed other seed selection options that may be refined for your area. Refer to experienced farmers or educators for local advice.

USING THE DECISION GUIDES

1. Identify the desired crop rotation.
2. Answer the questions—decisions—from left to right.
3. Arrive at a cover crop species or mix recommendation.
4. Finalize the decision based on the level of management best suited to a grower’s operation.

Certified seed generally is more costly but provides guaranteed germination and seed quality (cleanliness and varietal consistency). Work with suppliers you trust when purchasing cover crop seed.



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Corn Grain Going to Soybeans

Seeding cover crops after a corn-for-grain harvest usually limits choices to species that can be planted late and are more cold-tolerant. Using a proven shorter season corn hybrid is a strategy more farmers are using to get cover crops planter earlier in the fall. While the cover crops listed here can survive in cool late-fall temperatures, this does not mean that they will survive the winter. So the first decision a grower must make is how and/or when the cover crop will be terminated.

Termination first

Winter termination is easier and less expensive, but it's important to anticipate the earlier breakdown of protective surface residue in the spring, opening up the possibility of erosion on sloping fields.

Using a cover crop with a longer-lasting residue and more root mass near the soil surface on sloping ground can help hold soil in place during snowmelt and spring rains. Along with earlier biomass breakdown comes earlier release of nutrients.

Grazing considerations

A mix of cover crop radish and oats grows quickly in cooler conditions and creates an opportunity for fall grazing, depending upon planting date and region.

If there is a desire for spring grazing, a longer-lasting spring cover, or delayed nutrient release, then consider recommending products that will overwinter, recognizing that these will require a spring termination.

Concepts behind seed choices

If spring termination fits in with the grower's system, the recommended product could include a legume to produce nitrogen, and/or annual ryegrass, because of its deep, fibrous roots and slower release of nutrients following termination.

For aggressive rooting

A mix of cover crop radish and annual ryegrass can penetrate compacted soils and claypans, bringing up nutrients from lower in the soil profile and opening root channels that can

help subsequent crops access moisture and nutrients.

A key management choice

Terminating annual ryegrass requires strategic management in the spring, which can be challenging for new cover crop users.

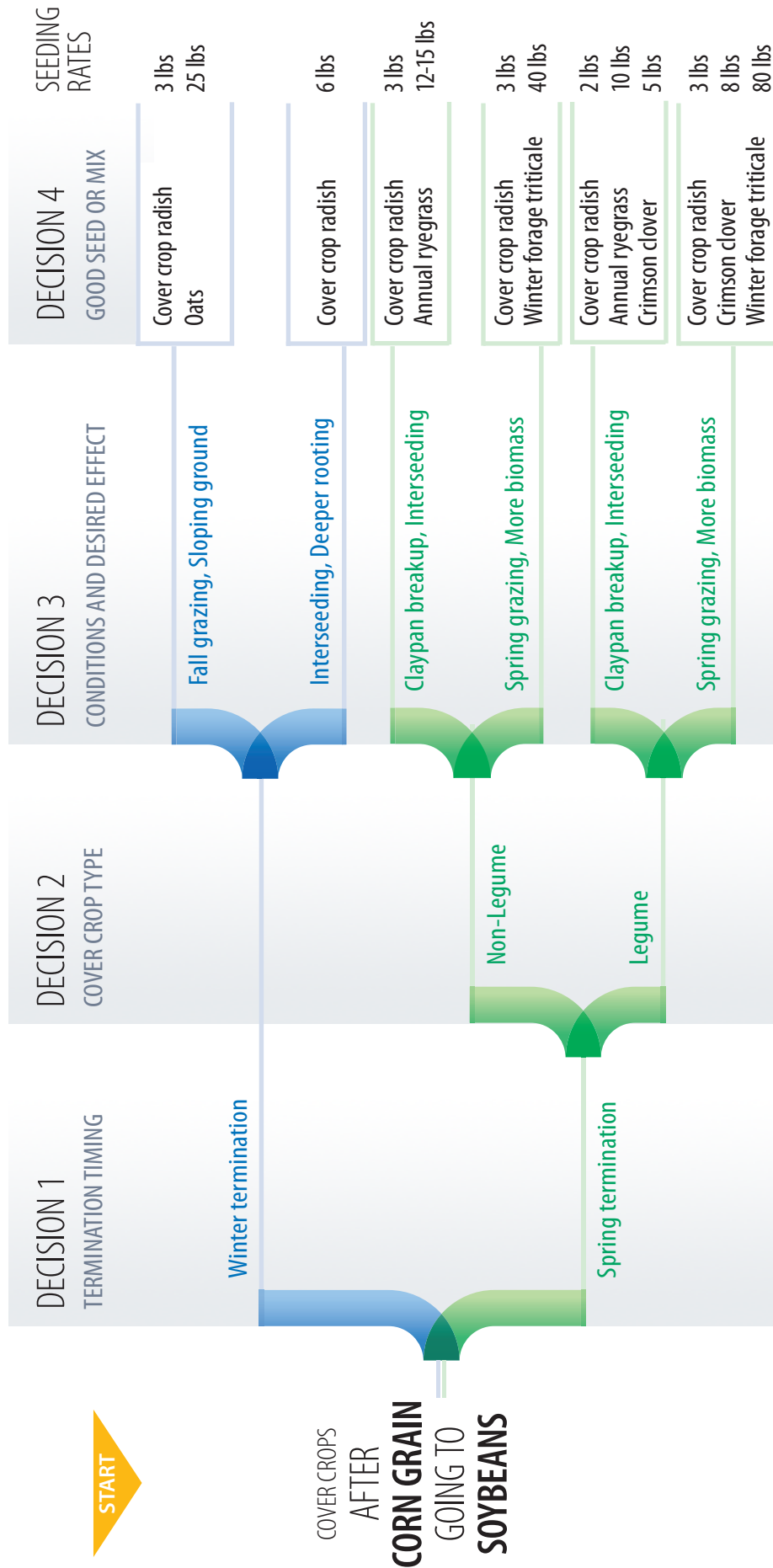
For growers not comfortable with this, we suggest mixes containing a winter forage triticale, as triticale can survive winter conditions across most of the northern states and is easier to terminate than annual ryegrass.

Winter forage triticale also provides earlier growth where spring grazing is desired.

Why not cereal rye? That is indeed a great choice and we do not advise against it. But progressive cover croppers are leaning toward winter triticale as it is easier to manage in the spring as it doesn't have the explosive growth spurt of cereal rye. And most triticale varieties seem to have the same degree of winter hardness as cereal rye as well.



Cover Crops After Corn Grain Going to Soybeans



decomposition may help early corn vigor in the absence of starter fertilizer.

Seeding cover crops after harvesting full-season soybeans can limit choices to species that can be planted later or are more cold-tolerant. Some farmers are using proven shorter season soybean varieties in order to plant cover crops earlier in the fall.

First decision: termination

While the cover crops listed here can survive in cool late-fall temperatures, this does not mean that they will survive the winter. So the first decision the grower must make is how and when the cover crop will be terminated.

Factors to consider

Other considerations include allowing sufficient time for cover crop establishment in the fall and the need for cover on sloping fields to limit soil loss by erosion, particularly in late winter and early spring.

Sloping fields

On sloping fields in particular, the recommended cover crop following soybeans needs to produce a heavier root system and sufficient surface residue to cover the field, since soybeans leave less residue on the field than corn and soybean residue breaks down faster than cornstalks.

Grazing and residue

If fall grazing is part of the grower's program, cover crop radish and oats is a good recommendation due to its ability to establish and grow quickly in cooler temperatures. If it isn't fall grazed, the combined residue from cover crop radish and oats generally provides adequate erosion protection in the fall and through the winter.

Keep in mind, however, that since both species are winter-terminated, residue will begin to break down as soon as soils start to warm in the spring.

Legumes

Legumes are a good recommendation ahead of corn planting because they can fix nitrogen and release it faster after termination. We suggest a mix that includes crimson clover, hairy vetch or winter pea to mixes that do not include legumes.

Spring grazing

If growers have a need for spring grazing or want to delay nutrient release until later, then products that will over-winter (but will require spring termination) should be considered.

Due to the low carbon-to-nitrogen ratio of cover crop radish and crimson clover, residue in this mix breaks down and releases nutrients quickly in the spring following termination. This rapid

Spring management

If selecting between cover crop species or mixes that require spring termination, it is important to know your customer's comfort or experience level with the careful burndown required for annual ryegrass control.

For those who are comfortable with annual ryegrass, it provides deep fibrous roots, that, when combined with cover crop radish, have the ability to penetrate compacted soils and claypans.

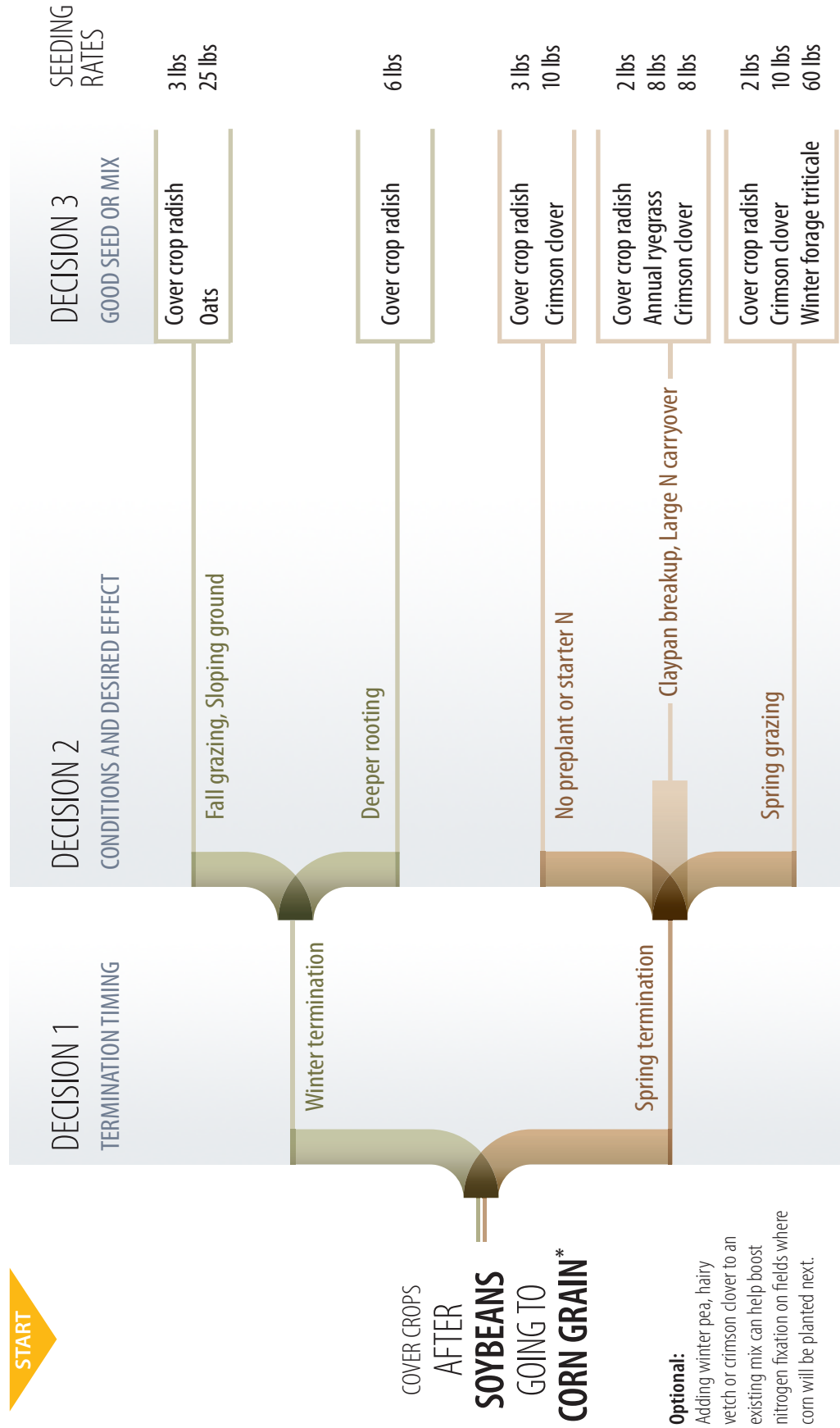
For growers who are new to cover crops or are not comfortable with annual ryegrass control, winter forage triticale is easier to control in the spring. It also provides earlier growth where spring grazing is desired.

Another benefit of triticale is that it is more likely to survive winter conditions across the northern U.S. than annual ryegrass.

Why not cereal rye? That is indeed a great choice and we do not advise against it. But progressive cover croppers are leaning toward winter triticale as it is easier to manage in the spring as it doesn't have the explosive growth spurt of cereal rye. And most triticale varieties seem to have the same degree of winter hardiness as cereal rye as well.



Cover Crops After Soybeans Going to Corn Grain



COVER CROPS AFTER SOYBEANS GOING TO CORN GRAIN*

* **Optional:**
Adding winter pea, hairy vetch or crimson clover to an existing mix can help boost nitrogen fixation on fields where corn will be planted next.

After Corn Silage

Planting a cover crop after corn silage harvest offers a wider planting window and more cover crop options than planting after harvesting corn grain or soybeans. Because of this extended growing window, it is necessary to take into account whether nitrogen fertilizer or manure has been or will be applied following silage harvest.

Legumes for N

If no nitrogen has been or will be applied, we recommend seeding a mix that includes legumes like crimson clover, winter pea, or hairy vetch. When seeding annual ryegrass or winter forage triticale add some or all of these legumes to provide nitrogen for subsequent crops.

Manure

Manure is often applied following corn silage harvest. The extra nutrients from applied manure and the longer growing window for cover crops seeded after silage harvest can combine for increased forage production for harvest or grazing. If not intended as a feed source, the cover crop will help retain nutrients that are a higher risk of loss when manure is applied before the soil cools. For growers preferring a winter terminated cover crop, it is important they understand this may increase the possibility for erosion on sloping fields.

Additionally, nutrient release from cover crops terminated in winter will begin as soon as soils begin to warm in the spring.

Sloping ground

On ground with a greater slope, a cover crop with more root mass near the soil surface like annual ryegrass and those with longer lasting residues (grasses and small grains), will help minimize erosion losses.

Fall grazing

Because of its ability to establish and grow quickly in cooler weather, a mix of cover crop radish and oats is a good option for those who want fall grazing. However, for those wanting to delay nutrient release until after planting, products that require spring termination are a better option.

Spring termination

For those who choose to terminate the cover crop in the spring but want early nitrogen availability, we recommend cover crop species that have a low carbon to nitrogen ratio, like cover crop radish and crimson clover, hairy vetch, and winter pea. These will break down and release nutrients quickly in the spring after termination. This rapid decomposition may help with early seedling vigor in the absence of starter fertilizer.

A key management decision

For those looking for later nutrient release in the spring, an overwintering grass-based cover crop mixture would be recommended. Deciding between mixes that include annual ryegrass or winter forage triticale comes down to the level of comfort the grower has with annual ryegrass. If the grower is comfortable with burning down annual ryegrass, its deep fibrous roots combine well with cover crop radish to penetrate compacted soils and claypans.

For new cover crop growers

For new cover crop users or those who are uncomfortable with controlling annual ryegrass, a mix containing cover crop radish, crimson clover and winter forage triticale is a good alternative. The earlier spring growth of the winter forage triticale in that mix can provide spring grazing if desired.

Another benefit of winter forage triticale is that it is more likely to survive winter conditions across the northern U.S. than annual ryegrass.

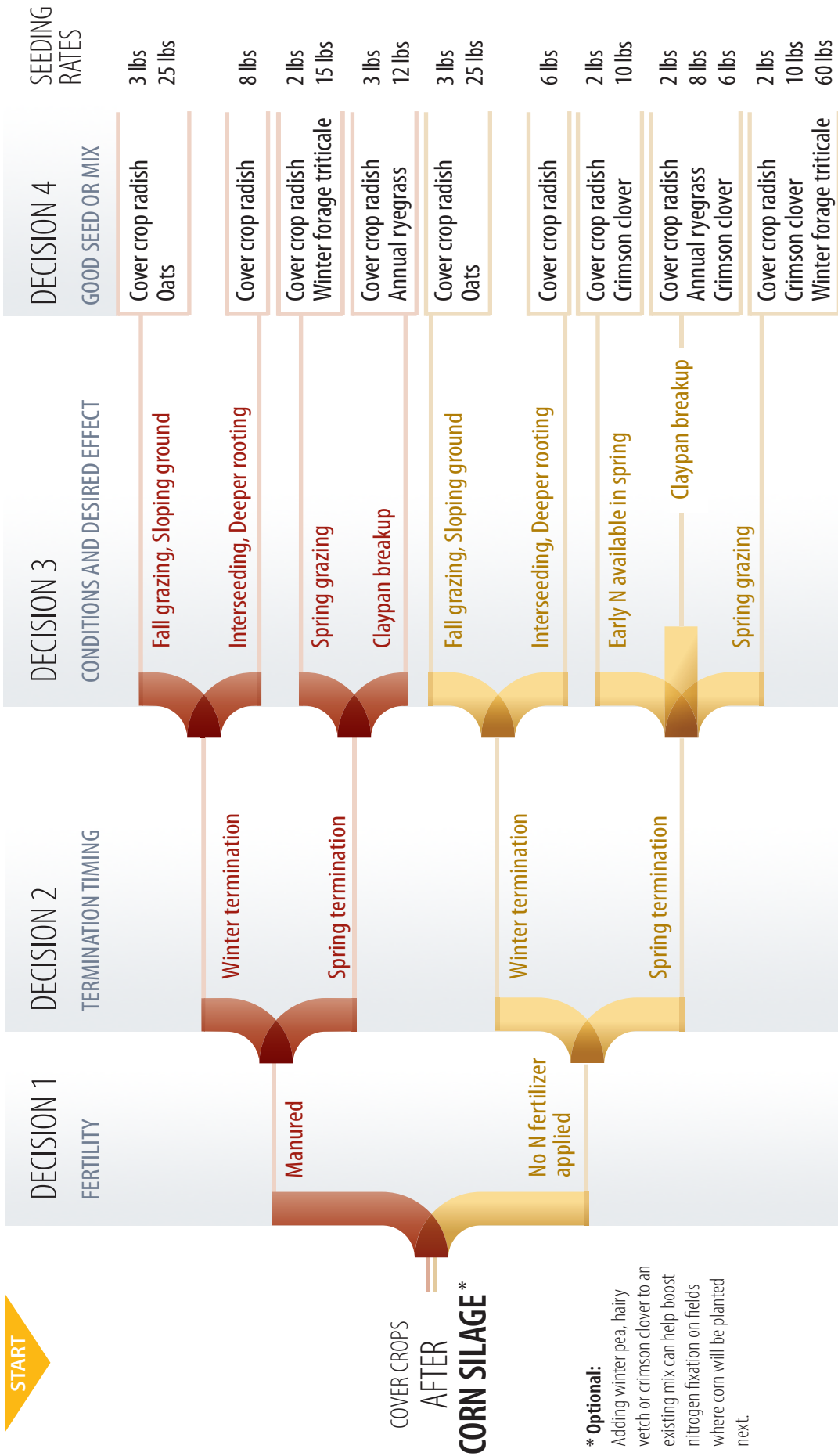
Why not cereal rye? That is indeed a great choice and we do not advise against it. But progressive cover croppers are leaning toward winter triticale as it is easier to manage in the spring as it doesn't have the explosive growth spurt of cereal rye. And most triticale varieties seem to have the same degree of winter hardiness as cereal rye as well.



COVER CROP DECISION GUIDE

Cover Crops After Corn Silage

START



COVER CROPS
AFTER
CORN SILAGE*

*** Optional:**

Adding winter pea, hairy vetch or crimson clover to an existing mix can help boost nitrogen fixation on fields where corn will be planted next.

Planting a cover crop after wheat offers a wider planting and growing window than when seeding after harvesting corn or soybeans, so there are more cover crop options.

Cover crops and wheat

This said, it is important that growers understand that any cover crop planted after wheat that usually over-winters may in fact winter kill if it grows 12 inches or more in height. Additionally, nutrient release from winter-terminated cover crops will begin as soon as soils begin to warm in the spring.

Fertility

When seeding after wheat, growers should know what their next cash crop will be, and when and how fertilizer and/or manure may be applied for it. If no nitrogen fertilizer will be applied, we recommend a mix that includes a legume, such as Winter pea, Hairy vetch, or Crimson clover, to supply nitrogen through fixation.

Fighting erosion

While there is a possibility for erosion on sloping fields with a winter-terminated cover crop, the longer growing window after wheat harvest usually allows enough growth to provide adequate cover for erosion control.

A cover crop with more root mass near the soil surface, like annual ryegrass, and those with longer lasting residues (grasses and small grains), will help minimize erosion losses.

This is especially true on ground with a greater slope and areas prone to high wind erosion losses.

Fall grazing

Cover crop radish, sunn hemp and sorghum sudangrass or Cover crop radish and oats provide an opportunity for fall grazing due to their ability to establish and grow quickly, depending upon planting date and region.

For a delayed nutrient release, growers should consider products that require spring termination in their region.

Spring termination

Growers who opt for spring termination, but also want early nitrogen availability, need a cover crop with a low carbon to nitrogen ratio like Cover crop radish and Crimson clover so the residue breaks down and releases nutrients quickly in the spring following termination. This rapid decomposition may help with early seedling vigor in the absence of starter fertilizer.

If the grower prefers nutrient release later in the spring, recommend a mix that includes an over

wintering grass cover, like Annual ryegrass or Winter forage triticale. The decision between a cover crop mix based on annual Ryegrass vs. Triticale comes down to the level of comfort the grower has with annual Ryegrass.

Key management decision

For growers comfortable with the carefully managed burndown required for annual Ryegrass control, its deep fibrous roots when combined with Cover crop radish can penetrate compacted soils and claypans.

For new cover crop growers

For new cover crop users or those uncomfortable with annual Ryegrass, a mix of Cover crop radish, Crimson clover and Triticale is a good alternative. Plus, the earlier spring growth of the Triticale in that mix can provide spring grazing if desired. Another benefit of Triticale is that it is more likely to survive winter conditions across the northern U.S.

Reiterating an important point

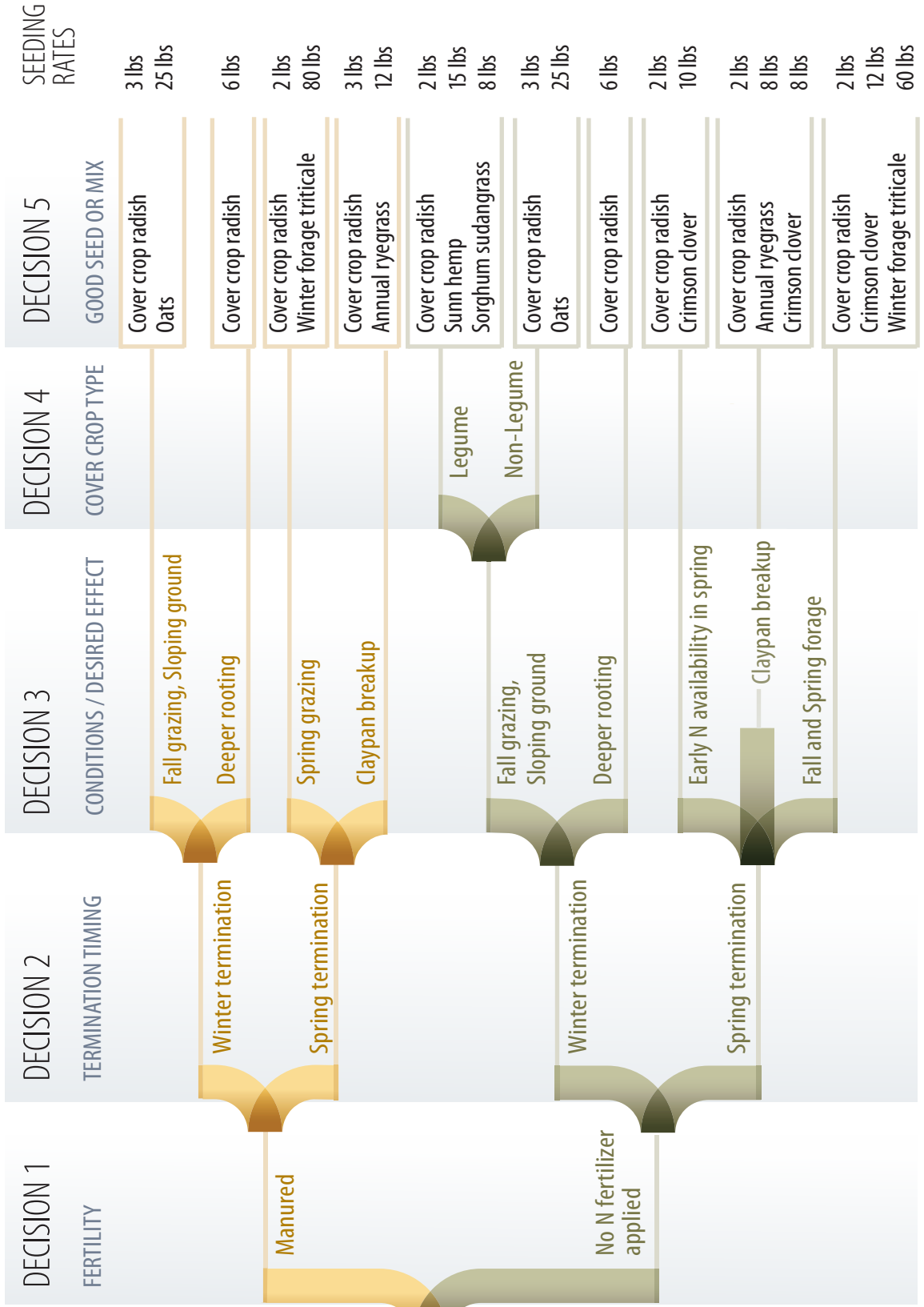
It is very important that growers understand that any cover crop that usually over-winters may winter kill if allowed to grow to more than 12 inches or more in height, which is likely to happen when planting is in July or August.



COVER CROP DECISION GUIDE

Cover Crops After Wheat Going to Corn

START



COVER CROPS AFTER WHEAT GOING TO CORN *

* **Optional:** Adding winter pea, hairy vetch or crimson clover to an existing mix can help boost nitrogen fixation on fields where corn will be planted next.



COVER CROP DECISION GUIDE

Prevented Planting

1) CHECK CROP INSURANCE FIRST

When in a prevented planting situation, growers must first thoroughly review their crop insurance policy. They may wish to contact their insurance agent to verify when they can plant a cover crop and how the cover crop may or may not be used. These factors can vary by program, the unplanted crop and by region.

2) CHECK PREPLANT HERBICIDES

If this is a concern, take a representative 2" deep soil sample and place in a pot or bucket. Sow the intended cover crop seeds and observe 7-10 days later to see if there is any negative herbicide affect on the seedlings.

Fertility

Once growers have answered these two questions and know when they can plant, it's important to know whether nitrogen fertilizer has been or will be applied.

If nitrogen has already been applied, a cover crop that can scavenge and hold the nitrogen should be chosen. If no nitrogen has been applied, and the next crop in the grower's rotation is a heavy nitrogen user, such as corn or small grains, a cover crop mix that includes a legume is recommended to add nitrogen through fixation.

Planting window

The next decision to be made is when the cover crop will be planted. Earlier plantings allow summer annuals, like Sorghum sudangrass and Sunn hemp, to generate more biomass. Some species perform better than others when planted earlier in the season due to the influence of day length. However, Cover crop radish should not be planted before July 15.

Timing and seed choices

If cover crops are planted before July 15, the longer growing window gives the grower more opportunities for summer, fall and spring forage or grazing.

However, it is important to know the limitations of the grower's insurance program regarding fall grazing or forage harvest. If herbicides have been applied for the prevented planting crop, the grower needs to be aware of any restrictions on grazing on the herbicide labels as well. If planting later than July 15, deciding how or when the cover crop will be terminated is important.

Warm season legume

Cover crop radish, sunn hemp and sorghum sudangrass is a great warm season cover crop mix that adds species diversity, good biomass production, and is winter-terminated.

The Sunn hemp in the mix is excellent at fixing nitrogen.

Early planting

It is very important that growers understand that any cover crop that usually over-winters (hairy vetch, crimson clover, etc.) may winter kill if allowed to grow to more than 12 inches or more in height, which is likely to happen when planting is in July or August.

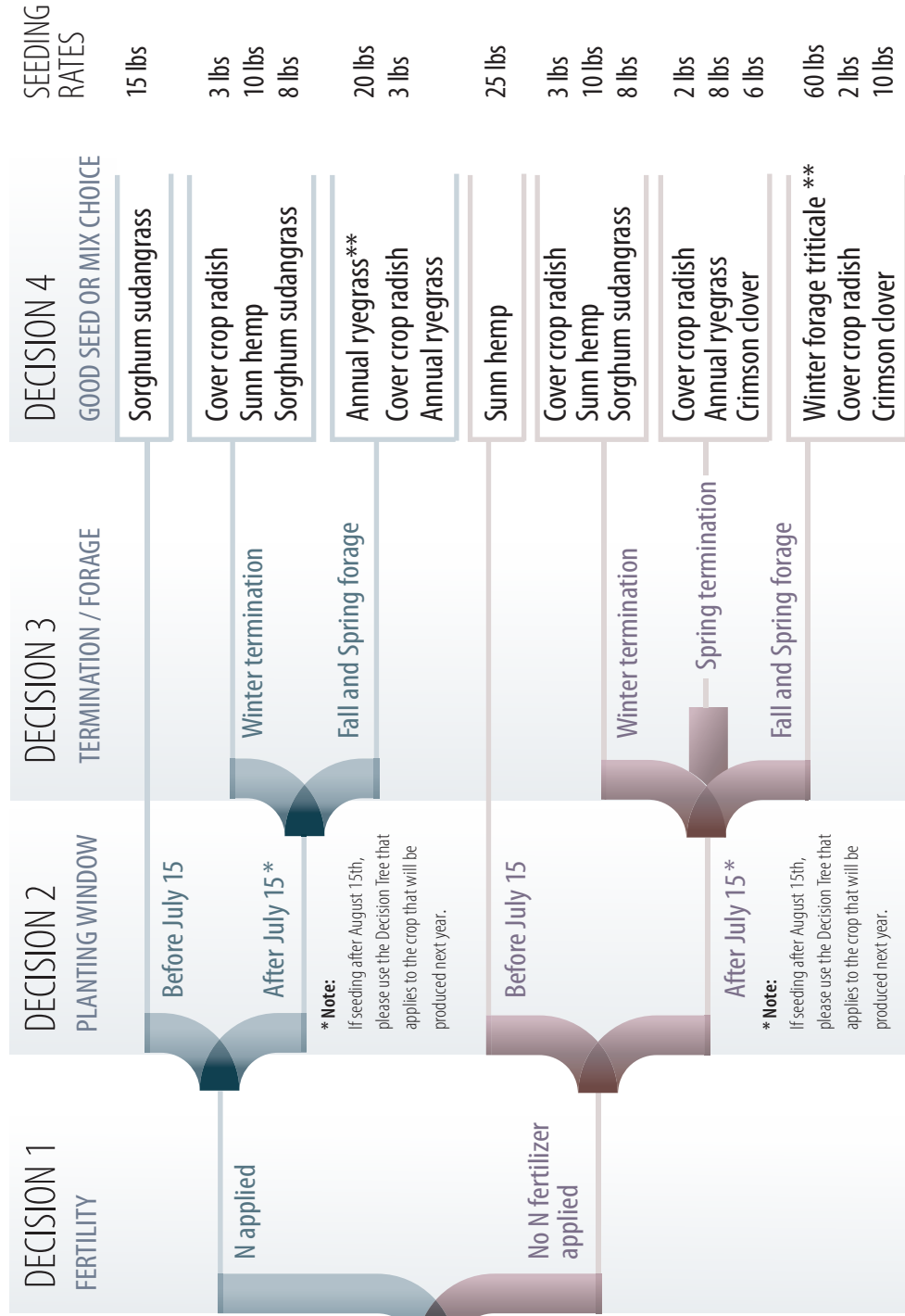
Spring termination

If the grower will terminate the cover crop in the spring, deciding between mixes that feature Annual ryegrass Annual Ryegrass or Winter forage triticale comes down to the comfort level the grower has with terminating annual Ryegrass, which requires careful management.



START

Prevented Planting



COVER CROPS FOR PREVENTED PLANTING

*** Optional:** Adding winter pea, hairy vetch or crimson clover to an existing mix can help boost nitrogen fixation on fields where corn will be planted next.

**** Note:** May winter-terminate when planted in July or August if growth is more than 12 inches in height at freeze up.

Field activities such as installing tile lines, installing pipelines, or building terraces can prevent a normal cropping program and create a need for soil remediation.

Fertility

For soil remediation, it is necessary to know whether any nitrogen fertilizer will be applied on the field in question. If no N will be applied, recommend a cover crop that includes a legume to supply N through fixation. The next step is to determine when the cover crop will be planted.

Planting window

Early summer plantings allow warm season annuals, like sorghum sudangrass and sunn hemp, to generate more biomass, providing grazing and forage opportunities in the fall and spring.

Certain species do not perform as well when planted early in the season due to the influence of day length. For this reason, we do not recommend planting cover crop radish before July 15th.

Termination choice: winter kill

The next step is determining how the cover crop will be terminated. With winter-terminated cover crops, it is important to understand that there may be a greater possibility for erosion, especially on sloping fields.

Reducing soil loss

To help minimize soil losses, we recommend a cover crop or mix that has more root mass near the soil surface, like cover crop radish and oats, or mixes with longer-lasting residues, like a mix of cover crop radish, sunn hemp and sorghum sudangrass—a good choice when plant diversity and large quantities of biomass are desired.

Spring termination

If planting a spring-terminated cover crop after July 15, deciding between an annual ryegrass or triticale-based cover crop comes down to the grower's level of comfort with annual Ryegrass control, which requires careful management.

Note, however, that both annual ryegrass and triticale may winter kill if growth exceeds 12 in. and the likelihood of this occurring is higher when planting in July or early August.

If the grower is comfortable with spring control of annual ryegrass, it's a good addition because its deep fibrous roots, when combined with cover crop radish, can penetrate compacted soils and claypans.

Annual ryegrass alternative

If the grower is uncomfortable with annual ryegrass and the level of management it requires for control, triticale is a great alternative. Triticale also provides earlier growth where spring grazing is desired. Another benefit is that triticale seeded in late August or later is more likely to survive winter conditions across the northern U.S. than annual ryegrass seeded at the same time.

Early planting and winter kill

It is very important that growers understand that any cover crop that usually over-winters may winter kill if allowed to grow to more than 12 inches or more in height, which is likely to happen when planting is in July or August.

Unique species for Remediation

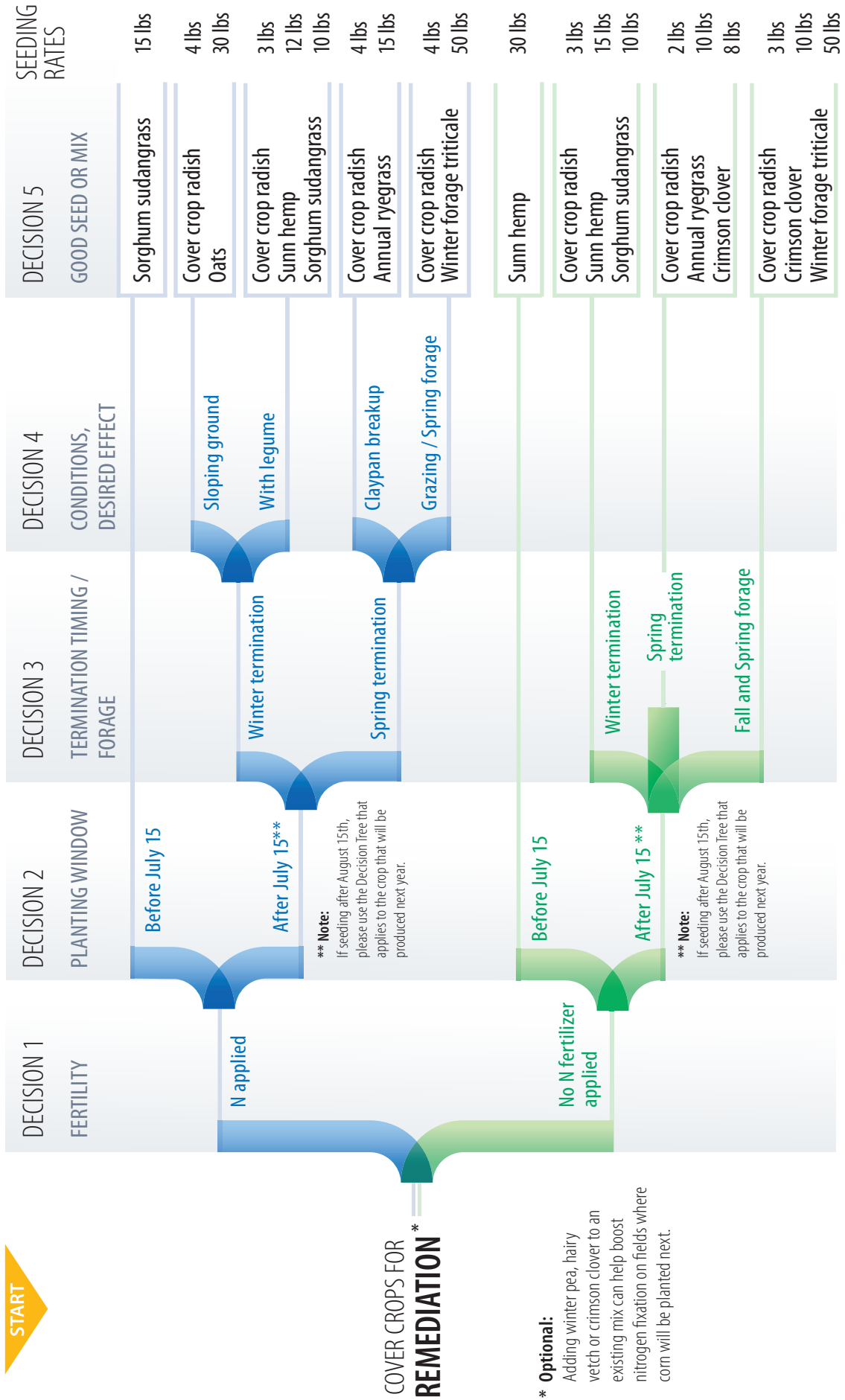
Phacelia is little known in the U.S. but widely used in Europe as a cover crop to build soil structure. It would be the best species to use where soil has been severely disturbed as it can re-aggregate soil like no other.



COVER CROP DECISION GUIDE

START

Cover Crops for Soil Remediation



COVER CROPS FOR REMEDICATION *

* **Optional:**
Adding winter pea, hairy vetch or crimson clover to an existing mix can help boost nitrogen fixation on fields where corn will be planted next.

Fall Grazing or Forage Harvest

Generally speaking, cover crops can provide a good grazing and forage opportunity as a secondary benefit – if you get them planted early!

When the grower's *main objective* for a cover crop is to provide fall grazing or a fall forage harvest, the recommended mix or species depends greatly on when the cover crop can be planted. The planting date is a pivotal point for success in maximizing the benefit of a cover crop for fall grazing or forage harvest.

Plant early for grazing

Fall grazing requires earlier planting for a longer growing window to allow the crop to grow sufficiently to withstand grazing.

Fertility

If manure is not applied, it is suggested to consider adding supplemental N to maximize forage production. Or, adding a legume to the mix can accomplish the same effect.

Fall forage harvest opportunity

If the cover crop can be established early enough, there may be an opportunity for a fall hay or haylage harvest. A longer window for growth

allows annual ryegrass to provide sufficient growth for a single cutting in the fall, for example. Remember that dry hay requires warm, dry weather to dry adequately before baling.

High moisture preferred in fall

Seeding the cover crop after normal fall harvest dates in much of the U.S. leaves too little time for dry hay in most areas, hence most growers use some sort of high moisture method.

Some recommendations

Cover crop radish, sunn hemp and sorghum sudangrass mix is recommended after a small grain harvest when the grower wants a product that will provide early fall grazing and will winter terminate.

Because sorghum sudangrass is included in the cover crop radish, sunn hemp and sorghum sudangrass mix, prussic acid may be a concern if grazed too early or after a frost.

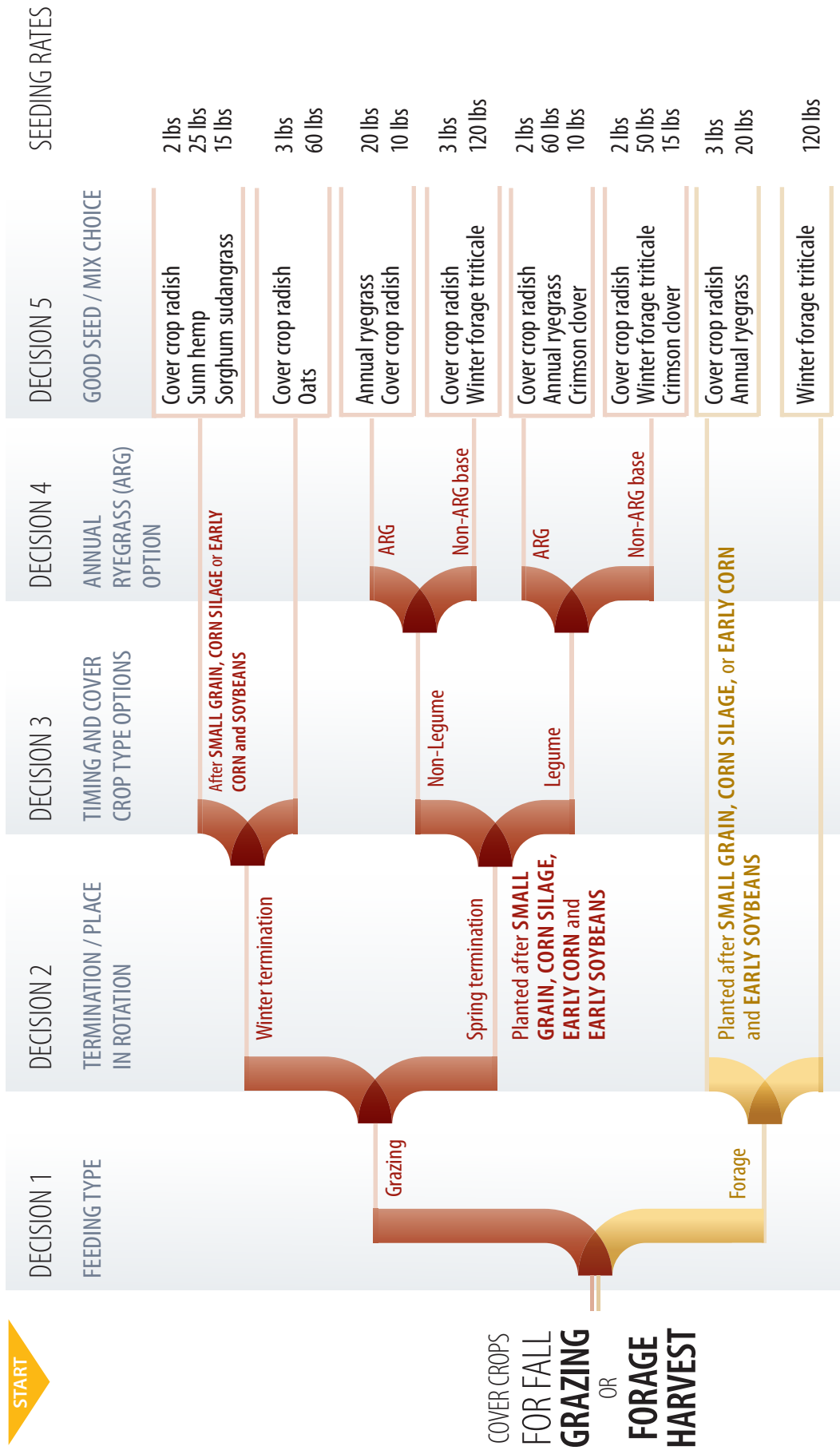
Sorghum sudangrass should not be grazed before it reaches a height of 30 in., or for at least two weeks following a frost.

Cover crop radish and oats is recommended for

fall grazing when the crop will be seeded after harvesting corn silage, early corn for grain, or soybeans. The mixture of oats and cover crop radish will provide quick biomass for a longer fall grazing period.

If growers intend to use the cover crop for fall grazing, winter cover and for forage again in the spring, the recommended cover crop mix depends both on their comfort level with annual ryegrass control and whether they want a legume in the mix to increase diversity and biomass production. Options are shown in the Decision Guide.

Cover Crops As Fall Grazing or Forage



Spring Grazing or Forage Harvest

Generally speaking, cover crops can provide a good grazing and forage opportunity as a secondary benefit.

But when the grower's *main objective* for a cover crop is to provide spring grazing or a spring forage harvest, the recommended mix or species depends greatly on when the cover crop can be planted.

Planting window

Planting after small grains, corn silage, or an early corn grain or soybean harvest allows for earlier planting, which is better when considering products with annual ryegrass in the mix.

For any cover crop that does not include a legume, or where manure has been applied, it is recommended to consider adding additional Nitrogen to enhance forage production.

Winter forage triticale or cereal rye is recommended when the grower wants spring forage or grazing, and will plant the cover crop after soybean harvest. Triticale is more winter-hardy than annual ryegrass and is better able to survive the winter in northern regions of the U.S.

Annual Ryegrass or Triticale?

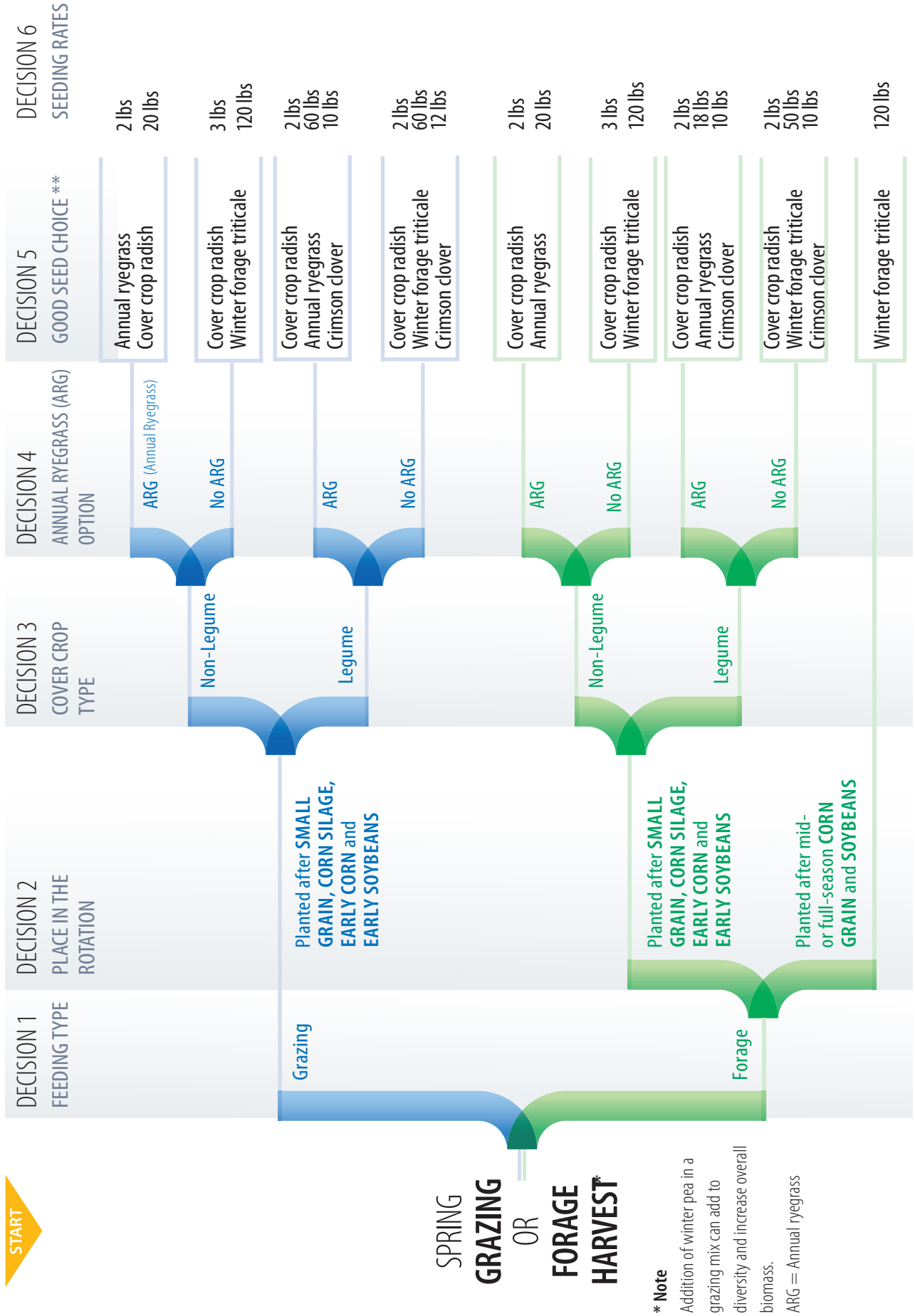
In many areas the decision between a mix based on annual ryegrass or triticale depends on the grower's comfort level with annual ryegrass, which requires a higher level of management for spring termination than triticale does.

Why not cereal rye? That is indeed a great choice and we do not advise against it. But progressive cover croppers are leaning toward winter triticale as it is easier to manage in the spring as it doesn't have the explosive growth spurt of cereal rye.

And most triticale varieties seem to have the same degree of winter hardiness as cereal rye as well.

Once the choice has been made between annual ryegrass and winter forage triticale or cereal rye as a base for the cover crop, the next decision is whether or not to include a legume in the mix to increase nutrition levels of the feed, add diversity and increase tonnage.

Spring Grazing or Forage Harvest



**SPRING
GRAZING
OR
FORAGE
HARVEST***

*** Note**

Addition of winter pea in a grazing mix can add to diversity and increase overall biomass.

ARG = Annual ryegrass

Early Vegetables

The opportunities

Early harvested vegetable crops provide a wide opportunity for establishing cover crops. Fields where the earliest vegetable crops are harvested could be ready to seed into cover crops by mid-June, or even earlier in some parts of the southern U.S.

Early harvested vegetables, provide the potential for a summer cover crop followed by an additional fall vegetable crop.

About species

Certain species do not perform as well when planted early in the season due to the influence of day length. For this reason, it is not recommended planting cover crop radish before July 15th, unless the projected cover crop growing window is less than 6 weeks. Early summer plantings allow summer annuals, like sorghum sudangrass and sunn hemp, to generate greater amounts of biomass. In addition, buckwheat is a popular summer cover crop due to its quick growth. But be aware that is may have mature seeds in as little as 6 weeks so be prepared to manage according to your objectives with this species.

Many variables, and some good options

When the objective is a summer green manure crop between vegetable crops, sunn hemp is recommended based on its abilities to grow quickly, fix nitrogen and suppress some types of nematodes.

Termination considerations

When the objective is to allow the cover crop to grow the rest of the season, it is important for the grower to decide whether they want the cover crop to winter-terminate or over-winter, which will require a spring termination.

It is also important to understand that any cover crop that usually over-winters when planted in the fall may winter kill when established in July or early August, if growth exceeds 12 in. and/or transitions into flowering stages.

Cover crop radish, sunn hemp and sorghum sudangrass performs well in longer growing windows, and is recommended whenever plant diversity, nitrogen fixation and large quantities of biomass are desired.

Management decision

When deciding whether to plant annual ryegrass or winter forage triticale in early summer, take into

consideration that annual ryegrass has the potential to reseed itself. Preventing reseeding of annual ryegrass requires additional management, such as mowing.

Frost date crucial

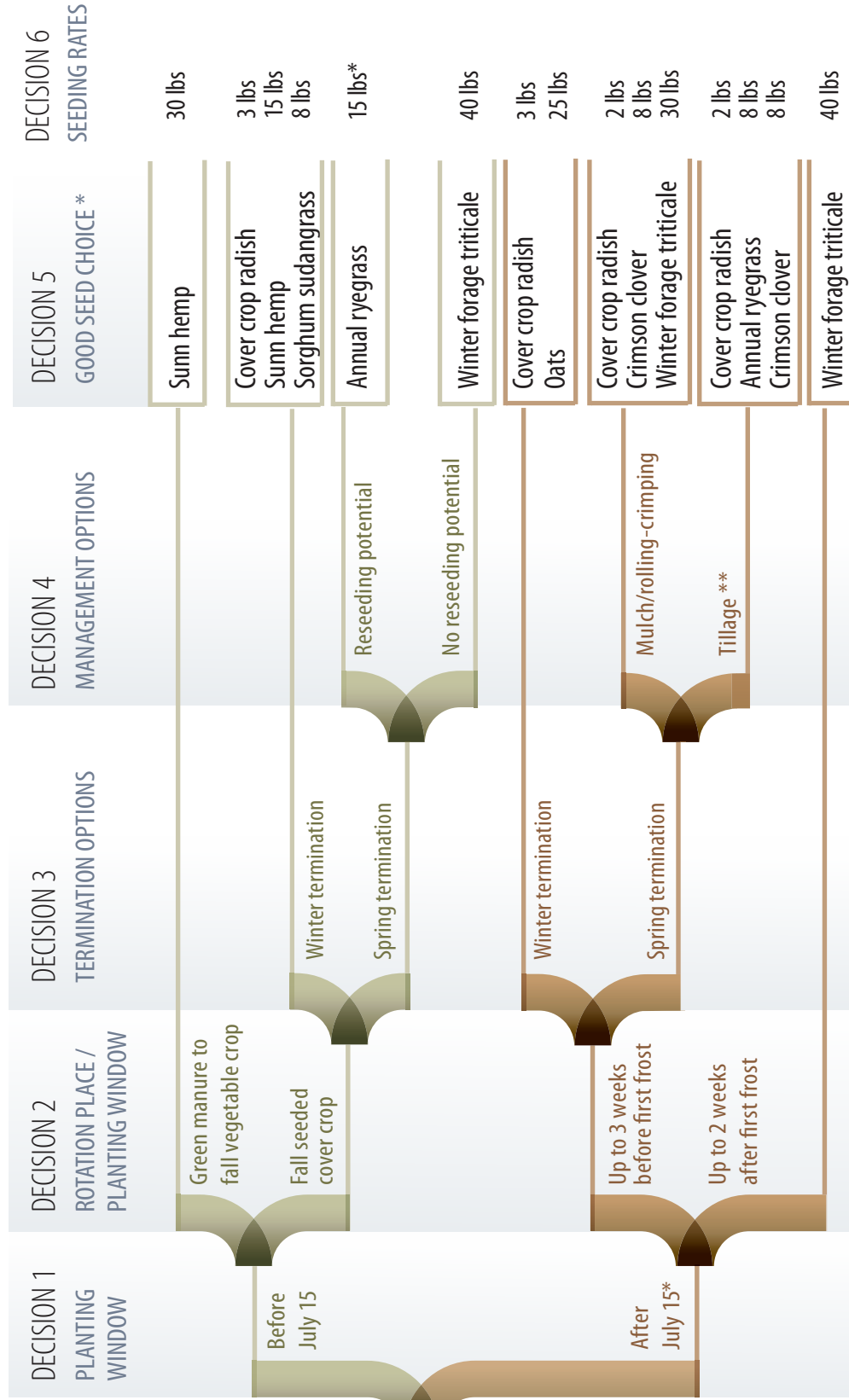
The frost date is important when deciding between cover crop options to plant after July 15th. Cover Crop species that kill with the first frost need to be established 6-8 weeks before that average date.

A minimum of three weeks before the first frost is required in order to warrant planting a winter terminated cover crop in the fall such as cover crop radish and oats mix.

If the grower wants a cover crop that will over-winter and produce additional growth in the spring, the next decision will depend upon the management system for the following crop.

A mix of cover crop radish, crimson clover and winter forage triticale is recommended for use in a no-till vegetable system because it is most likely to be controlled after pollination with roller crimping, and has high biomass potential with long-lasting residue.

START



COVER CROPS AFTER EARLY VEGETABLES

*** Optional:**

Adding Winter pea, Hairy vetch or Crimson clover to an existing mix can help boost nitrogen fixation on fields where corn will be planted next.

**** Important Note:**

Deep tillage will terminate the cover crop in most situations. Light tillage requires an herbicide application for cover crop termination.

* May winter kill if biomass grows more than 12"

The following tables give a general snapshot of some of the benefits you can expect from the more common cover crops.

While many factors can influence the effectiveness of a cover crop, these tables are intended to provide a starting point for strategically planning to achieve what you wish to accomplish.

The table below is a summary of benefits from single cover crop species, while the table on the next page gives those for mixtures.



Single Species

	WHAT DO YOU WANT TO ACCOMPLISH?	RADISH	ANNUAL RYEGRASS	CEREAL RYE OR TRITICALE	SUNN HEMP	WINTER PEA	HAIRY VETCH	CRIMSON CLOVER	SORGHUM SUDAN GRASS
FERTILITY	Spring N fixation	○	○	○	○	◐	◐	◐	○
	Summer N fixation	○	○	○	●	◐	◐	◐	○
	Scavenge N in fall	●	●	●	◐	◐	◐	◐	●
	Scavenge N in spring	○	●	●	○	◐	◐	◐	○
	Fast nutrient release	◐	◐	◐	◐	●	●	●	◐
SOIL BENEFITS	Reduce wind erosion	●	◐	●	●	◐	◐	◐	●
	Reduce water erosion	◐	●	●	◐	◐	◐	◐	◐
	Alleviate compaction	●	●	◐	◐	◐	◐	◐	◐
	Add soil organic matter	●	◐	◐	◐	◐	◐	◐	●
	Winter survivability	◐	◐	●	○	◐	●	◐	○
	Root knot nematode reduction	○	○	○	◐	○	○	○	◐
FUNCTIONS	Stands erect	●	◐	●	●	◐	◐	◐	●
	Length of vegetative stage	◐	◐	●	◐	◐	◐	◐	◐
	Winter ground cover	◐	●	●	◐	◐	◐	◐	◐
	Total above-ground biomass*	◐	◐	◐	●	◐	◐	◐	●

*Optimal planting window



Popular Mixes

WHAT DO YOU WANT TO ACCOMPLISH?		3 lbs Radish 10 lbs Crimson Clover	3 lbs Radish 10 lbs Annual Ryegrass	3 lbs Radish 8 lbs Crimson Clover 9 lbs Annual Ryegrass	3 lbs Radish 40 lbs Triticale or Cereal Rye	3 lbs Radish 8 lbs Crimson Clover 35 lbs Triticale or Cereal Rye	3 lbs Radish 30 lbs Oats	3 lbs Radish 10 lbs Sunn Hemp 8 lbs Sorghum Sudan
FERTILITY	Spring N fixation	GOOD	NOT APPLICABLE	GOOD	NOT APPLICABLE	GOOD	NOT APPLICABLE	NOT APPLICABLE
	Summer N fixation	GOOD	NOT APPLICABLE	FAIR	NOT APPLICABLE	FAIR	NOT APPLICABLE	GOOD
	Scavenge N in fall	FAIR	EXCELLENT	EXCELLENT	EXCELLENT	EXCELLENT	EXCELLENT	EXCELLENT
	Scavenge N in spring	FAIR	GOOD	GOOD	GOOD	GOOD	NOT APPLICABLE	NOT APPLICABLE
	Fast nutrient release	EXCELLENT	FAIR	FAIR	FAIR	FAIR	GOOD	GOOD
SOIL BENEFITS	Reduce wind erosion	GOOD	EXCELLENT	EXCELLENT	EXCELLENT	EXCELLENT	GOOD	EXCELLENT
	Reduce water erosion	GOOD	EXCELLENT	EXCELLENT	EXCELLENT	EXCELLENT	GOOD	EXCELLENT
	Alleviate compaction	GOOD	EXCELLENT	EXCELLENT	GOOD	GOOD	GOOD	GOOD
	Add soil organic matter	GOOD	EXCELLENT	GOOD	EXCELLENT	GOOD	GOOD	EXCELLENT
	Winter survivability	GOOD	GOOD	GOOD	GOOD	GOOD	NOT APPLICABLE	NOT APPLICABLE
FUNCTIONS	Species diversity	GOOD	GOOD	EXCELLENT	GOOD	EXCELLENT	GOOD	EXCELLENT
	Prevent Plant - dry	FAIR	FAIR	FAIR	FAIR	FAIR	GOOD	GOOD
	Prevent Plant - wet	FAIR	FAIR	FAIR	GOOD	GOOD	GOOD	GOOD
	First time cover cropping	EXCELLENT	FAIR	FAIR	GOOD	GOOD	EXCELLENT	GOOD
	Interseeding	EXCELLENT	EXCELLENT	EXCELLENT	GOOD	GOOD	GOOD	NOT APPLICABLE

The Benefits of Cover Crops

Steve Groff



What Cover Crops Can Do for Growers and Communities

There are many potential benefits from a properly placed cover crop. While erosion control is the most frequently cited of these, increasing crop production profits is the most frequently desired. Some benefits of cover crops may be experienced within the first year of use, while other benefits may be realized only after several years of use. In either case, an investment in time and resources is required in order to reap these benefits.

The table below lists 16 different possible benefits from cover crop use and groups them into five general categories. Some of these groupings are subjective, but it provides a good starting point for discussion.

As you can see from the table, there are many benefits that, with proper management, can increase growers' profits.

COVER CROP BENEFITS	ENVIRONMENTAL		LONG TERM PROFIT	SHORT TERM PROFIT	
	Protect Soil	Protect Water Quality	Improving Soil	Improved Production Efficiency	Increased Yield*
Erosion wind/water	✓	✓	✓		✓
Nutrient capture/release		✓		✓	✓
Reducing nitrate loss		✓		✓	✓
Fixing N				✓	✓
Breaking compaction			✓	✓	✓
Increasing rooting depth			✓	✓	✓
Suppressing nematodes				✓	✓
Forage production		✓		✓	✓
Increasing soil organic matter			✓	✓	✓
Breaking disease cycles				✓	✓
Weed suppression	✓			✓	✓
Changing soil microbiology		✓	✓	✓	✓
Drought protection			✓	✓	✓
Water infiltration			✓	✓	✓
Nutrient relocation		✓	✓	✓	✓
Habitat for beneficial insects				✓	✓

* Providing good cover cropping practices utilized

Nutrient Capture & Release

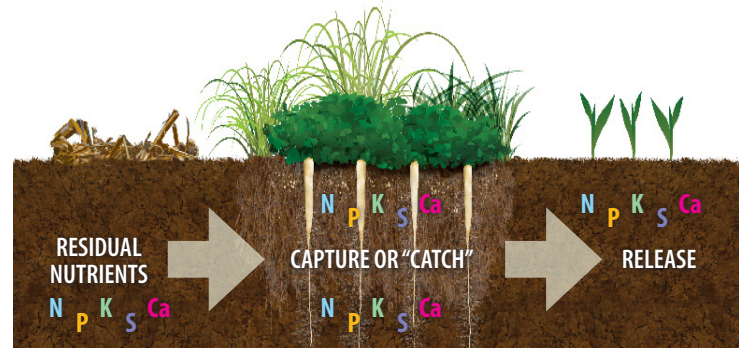
Cover crops can increase the amount of nutrients available for the next crop by taking up nutrients that remain in the soil and holding them in plant tissue until they are released the next spring.

Because non-legumes take up nitrogen (N), the cover crop doesn't have to be a legume to provide an N credit. Examples of non-legume cover crops that can contribute an N credit include radish, annual ryegrass, and to some extent cereal rye and triticale. The termination timing of the latter 2 will significantly affect the amount and when an N credit can be counted on. Cereal rye and triticale killed up to boot stage will have an N credit that growing season. Terminated later may yield minimal, if any that year.

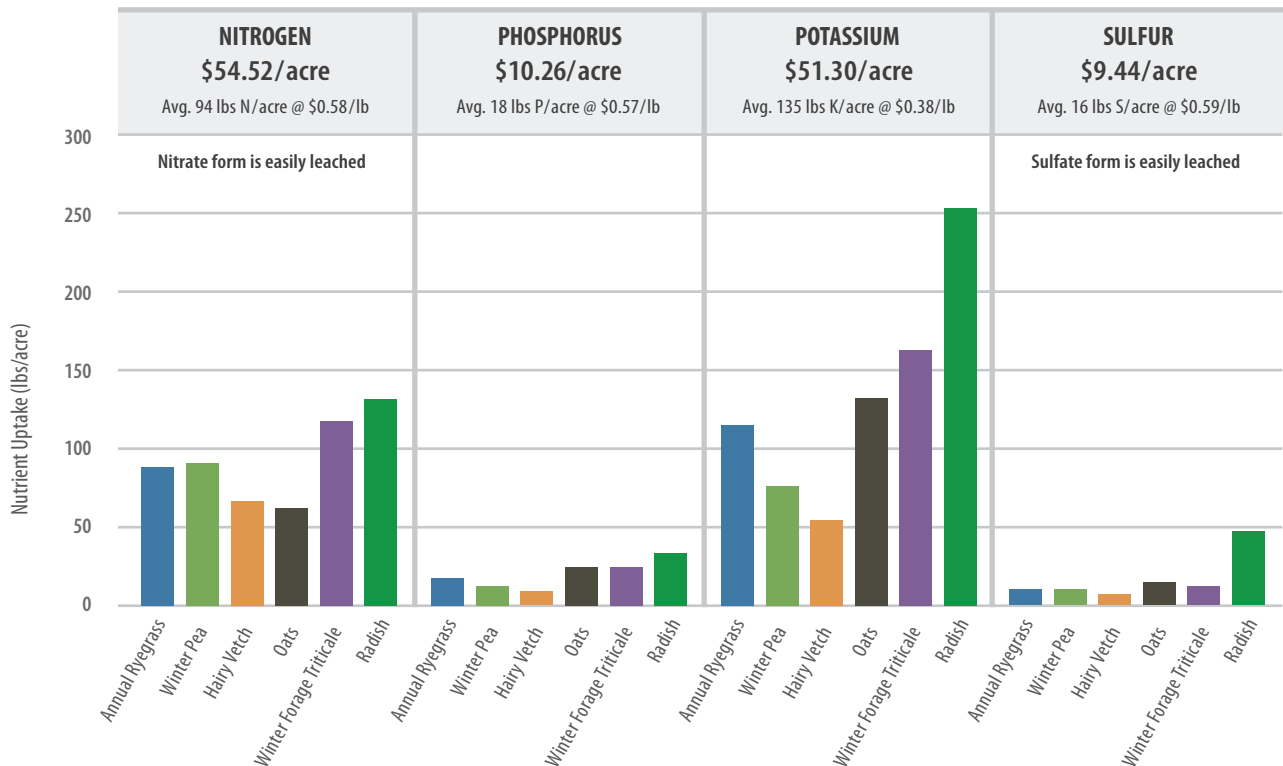
- Nutrients like N in the nitrate form and sulfur (S) in the sulfate form can be easily lost by leaching in fallow fields. A cover crop can take up and hold those nutrients and release them in the spring.
- Nutrients not lost to leaching are nutrients you don't need to purchase next season.
- Nutrients like phosphate (P) and potash (K) are not generally lost from the soil, but only a small amount of these nutrients are in a plant-available form.

Using cover crops can make P, K, and a wide range of other nutrients more available to the next crop than they would be without cover crops.

Holding Nutrients in Place



Fall Nutrient Uptake



Data shown above are from replicated plots planted after wheat in Holtwood, PA

The graph above shows values from field scale research plots. The value of the nutrients at the top of the graph are calculated from fertilizer prices that may be different in your region. Adjust accordingly.

- Nutrient release from your cover crops is linked into many factors that affect the rate of plant decomposition, nutrient leaching, and nutrient tie-up. Knowing the full nutrient content of your cover crop gives you a better picture of what you are working with.
- It is not recommended to pull nutrient management decisions from these exact numbers.
- Contact a regional expert for more details on nutrient credits.

Cover Crop Radish

FALL

PLANTING

Plant 3 to 10 weeks before the first killing frosts.

Radish size depends on growth time, plant competition and available nutrients to scavenge.

NUTRIENT SCAVENGING

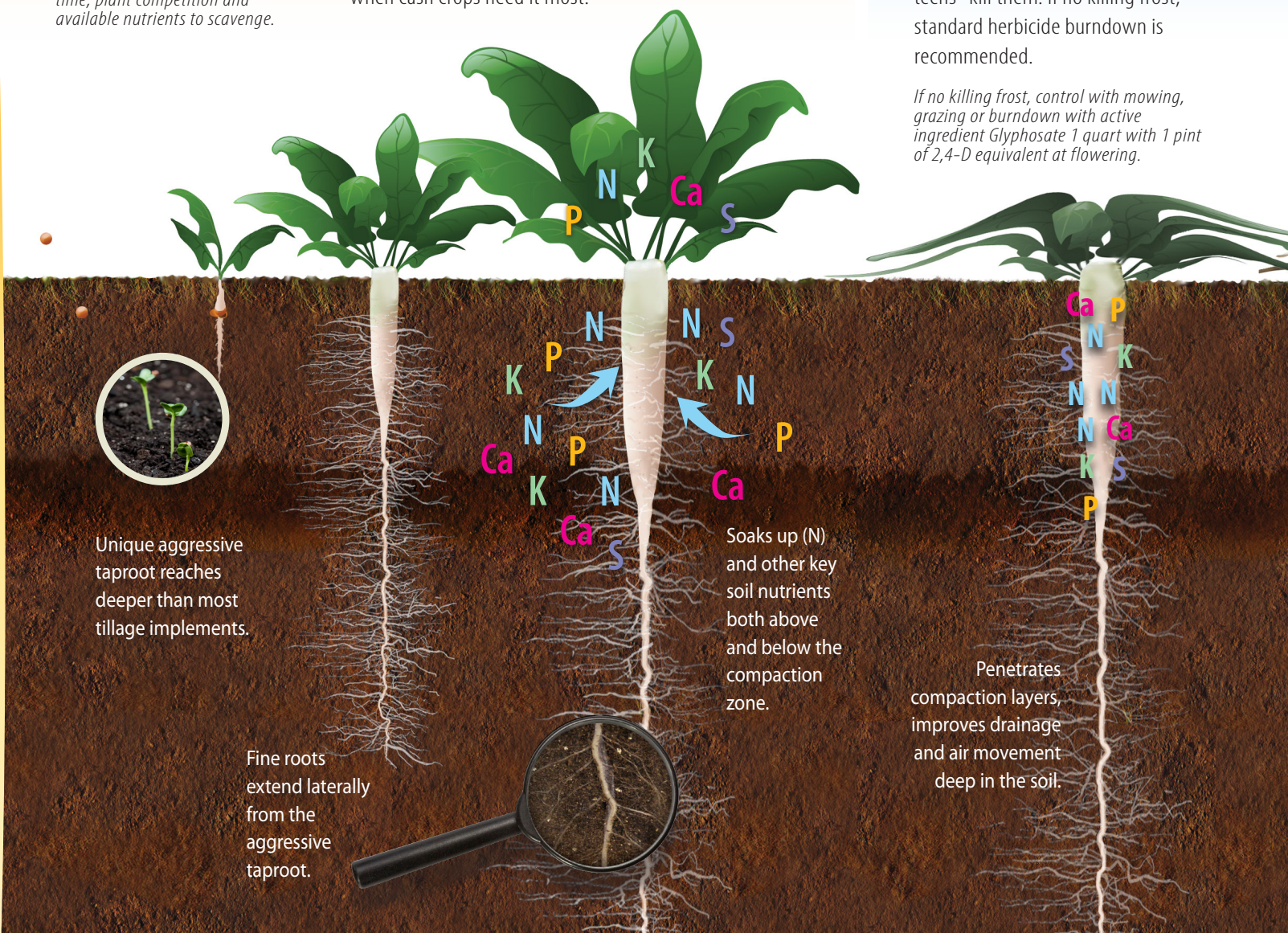
Cover crop radish absorbs nitrogen (N) and other key nutrients, including that from manure, and releases them in spring when cash crops need it most.

WINTER

N WINTERS OVER

Cover crop radish holds plant-available (N) and other soil nutrients. A few cold nights in the "mid-teens" kill them. If no killing frost, standard herbicide burndown is recommended.

If no killing frost, control with mowing, grazing or burndown with active ingredient Glyphosate 1 quart with 1 pint of 2,4-D equivalent at flowering.



Unique aggressive taproot reaches deeper than most tillage implements.

Fine roots extend laterally from the aggressive taproot.

Soaks up (N) and other key soil nutrients both above and below the compaction zone.

Penetrates compaction layers, improves drainage and air movement deep in the soil.

SPRING

WHAT WEEDS?

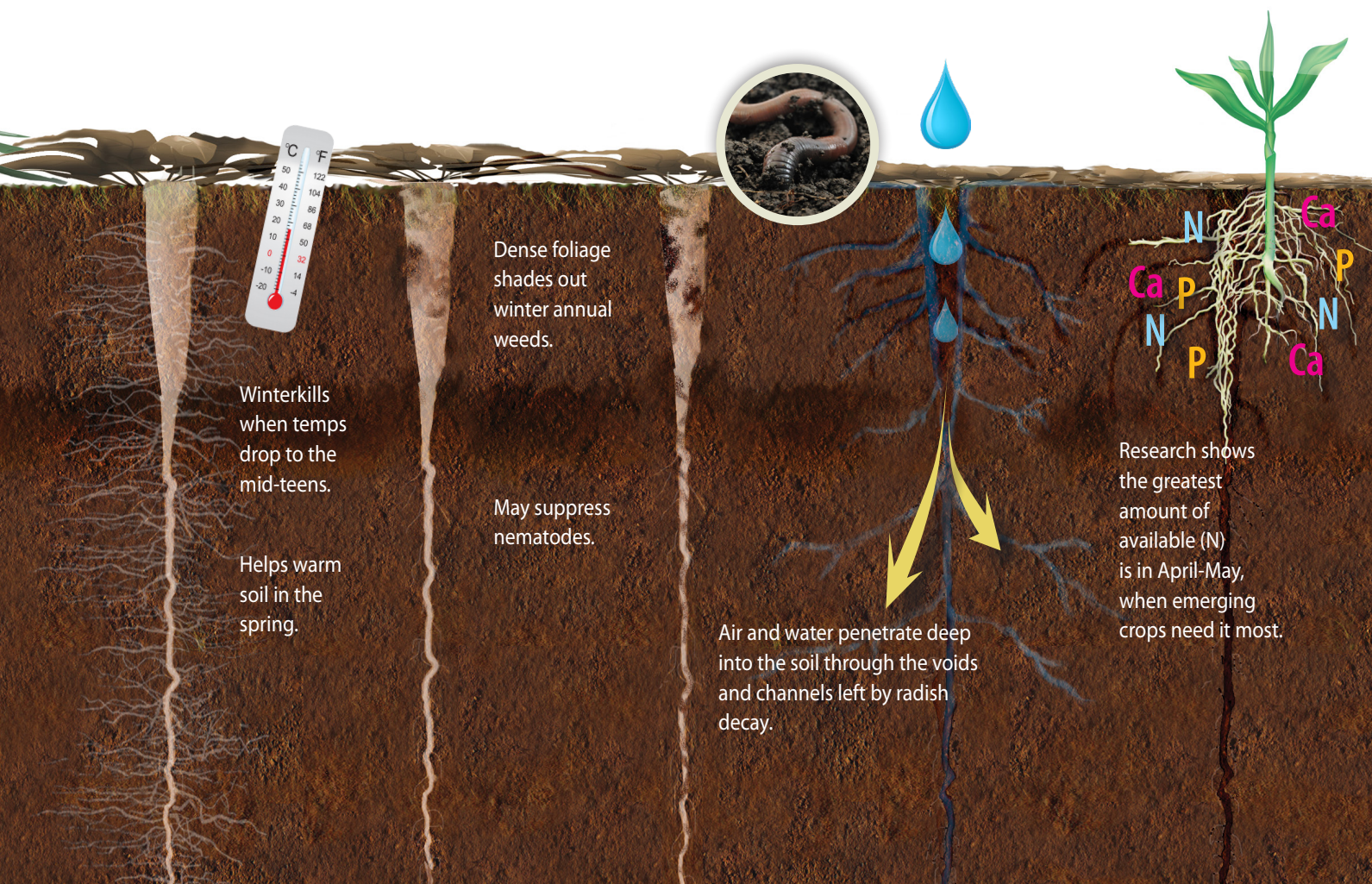
The dense cover crop radish foliage forms a thick canopy so most winter annual weeds never see the light of day. Herbicide burndown can be reduced.

SOIL CONDITIONING

As cover crop radish decays, voids are left in the soil, with holes in the compaction zone created by the taproot. This means greater air and water circulation in the soil, increased microbial activity, and much easier planting.

DECAY AND RELEASE

As temperatures rise, the (N) is released back to the rhizosphere, the root zone, where it is available for the crop that follows cover crop radish.



Species, Mixes & Management Considerations

Steve Groff



Annual Ryegrass



EXCELLENT FOR...

- ✓ Scavenging and holding nutrients through the fall and spring
- ✓ Dense rooting network for compaction relief
- ✓ May help in managing soybean cyst nematode
- ✓ Slower to mature than cereal rye

Its dense network of fibrous roots provides better soil to root contact, to take up more nutrients and break up compaction which leads to better soil aeration.

Annual Ryegrass will overwinter in many areas, which leads to a longer period of nutrient uptake and later release of scavenged nutrients.

When annual ryegrass is planted early enough, there has been some evidence that soybean cyst nematode egg counts will be decreased. The mechanism for this is not well understood and more research is planned.

FORAGE POTENTIAL

Because it overwinters, Annual Ryegrass offers the opportunity for spring grazing or a silage crop. Remember that when using Annual Ryegrass as a forage, nutrients taken up by the cover crop will be removed from the field and fertilizer adjustments will be needed for the subsequent crop.

PLANTING TIPS & SEEDING RATES

Planting: Plant 3-10 weeks prior to first freeze

Seeding Depth: 0.5"–1" Comparable seed on drill chart is **Tall Fescue** (reduce by 20%), **Crested Wheat Grass** (reduce by 10%), **Annual Ryegrass**

Seeding Rate:

- **Drilling (7.5" rows):** 12 lbs/acre
- **Broadcast / Aerial:** 15-18 lbs/acre
- **Precision Planting (15" with 1.5" in-row spacing):** 10 lbs/acre
(Kinze Brush Meter with Backing Plate - 60 Cell Milo Plate (Red) set to 275K Pop)
- **For Forage:** Increase drilling rate to 25-30 lbs/acre

Control: For detailed instructions, please refer to the following page:
[Controlling Annual Ryegrass](#)

Winter Forage Triticale



EXCELLENT FOR...

- ✓ Scavenging and holding nutrients through the fall and spring
- ✓ Good forage for fall or spring grazing or a spring silage crop
- ✓ Moderate spring growth lends to longer spring window for control
- ✓ Good vigor for early canopy development to suppress weeds
- ✓ Good wind and water erosion control
- ✓ Latest fall seeding option

Winter Forage Triticale provides a good alternative to cereal rye because of the similarity in fall establishment and cold tolerance but with delayed maturity in the spring, giving growers a broader window for termination.

Because of its good seedling vigor and early canopy development, Winter Forage Triticale provides a good option for fall weed suppression. This also means more nutrient uptake in the fall than with annual ryegrass, so less can be lost to leaching in the fall and over the winter.

Winter Forage Triticale provides an option for fall and/or spring grazing or producing a high quality spring forage crop. If used for grazing or forage, remember to adjust fertilizer application for subsequent crops.

PLANTING TIPS & SEEDING RATES

Planting: Plant 4-8 weeks prior to first freeze, and as late as 6 weeks after the freeze. Planting is similar to Cereal Rye

Seeding Depth: 1 - 1.5" as required for good seed-to-soil contact. Comparable seed on drill chart is **Wheat**. Soil pH 5.5 to 7.5

Seeding Rate as Cover Crop:

- **Drilling:** 60 lbs/acre
- **Broadcast / Aerial:** 70-80 lbs/acre
- **Precision Planting (15" with 2" in-row spacing):** 40 lbs/acre
(Kinze Brush Meter with Backing Plate - 60 Cell Soybean Plate (Black) set to 175K Pop; with White Planter, use Wheat Plate)
- **For Forage:** Increase drilling rate to 120 lbs/acre

Control: Requires a burndown of one quart glyphosate prior to boot stage. Can also be mechanically controlled by mowing or flattening with a roller or crimper in the milk or dough stage.

Annual Ryegrass Control Made Easier, More Effective

Annual Ryegrass (ARG) is an outstanding cover crop for building soil health. But don't let it go to seed or it will create weed management problems in the future. The goal is successful control following the first herbicide application. If complete control was not achieved, here are a few things to consider.

THE PLANT

- Control Annual Ryegrass before the first node appears when possible.



First node / joint

Uncertified Annual Ryegrass seed may grow at different rates, which makes control more difficult because of uneven maturity. Certified seed grows at a uniform rate, which makes control with a single application easier to achieve.



UNCERTIFIED CERTIFIED

Control is most effective before the first node/joint appears. Once the third node/joint appears control is poor because of limited translocation, as active growth in the plant goes to reproduction.

THE CHEMISTRY

- Remove all traces of atrazine or mesotrione (Calisto,* Lumax, Lexar) in the spray tank when using glyphosate.
- Glyphosate recommendations are now 2 qts per acre.
- Inconsistent control has been experienced using Accent (nicosulfuron) or Steadfast post emergence on corn. Follow the label even with adding fertilizer, AMS and crop oil to improve herbicide absorption efficiency.
- Glyphosate works effectively alone or with 2,4-D. MAINTAIN the 2 qt. rate of glyphosate IF adding Princep, Balance Pro (isoxaflutole), Prowl H2O (pendimethalin), Resolve (rimsulfuron), Basis (rimsulfuron & thifensulfuron), Corvus (Thiencarbazone-methyl & Isoxaflutole) or Axiom (fluefenacet + metribuzin) to the glyphosate application.

TECHNIQUE

- Do not repeat mistakes that may have happened on the first application.
- Make sure the spray tank water is between 4.5 to 5.5 pH. Make sure to add AMS (ammonium sulfate) or citric acid, with 3-5 minutes of agitation for pH adjustment. This step is critical when water is high in calcium, magnesium, iron and other minerals that interfere with glyphosate activity. Agitation of the mixture is cheap insurance.
- Don't pull your punches. Use the full strength of the suggested control rate. The goal is complete control on the first pass.
- If you use a generic brand of control, make sure to adjust the rate.
- Plant contact is critical. Use a medium spray droplet size or moderate spray pressure. Spray application volume should be 8 to 12 gallons per acre, so spray strength is important.

TIMING

- Warm temperatures are essential to translocate glyphosate throughout the plant so that it is absorbed into the roots for control.

CONTROL IS BEST WHEN THE PLANT IS ACTIVELY GROWING (HIGH TRANSLOCATION)

Key trigger points to consider when controlling with glyphosate.

1. Top Growth should be more than 7 inches
2. Sunlight – the more the better
3. Soil Temperatures – above 45 degrees F
4. Air Temperatures – above 60 degrees F
5. Moisture – growing conditions should be good

If night temperatures go below 38 degrees wait 3 days before spraying. This is due to a protection mechanism by the plant to prevent freezing tissue.

- Spray at least 4-5 hours prior to sunset to allow translocation time.
- If a second pass is needed, there should be a minimum of three weeks after the first control application. The regrowth and retillering will allow for more herbicide to get to the roots for final control.

FOR ROUNDUP READY CORN OR SOYBEANS

When planting Roundup Ready corn or soybeans after emergence use a full rate of glyphosate – up to 2 quarts per acre.

On Roundup Ready soybeans you can add SelectMax (clethodim), Poast Plus (sethoxydim) or Fusilade DX (fluzifop), using label instructions on the use of fertilizer, AMS or crop oil.

FOR LIBERTY LINK CORN OR SOYBEANS AFTER EMERGENCE

CORN — Liberty does not control annual ryegrass very well. Products with Accent (nicosulfuron) have been inconsistent. Use label recommendations of adding fertilizer, AMS or crop oil to improve performance.

SOYBEANS — Add SelectMax (clethodim), Poast Plus (sethoxydim) or Fusilade DX (fluzifop), using instructions from the Liberty/Ignite label for any needed additives.

FOLLOW THROUGH

- Inspect fields 7-10 days after control application. Be alert for regrowth or missed areas that need further control.
- The following year, scout these areas for volunteer ARG.

SOURCES: Annual Ryegrass Cover Crop Management for Corn and Soybean Production 2012; management recommendations by Mike Plumer, Cover Crop Specialist; Mark Melbye, OSU Ext. Agronomist; Andy Hulting, OSU Ext. Weed Management Specialist

* Herbicide brands mentioned here are recognized as the property of their respective manufacturers.

Annual ryegrass cannot be terminated with a roller/crimper.

Sunn Hemp



EXCELLENT FOR...

- ✓ Fast growing cover crop
- ✓ Good N scavenging / Fixation
- ✓ Terminates at first freeze
- ✓ Can suppress weeds (with high populations + narrow spacing)
- ✓ Good wind erosion control
- ✓ Heat and drought tolerant
- ✓ Can suppress root-knot and reniform nematodes

Sunn Hemp is an outstanding cover crop for producing larger amounts of biomass and living cover in warmer regions. In some areas in the south, Sunn Hemp planted at higher populations and narrow plant spacing has suppressed late season *Palmer Amaranth* and other weeds. It can be rolled down to provide a mat that will help prolong weed suppression.

Although a legume, Sunn Hemp will scavenge available nitrogen and will fix nitrogen when nitrogen stressed. Either way, Sunn Hemp will hold/produce sufficient nitrogen to provide a significant nitrogen credit for the following crop.

When grown past the flowering stage, nitrogen content is reduced and stalks and stems will take longer to decompose. Sunn Hemp has been shown to suppress both root-knot and reniform nematodes.

PLANTING TIPS & SEEDING RATES

Planting: Anytime after the last threat of spring frost. For most benefit, plant a minimum of **8 weeks** prior to first freeze.

Seeding Depth: 0.5 - 1" as required for good seed-to-soil contact. Comparable seed on drill chart is **Wheat**. Soil pH 5.5 to 7.5

Seeding Rate:

- **Drilling (7.5" rows):** 20 lbs/acre
- **Broadcast / Aerial:** Not recommended
- **Precision Planting (15" with 3" in-row spacing):** 15 lbs/acre
- **Precision Planting (30" with 3" in-row spacing):** 8 lbs/acre

(Kinze Brush Meter with Backing Plate - 60 Cell Milo Plate (Red) set to 130K Pop)

Control: It is strongly recommended to terminate Sunn Hemp if flowers are present and no freeze is in sight. Fibrous stems are difficult to manage the following spring. Requires a burndown of one pint of 2,4-D along with one quart of glyphosate.

Radish/ Crimson Clover Mix



EXCELLENT FOR...

- ✓ Combination of N scavenging and fixing
- ✓ Favorable C:N ratios for favorable nutrient release timing
- ✓ Good wind erosion control
- ✓ Good mix for aerial seeding
- ✓ Easy to terminate in spring

A mix of radish and crimson clover is a good combination when looking for good nutrient capture, nitrogen fixation and quick nutrient release.

The cool season growth and deep tap root of the radish lead to significant fall nitrogen uptake. Combined with the nitrogen fixing capabilities of the clover in both the fall and spring makes a good potential for nutrient credits towards the next crop.

The nutrients will be released fairly early due to the winter termination of radish and the low C:N ratio of crimson clover.

The winter termination of radish and the ease of termination for crimson clover make this an easy cover crop to control, making it a good option for cover crop beginners.

PLANTING TIPS & SEEDING RATES

Planting: Plant 3-10 weeks prior to first freeze

Seeding Depth: 0.25 - 1" Comparable seed on drill chart is **Alfalfa**. Small seed box can be used

Seeding Rate:

- **Drilling (7.5" rows):** Radish 3lbs/acre and crimson clover 7lbs/acre
- **Broadcast / Aerial:** Radish 4lbs/acre and crimson clover 11 lbs/acre
- **Precision Planting (15" with 1.5" in-row spacing):** Radish 2lbs/acre and crimson clover 8lbs/acre

(Kinze Brush Meter with Backing Plate - 60 Cell Milo Plate (Red) set to 275K Pop)

Control: Radish winter kills with 3 nights in the mid-teens. Crimson Clover can be controlled by a spring burndown with one pint of 2,4-D along with one quart glyphosate.

Radish & Annual Ryegrass



Annual ryegrass provides a wider window for control in the spring than cereal rye.

This mix produces a high quality forage for grazing in the fall. Radish is winter-terminated in most areas, the remaining annual ryegrass may be grazed or harvested for silage in the spring.

EXCELLENT FOR...

- ✓ Scavenging and holding nutrients through the fall and spring
- ✓ Provides a uniform certified annual ryegrass for easier spring control
- ✓ Dense, deep root network for soil compaction relief
- ✓ Good forage for fall or spring grazing
- ✓ Wind & Water erosion control

A mix of radish and annual ryegrass combines two excellent fall nitrogen scavengers. The cool season growth and combination of rooting types lead to great fall and spring N uptake which reduces nitrogen losses over the winter or early spring. The dense, deep root network of the two scavengers are well suited to alleviate soil compaction and take up manure nutrients.

This mix is a good combination when looking for a good nutrient capture, and a slower nutrient release to prevent early leaching losses.

PLANTING TIPS & SEEDING RATES

Planting: Plant 3-4 weeks prior to first freeze

Seeding Depth: 0.25 - 1" Comparable seed on drill chart is **Tall Fescue** (reduce by 25%), **Crested Wheat Grass** (reduce by 15%), **Annual Ryegrass**

Seeding Rate:

- **Drilling:** Radish 3lbs/acre and annual ryegrass 12lbs/acre
- **Broadcast / Aerial:** Radish 5lbs/acre and annual ryegrass 15lbs/acre
- **Precision Planting (15" with 1.75" in-row spacing):** Radish 2lbs/acre and annual ryegrass 8lbs/acre

(Kinze Brush Meter with Backing Plate - 60 Cell Milo Plate (Red) set to 240K Pop)

- **For Forage:** Radish 2lbs per acre and annual ryegrass 23 lbs/acre

Control: Radish winter kills with 3 nights in the mid-teens. If it does not winter kill, add one pint of 2,4-D. Annual ryegrass requires a burndown of two quarts of glyphosate. Refer to previous page: Controlling Annual Ryegrass

Radish, Crimson Clover & Annual Ryegrass Mix



Radish is usually winter-terminated, annual ryegrass and crimson clover allow a wider window for control in the spring than cereal rye. This mix makes a high quality forage for grazing and can be ensiled in the spring.

EXCELLENT FOR...

- ✓ Scavenging and holding nutrients from fall through spring
- ✓ Three distinct cover crops species from diverse plant families to help promote a diversified soil biology
- ✓ A balance of fall uptake, spring growth, and favorable C:N ratios for favorable nutrient release timing
- ✓ Can add some nitrogen through fixation by crimson clover
- ✓ Good forage for fall or spring grazing
- ✓ Wind & water erosion

This mix combines crimson clover with two fall N scavengers, radish and annual ryegrass. The cool season growth and combination of the rooting types lead to great fall and spring nitrogen uptake, reducing nitrogen losses over the winter and in early spring.

These 3 cover crops in a mix is a good choice when seeking nutrient capture, nitrogen fixation and slower nutrient release in the spring to prevent early leaching losses.

PLANTING TIPS & SEEDING RATES

Planting: Plant 3-4 weeks prior to first freeze

Seeding Depth: 0.25 - 1"
Comparable seed on drill chart is **Tall Fescue** (reduce by 25%), **Crested Wheat Grass** (reduce by 15%), **Annual Ryegrass**

Seeding Rate:

- **Drilling:** Radish 2lbs/acre, annual ryegrass 10lbs/acre, and crimson clover 6lbs/acre
- **Broadcast / Aerial:** Radish 4lbs/acre, annual ryegrass 12lbs/acre, and crimson clover 9lbs/acre

- **Precision Planting (15" with 2" in-row spacing):** Radish 2lbs/acre, annual ryegrass 6lbs/acre, and crimson clover 5lbs/acre

(Kinze Brush Meter with Backing Plate - 60 Cell Milo Plate (Red) set to 210K Pop)

- **For Forage:** Radish 2lbs/acre, annual ryegrass 15lbs/acre, and crimson clover 8lbs/acre

Control: Radish winter kills with 3 nights in the mid-teens. Annual ryegrass and crimson clover require a burndown of two quarts of glyphosate with one pint of 2,4-D. Refer to previous page: Controlling Annual Ryegrass

Radish & Triticale



EXCELLENT FOR...

- ✓ Scavenging and holding nutrients through the fall and spring
- ✓ Good forage for fall or spring grazing or a spring silage crop
- ✓ Moderate spring growth allows longer spring window for control
- ✓ Good vigor for early canopy development to suppress weeds
- ✓ Good wind and water erosion control
- ✓ Easier to control than annual ryegrass
- ✓ Longer window to control than cereal rye

This mix combines two excellent fall N scavengers, radish and triticale. The cool season growth and combination of the rooting types lead to great fall and spring nitrogen uptake, which reduces nitrate losses over the winter and early spring.

This mix is a good combination because triticale overwinters and continues to take up nutrients in the spring, resulting in a slower nutrient release to help minimize early spring leaching losses.

Radish will winter-terminate in most areas. Because of its later maturity, Triticale is easier to control in the spring than annual ryegrass and a longer window than cereal rye.

These 2 cover crops in a mix makes a high quality forage for fall grazing and the remaining triticale can be grazed or ensiled in the spring.

PLANTING TIPS & SEEDING RATES

Planting: Plant 2-4 weeks prior to first freeze

Seeding Depth: 1" Comparable seed on drill chart is **Wheat**

Seeding Rate:

- **Drilling (7.5" rows):** Radish 3lbs/acre and triticale 40 lbs/acre

- **Broadcast / Aerial:** Radish 5 lbs/acre and triticale 50 lbs/acre

- **Precision Planting (15" with 5" in-row spacing):** Radish 2 lbs/acre and triticale 28 lbs/acre

(Kinze Brush Meter with Backing Plate - 60 Cell Soybean Plate (Black) set to 85K Pop)

- **For Forage:** Radish 2 lbs/acre and triticale 75 lbs/acre

Control: It is recommended to control when triticale reaches 18" in height. Use one quart of glyphosate and one pint of 2,4-D which will control any radish® that may not have been winter killed. See also: "Planting Green" on page 49.

Radish, Triticale & Crimson Clover



EXCELLENT FOR...

- ✓ Scavenging and holding nutrients through the fall and spring
- ✓ Three distinct cover crops species from diverse plant families to help promote a diversified soil biology
- ✓ A balance of fall uptake, spring growth, and favorable C:N ratios for favorable nutrient release timing
- ✓ Good forage for fall or spring grazing
- ✓ Good wind and water erosion control
- ✓ Easier to control than annual ryegrass
- ✓ Longer window to control than cereal rye

This mix combines crimson clover with two excellent fall N scavengers - radish and triticale. The cool season growth and combination of different rooting types lead to great fall and spring nitrogen uptake, which reduces nitrate losses over the winter and early spring.

This mix is a good combination when seeking a good nutrient capture, nitrogen fixation and slower nutrient release to prevent early leaching losses. The presence of Crimson Clover in this mix will help accelerate residue breakdown, making nutrients more readily available for the following crop than with the triticale residue alone.

Radish is winter-terminated in most areas. Triticale and Crimson Clover are easier to control in the spring than cereal rye. This mixture makes a high quality forage for grazing and can be ensiled in the spring.

PLANTING TIPS & SEEDING RATES

Planting: Plant 2-4 weeks prior to first freeze

Seeding Depth: 1" Comparable seed on drill chart is **Wheat**

Seeding Rate:

- **Drilling (7.5" rows):** Radish 5 lbs/acre, crimson clover 10 lbs/acre, triticale 50 lbs/acre

- **Broadcast / Aerial:** Radish 5 lbs/acre, crimson clover 10 lbs/acre, triticale 50 lbs/acre

- **Precision Planting (15" with 5" in-row spacing):** Radish 2 lbs/acre, crimson clover 5 lbs/acre, triticale 30 lbs/acre

(Kinze Brush Meter with Backing Plate - 60 Cell Soybean Plate (Black) set to 85K Pop)

- **For Forage:** Radish 2 lbs/acre, crimson clover 7 lbs/acre, triticale 60 lbs/acre

Control: It is recommended to control when triticale reaches 18" in height. Use one quart of glyphosate and one pint of 2,4-D which will control triticale, crimson clover and any radish that may not have been winter killed. See also: "Planting Green" on page 49.

Radish & Oats



EXCELLENT FOR...

- ✓ Great for first-time cover crop users
- ✓ Rapid fall growth
- ✓ Good wind and erosion control
- ✓ Aggressive fall nutrient uptake
- ✓ Winter terminates in much of the Corn Belt
- ✓ Earlier season nutrient release
- ✓ Good fall weed suppression

This mix combine two excellent fall N scavengers – radish and oats. The cool season growth and combination of the rooting types lead to superior fall N uptake which reduces N losses over the winter and early spring. Its rapid growth and nutrient uptake provide a good canopy for fall weed suppression.

The deeper tap root of the radish and the high density of fibrous roots from the oats provide an impressive rooting network for nutrient uptake.

Radish residue breaks down in the spring faster than that of the oats, helping make some nutrients available early for the next crop. Nutrient release from the oat residue is delayed because decomposition is slower. An added benefit of the delayed decomposition is that it also provides some spring protection from soil erosion.

FORAGE POTENTIAL

This mix has the potential to produce high yields of high quality forage, and is excellent for fall grazing both dairy and beef animals.

It can be harvested for hay if there are adequate drying conditions, which can be a challenge late in the season. A better option would be to bale and wrap or chop for silage at the appropriate moisture for method of storage.

When planted in early-to-mid August, radish and oats will produce higher yields of higher quality forage than when planted early to mid July. When planted early in the season, it is possible that the oats will head out, with the potential of producing viable seed if not controlled in a timely manner.

PLANTING TIPS & SEEDING RATES

Planting: Plant 3-4 weeks prior to first freeze

Seeding Depth: 0.5 - 1" Comparable seed on drill chart is Oats

Seeding Rate:

- **Drilling:** Radish 3 lbs/acre, oats 30 lbs/acre
- **Broadcast / Aerial:** Radish 5 lbs/acre, oats 40 lbs/acre
- **Precision Planting (15" with 5" in-row spacing):** Radish 3 lbs/acre
oats 20 lbs/acre

(Kinze Brush Meter with Backing Plate - 60 Cell Soybean Plate (Black) set to 85K Pop)

- **For Forage:** Radish 2 lbs/acre, oats 60 lbs/acre

Control: Winter kills with 3 nights in the mid-teens. If radish or oats does not winter kill, apply a combination of one pint of 2,4-D along with one quart of glyphosate at flowering or heading.

Radish, Sunn Hemp & Sorghum Sudangrass



EXCELLENT FOR...

- ✓ Good N scavenger and fixer
- ✓ Three distinct cover crops species from diverse plant families to help promote a diversified soil biology
- ✓ Winter terminates
- ✓ Good mix for prevented planting or other longer growing windows after cereal grains
- ✓ Good summer canopy for weed suppression
- ✓ Good wind and water erosion control
- ✓ Large biomass potential due to rapid warm season growth

This mix works well for a longer, warmer cover crop growing window such as for prevented planting acres or after wheat and spring vegetable crops.

The mixture provides a diverse set of species that are excellent nutrient scavengers and provide rapid growth and large amounts of biomass. The quick canopy development makes for good summer weed suppression.

Sunn Hemp will both scavenge available nitrogen from the soil, and also fix nitrogen if it is limited. Whether scavenging residual nitrogen or fixing additional nitrogen, the captured nitrogen will provide a benefit to the following crop.

The productivity and rooting pattern of these crops provide a lot of growth both above and below the ground. This results in many benefits that range from increased organic matter to reducing root-knot nematodes.

PLANTING TIPS & SEEDING RATES

Planting: Anytime after the last threat of spring frost. For most benefit, plant a minimum of 6-12 weeks prior to first freeze.

Seeding Depth: 1" Comparable seed on drill chart is Wheat

Seeding Rate:

- **Drilling:** Radish 3 lbs/acre, Sunn hemp 10 lbs/acre, 7 lbs/acre
- **Broadcast / Aerial:** Not recommended
- **Precision Planting (15" with 4" in-row spacing):** Radish 2 lbs/acre,
Sunn hemp 8 lbs/acre, 5 lbs/acre

(Kinze Brush Meter with Backing Plate - 60 Cell Soybean Plate (Black) set to 100K Pop)

- **For Forage:** Radish 3 lbs/acre, Sunn hemp 15 lbs/acre, 12 lbs/acre

Control: Sunn Hemp and Sorghum Sudangrass kill with the first freeze. Tillage Radish® is winter killed with a few nights in the mid-teens. A quart of glyphosate and one pint of 2,4-D will control any radish that may not have been winter killed.

Winter Pea



EXCELLENT FOR...

- ✓ Cool season legume that can fix and scavenge nitrogen
- ✓ Good vigor for thick canopy development to suppress weeds
- ✓ Residue breaks down and releases nutrients quickly
- ✓ Some degree of winter hardiness
- ✓ Efficient use of moisture

As a legume cover crop, Winter Pea is good at both scavenging and fixing nitrogen. It can produce large amounts of biomass quickly, resulting in a dense canopy that smothers out weeds.

It is especially well-suited for spring planting when there is an adequate time for growth before planting the next crop. However, fall seeding is generally preferred because of the higher potential for fixing nitrogen and providing other benefits.

Winter Pea may not overwinter in some northern areas, but where it does overwinter, it's relatively easy to terminate.

The spring growth is vigorous and provides a thick canopy to smother spring weeds. The longer the spring growth, the more nitrogen can be credited for the next crop. Winter Pea makes a good green manure crop.

FORAGE POTENTIAL

Winter Pea can provide a grazing or forage benefit and can be mixed with cereal cover crops to boost forage quality. Mixing winter pea with a cover crop species like triticale that provides a protective mulch may increase winter survival.

PLANTING TIPS & SEEDING RATES

Planting: Plant in fall 3-5 weeks prior to first freeze. Can also be planted in early spring.

Seeding Depth: 1 - 2" Comparable seed on drill chart is Soybean

Seeding Rate:

- **Drilling:** 40 lbs/acre

- **Broadcast / Aerial:** Not recommended

- **Precision Planting (15" with 4" in-row spacing):** 26 lbs/acre

(Kinze Brush Meter with Backing Plate - 60 Cell Soybean Plate (Black) set to 100K Pop)

- **For Forage:** Increase drilling rate to 90 lbs/acre

Control: At any stage can be terminated using one quart glyphosate or one pint of 2,4-D. It can also be mechanically controlled by disking lightly or mowing after full bloom. See also: "Planting Green" on page 49.

Hairy Vetch



EXCELLENT FOR...

- ✓ Cool season legume that can fix and scavenge nitrogen
- ✓ Good spring vigor for thick canopy development to suppress weeds
- ✓ Residue breaks down and releases nutrients quickly
- ✓ Some degree of winter hardiness
- ✓ Easy to terminate in spring

As a cover crop, Hairy Vetch is better suited to a wider range of environments than other vetch species. It is considered one of the top nitrogen-fixing cover crops. The longer it's permitted to grow, the more nitrogen will be fixed.

Hairy Vetch may not overwinter in some northern areas, but where it does overwinter, it's relatively easy to terminate. Spring growth is vigorous and provides a thick canopy to smother spring weeds. The longer the spring growth, the more nitrogen can be credited for the next crop. Hairy Vetch also makes a good green manure crop.

PLANTING TIPS & SEEDING RATES

Planting: Plant 4 weeks prior to first freeze. Requires specific inoculant for maximum N production. Slow to establish in the fall but does well with a nurse crop such as oats or triticale.

Seeding Depth: 0.5 - 1.5"

Comparable seed on drill chart is Vetch or Sorghum

Seeding Rate:

- **Drilling:** 20 lbs/acre

- **Broadcast / Aerial:** 25 lbs/acre

- **Precision Planting (15" with 3" in-row spacing):** 15 lbs/acre

(Kinze Brush Meter with Backing Plate - 60 Cell Milo Plate (Red) set to 150K Pop)

Control: Requires a burndown of one quart glyphosate with one pint 2,4-D. Can also be mechanically controlled by rotary mowing, flailing or flattening with a roller or crimper if in 50% bloom. Optimal nitrogen production is up to first flower. Can be planted into green. See also: "Planting Green" on page 49.

Crimson Clover



EXCELLENT FOR...

- ✓ Cool season legume that can scavenge and fix nitrogen
- ✓ Good early season vigor
- ✓ Residue breaks down and releases nutrients quickly
- ✓ Some degree of winter hardiness
- ✓ Easy to terminate in spring

As a cover crop, Crimson Clover has more seedling vigor, growing more rapidly and producing more fall biomass, than red clover. As a legume, it begins fixing nitrogen within the first 30 days of growth. The longer it's permitted to grow, the more nitrogen will be fixed.

When used as part of a grazing mix with small grains or annual ryegrass, Crimson Clover can increase protein and overall forage quality.

It may not overwinter in northern areas, but where it does overwinter, it's relatively easy to terminate.

PLANTING TIPS & SEEDING RATES

Planting: Plant 6-9 weeks prior to first freeze

Seeding Depth: 0.25 - 0.5" as required for good seed-to-soil contact. Comparable seed on drill chart is **Crimson Clover** or alfalfa

Seeding Rate:

- **Drilling (7.5" rows):** 12 lbs/acre
- **Broadcast / Aerial:** 15 lbs/acre
- **Precision Planting:** Not recommended
- **For Forage:** Add to grazing mix at no more than 7 lbs/acre

Control: Requires a burndown of one pint of 2,4-D along with one quart of glyphosate. See also: "Planting Green" on page 49.

Sorghum Sundangrass



EXCELLENT FOR...

- ✓ Good warm season production
- ✓ Large biomass potential
- ✓ Good forage source
- ✓ Good drought tolerance
- ✓ Strong rooting system
- ✓ Helps suppress root-knot nematodes

Sorghum Sundangrass is an outstanding cover crop for producing larger amounts of biomass and living cover through warmer conditions when adequate fertility is present. Sorghum Sundangrass is male sterile, so no viable seed will be produced.

It can provide a good quality and high yielding feed source that is palatable for cattle when fertilized appropriately. The growth pattern permits a wide harvest window for forage.

In addition, it has been proven to reduce root-knot nematode pressure. Sorghum Sundangrass has a low water requirement and thrives in warm weather.

SUCCESS TIPS

1. Avoid large nitrogen applications prior to expected drought periods as this can increase prussic acid concentration for several weeks after application.
2. Do not harvest drought-damaged plants within four days following a good rain.
3. Do not green chop within seven days of a killing frost.
4. Cut at a higher stubble height, nitrates tend to accumulate in the lower stalk.
5. When ensiling sorghum sundangrass, wait at least a month before feeding to give prussic acid enough time to escape.

PLANTING TIPS & SEEDING RATES

Planting: Anytime after the last threat of spring frost. For most benefit, plant a minimum of 6 weeks prior to first freeze.

Seeding Depth: 0.75 - 1" as required for good seed-to-soil contact. Comparable seed on drill chart is **Sudangrass**. Soil pH 5.5 to 7.5

Seeding Rate:

- **Drilling (7.5" rows):** 25 lbs/acre
- **Broadcast / Aerial:** 30 lbs/acre
- **Precision Planting (15" with 4" in-row spacing):** 20 lbs/acre
(Kinze Brush Meter with Backing Plate - 60 Cell Milo Plate (Red) set to 100K Pop)
- **For Forage:** Increase drilling rate to 50 lbs/acre

Control: Terminate when seed heads begin to appear unless a freeze is in sight. Requires a burndown of one quart of glyphosate.

Radish



Radishes can be planted up to 3 weeks before the average first killing frost so strategies for timely planting is paramount to take advantage of all this cover crop species has to offer.

Forage Potential

Radishes are not good to be used as a forage by themselves. However, in a mix, they are very advantageous. Use no more than 2 lbs per acre regardless of how many species are in the mix.

PLANTING TIPS & SEEDING RATES

Planting: 3-10 weeks prior to first freeze

Seeding Depth: 0.5"-1" (down to 1.5" if dry)

Use alfalfa setting on drill chart- reduce by 10%

Seeding Rate:

-Drilling (7.5" rows): 6 lbs/acre

-Broadcast/Aerial: 10-12lbs/acre

- Precision Planting (15" rows with 4" in-row spacing) 4lbs/acre

Use small sugar beet plate

For Forage: Only recommended at 2 lbs/acre with other species

Control: Radishes generally are winterkilled. If not, apply 1 pt 24-D and 1 qt glyphosate per acre

EXCELLENT FOR...

- ✓ Fastest growing cover crop in the fall
- ✓ Scavenging and holding nutrients through the fall and into early spring
- ✓ Winter kills with a few nights in the mid-teens making for easy termination
- ✓ Deep roots alleviate compaction
- ✓ May suppress nematodes
- ✓ Works well in many mixes

Radishes are the easiest cover crop to grow. They germinate easy and winterkill in most winters making termination a cinch.

Beware of which variety you buy as not all radishes are created equal! Buy from a trusted seed dealer who has experience with the variety they are selling.

Cover crop radishes excel due to the taproots ability to go through compacted soil which opens up channels for water infiltration and for subsequent cash crops to root deep down into the soil profile

Cereal Rye



Because of its rapid growth in the spring, it makes a great forage that than allows for a cash crop like corn to be planted in good time. But the optimum time for forage quality is only a few days so astute timing is required to manage that aspect.

PLANTING TIPS & SEEDING RATES

Planting: Plant 4-8 weeks prior to freeze and as late as the ground is still plantable- even up to the middle of December

Seeding Depth: 1-1.5" as required for good seed-to-soil contact.

Comparable seeding chart is Wheat. Soil pH 5.5 to 7.5

Seeding as a cover crop:

-Drilling: 40lbs/acre early; 60lbs/acre mid; 90lbs/acre late

-Broadcast/aerial: 60-80lbs/acre

-Precision Planting: (15" with 2" in-row spacing): 40 lbs/acre

(Kinze Brush Meter with Backing Plate - 60 Cell Soybean Plate (Black) set to 175K Pop; with White Planter, use Wheat Plate)

- For Forage: Increase drilling rate to 100 lbs/acre

Control: Requires a burndown of one quart glyphosate prior to boot stage.

Can also be mechanically controlled by mowing or flattening with a roller or crimper in the milk or dough stage.

EXCELLENT FOR...

- ✓ Most versatile cover crop that can be planted into early winter
- ✓ Scavenging and holding nutrients through fall and spring
- ✓ Good forage for fall if planted early and/or spring grazing or for forage
- ✓ Fast spring growth can be a challenge to control
- ✓ Good wind and water soil erosion control
- ✓ Great for suppressing weeds- especially those resistant to herbicides

Cereal rye is the most popular cover crop due to its wide planting window and ability to over winter in any weather. Even planted in late November or early December and never germinates, it will grow in early spring.

It is the best cover crop to help suppress herbicide resistant weeds, especially in soybeans.

Planting into Green Living Cover Crops

“Planting green” is a concept of planting a primary crop into an actively growing cover crop with a no-till planter or drill. Although this practice is typically used when the primary crop is cash grain, it also is applicable when planting one forage crop into another forage crop. Planting green is particularly appropriate where growing seasons for cover cropping are short and where cover crops are planted late in the fall such as following harvest of grain corn and soybeans. Planting green is an approach to enhance soil health in no-till systems.

PLANTING GREEN: POTENTIAL BENEFITS

1. Traditionally cover crops are killed 10 to 14 days before planting. When killing the cover crop at or after planting, both above-ground and below-ground biomass increase significantly.

2. Winter hardy legumes such as hairy vetch and clovers will produce more nitrogen for the following crop.

3. Actively growing grasses and other covers will take up more available nitrogen, potash and phosphorus due to a deeper and larger root system. This will result in conservation of nutrients for future crops and reduced loss to the environment.

4. A growing cover crop can be important in reducing excess soil moisture during the spring planting season. It will allow for earlier spring planting.

5. Planting green helps keep living roots in the soil throughout the year. This principle is an integral part of the no-till systems approach for sustainable agriculture and soil health (Duiker and Myers 2005).

6. Living root systems and greater soil cover decrease rill, interrill and gully erosion.

7. Living root systems exude labile organic compounds that feed living soil organisms in the rhizosphere. These organisms play important roles in building soil structure and nutrient recycling.

8. Living root systems help soil both resist and alleviate soil compaction.

9. Planting green will reduce surface runoff from rainfall. Research shows that increasing surface residue reduces surface runoff and soil erosion. Having 50% or greater surface cover throughout the year is an excellent goal for producers desiring enhanced soil health and yields.



Rolling is not necessary when Planting Green into cover crops less than 20" tall.

10. Increased soil cover will reduce soil moisture losses and maximize rainfall infiltration during the summer months.

11. Preliminary results suggest that slugs prefer to feed on some cover crop instead of the primary crop during its establishment period. This can reduce slug damage.

PLANTING GREEN: POTENTIAL CHALLENGES

1. Nitrogen management changes when planting corn into living cereal rye or triticale. More nitrogen is needed in the early weeks of corn growth. However, soybeans thrive when planted green into cereal rye or triticale.

2. Cash crop emergence can be slower due to cooler soil temperatures in the spring. Later on in the heat of summer, the cover crop biomass will continue to keep the soil cooler which is a benefit to the crop.

3. Proper row cleaners and closing wheels are needed so as not to wrap with the taller cover crop stems.

4. Specific attention needs to be directed to closing the seed slot as the living root mass can be a challenge. Spoked type closing wheels seem to make this challenge an easy fix.

5. Tall growing cover crops can tangle and catch on planter parts. The degree of this problem is associated in how the planter is set up. Planters with rollers attached don't seem to have as much problem with this due to the cover crop being laid down toward the front of the machine. Some farmers have simply used ropes near the front of the planter to lay the cover crop forward a bit so as not to catch on the planter.

PLANTING GREEN: CONSIDERATIONS

1. This practice is not recommended for the beginning no-tiller. Experienced no-tillers are more likely to be successful with this practice.

2. Planting equipment needs to include appropriate attachments including row cleaners, seed firmers, and effective closing wheels. Pay close attention to accurate seed placement and seed slot closure.

Consider planting deeper to cleanly cut the cover crop residue and avoid “hairpinning.” Modern hybrids have strong emergence characteristics and Planting Green typically happens later in the season with warmer temperatures.

3. Planters and drills must be properly maintained and adjusted to do this type of planting. They should have adequate weight for penetration, heavy down pressure to force planting units into the soil. Worn bushings should be replaced, units set to run level with the soil surface and double disk openers should have proper diameter and touch each other according to manufacturer’s specifications.

4. Monitor insect pests and apply insecticides if needed, following IPM procedures. For example, if cut worms are typically a problem, pay particular attention to this pest and scout every few days after corn emerges. The use of a knowledgeable crop advisor who supports this practice is strongly recommended when planting green.

5. When a dry spring (at or just prior to planting time) is anticipated or observed, it is recommended to kill the cover crop early and not plant green. Plans need to be in place to either terminate or use a roller

crimper in the event of rainy periods at planting time. Soil moisture recharge over the winter months and soil moisture storage capacity will affect this decision. It is a very important aspect of planting green and experience over a number of years will help a producer to refine this decision.

6. For the more advanced cover crop farmers, allowing cover crops to grow to boot stage or heading stage will give the best ground cover for the summer. When allowing cereal rye or triticale to grow longer, consideration must be made in light of those cover crop species taking up all available nitrogen at the time of planting.

Be sure to add nitrogen as part of a starter fertilizer in furrow and close to the seed or broadcast. If planting into legumes or if legumes were included in a mix, the need for nitrogen at planting can be reduced.

7. When terminating a cover crop without herbicides by using a roller crimper, the planting date is strictly determined by the cover crop maturity. For Cereal rye, this is at or after milk stage– past pollination. Use cereal rye if you intend to plant soybeans. For corn, use hairy vetch or crimson clover and wait until full flower to terminate.

For those who use herbicides, much more flexibility is available in relation to the planting

date. Ideally a herbicide is sprayed 2 days ahead of planting in order to give it time to trans-locate to the cover crop roots. But be intentional about not spraying any more than you can plant before the next rain as a dying cover crop will not take up extra moisture and could keep you out of the field for an extended period of time.

Some farmers have had success spraying after roll crimping but it is not recommended. Burn down herbicides can be reduced in a roll crimp situation. A little bit of herbicide goes a long way with this practice!

8. If roll crimping in a separate pass, careful planning needs to be considered when doing end rows and point rows. **YOU CANNOT PLANT ACROSS MATURE CEREAL RYE STEMS!** Always try to roll in direction of intended planting.

9. Cover crops 20 inches or more tall will risk shading rows and cause spindly stalks and possible yield loss.

10. Conditions will change from year to year depending on the weather, your comfort level, and other factors. Have a backup plan in place in case the covers get too big and you reach the limitations of your current planter setup.



If planting into cover crops that are taller than 24” a smooth closing wheel will avoid wrapping. However, a spoked type closing wheel will require less down pressure to consistently close the seed trench. A deflector will help eliminate wrapping in tall cover crops.



Use smooth or curve spoked type row cleaners with treader attachments to avoid wrapping. Many long-term cover crop farmers take off the no till coulters, use 3.5mm double disk openers and closely monitor seed tube protector wear.

Establishing a Cover Crop

Steve Groff



Establishing a Cover Crop

For most farmers, seeding a cover crop requires management and labor just when the primary crop harvest is approaching. It's a good idea to make two primary decisions before harvest activities begin by answering the following questions:

1. Will you plant cover crops yourself, or hire a custom applicator?
2. Do you want cover crop seed placed *on the surface* or *in the soil*?

SEEDING ON THE SOIL SURFACE

Broadcast seeding on the surface can let you successfully plant your cover crop into a standing crop like mature corn if there is adequate soil moisture and sunlight for it to get established. In some circumstances, light tillage may help improve seed-to-soil contact. Methods used to seed cover crops on the surface include but are not limited to the following techniques.

Aerial or Surface Broadcast

- Immediately following harvest.
- Into standing crops when conditions allow: corn at black layer, soybeans just before leaf drop.

Dry Fertilizer Equipment

- Apply cover crop seed alone or mixed with dry fertilizer. Be sure to apply any cover crop mixed with fertilizer the same day.

High-Clearance Equipment

- With drop tubes, spinners or other attachments.

Combine Attachment

- Places seed on soil under the header, seed under residue.

SEED PLACED IN THE SOIL

Seed-to-soil contact typically results in higher germination and plant vigor as it finds water more easily.

Precision Planting

- Technique is the same as with corn, soybeans, wheat or other cash crops.
- Available plates help accommodate seed mixes. Contact us for details.

Grain Drills

- A preferred method for planting mixes without the need for special plates.

Interseeding

- Still experimental, this approach seeds cover crops between corn rows at the V3 to V4 stage.
- By grain drill, drop tubes or broadcast seeding between rows; can be done in conjunction with side dressing nitrogen or a post emerge herbicide application.
- Early interseeding is best with corn, before canopy closes over.
- Corn allows enough sunlight to keep cover crops alive but dormant during the warmest part of the growing season.

Freeze Seeding

- Plant cover crop very late fall or early winter into slightly frozen ground that still allows a no till drill to penetrate the soil. Germination will occur when temperatures warm in the spring.
- This technique is not applicable in most situations, but has been successful with radish, annual ryegrass, hairy vetch, and triticale.

EARLY SEASON INTERSEEDING

Still experimental, but with good progress being made on techniques and equipment.

Quest for seeding technique options

This diagram shows some of the strategies being used to plant cover crops in conjunction with corn.

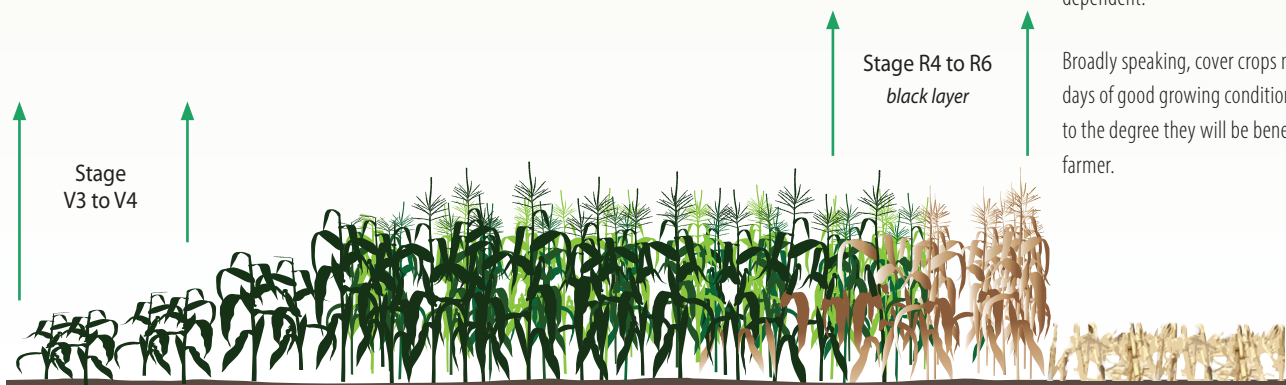
PRE-HARVEST SEEDING

There has been some success with a range of application types when the canopy is thinning allowing light to the surface.

AT-HARVEST, POST-HARVEST

Of all seeding methods listed above, pushing seed in the ground with a drill or planter is the most effective. The planting window may be narrower in some areas than others after harvest and is, of course, weather dependent.

Broadly speaking, cover crops need 30-45 days of good growing conditions to mature to the degree they will be beneficial to the farmer.



Step by Step Drill and Planter Calibrations for Planting Cover Crops

Grain/seed drills are important tools for establishment of cash crops as well as cover crops. Since drills use flutes or sponges to distribute seed it will not be singulated but randomly spaced within each row. Modern day drills do an excellent job of placing seed at a uniform depth, however they do not singulate seed like a planter.

Seed charts provided with drills provide an excellent start in obtaining the desired seeding rate. Keeping records of settings and planted acres for species over time helps check planned and actual seeding rates over the years. However from time to time, new species or mixtures of species may be planted for the first time.

This makes drill calibration especially important. Other variables that can affect seeding rates and may call for drill calibration include seed size and shape variations between crop varieties, seed coatings or seed treatments and seed density (bushel weight). This fact sheet gives easy steps to calibrate your drill.

Considerations in determining seeding rate and seed purchase

A number of considerations are pertinent in determining seeding rates. Recommended seeding rates may be provided by seed suppliers for their specific species and varieties. These rates may be modified by the time of year that planting is being completed. Generally recommended rates are based on the desired plant population following emergence.

Seeding rates in pounds per acre will be determined with the knowledge of how many seeds are in one lb of seed. Once this information is known the seeding rate will be modified to allow for actual germination and the amount of non-seed that is contained on the seed label. Hard seed is defined as seed that will not germinate as soon as the other pure seed in the bag. Hard seed is common in legumes, but usually seed rates do not need to be adjusted for hard seed.

Check with your seed supplier if you have seed with more than 5% hard seed. In selecting seed always review the seed labels for purity and germination. Pure Live Seed (PLS) is required by law to be stated on labels for all seed sold in some states. PLS is the percentage of the seed that is viable or will potentially germinate when planted. Be very cautious when considering purchasing seed with a lower than typical price.

Planting Considerations

The actual seeding rate can be monitored while planting in the field.

If your drill has an acre meter, keep track of the seed placed in the drill and what is used by refilling the drill and dividing the amount of seed by the acres planted. Alternatively, if acreage is known for a given field calculate the rate in a similar fashion. If a minor adjustment is needed look at the seed rate increments between settings and use them to more accurately make the adjustment. Actual seeding rates may vary somewhat due to ground cover, soil conditions and driving speed.

Drill depth adjustment to ensure consistent plant establishment

Depth should be checked frequently when starting planting until proper depth is achieved. Depth adjustments may need to be made in different levels of residue, no residue, as well as in different soil conditions. Be careful when planting small seeded legumes. Do not plant them too deep especially in spring in cold soils. Use no more down pressure on the drill and closing wheels than necessary to firm the soil to provide consistent seed to soil contact. Too much down pressure, especially in wet soils provides a very poor environment for emerging seedlings. Always be sure the drill drive wheel continuously rides on the soil surface to ensure consistent seed drop.

2 Easy Methods of Drill Calibration for Cover Crops and Cover Crop Blends

Option #1: In-shop calibration-preferred method for the large seed box. Requires 2 people.

1. In a field, available for planting, measure and mark 200 feet in length.
2. Place a visible mark on the wheel that drives the seeding mechanism.
3. Engage the drill fully into the ground as you would to plant and have someone count the number of revolutions of the drive wheel for the 200 feet previously marked.
4. Multiply the width of your drill X 200 feet. (Example: 15 foot drill width X 200 feet driven = 3,000 square ft.)
5. Divide the square feet covered in #4 by 43,560 (sq. ft. in 1 acre). (Example: 3,000 divided by 43,560 = .069 acre.)
6. Using the rate chart on the drill of similar type seeds and set the seed meter for the desired seeding rate. Use your best judgment and select a seeding rate for a similar seed size. Make sure enough seed is in the seed box to completely cover the flutes and openings.
7. On a solid surface, jack up the drive wheel on the drill or lift the wheel driving the seed mechanisms off the ground. Make sure the drill is secure, hooked to a tractor and is not a safety hazard.
8. Turn the drive wheel until seed starts to drop out of ALL the openers.
9. Place a large tarp under the drill so all seed can be retained on the tarp. On some drills the seeding mechanism needs to be fully engaged (down position) in order for the seeds to come out of the openers.
10. An alternative is to remove all seed tubes and attach a sturdy plastic bag with rubber bands or ties to each opening. On smaller drills it is recommended to test all openings. On larger drills at least 5 seed openings should be tested—the more the better. You'll have to account for the seeding width this represents in calculating acreage.
11. Turn the drive wheel the number of revolutions measured in step #4. Collect all of the seeds from the tarp or from the bags and weigh. (Example: 1.38 pounds collected seed divided by .069 acres for a 15 feet drill = 20lbs per acre.)
12. If the calculated seeding rate is too low or too high, open seed meter more or less and repeat the process until you get close to the desired bulk seeding rate.
13. Confirm seeding rate in field conditions
14. Next to the manufactures seed index chart use a permanent marker and write the seed index setting associated with each seed or seed blend for future reference.

Option #2: In-field calibration- an easier method, especially for the small seed box. Requires one person.

1. In a field, available for planting, measure and mark 200 feet in length.
2. On smaller drills it is recommended to test all openings. On larger drills at least 5 seed openings should be tested—the more the better. Remove seed tubes and attach a sturdy plastic bag with rubber bands or wire ties to each opening. Be sure to secure detached seed tubes (especially from a large seed box) so they don't fall under disk blades for the in-field test. You'll have to account for the seeding width represented. Calculate the seeding area this represents using steps #4 and 5 above.
3. Drive the marked distance of 200 feet with the drill engaged in the ground.
4. Weigh the collected seed and calculate the pounds per acre. Adjust the setting as necessary, turn around and drive back. Weigh the seed and calculate the pounds per acre. Repeat until the desired seed rate setting is obtained.
5. Confirm seeding rate in field conditions
6. Next to the manufactures seed index chart use a permanent marker and write the seed index setting associated with each seed or seed blend for future reference.

Option #3: Use Acuscale.com Seeder Meter. Simpler and does some calculations for you. Costs around \$60.

Option #4. Use a scale on the planter itself.

By far the easiest method! Dial in close using similar seed sizes, than plant and acre and calculate how much seed was used. Adjust accordingly. Cost can be over \$2,000 but useful for other reasons as well.

Calibrating Precision Planters

Regardless of row spacing, most cover crop single species should be set to a 4" in-row spacing. For larger seeds like peas use soybean seeding disks. For smaller seeds like radish and hairy vetch, use a small sugar beet or small milo seeding disk. The Kinze brush meter, with the addition of a customized backing plate, has the ability to plant a wide array of cover crop species and even blends.

RECOMMENDED SEED DISCS for various planters for small seeded cover crops.

SeedRight.com has custom made discs to plant cover crop mixes for JD and Kinze planters

John Deere Pro or MaxEmerge Vacuum – A51712

Kinze Edge Vac – D17050

Kinze Brush Meter – GA5795

Great Plains Twin Row Air Pro- Milo / Pelletized Sugar Beet 65 Cell Disk 817-849C

White – 854047

Case/IH 1200 series – 236027A2 (Old Milo Drums improve population)

Precision Planting (eSet disc) – 720220 (Run vacuum at 15")

Monosem – 6020

Cover Crop Seed Planting Guide

CCS Products and Mixes	Seeding Depth Inches	Drilled (7.5" rows) Seeding Rate Lbs/Acre	Comparable Seed on Drill Chart	Can small seed box be used?	Broadcast Seeding Rate Lbs/Acre	Drilled Forage Seeding Rate Lbs/Acre	Precision Planting (PP) 4" in-row spacing*	(PP) 15" rows 4" in-row Lbs/Acre	(PP) Plant Pop.
Radish	.5 to 1	6	Alfalfa (reduce by 10%)	Yes	8-10	Not rec.	Small Sugar Beet Plate	4	100 K
Annual Ryegrass	3/8 to .5	12	Tall Fescue (reduce by 20%), Crested Wheat Grass (reduce by 10%) or Annual Ryegrass	Yes	15-18	25-30	Kinze Brush Meter with Backing Plate (60 Cell Milo Plate)	10 (1.5" in-row)	275 K
Triticale	1 to 1.5	60	Wheat	No	70-80	120	Kinze Brush Meter 60 Cell Soybean Plate / with White Planter, use Wheat Plate	40 (2" in-row)	175 K
Sorghum Sudangrass	.75 to 1	25	Sudangrass	Yes	30	50	Kinze Brush Meter with Backing Plate (60 Cell Milo Plate)	20	100 K
Nitrogen Producing Cover Crop Legumes (Specific inoculants required)									
Sunn Hemp	.5 to 1	20	Wheat	No	Not Rec.	Not Rec.	Kinze Brush Meter with Backing Plate (60 Cell Milo Plate)	15	100 K
Winter Pea	1 to 2	40	Soybean	No	Not Rec.	Not Rec.	Soybean Plate	26	100 K
Hairy Vetch	.5 to 1.5	20	Vetch or Sorghum	No	25	Not rec.	Milo Plate	40 (3" in-row)	150 K
Crimson Clover	.25 to .5	12	Crimson Clover or alfalfa	Yes	15	Not rec.	Not Rec.	Not rec.	N/A
Cover Crop Mixes (refer to specific seeding rates of each species in the mixes as listed)									
Radish, Annual Ryegrass, Crimson Clover	.25 to 1	18	Tall Fescue (reduce by 25%), Crested Wheat Grass (reduce by 15%) or Annual Ryegrass	No	25	25	Kinze Brush Meter with Backing Plate (60 Cell Milo Plate)	13 (2" in-row)	200 K
Radish, Annual Ryegrass	.25 to 1	15	Tall Fescue (reduce by 25%), Crested Wheat Grass (reduce by 15%) or Annual Ryegrass	No	20	25	Kinze Brush Meter with Backing Plate (60 Cell Milo Plate)	10 (1.75" in-row)	240 K
Radish, Crimson Clover	.25 to 1	10	Alfalfa	Yes	15	Not rec.	Kinze Brush Meter with Backing Plate (60 Cell Milo Plate)	10 (1.5" in-row)	275 K
Radish, Oats	.5 to 1	33	Oats	No	45	62	Kinze Brush Meter with Backing Plate (60 Cell Soybean Plate)	23 (5" in-row)	85 K
Radish, Triticale, Crimson Clover	1	50	Wheat	No	65	69	Kinze Brush Meter with Backing Plate (60 Cell Soybean Plate)	37 (5" in-row)	85 K
Radish, Triticale	1	43	Wheat	No	55	77	Kinze Brush Meter with Backing Plate (60 Cell Soybean Plate)	30 (5" in-row)	85 K
Radish, Sunn Hemp, Sorghum Sudangrass	1	20	Wheat	No	Not Rec.	30	Kinze Brush Meter with Backing Plate (60 Cell Soybean Plate)	15 (4" in-row)	100 K

SEEDING RATE ADJUSTMENTS

For different techniques based on the drilling rate

Broadcast Increase rate by 25%

Aerial Seeding Increase rate by 30%

For Forage Increase rate by 50%

Precision Plant Decrease rate 10%-50%

Late Planting Increase rate 10-20%

Weed Control Increase rate by 50% or more when weed control is primary objective

NOTE CHARTS ARE ONLY A GUIDE. RATES ARE AFFECTED BY SEED SIZE AND QUALITY, EQUIPMENT CALIBRATION, WHEEL SLIPPAGE, SOIL FERTILITY AND RAINFALL, ETC.

* Refer to bag label for seeds per lb.

Not Rec. = Not Recommended

Cover Crops for Forage & Grazing

Steve Groff



Using Cover Crops for Forage

When given adequate growing time and proper management, cover crops can achieve soil and nutrient conservation goals while also providing the opportunity to produce hay, silage or use for grazing.

Considerations to maximize the utilization of cover crops for forage include the following:

1. For better results when using cover crops for feed, you may need to increase seeding rates and apply fertilizer.
2. Ratios of different species in mixtures may need to change with increased seeding rates. This is particularly true for mixes that include radish, where we generally recommend increasing the percentage of grasses in the mix in order to maximize tonnage produced. Consult with a Cover Crop Solutions dealer for more information.
3. You'll need adequate growing time after seeding for the cover crop to develop if fall grazing or a forage crop is desired, so seeding into the standing crop or after an early harvested cash crop should be a consideration.
4. When seeded following corn or soybean harvest, the most likely use for cover crop forage will be grazing, since cooler temperatures make it difficult to get sufficient growth to harvest and store for forage.
5. Some cover crops can be grazed in the spring in some areas. A spring forage harvest may also be possible if you allow for enough spring time growth. Be sure to plan accordingly, so your cover crop forage or grazing plans do not interfere with planting subsequent cash crops.

6. If corn stalk grazing is a normal part of your fall feeding program, interseeding cover crops into standing corn before harvest will allow more growth for improved overall digestibility and a longer fall grazing period.
7. Select the appropriate species for the time and type of grazing you want. For example, seeding annual rye grass or triticale will enhance nutritional value of feed when grazed in the fall, and may also allow early spring grazing or an early forage crop before weather is warm enough to plant cash crops.
8. Radish can greatly increase feeding value and total forage yield for fall grazing, but should be used in a mix with annual ryegrass or small grains for best results. For optimal grazing performance, limit the amount of radish in a forage mix to no more than 2 lbs. per acre. With better growing conditions, which include water, fertility and growing time, seeding rates for radish in mixtures can be reduced to 1.5 or even 1 lb. per acre.



Grazing Radish

Many farmers with livestock* have used radish as part of their grazing program. It is preferred that a companion forage crop, such as such as oats, annual ryegrass or triticale be included to better balance the ration. It is important to understand the dynamics of the two main reasons for using radish in a grazing situation: forage for cattle and compaction alleviation.

Careful management is needed to not allow the cattle to graze in very wet conditions as that will negate the compaction benefits radish has to offer. Also, the cattle cannot be allowed to graze the radish to the point where they can't express their genetic potential of deep rooting (if that aspect is desired).

Radish has been proven to bring up many nutrients from deep in the soil profile that can greatly benefit the cattle's diet.

***Not recommended for lactating dairy cows.**



PLANTING TIPS FOR GRAZING

- Always mix a grass species with radish planted at 4 lbs/acre
- Provides a high protein diet into early winter
- Allow the cattle to only graze off the top one-third in order for adequate re-growth

PLANTING TIPS FOR ESTABLISHED PASTURES

Radish seed needs a chance to get started in pastures, and it's ideal to have the grass grazed low or cut low with adequate moisture prior to planting. Have the soil (N) content at least between 40-60 lbs.

Seeding Rate:

- **Drilled:** 4 lbs/acre
- **Broadcast:** 6 lbs/acre with adequate seed-to-soil contact

The radish is very digestible and provides many nutrients. Having other species established provides a balanced diet.

- Plant radish at 4 lbs/acre when direct drilling into pastureland
- Plant radish at 6 lbs/acre when broadcast seeding into pastureland
- Follow soil test recommendations
- Nitrogen available between 40-60 lbs
- Allow 3-4 weeks growth time before grazing
- Re-graze approximately on a monthly interval
- Graze no lower than 4" if you desire multiple grazing
- For best palatability, graze before it flowers

Forage Production Using Annual Ryegrass

TIMING FOR FORAGE

Annual ryegrass is one of the highest quality cool-season grasses available. When planted in the early fall (August or the first week in September), it can be grazed or cut for haylage in the fall and possibly in the spring.

Using annual ryegrass leads to healthier livestock production, at a lower cost compared to stored forage. In the leafy stage it is highly digestible and is preferred by grazing animals over other forages.

Annual ryegrass is high in protein and contains significant amounts of vitamins and minerals. See the forage data below. After jointing, protein level will decrease as the amount of biomass increases.

SEEDING DETAILS FOR FORAGE POTENTIAL

Follow general recommendations for using annual ryegrass as a cover crop. However, make the following adjustments:

SEEDING DATE – THE EARLIER THE BETTER

- Seeding in August or early September is critical if you expect fall forage.
- Seeding after wheat, vegetables or corn silage, with manure applied, provides an excellent opportunity to produce some very high quality forage.
- A later seeding in late September may allow early spring grazing or greenchop.
- A dormant seeding in late November/December (soil temperature less than 40° F) may provide late spring forage (too late for corn, leaving soybeans the preferred crop to no-till).

SEEDING RATE – HIGHER SEEDING RATE NEEDED COMPARED TO USE AS A COVER CROP

- 18-30 lbs/ac drill and broadcast.

NITROGEN – A MUST

- Annual ryegrass is a nitrogen scavenger but needs an adequate amount of nitrogen in order to produce high quality forage.
- Planting annual ryegrass after manure has been applied is ideal.
- Apply 40-50 lbs/ac of nitrogen (DAP, urea, ammonia sulfate, etc.) before planting, if manure is not applied.
- If forage is harvested in the fall and spring forage is desired, then apply another 40-50 lbs/ac of nitrogen or manure in early spring.
- Do not apply manure to annual ryegrass seedlings as it may be smothered or burned by the manure's salts.

HARVEST MANAGEMENT

- Annual ryegrass can be harvested for haylage, green chop, or it can be grazed. Two to six tons/ac can be expected, depending on seeding date, fertility and weather conditions.
- Annual ryegrass does not present toxicity as do some tall fescues.
- For optimum yield and haylage quality (TDN, protein content, digestibility, etc.) cut annual ryegrass when the plant is between the boot and early head stage.
- For grazing and greenchop, start when annual ryegrass is 8-10 inches tall. Light grazing when annual ryegrass is 4-5 inches tall (60 days after planting).
- If regrowth is desired, graze or chop it no lower than three inches.
- If ungrazed, or undergrazed annual ryegrass can grow to seed head stage too quickly, resulting in lower quality and lower overall production.
- Good dry hay usually takes an extra day or two of drying time along with aggressive tedding of the swath as annual ryegrass has a waxy leaf coat and it makes a dense swath that is difficult to get air through, thus slowing the drying process.

If annual ryegrass vegetation is removed, then little, if any nitrogen can be expected for the following corn crop.

On-Farm Research

Steve Groff



ON-FARM RESEARCH: FINE TUNING WHAT WORKS ON YOUR FARM

This guide offers a wealth of knowledge for farmers and consultants who want to increase the cover crop benefits on their farms. When it comes to developing a plan that's specific to a specific farm, field and growing season, on-farm research can be a useful tool to find the management system that works for you.

THE BASICS

- ALWAYS have a control
- At LEAST 3 replications- 4 are preferred in case data from one of the reps needs to be rejected for bad data or abnormal results
- Each rep should be 500 ft length minimum- field length preferred
- Start small & increase slowly

THE BASICS

Find “the wall”. If you're testing maturity dates or groups for cash crops, for example, include varieties that you don't think will perform well in addition to those that you think might perform well. You might be surprised at the results!

Repeat the trial for multiple years. You want to make sure that results are consistent across different growing conditions.

Get into the data. Examine the data from individual plots in addition to the overall averages. Look for consistency in results within the different plots. For example, if one species performs better or worse overall, did it also perform that way in each replication?

Look at the big picture. How does the system perform through a whole crop rotation?

Be fair to the test!

The whole purpose of on-farm testing is to test the value of a new strategy. Make sure that you're making objective decisions throughout the whole process.

DETAILS, DETAILS

- Always create a border. TIP: plant short season crop on outside and end rows. Harvest this area first to open up the rest of field.
- Measure and flag reps.
- Make sure everything is set correctly before planting plots.
- HAVE SOMEONE TO HELP! A second set of eyes helps to avoid mistakes.
- RTK or RTX GPS is really helpful, but is less important if you're doing wider plots.
- Avoid abnormal areas in the field.
- Don't rely on plot data for short season yield info unless each variety was harvested at optimal maturity!
- Use weigh wagon or scales. (A yield monitor is okay for non-scientific field-length trials, but require calibration and can be finicky.)
- Note any variations in the field. Don't expect to remember!

FINAL THOUGHTS



“Treat cover crops just like every other high value crop you plant.”

“We must be both students and teachers when it comes to being a successful manager of cover crops for a better bottom line. Here are the basics I’ve learned from others and from my own experience.”

— Steve Groff

Choose performance over price. Use the same approach for cover crops that you use when buying seed for corn, soybeans or other high value crops. Be sure what you’re trying to accomplish, then look for the seed genetics with the potential to deliver it. It helps to find a dealer who knows cover crops and can help you make the best choices for cover crops that will pay.

Spread risk. Follow the fundamentals of crop establishment. Plant as soon after harvest or prior to harvest as possible. Plant for diversity to reduce weather risks, break pest cycles and prevent erosion that some monoculture species are vulnerable to.

Use test plots. A cover crop test plot on your farm is the best way to really know how cover crops work for you. Have a check strip adjacent to your test plots to show a comparison to help determine benefits.

Plan ahead. The formula for success is simple. Improved cover crops equal improved cash crops. Be prepared. Know your planting window. Have your seed available, equipment calibrated, and your workers prepared to plant.

Conduct your own research. Collaborate with others to replicate field scale research testing to give credible data for the real world. Follow up with a field day to show your neighbors and encourage what could work best for your area. Everyone will learn something.

Follow a plan. Be strategic in determining which species to plant in front of the next cash crop. Generally legumes before corn and grasses before beans. Radish can be planted before both, and mixes are becoming more popular. Consider adding wheat on a few acres or short season corn or soybeans to expand planting window opportunities.

Keep good records. As with cash crops, keep a record of cover crop planting dates, seeding rates, and other important details. Incorporate this information into your crop management programs: crop consulting, conservation plans, fertility, soil testing, yield testing, moisture and nutrient availability data. Make notes comparing soil quality, harvest ability, and any issues that may need to be addressed.

Spread out harvest. Make more of your fields available for cover cropping. Consider planting short season hybrids and varieties, planting wheat, or including grazing in your rotation.

Manage fertility. Legumes can add nitrogen while annual ryegrass and radish can keep nitrogen from leaching into tile lines and groundwater. sunn hemp is a warm season legume that can fix nitrogen during the growing season. These cover crops can be tools for planning nutrient management and for increasing soil biological activity.

Utilize the best available resources. Seek knowledgeable seed dealers, university extension teams, NRCS personnel and websites that provide credible cover crop information. Challenge yourself, your hired hands and the next generation to find ways to incorporate cover cropping into your operation. The reward is more than worth the effort.