Fall Cover Crop Options

Becky Maden and Laura Johnson

August 26th, 2020

12-1pm

What do we mean by cover cropping?

Intentionally planting a crop after or between established or establishing cash crops to cover bare soil.

4 main plant categories: grasses, legumes, other non-grass/legumes (ie. brassicas), and mixes.

Cover crops can help meet important soil management goals

Protecting soil from erosion or runoff (grasses)

Adding active organic matter to soil (grasses)

Scavenging soil nitrogen (grasses)

Fixing nitrogen (legumes)

Breaking hardpan (brassicas)

Weed and pest control (grasses, brassicas)

Improving soil livestock diversity with crop diversity (all)

Improving soil aggregate stability (all)

Types of cover crops

Three main categories based on season of growth

Summer annuals

Winter annuals

Perennials

Summer annuals for early fall-will winterkill

Aug 15-Sept 15

Grown for a short time that season

Crop residue as a dead winter cover

Nitrogen scavenging and nitrogen fixation

Provide soil cover, add OM, weed suppression

Over-winter cover: dead oats mid-May.

Provide soil cover,
add OM,
weed suppression

Photo credit: Vern Grubinger, UVM

Fall seeded field peas + oats

Biomass, nurse crop and nitrogen fixation

Photo credit: Becky Maden, UVM

Over-winter cover: dead forage radish

Tap root-Break hardpan, water infiltration (=drier fields in spring)

Mustard

Biofumigant

- Root-knot nematode

- Soil-borne fungal pathogens (Fusarium, Verticillium, Rhizoctonia, Pythium,and Phytophthora capsici).

- Allelopathic against weeds.

Image credit: Johnny's Selected Seed

Winter annuals and Perennials -winter hardy

Aug 15-Sept 15 (early fall, legumes, brassicas, and grasses)

Aug 15-Oct 1 (fall, grasses)

Provide soil protection and nitrogen scavenging

Fall seeded or early spring (legumes) seeded

Begin some growth in the fall and resume growth the following spring

OR

Provide soil cover for multiple years and N fixation

Winter annuals and Perennials- winter hardy

Nitrogen catch crop, lots of spring biomass, outcompetes weeds and allelopathic effects.

Other grasses: triticale (wheat/rye hybrid), winter wheat, annual and perennial rye (poor germ in dryer conditions), all less aggressive in spring.

Winter/cereal rye, broad cast seeded and lightly disked in. Planting date 9/15, photo taken 11/12.

Hairy Vetch—BIG N contributor

Hairy Vetch—big N contributor

Best if terminated later May

(But can be a tangled mess!)

Mixed seeding- winter hardy

Nitrogen fixation, erosion control (do well frost seeded in spring, unless very sandy soil)

Red clover and mixed perennial grasses

Mixed seeding- winter kill with winter hardy

Winter wheat- spring biomass less aggressive than winter rye in spring.

Nutrient catch crop, erosion control, OM and soil tilth builder

Winter wheat, mustard, radish mix - Mid-September planting, photo October 24th.

Integration of perennial crops-Interplanting/Undersowing

Strip-cropping cover crops

- Plant strips of legumes, grass, or legume/grass mixes between cash crop.
- Option for late harvest veg crops
- Cover crop strips are left for 1 to 3 years then rotated back to vegetables.
- Strips are mowed as needed.

Considerations

- Traffic is limited to durable strips
- Strips allow cropping of more sloping ground - hold soil and nutrients from erosion
- Less need to seed winter annual green manure during end of season narrow weather windows.
- Extra seed expense
- Equipment considerations
- Better with some vegetables than others (corn or squash vs carrots and onions)

White clover (durable!) strip crop November 2019

The University of Vermont

Oats between strawberry rows

Photo credit: Carl Johanson

Deep zone tillage strips in rye, early May.

Photo credit: Becky Maden, UVM

Zone planted winter squash into crimped winter rye

Photo credit: Becky Maden, UVM

Interseeded winter cover

Successful Example

Image credit: Becky Maden

Interseeding/Undersowing

Winter rye broadcast at side dress time in July, establishment in October 2019

Less successful example

Grass-legume mixes - Why the nurse crop?

- Rye/wheat and hairy vetch
- Oats and peas
- Oats or rye and alfalfa

Why nurse crops? Grass-legume mixes

- Nurse
- Provide physical structure for growth (trellis) and minimizes tangling/matting (hairy vetch)
- Provide protection for young seedling
- Winterkilled oats protect legume from frost heaving
- Help provide C:N ratio balance and N availability (influenced by seeding rates)
- Mopping N by grasses
- Nurse is different family, increase diversity of root structures and therefore soil biology

- Companion
- Each independently grow
- May be in same family (grasses, like oats and annual rye)
- May also be grass-legume mix (example, annual rye and clover)

Thinking about late season oats and peas?

Figure 5. Oats and field peas planted 8/5/11.

Image credit: Dept. of Horticulture, Cornell University

Planting date can make a big difference in biomass and N production.

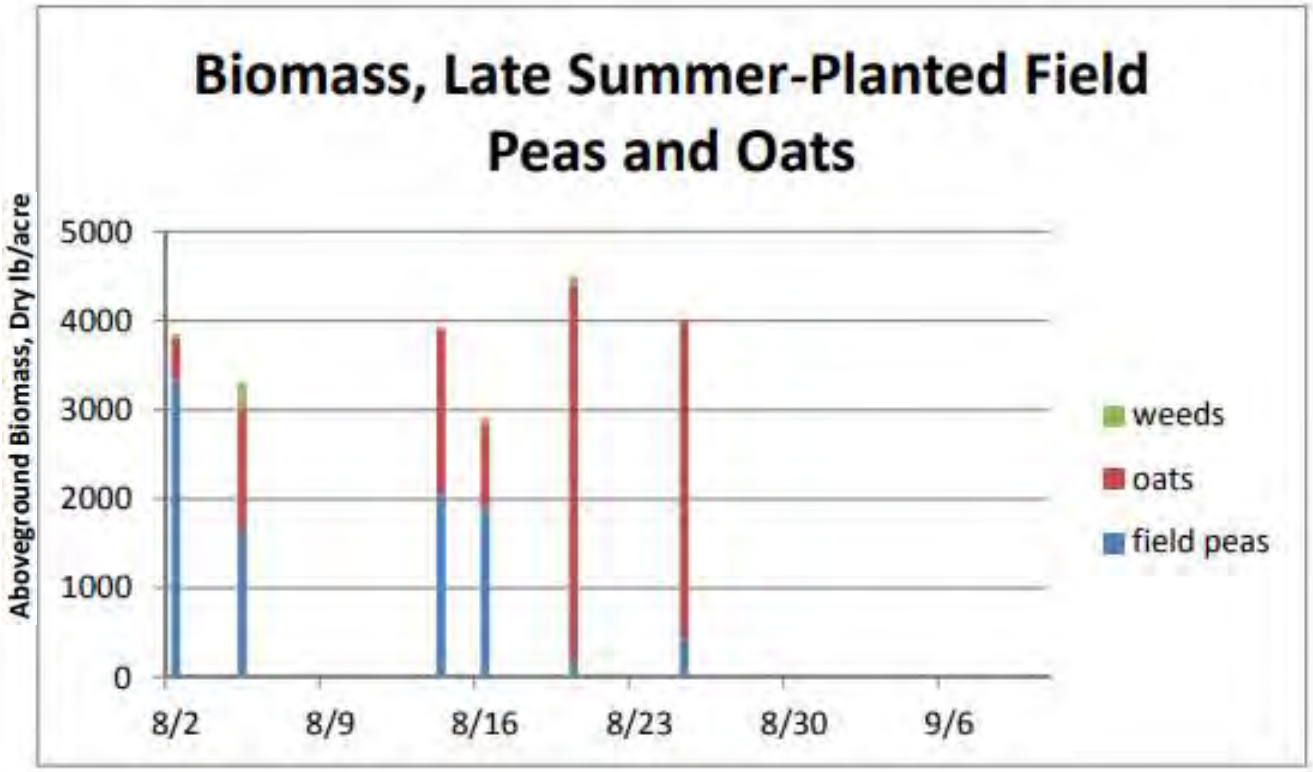


Image credit: Dept. of Horticulture, Cornell University

4,184 dry lb/acre total aboveground biomass (plant date, 8/20)
vs
2,307 dry lb/acre total aboveground biomass (plant date, 8/31)
Note: not shown in graphic

<u>The variety makes a difference</u>:

Grain-type field peas are tend to be short-statured and produce less biomass.

Forage-types produce more biomass and are better for green manure crops.

Remember your inoculants!

- For good root nodulation and maximum nitrogen production (N2 --> NH3), inoculate the appropriate species of bacteria at planting.
- Clover inoculant on peas or vetch will not be successful.
- Pre-inoculated seed available, but many times you will need to apply. Seed suppliers should have inoculant available as well.
- Sometimes, rhizobia bacteria are already present to infect the plant roots where the same legume species has been grown in the field in the recent past (2-3 years).
- Inexpensive
- Check expiration date and use before expires, short shelf life

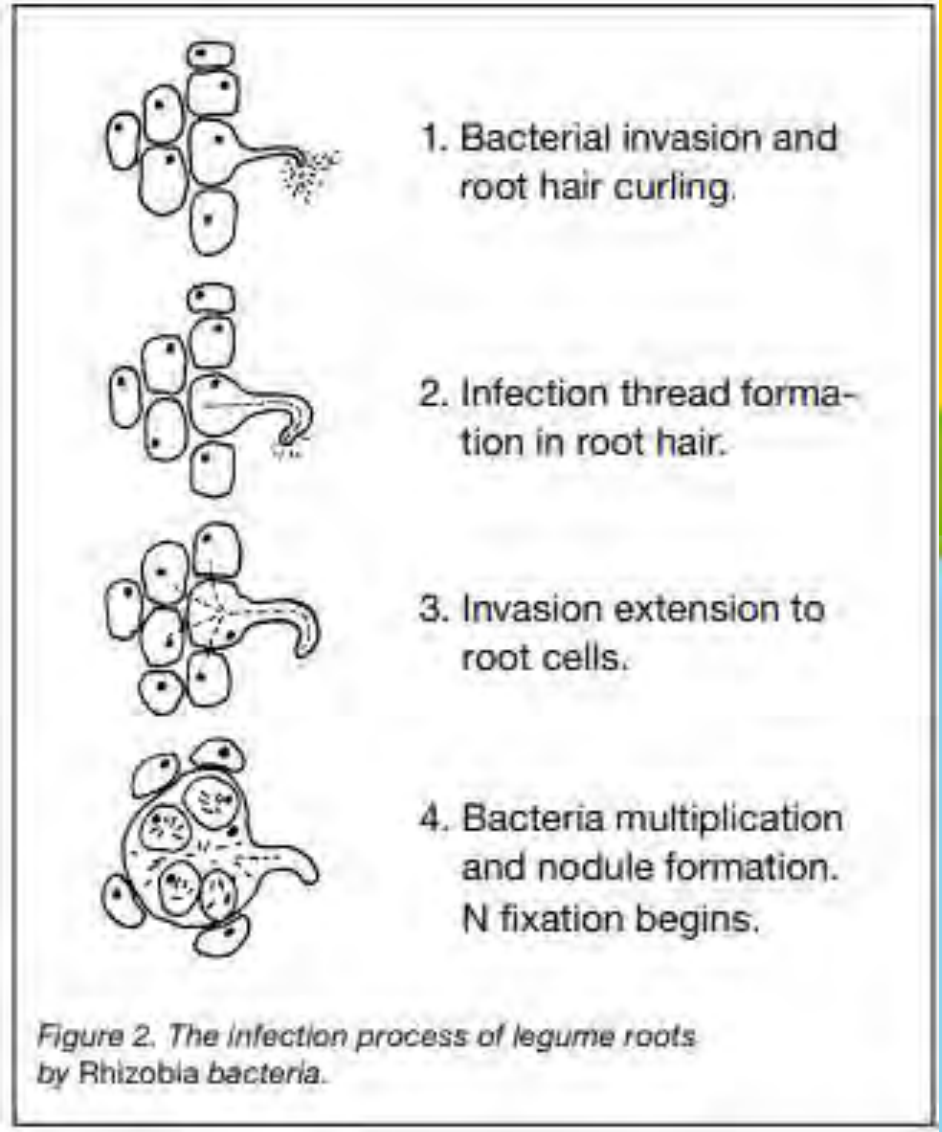


Figure 2. The infection process of legume roots by Rhizobia bacteria.

Image credit: Penn State Extension

Inoculants

To prep seed with inoculant on day of seeding:

- In a separate container, coat seed with a sticker, ie. wet the seed until just moist with sugar water, Coca-Cola, or milk in separate container, just to slightly moisten
- Add inoculant and mix thoroughly
- May spread seed and inoculant mix out on tarp or newspaper, break up any clumps

Pictureof N fixing rhizobium nodules

Nitrogen fixing nodules seen on a soybean root with nodules cut open to reveal red color indicating an active nodule
Photo Credit: Jennifer Dean,
http://phys.org/news158926862.html

Typical pattern #1 – vegetables planted April-mid May

Early Spring	Later Spring through mid-Summer	Mid-Summer to late Summer or Fall	Late Summer to early Fall
Overwintered young rye OR Winterkilled oat or oat-pea combo – generally not N fixer	Market vegetable crop (greens, brassicas, onions, etc).	Bare fallow, 4-6 weeks, based on following crop	Seed fall - winter cover crop: oats, oats & peas, rye & vetch

Slide courtesy of Intervale Community Farm

Spring—young rye
Low C:N ratio

Slide courtesy of Intervale Community Farm

Typical pattern #2 – vegetables planted later-May or after

Spring	Late Spring through late Summer	Late Summer to mid-Fall	Winter
Overwintered living cover crop, usually rye-vetch or straight rye	Market vegetable crop (cucurbits, corn, solanum, etc.)	Seed rye-vetch or rye, timing dependent	Live cover crop

Slide courtesy of Intervale Community Farm

Later spring-- mature rye plow down
Medium C:N ratio

Root 5 Farm, Fairlee

Late spring-- mature rye plow down
Higher C:N ratio

Slide courtesy of Intervale Community Farm

Winter rye with mature seed
VERY HIGH C:N ratio

Tarping freshly incorporated cover crop

Root 5 Farm, Fairlee

High residue vs low residue

Slide credit: From Jason Lilley, UMaine Extension presentation on august 12, 2020

Impact of Planting Date on Ground Cover and Biomass Accumulation

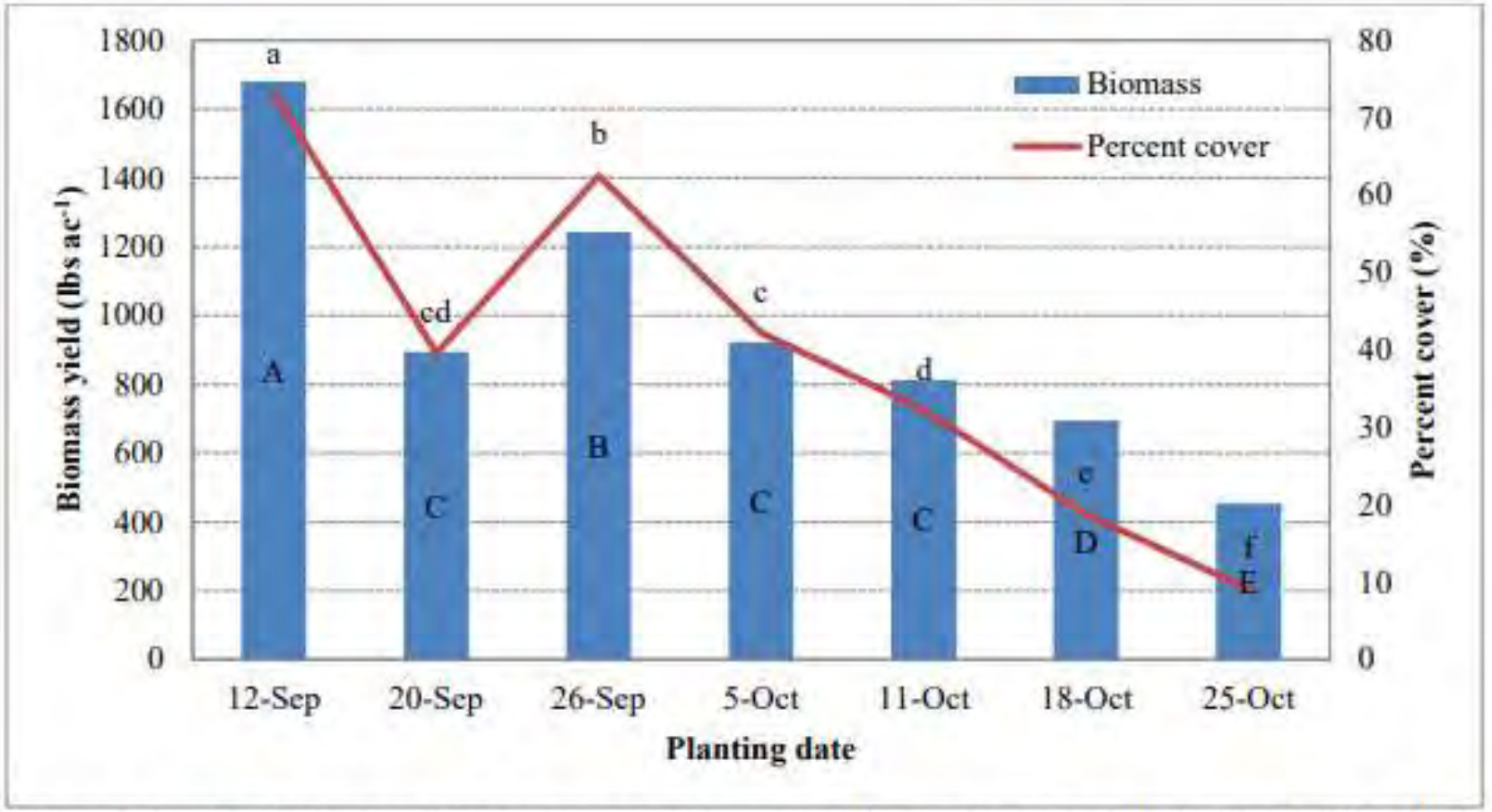


Figure 1. Impact of planting date on cover crop biomass and percentage of ground cover in Alburgh, VT. Treatments that share a letter were not significantly different from one another (p=0.10, compare capital letters for biomass and lower-case letters for percent cover).

"One day's growth in September is worth at least a week of growth in October" – Steve Groff

Heather Darby, 2013

Impact of Planting Date on Ground Cover and Biomass Accumulation

Heather Darby, 2016

Tools for establishing cover crops

Tools for establishing cover crops

Nylon bag spinner

Make sure to get good seed to soil contact!

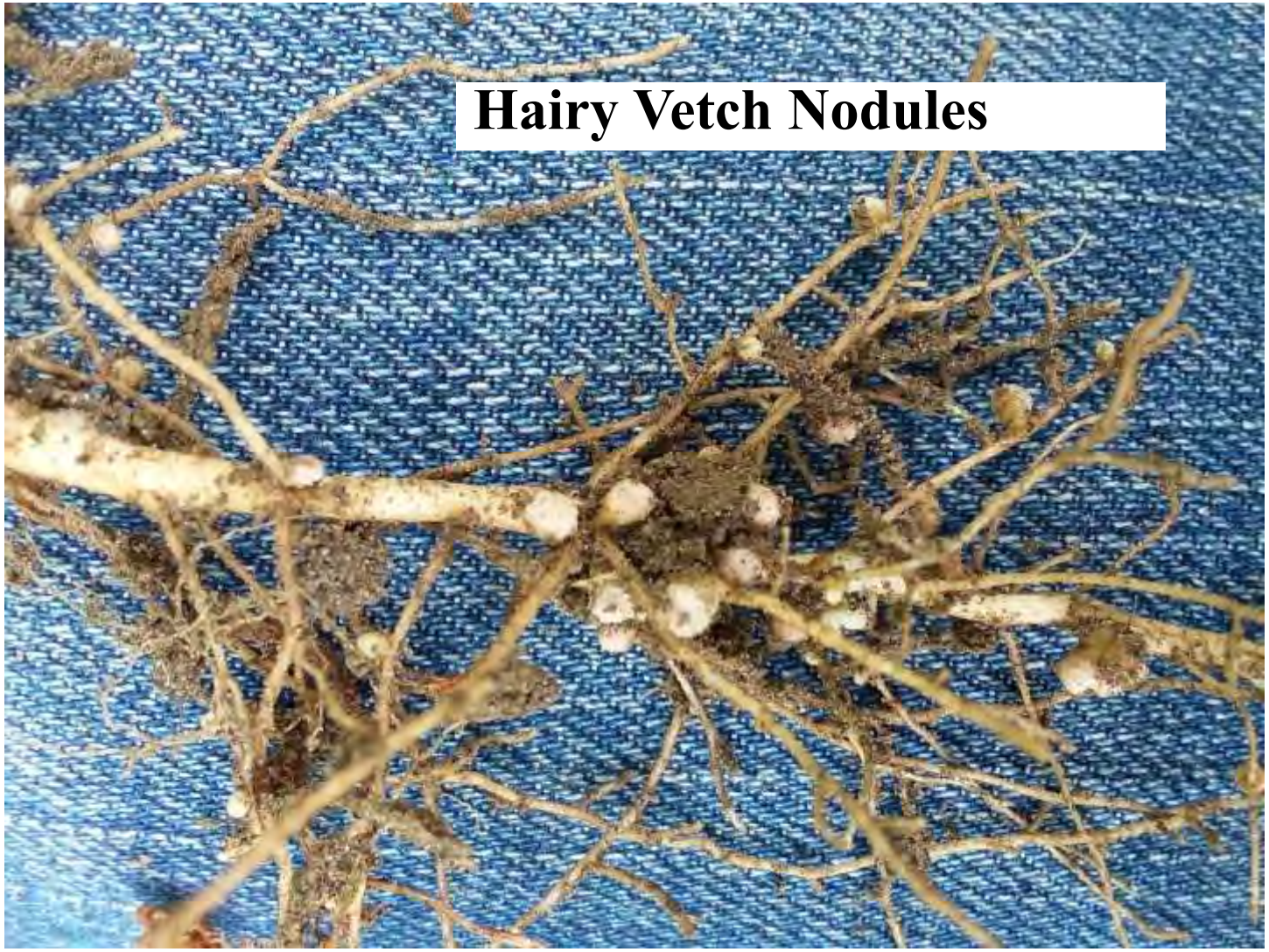
Germinating winter rye

Brillion cultipacker—for smaller seeds

No-till seeder

No-till seeder

Legume Nitrogen Contributions



Field Pea Nodules

Estimated cover crop N contributions

Cover crop	Nitrogen lbs/acre
***Rye	25
***Oat, leonard	10
Hairy vetch, spring incorp	40-70
Hairy vetch, mid summer incorp	90-200
Red clover, spring incorp	40-70
Red clover, mid summer incorp	70-150
Alsike clover	90
Sweetclover	90-170
Sudangrass	25
Field Peas	90-150
Buckwheat	10
Berseem clover	75-220

****Rates for young, succulent rye and oats. As these crops mature, the C:N ratio increases and the plant ties up nitrogen, so the N release rates become neutral*

Adapted from Albert Lea Cover Crops and Winter Grains 2015 Catalogue and the Intervale Community Farm, Burlington VT Records.

Estimated Costs per pound N

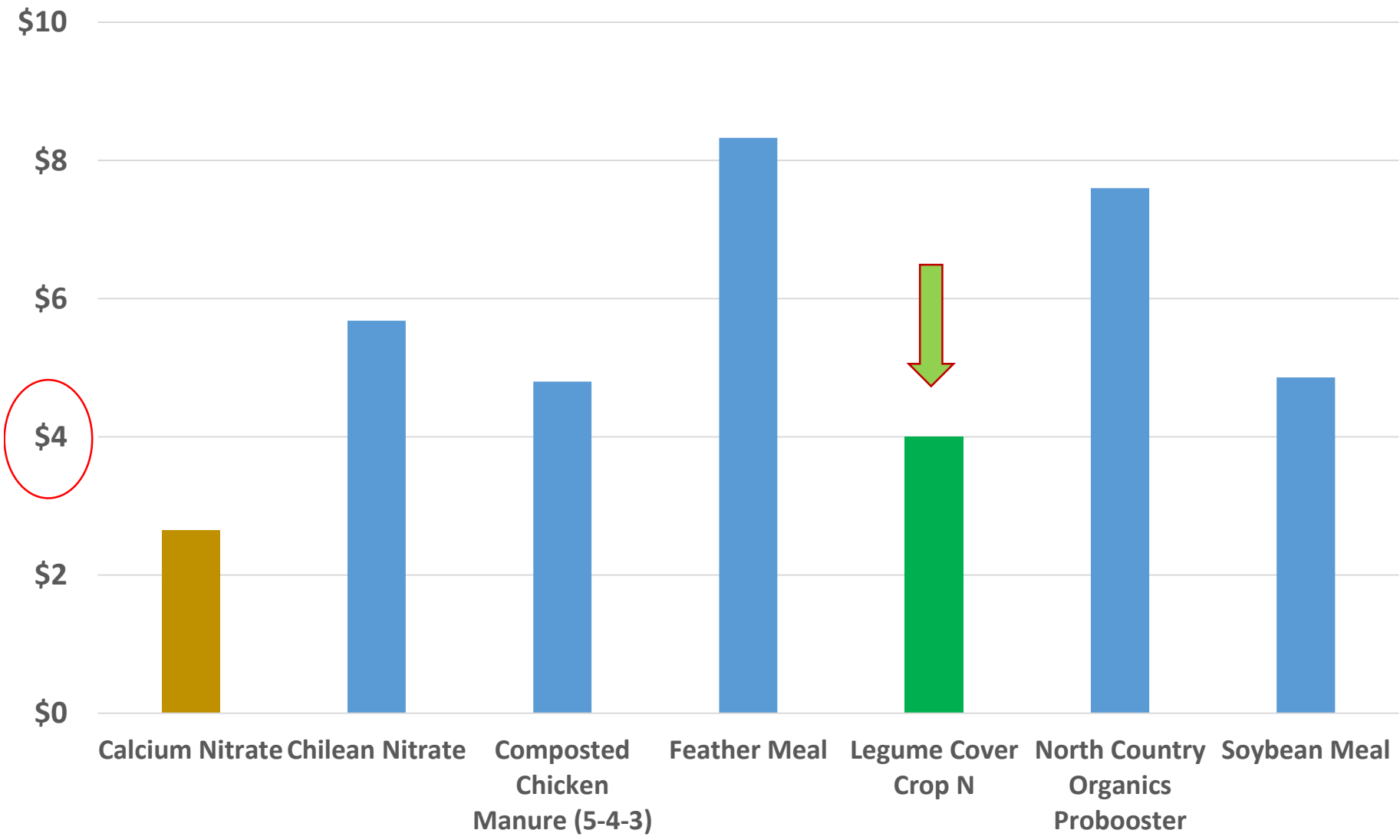
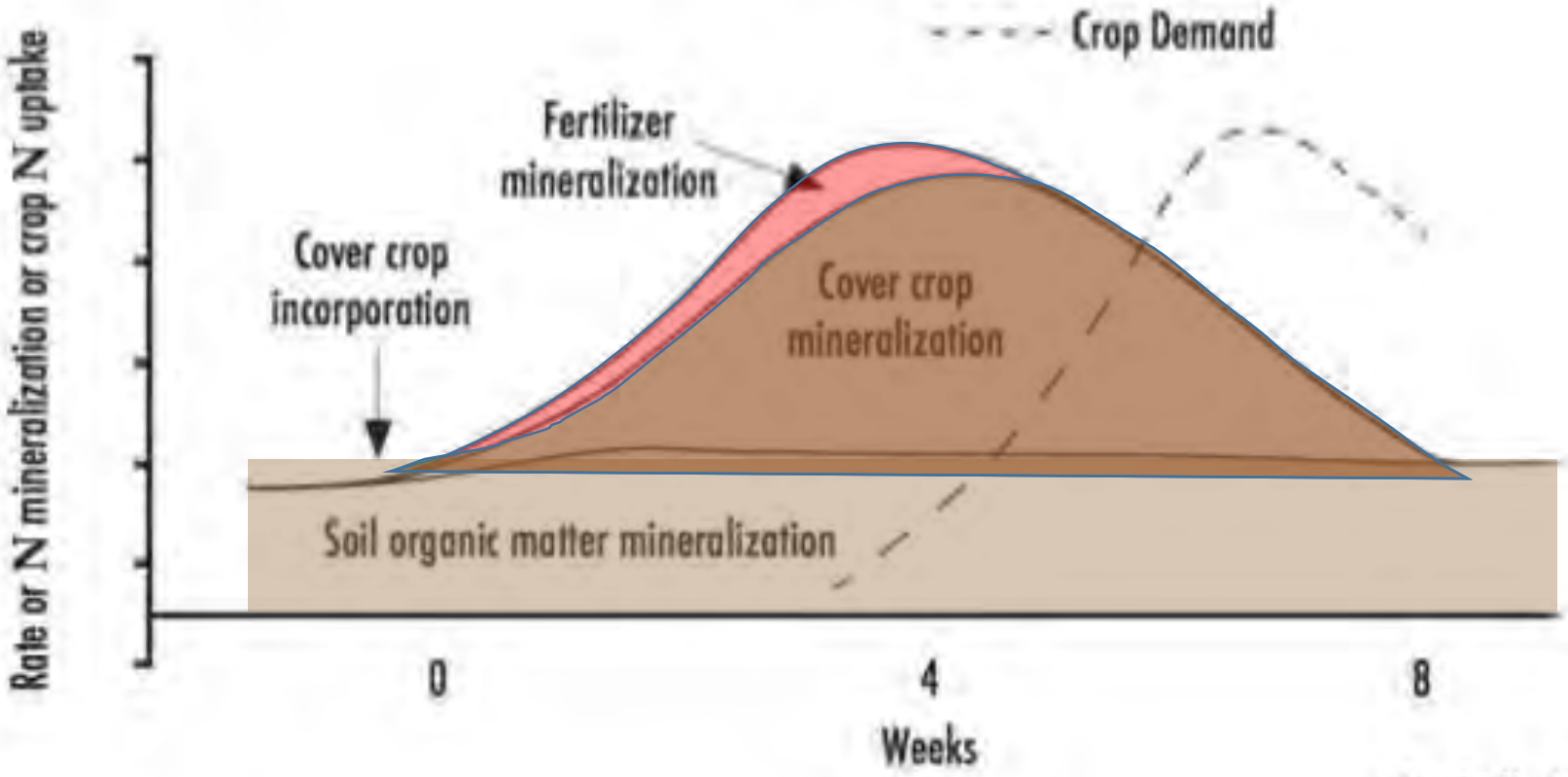
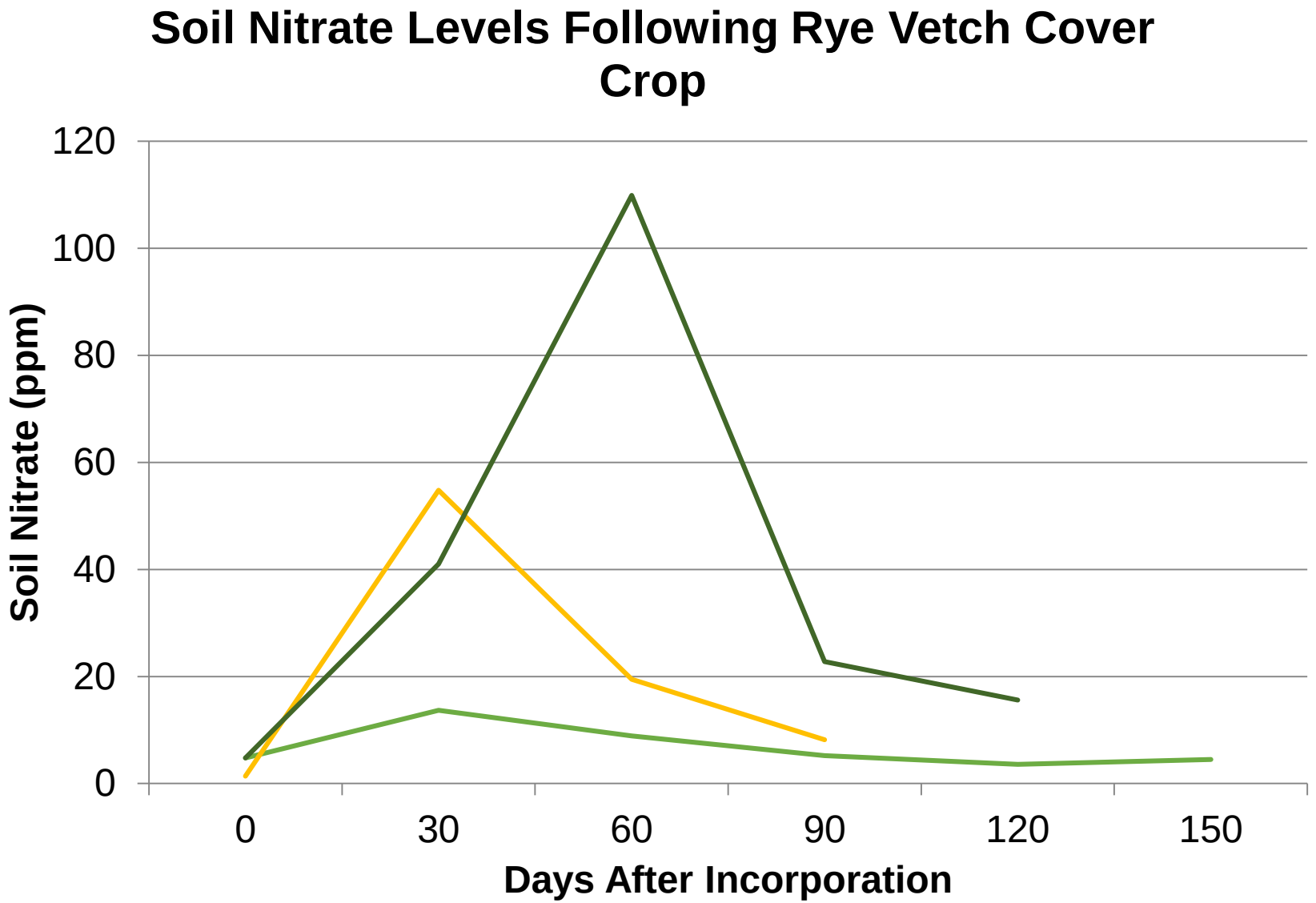


Figure 1. Timing of nitrogen mineralization from soil organic matter, cover crop residue, and organic fertilizer in relation to crop nitrogen uptake.



Gaskell, 2006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Soil Nitrate (ppm)
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Days After Incorporation

Resources

Northeast Cover Crop Council http://northeastcovercrops.com/

SARE Managing Cover Crops Profitably https://www.sare.org/resources/managing-cover-crops-profitably-3rd-edition/

Northeast Cover Crop Handbook by Marianne Sarrantonio https://www.johnnyseeds.com/tools-supplies/books/northeast-cover-crop-handbook-marianne-sarrantonio-9709.html

Midwest Cover Crop Selector Tool http://mccc.msu.edu/selector-tool

Links to more info and presentations https://www.uvm.edu/vtvegandberry/

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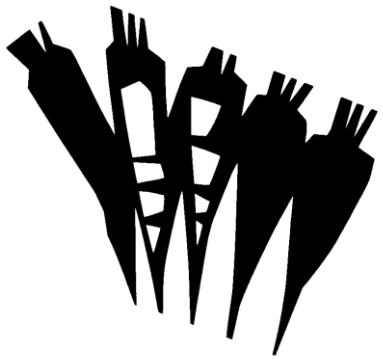
- Cash crop / cover crop rotation
- Termination strategies
- Biomass
- Nitrogen fixers
- Resources

Cover crop/ cash crop rotation for early season vegetables

Early Spring	Later Spring through mid-Summer	Mid-Summer to late Summer or Fall	Late Summer to early Fall
Overwintered young rye OR Winterkilled oat or oat-pea combo – generally not N fixer	Early season vegetable crop (greens, brassicas, onions, etc).	Bare fallow, 4-6 weeks, based on following crop	Seed fall - winter cover crop: oats, oats & peas, rye & vetch



Slide courtesy of Intervale Community Farm

Spring—young rye
Low C:N ratio

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Winter killed peas and oats

Cover crop/ cash crop rotation for summer vegetables

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Termination strategy: use hay mower, can bale into straw mulch

Termination strategy: plow young rye

Termination strategy: flail mow; incorporate, or collect for mulch

Mulching with cover crops

Freshly chopped cover crop for mulch

Root 5 Farm,
Fairlee

Tarping freshly incorporated cover crop

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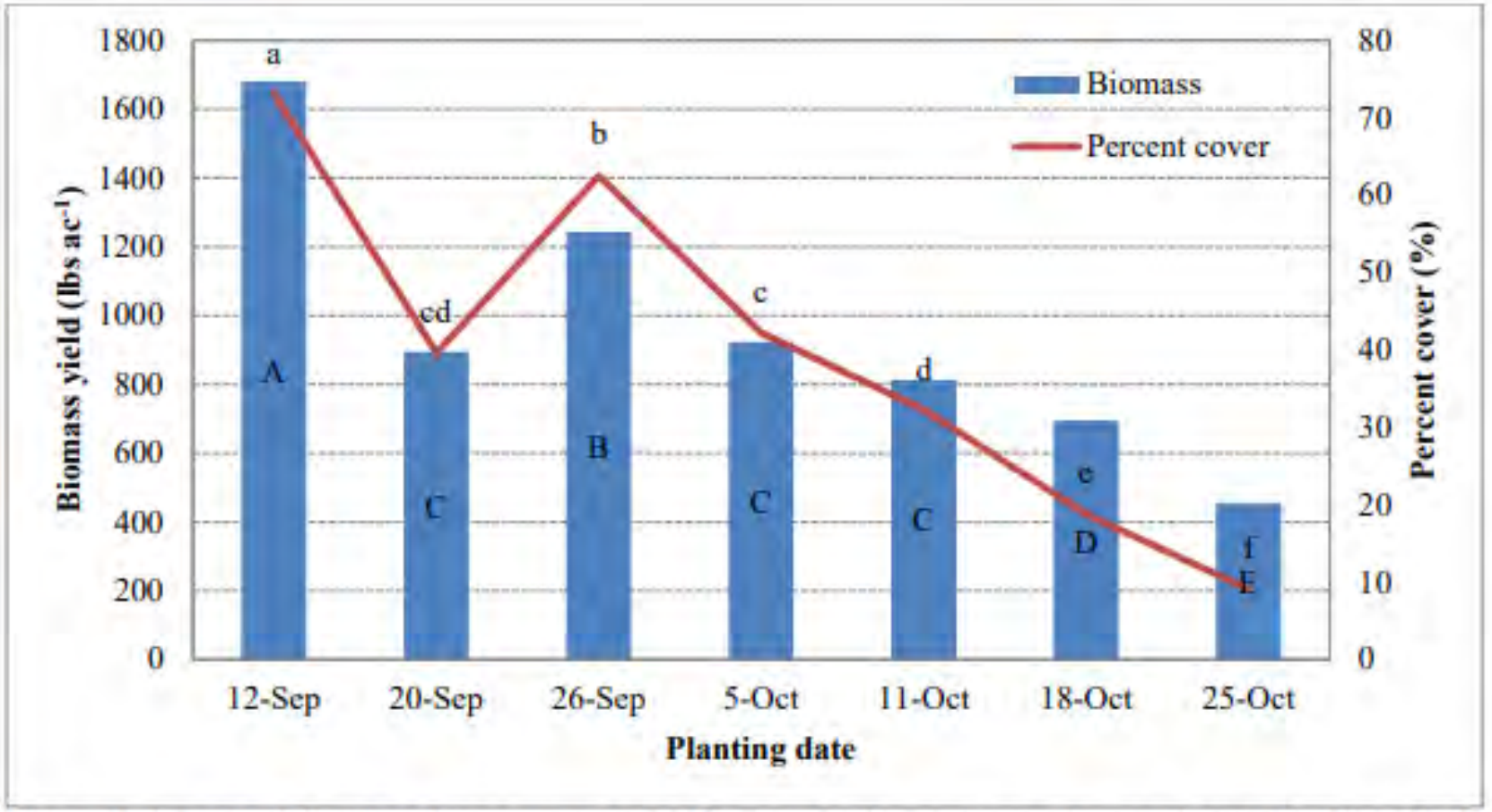

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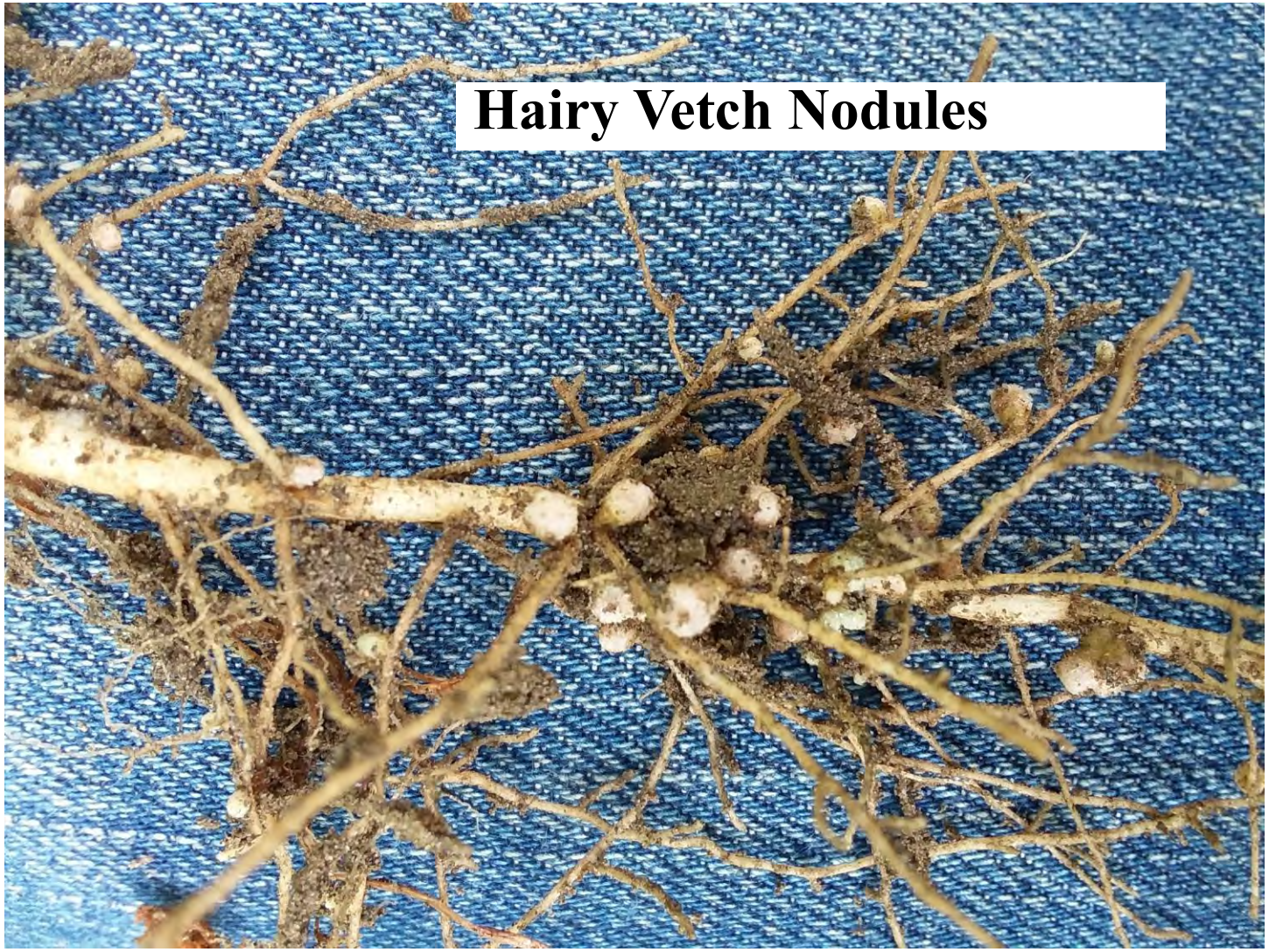

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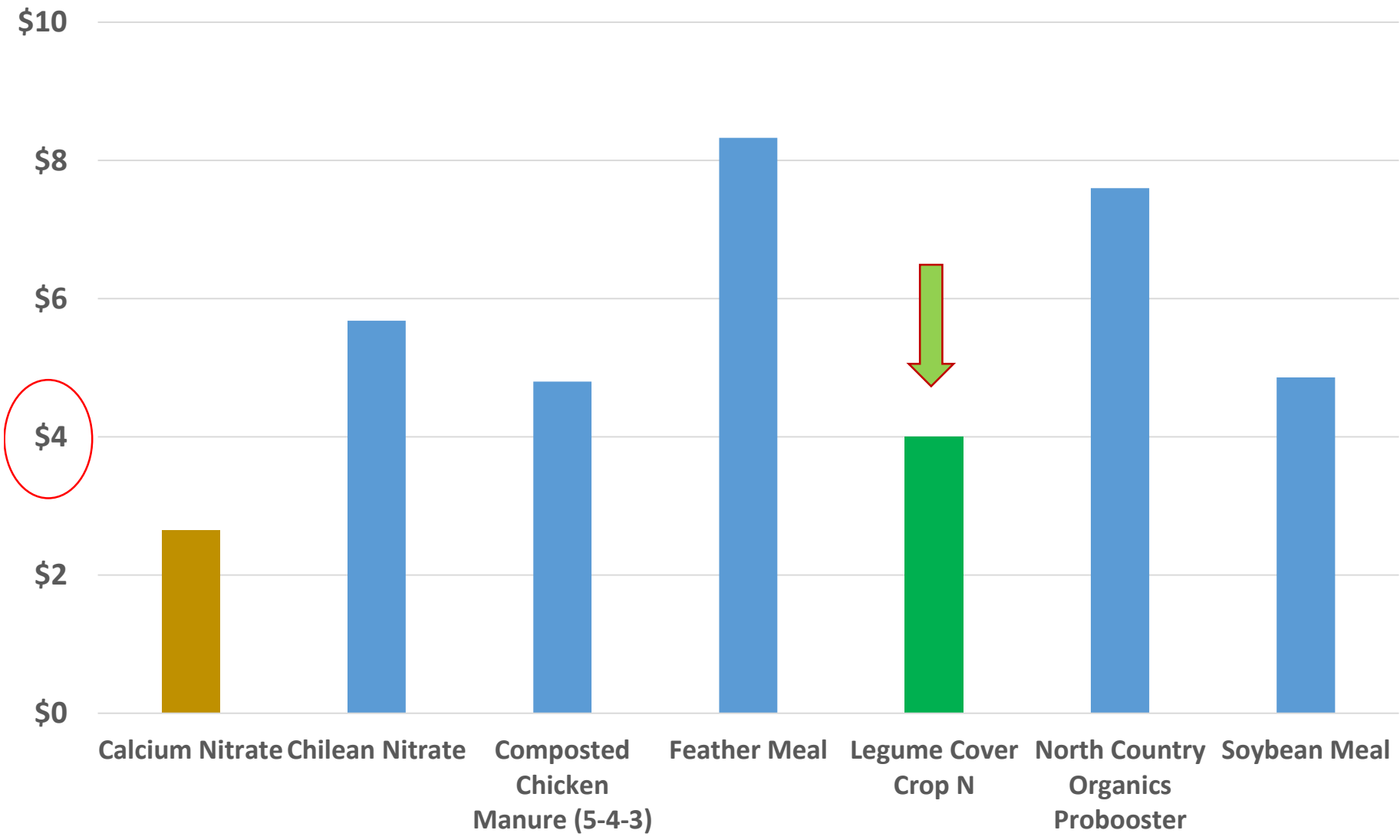

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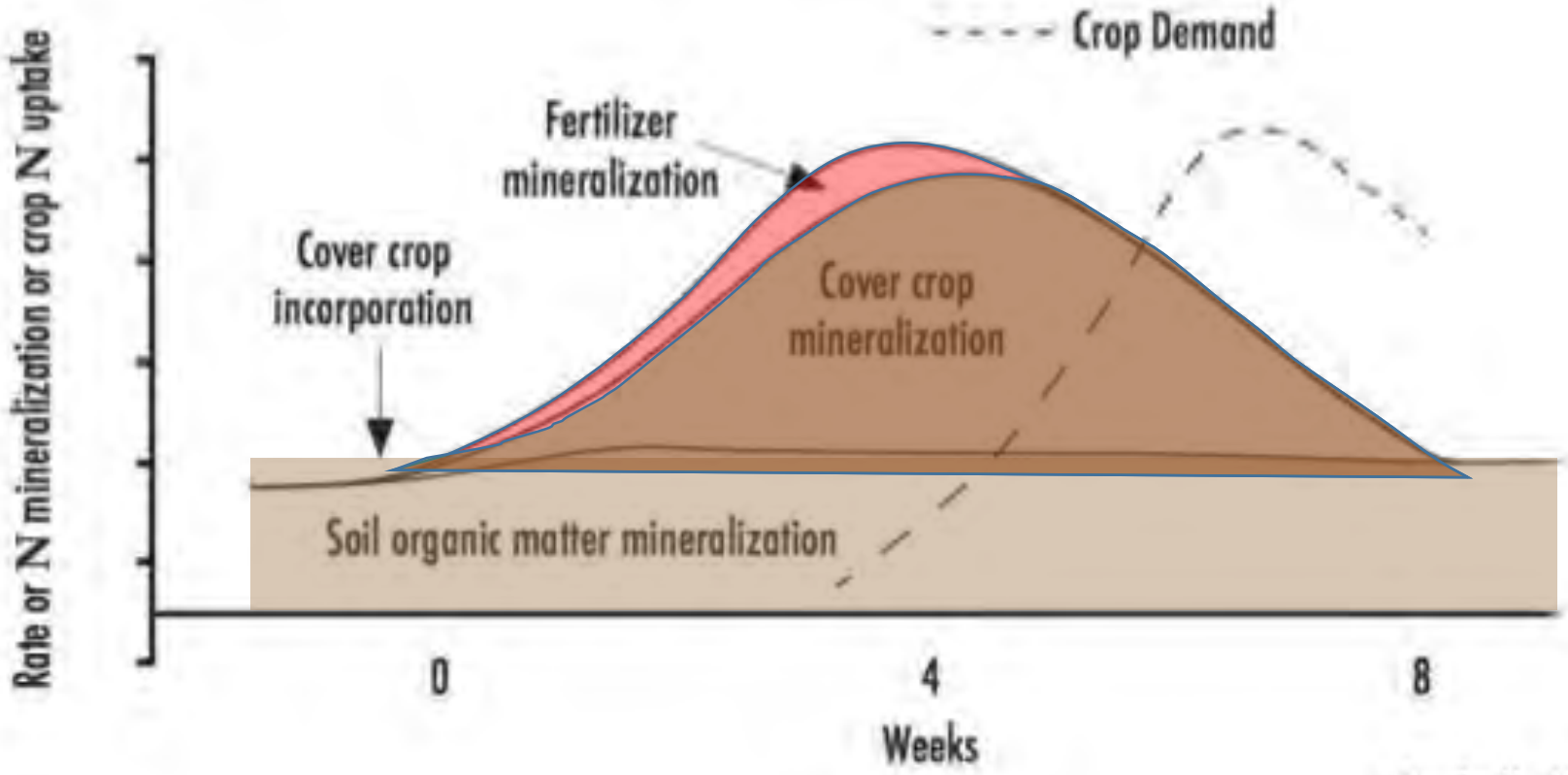

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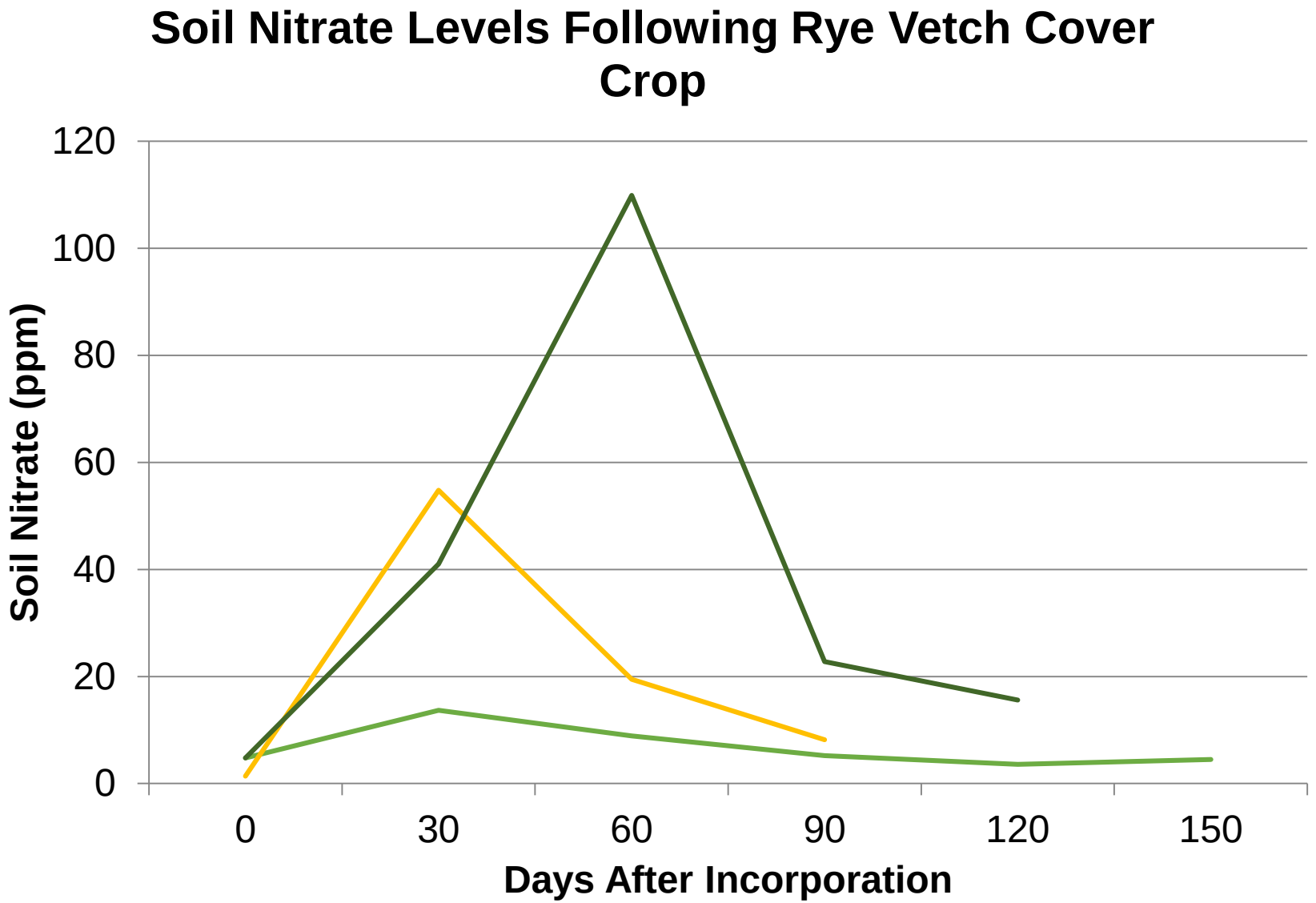
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Seed Sources in Vermont

Boucher Fertilizer, Highgate, VT

Butterworks Farm, Westfield VT

High Mowings Seeds, Wolcott VT

Lakeview Organic Grain, Penn Yan, NY

Lawes Ag Service, Brandon, VT

Oliver Seed, Milton, VT

Seedway, Shoreham, VT

Questions?

Thank you!

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