THE FUTURE OF COVER CROPS:
New Varieties, Technologies, and Trends

Rob Myers, University of Missouri

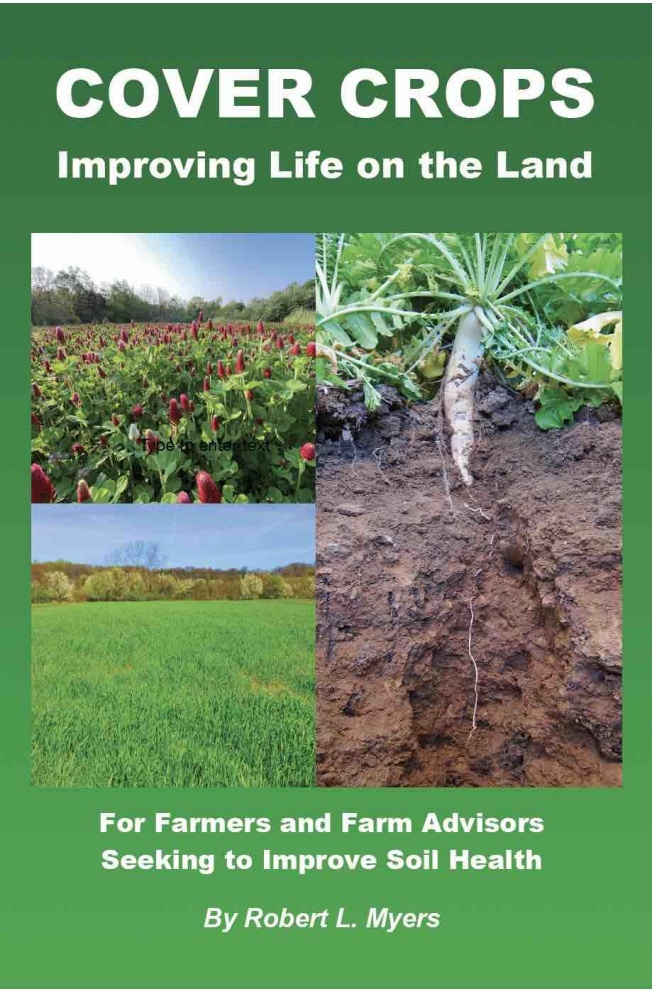

Future of Cover Crops
What's on the Horizon?
Photo credit: Edwin Remsburg

David Brandt
Ohio Farmer
and
Soil Health
Trailblazer

Photos courtesy of Jay Brandt

Photos courtesy of Jay Brandt

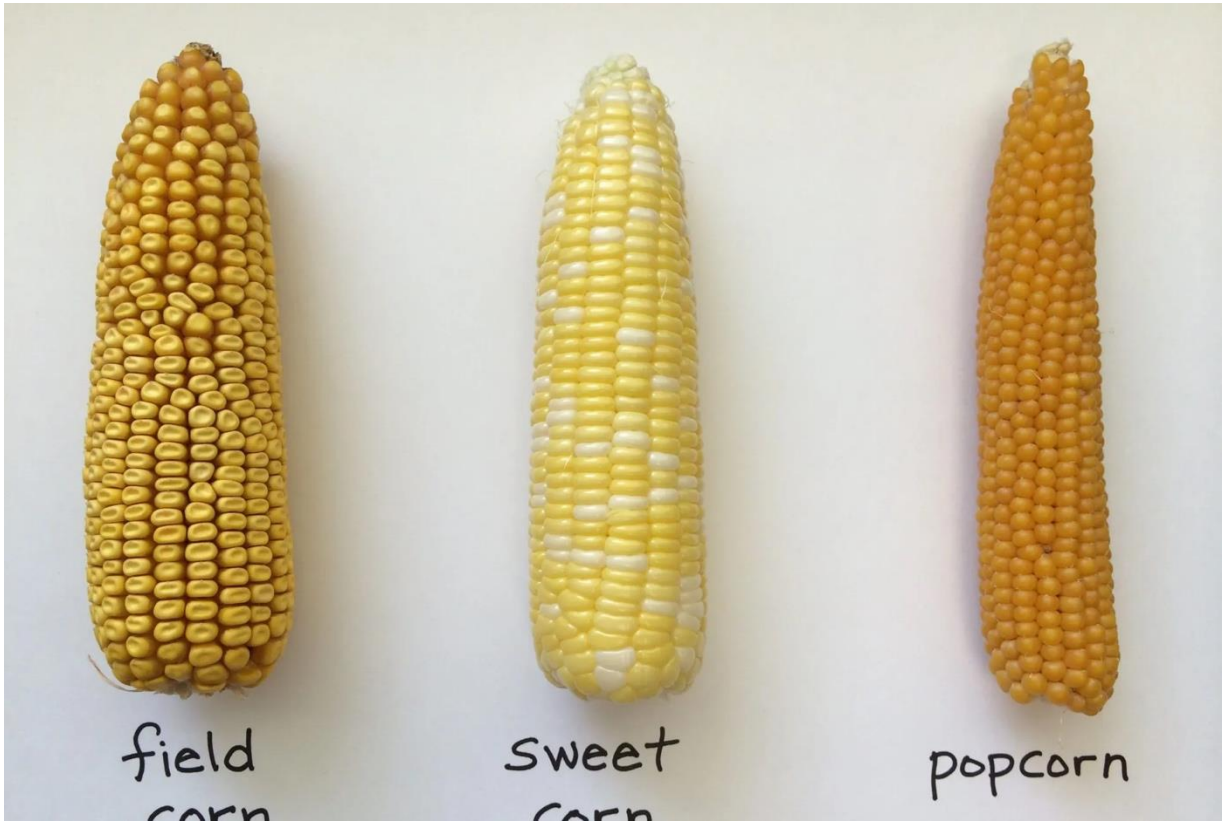
Over 150,000 American Farms with Cover Crops Today!



Upcoming Developments with Cover Crops

1. Development of new cover crop varieties
2. Cover crop grazing
3. Virtual fencing
4. Equipment advances including drones and robots
5. Designing the cropping system to maximize profit and soil health

Does Variety Matter?



Variety Difference – Balansa Clover

New Cover Crop Varieties

NATIONAL COVER CROP VARIETY DEVELOPMENT PROJECT

Center for Regenerative Agriculture
University of Missouri

asta american seed trade association

USDA National Institute of Food and Agriculture
U.S. DEPARTMENT OF AGRICULTURE

Future Cereal Rye Varieties With High or Low Levels of Allelopathy

Allelopathy ring

Cover Crop Breeding Network

Meeting diverse cover crop needs with new varieties

- Winter hardiness

- Above and below ground biomass

- Different maturities

- Suitability for grazing/forage

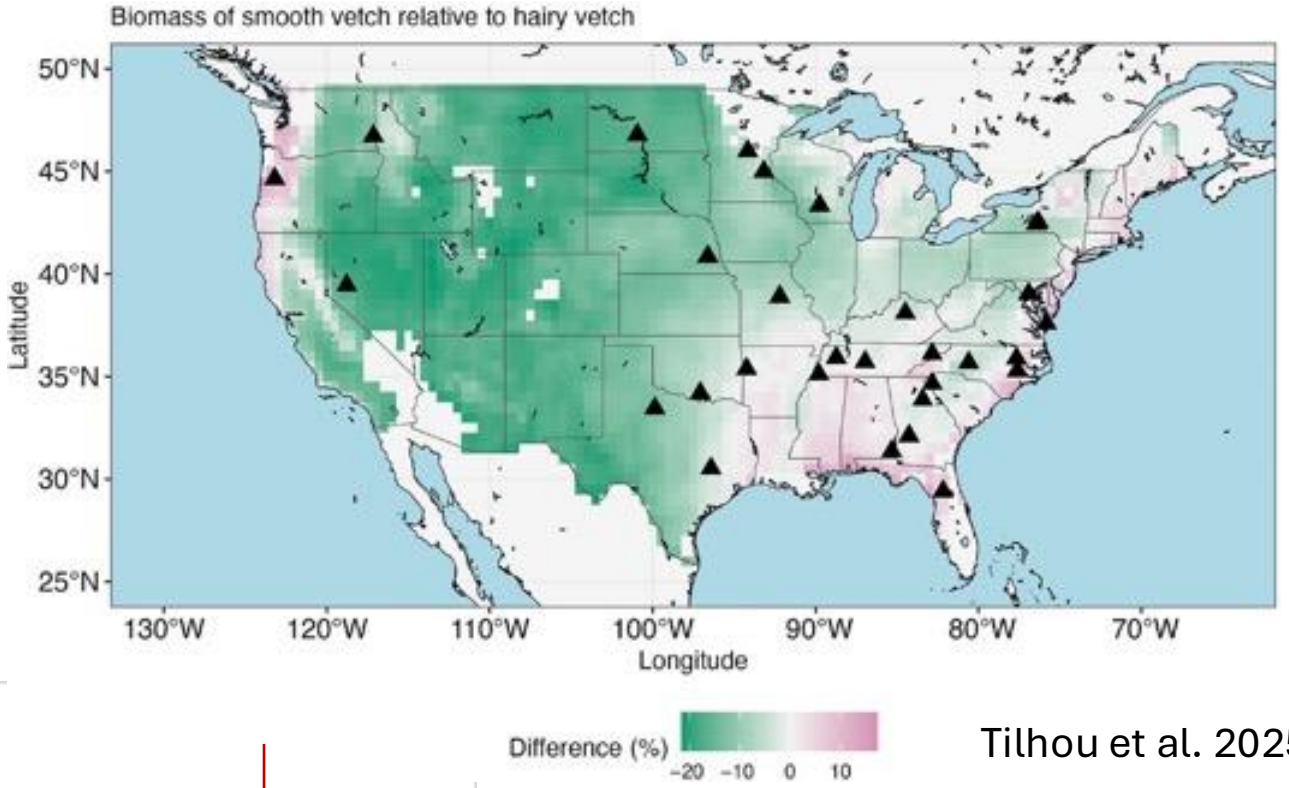
- Disease resistance

- Root growth

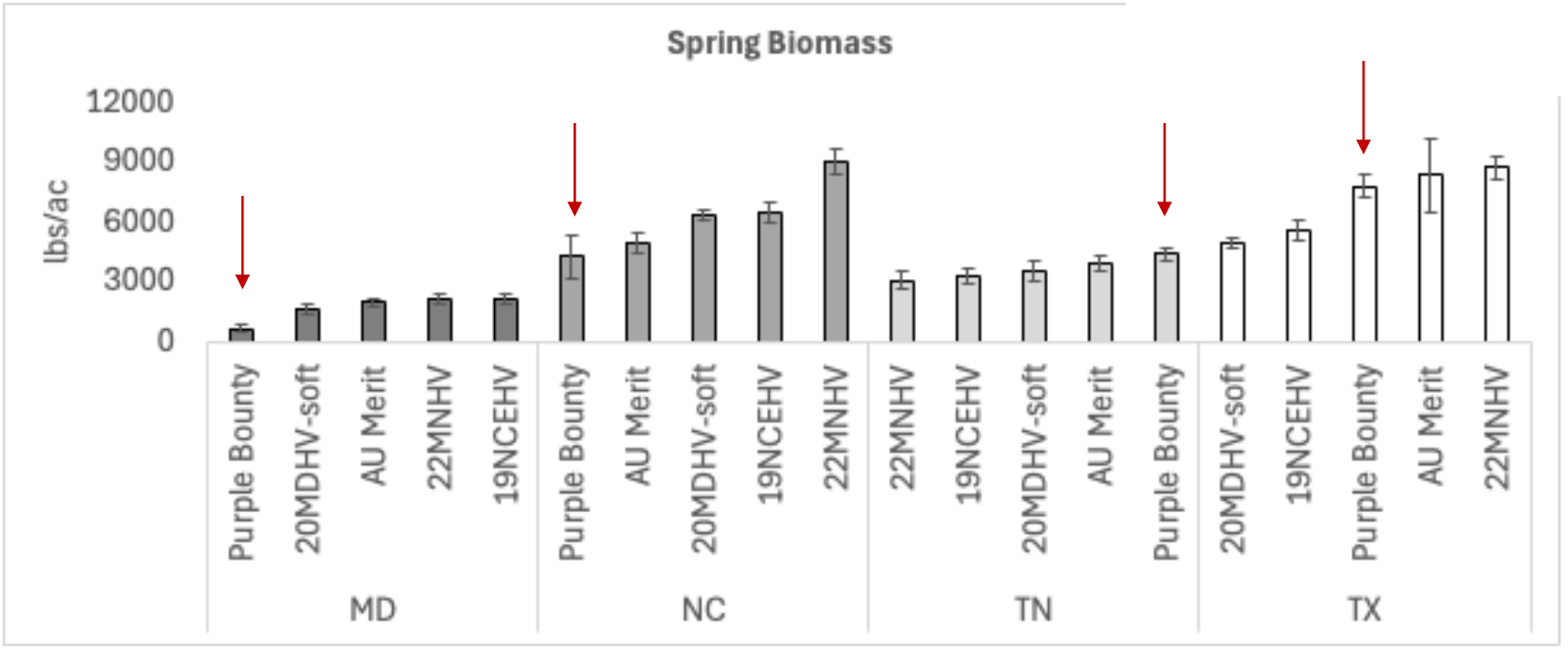
New Hairy Vetch Varieties with Soft Seed

Results: **Hairy Vetch**

Purple Bounty is actually mostly smooth vetch, not hairy vetch…



Tilhou et al. 2025



- Excels in southeast
- Not as winter hardy
- Struggles in loose soils

National Variety Testing: 25 varieties representing 6 species

Survivor
WyoWinter
Frostmaster
Keystone
Austrian winter pea

Dixie
Kentucky Pride
Heusers Ostsaat
17MDCC-soft*
19NCEHV*

Purple Bounty
AU Merit
20MDHV-soft*
22MNHV*
19NCEHV*

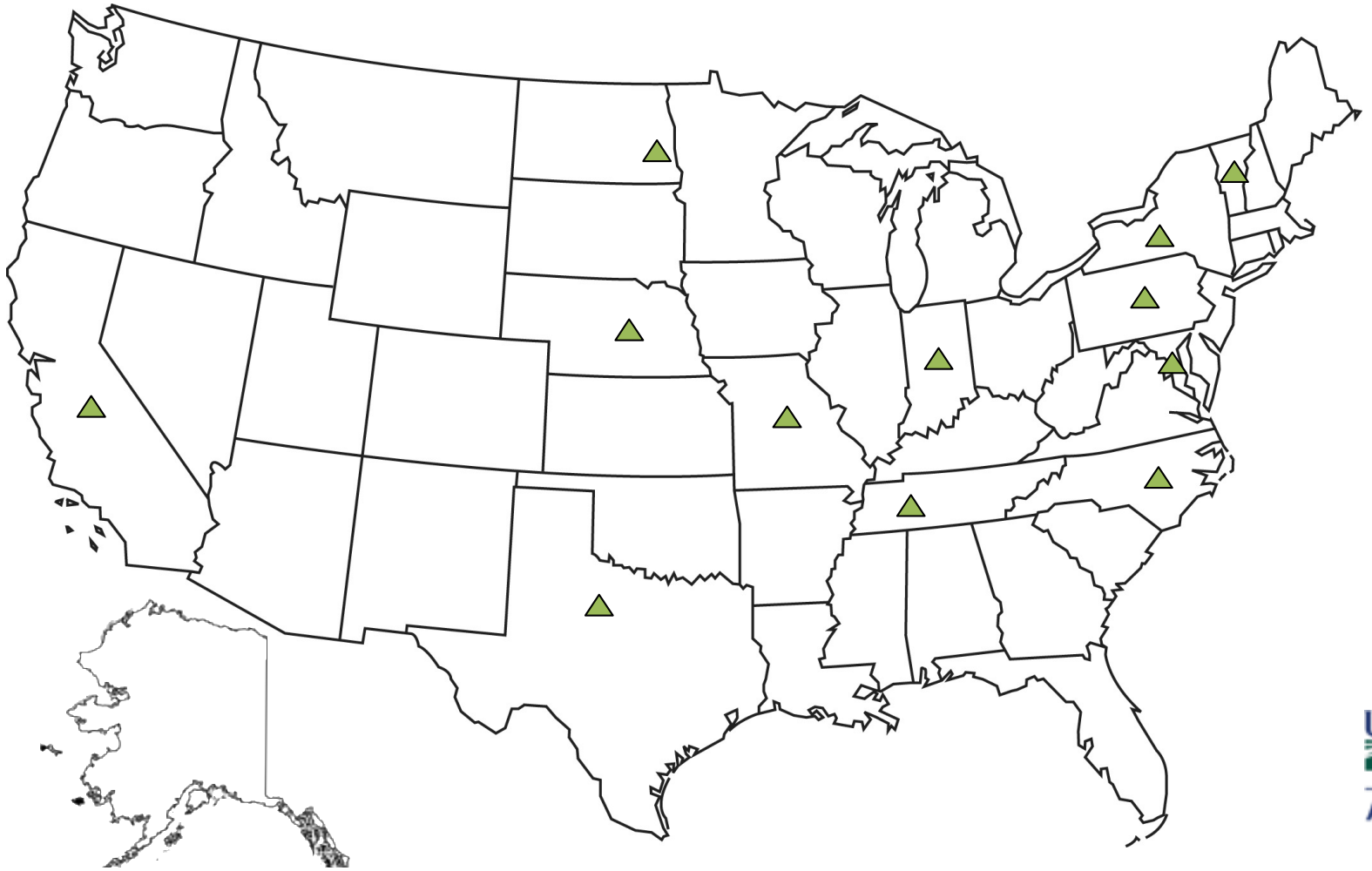
Wrens Abruzzi
Elbon
ND Gardner
NC20-R109*
Undisclosed forage variety

Torrington
KS 4989
CP1066WC

Aerifi
Driller

**Experimental variety from the Cover Crop Breeding Network*

2024-2025 Cover Crop Variety Testing Sites



NC State University

University of Vermont

UC Davis University of California

University of Missouri

Cornell CALS College of Agriculture and Life Sciences

Texas A&M University

Tennessee State University

NDSU

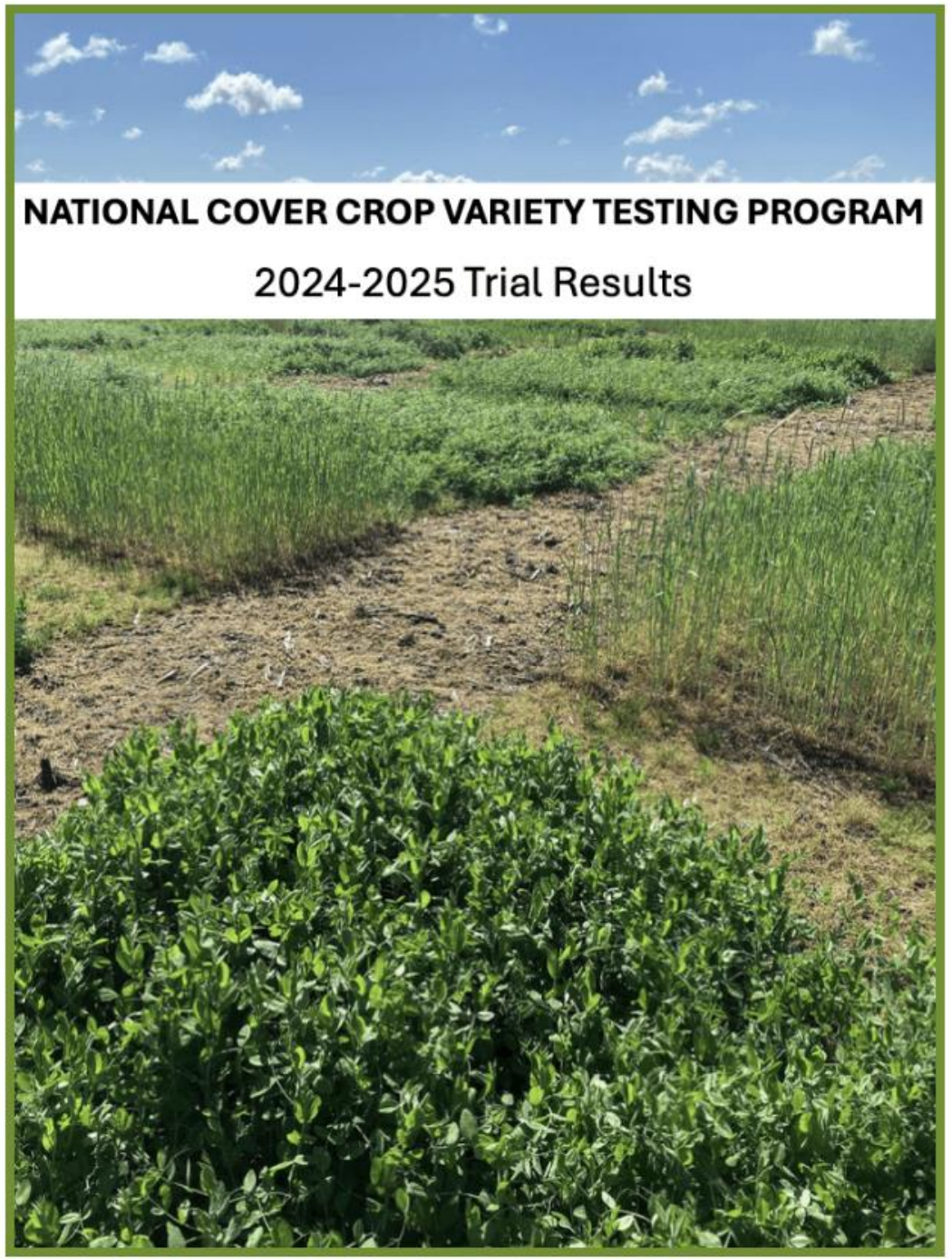
Purdue University

USDA United States Department of Agriculture Agricultural Research Service

University of Nebraska Lincoln

Variety Testing Program leadership:

Dr. Chris Reberg-Horton, Alyssa Woodard, Esleyther Enriquez-Inoa

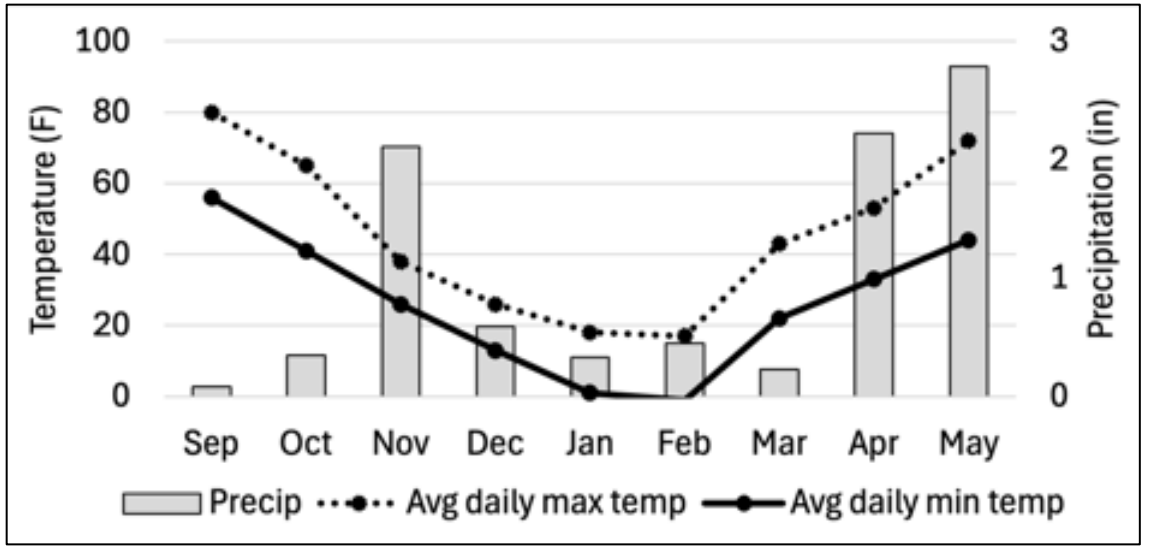


National Cover Crop Variety Test Report

– Available free online –

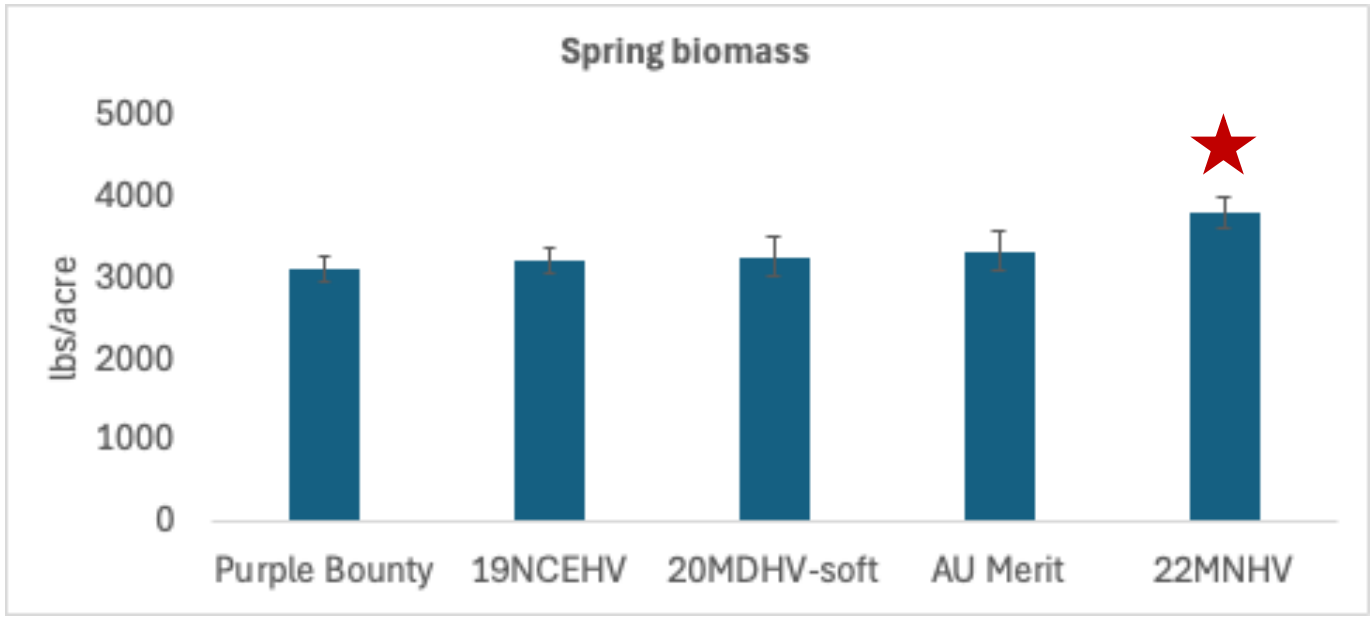
Results: **Cereal Rye**

ND Gardner outperformed all other varieties in harsh growing environment of North Dakota



SPECIES (variety)	Fall establishment (%)	Spring stand (%)	Fall biomass (lbs/ac)	Spring biomass (lbs/ac)	Heading date (rye only)
CEREAL RYE					
Undisclosed	50	47 (b)	332 (c)	619 (b)	June 1-5 (d)
Wrens Abruzzi	41	20 (c)	780 (bc)	660 (b)	May 25-30 (c)
NC20-R109	59	30 (bc)	564 (c)	714 (b)	May 25-30 (bc)
ND Gardner	75	80 (a)	1375 (a)	1219 (a)	May 10-15 (a)
Elbon	60	63 (ab)	969 (ab)	904 (ab)	May 20-25 (b)

Results: **Hairy Vetch**



Cover Crop Breeding Network experimental variety 22MNHV produced 6-10% more biomass on average across sites than other varieties and is now moving towards commercial release.

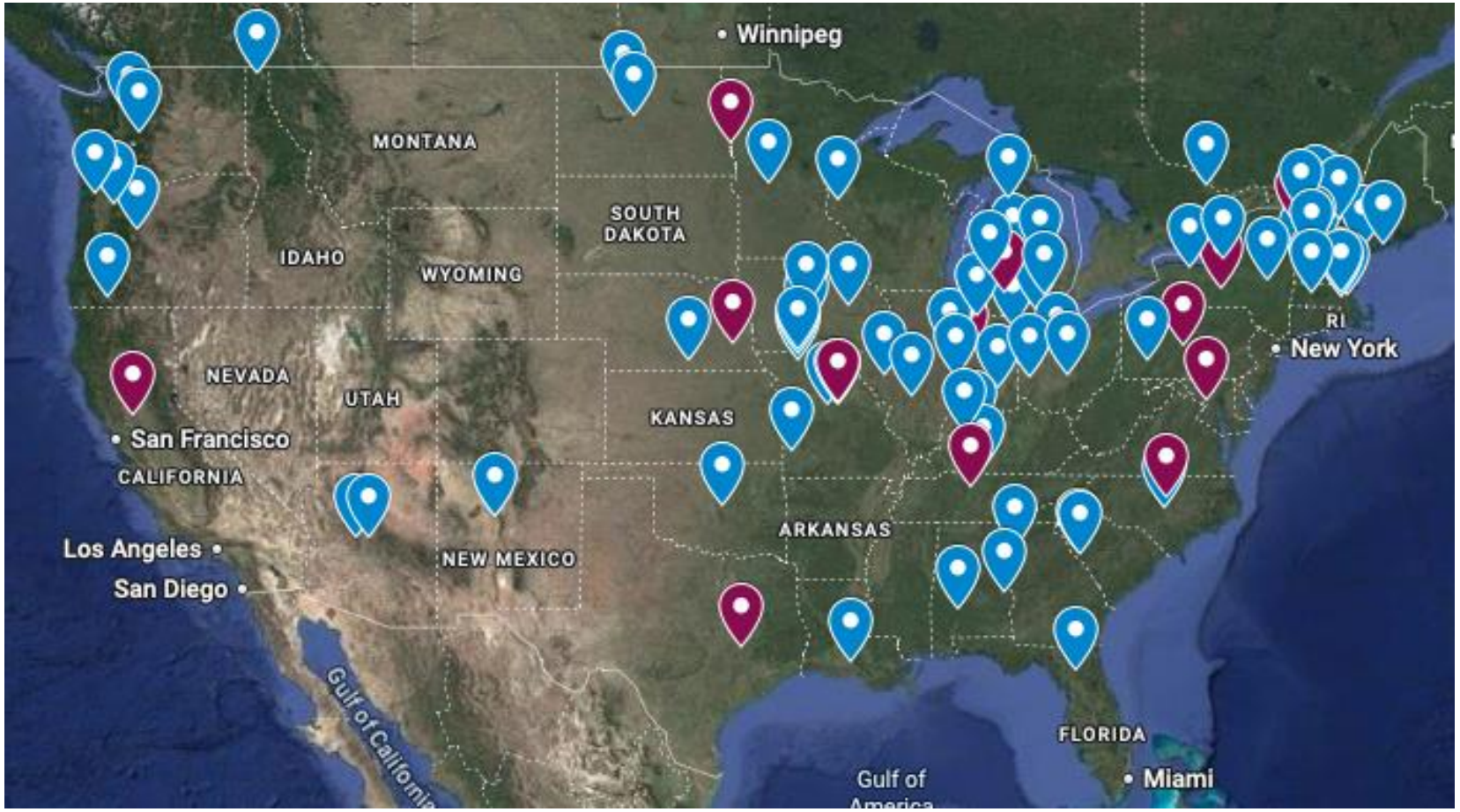
Results: **Crimson Clover**

Region/Sites	Best performing variety
Northeast (NY, VT, PA)	Heusers Ostaat
Midwest (MO, IN) + MD	Kentucky Pride
Southeast (NC, TN)	19MDCC (experimental)

- Strong evidence for benefits of regional adaptation
- Kentucky Pride shows tolerance to wide range of planting conditions – very wet in MD, but very dry in MO at planting
- 19MDCC was early maturing, while Kentucky Pride was late maturing in NC/TN

Have Added On-farm Cover Crop Variety Tests

(2025-2026 on farm test sites labeled in blue)



Coordinator: Etienne Sutton
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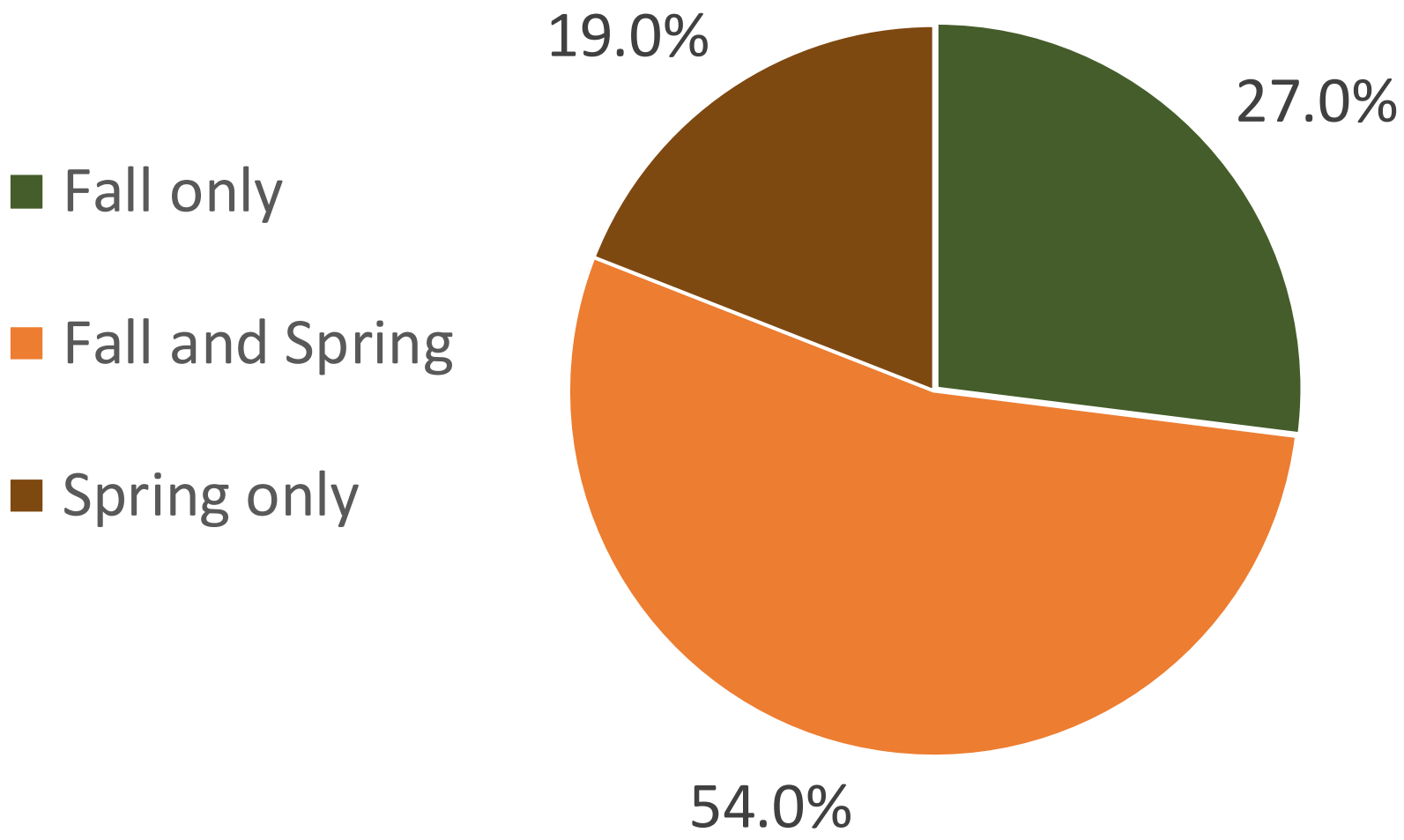
Cover Crop Grazing

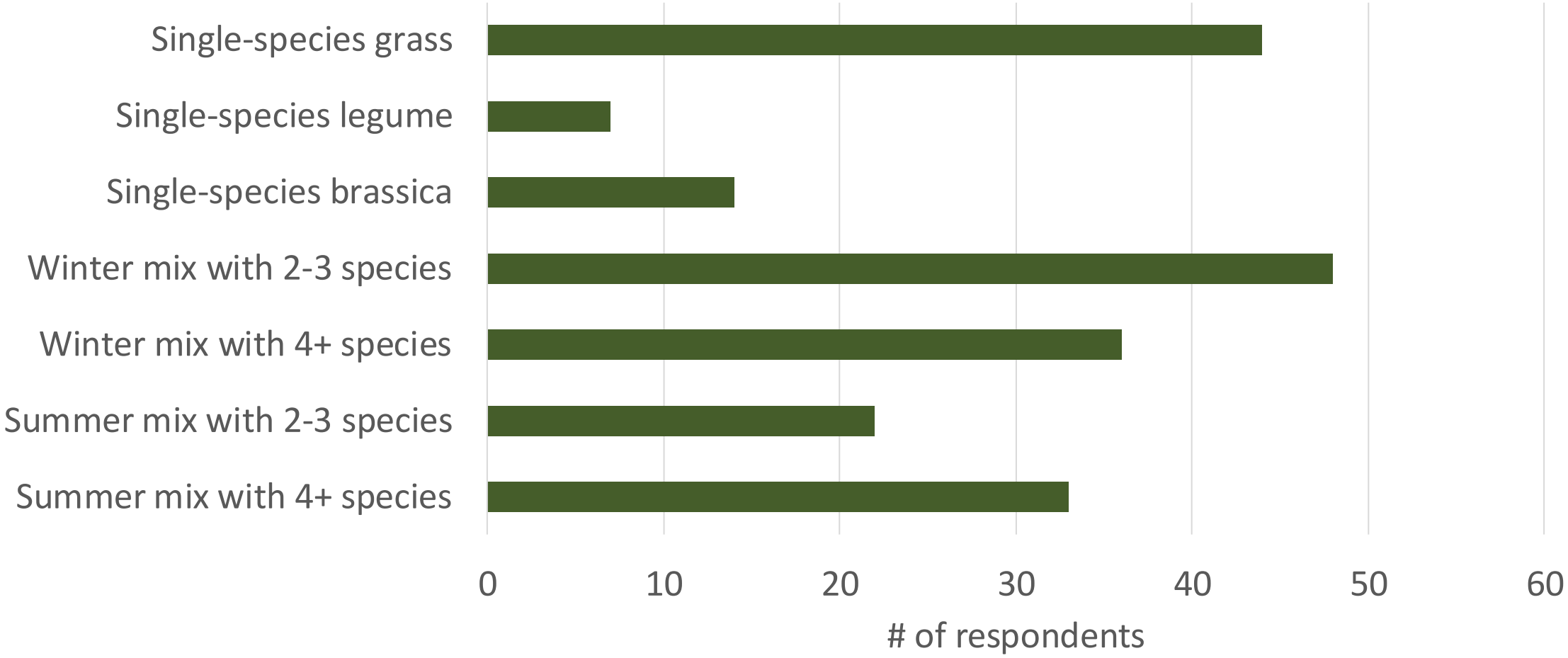
Grazing Cover Crops
A Profitable and Fast Way to Build Soil Health

Timing of Cover Crop Grazing



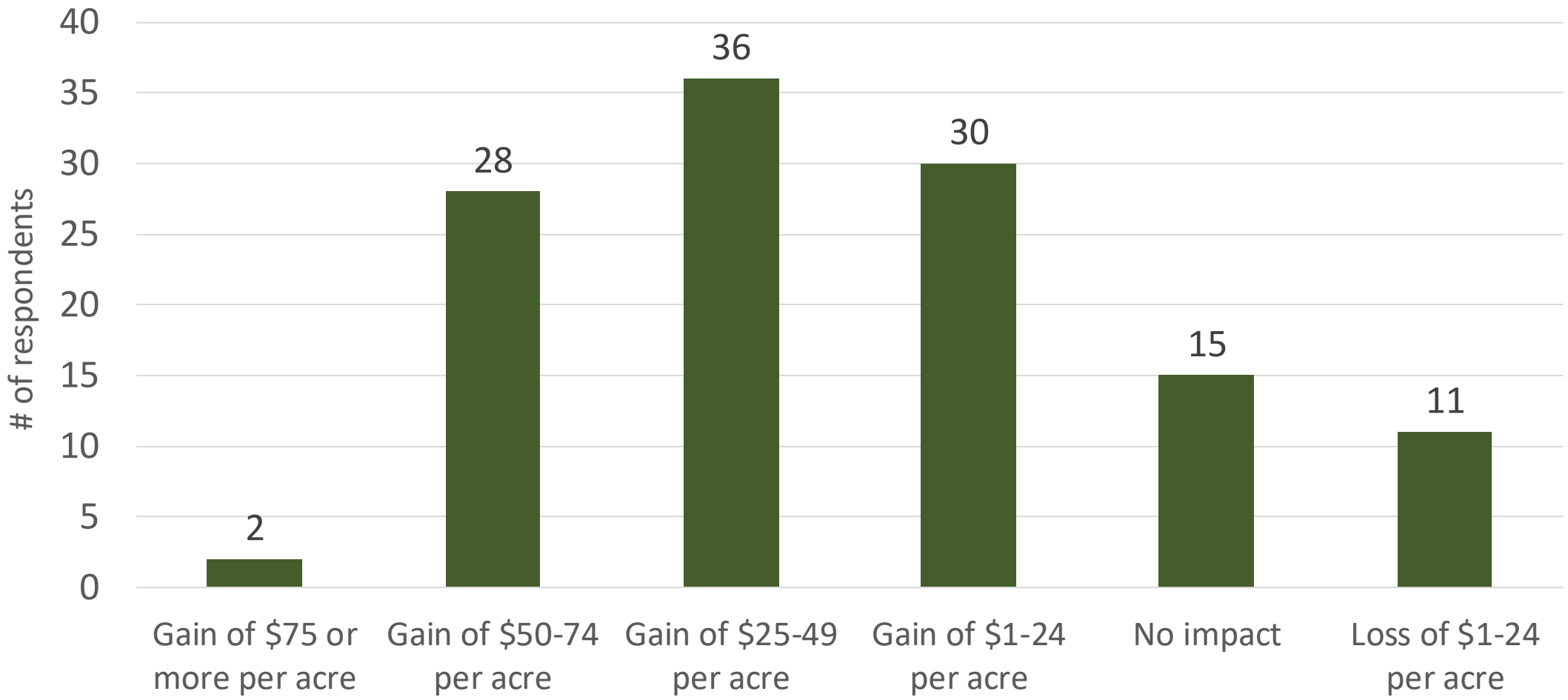
Farmer responses from 2022-23 SARE/CTIC National Cover Crop Survey

Type of Cover Crop Grazed



Farmer responses from 2022-23 SARE/CTIC National Cover Crop Survey

Cover Crop Grazing Impact on Net Profit



Farmer responses from 2022-23 SARE/CTIC National Cover Crop Survey

Key Points on Cover Crop Grazing

- Creates significant profit opportunity both for crop-livestock operators and for crop farmers who can collaborate with a neighbor that has livestock
- Cover crop grazing is one of the fastest ways to stimulate soil biology and improve soil health
- Getting more biodiversity into the rotation improves resilience of the system to weather and pests and can help lower inputs while boosting profit

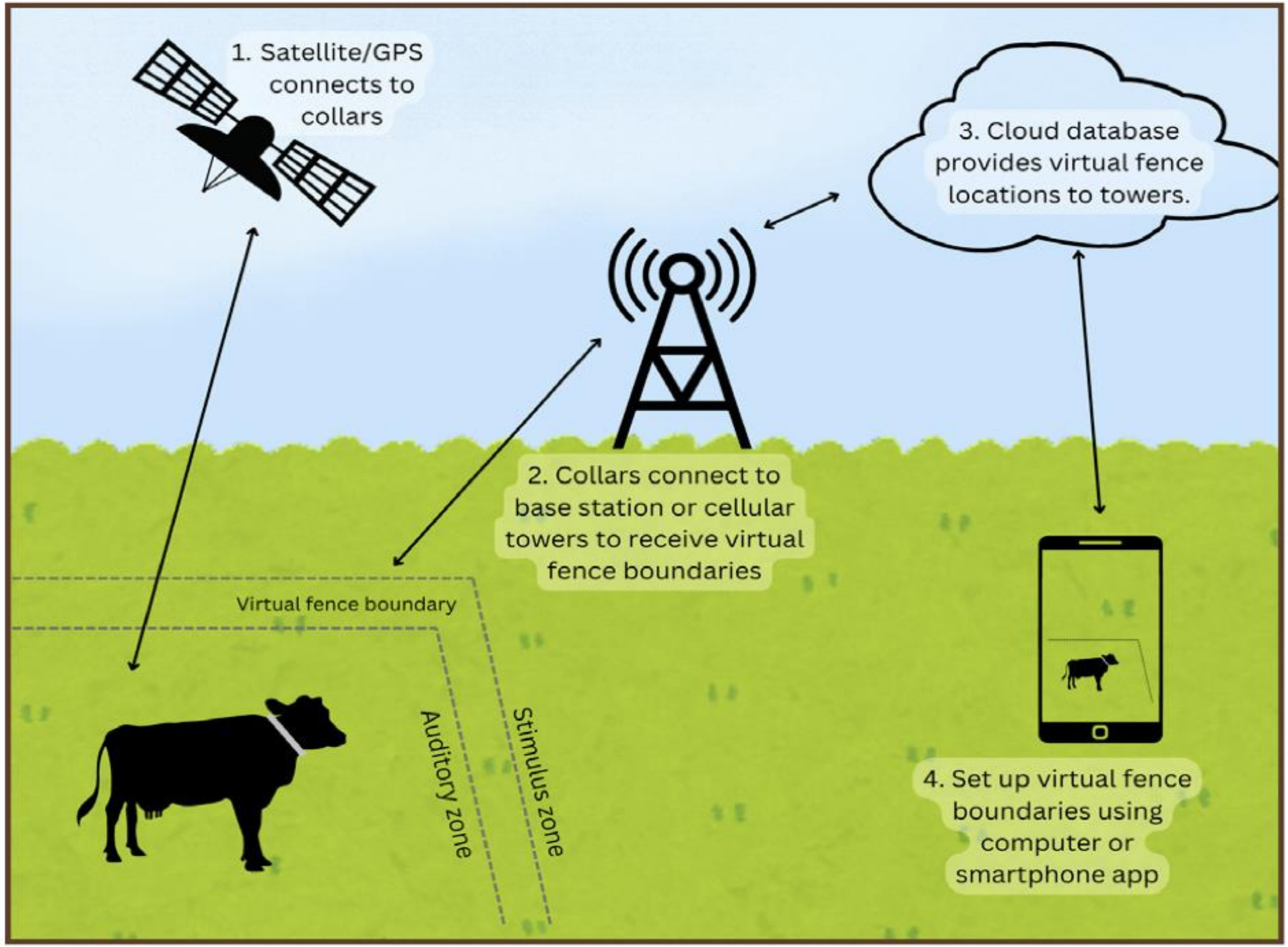

Virtual Fencing

Grazing Cover Crops with Virtual Fencing

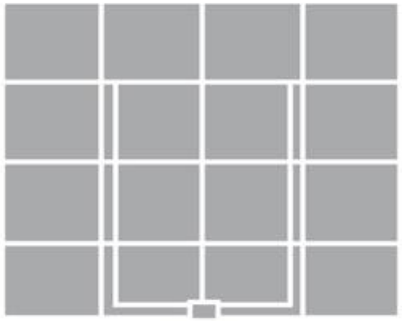
Photo credit: Nofence.

Jim Isermann farm, Illinois –
Photo credit: Progressive Forage

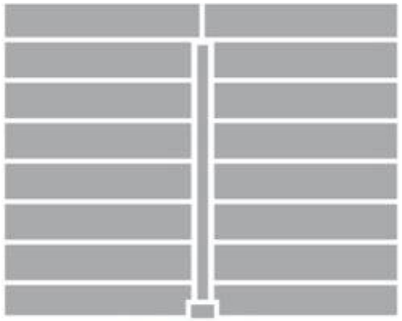
Collars for Cattle, Sheep and Goats


1. Satellite/GPS connects to collars
3. Cloud database provides virtual fence locations to towers.
2. Collars connect to base station or cellular towers to receive virtual fence boundaries
Virtual fence boundary
Auditory zone
Stimulus zone
4. Set up virtual fence boundaries using computer or smartphone app

Grazing Pattern – Unlimited Options with Virtual Fencing, and Program Multiple Moves in Advance

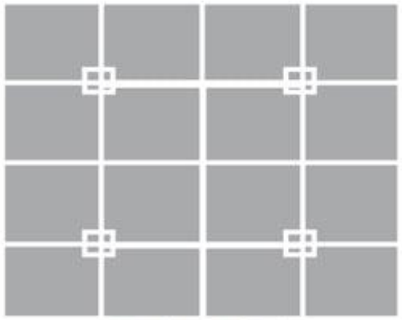


Two Alley Ways,
4 Miles of Cross-Fence,
Even Grazing, Manure in Alley,
Low Labour Costs.

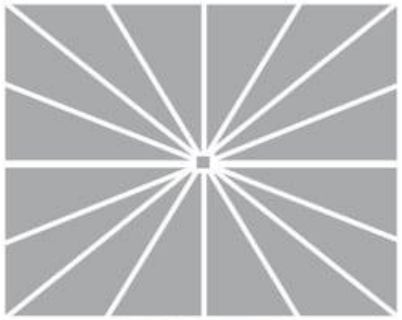


One Alley Way,
4.4 Miles of Cross-Fence,
Uneven Grazing, Manure in Alley,
Low Labour Costs,
Great for Bale Grazing.

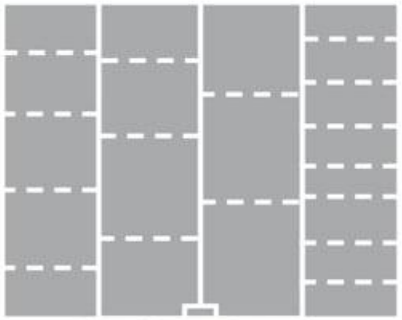
Water Truck Method,
3 Miles of Cross-Fence,
Even Grazing,
Excellent Manure Distribution,
Increased Capital & Labour Costs,
Increased Herd Effect.



Pipeline Method,
3 Miles of Cross-Fence,
Even Grazing ,
Good Manure Distribution,
Increased Capital Costs.



Cell Centre,
4.8 Miles of Cross-Fence,
Uneven Grazing,
Fair Manure Distribution,
Low Labour Costs.



Portable Strip Grazing,
1 -1/2 miles of Cross-Fence, Two Portable Fences,
Variable Utilization, Higher Labour Costs,
Flexibility of Paddock Size,
Low Capital Costs, Variable Manure Distribution.

From Canadian Cattlemen

Virtual Fencing Boundaries Can Be Irregular

Phone App helps Track Livestock Grazing Pattern

From Gallagher


Equipment Advances


Drone Ag Services

COVERING GROUND

Seeding Cover Crops with Drones


BESTWAY AG
N-Stor


SEEDING COVER CROPS
WHILE HARVESTING


MonTag
JOHN DEERE

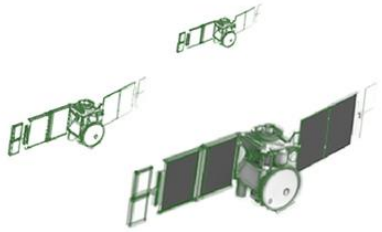
Advances in Equipment for Cover Crop Management

Photo credit: University of Illinois

Photo credit: RowBot.com

Photo credit: www.cropfertilityservices.com

Integrated Cover Crop Seeding Systems



SATELLITES

CLOUD

- OptiVisor Algorithm
- Task Planning
- Data Management

mars

Mobile Agricultural Robot Swarms

TABLET

- Operation
- Monitoring
- Diagnostics
- Updates

LOGISTIC UNIT

- Seeds Reservoir
- Energy Reservoir
- Communication Relay
- Robot Carrier
- RTK Base Station

ROBOTS

- Seeding Unit
- Communication
- GNSS Receiver
- Drive Control
- Energy

www.fendt.com

The Cropping System and Soil Health

Stacking Conservation Practices

Adding Perennials

Warm season cover crop mixes

- Grasses
  - Sorghum-sudan
  - Forage sorghum
  - Pearl millet
  - Other millets (Japanese, foxtail)
- Legumes
  - Cowpeas
  - Sunn hemp
  - Mung beans
- Other broadleaf species
  - Sunflowers
  - Buckwheat

Cover Crop Cocktails ->

- Add cool season covers for extended fall and spring grazing
  - Cereal rye, triticale, or wheat
  - Oats
  - Crimson clover
  - Radishes &/or turnips

Getting more grazing profit out of the crop rotation

Add wheat back to the rotation

- After wheat harvest, drill in high biomass summer cover crop mix
- Graze in early fall
- Graze in late fall
- Graze in spring
- Plant corn
- After corn, drill cereal rye, graze the rye fall &/or spring
- Plant soybeans
- After soybeans drill wheat and potentially fall graze the wheat


More Resources

Earn a Certificate of Completion for

Fundamentals of Cover Crops

Available online through

MU Extension

Extension
University of Missouri

Center for Regenerative Agriculture
University of Missouri

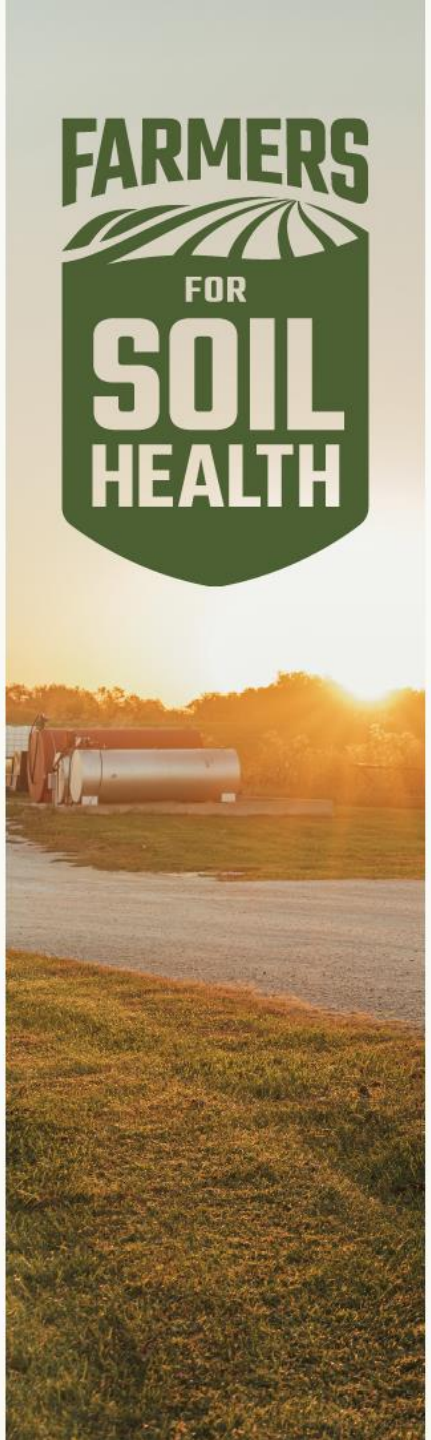
$25 course fee

11 modules to be completed at your own pace

Earn up to 5.5 CCA CEU credits

Enroll Now: mizzou.us/MUcovercrops

Special thanks to the University of Missouri, Midwest Cover Crops Council, Walton Family Foundation & Sustainable Agriculture Research & Education



Created by farmers for farmers

- Enhances soil health practices, like planting cover crops
- In partnership with AMP (Advancing Markets for Producers)
- Commodities came together in support

SOY CHECKOFF™ pork checkoff® NATIONAL CORN GROWERS ASSOCIATION

NFWF

Soil Health Institute

DTN

USDA-NRCS

The Sustainability Consortium

Walton Family Foundation

The National Association of Conservation Districts

The University of Missouri's Center for Regenerative Agriculture

The National Center for Appropriate Technology's ATTRA Sustainable Agriculture Program (NCAT-ATTRA)

- Financial incentives (Can be stacked with some other incentive programs)
- Local technical support
- Sustainability Marketplace to help connect farmers and supply chain partners directly
- **20 state** participation from the Dakotas to the Carolinas


CENTER FOR REGENERATIVE AGRICULTURE
Regenerating the health of our soils while building increased resiliency for farms and food production

The Future of Cover Crops is Promising, Especially if We All Work to Make it Happen

Photo credit: Edwin Remsburg