Mark Schonbeck

Mark Schonbeck has worked for 35 years as a researcher, consultant, educator, and advocate for sustainable and organic agriculture. He works one-on-one with farmers and homesteaders, taking a site-specific approach to soil test interpretation and organic soil, nutrient, and weed management for vegetables and other crops. In his capacity as Research Associate with Organic Farming Research Foundation, he develops research-based education materials including a series of practical guides on *Soil Health and Organic Farming*, available at http://ofrf.org/.

In the past, Mark has led or participated in several on-farm research projects conducted by Virginia Association for Biological Farming and collaborated with them and National Center for Appropriate Technology to help our agency Natural programs better serve organic producers.

Mark also serves as policy liaison with National Sustainable Agriculture Coalition. He also works with OFRF to develop policy recommendations to help organic producers mitigate the impacts of climate change on their operations and the communities they serve.

Cover Cropping for Soil Health and Fertility in Organic Production

Mark Schonbeck
Research Associate

April 17, 2023

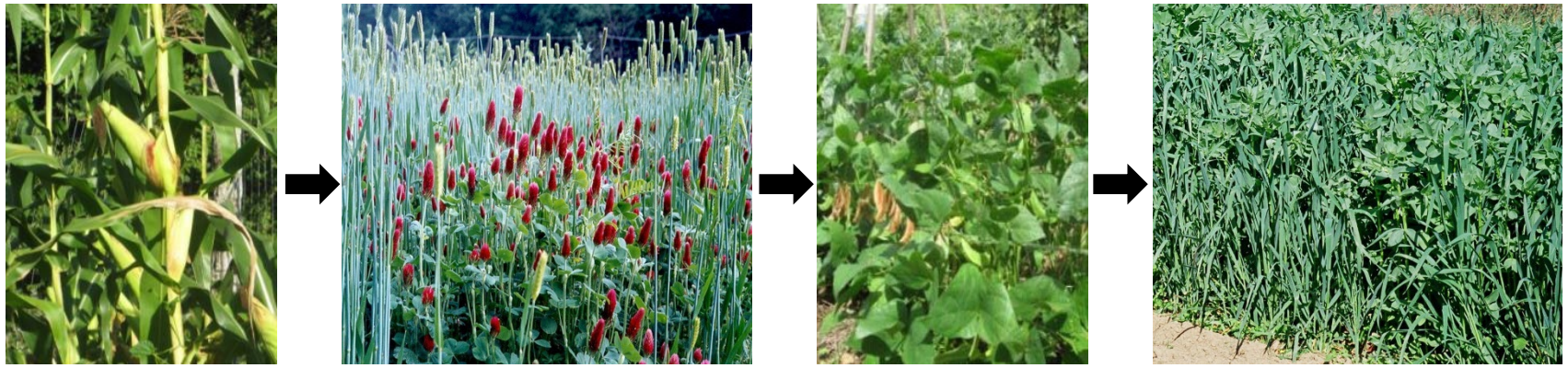
USDA
Natural Resources
Conservation Service

Why Cover Crop?

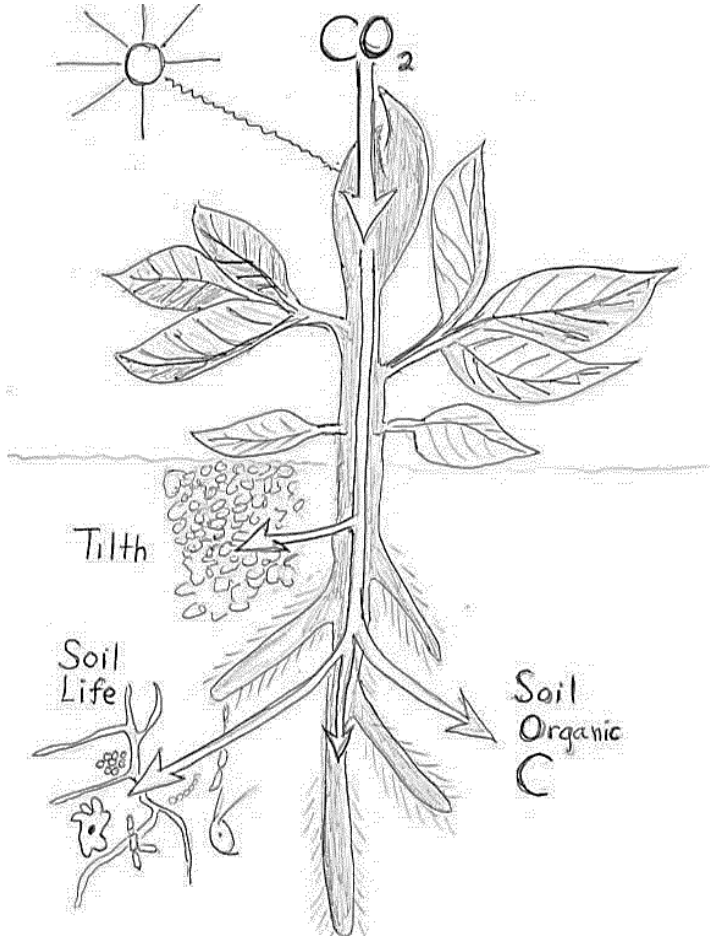
- Sustenance for soil life
- Soil and water conservation
- Organic crop nutrition and protection

Sustenance for Soil Life

Winter fallow: risks of erosion … and famine for soil life!



Winter cover: “green bridge” for mycorrhizal fungi and other beneficial microbes



Conservation Purposes of the Cover Crop Practice

- Reduce erosion from wind and water.
- Maintain or increase soil health and soil organic matter (SOM).
- Protect water quality by utilizing excess soil nutrients.
- Suppress weeds and break pest life cycles.
- Improve soil moisture use efficiency.
- Minimize soil compaction.

Conservation Practice Standard 340 Cover Crop, September 2014




Above: winter cereal rye, hairy vetch, buckwheat.
Left: sorghum-sudangrass hybrid.

Cover Crops and the Five Principles of Soil Health

Vigorous, high-biomass cover crops:

- **Cover and protect the soil**, while living and after mowing, roll-crimping, or winterkill.
- Maintain robust **living roots**.
- **Diversify** the rotation and the soil microbial community – multispecies mixes are best.
- **Minimize disturbance** by sustaining food supply for soil life and reducing input needs.
- Support **livestock-crop integration** with high quality forage for grazing.

Each species in a cover crop mix harbors its own root microbiome, and thus builds soil functional biodiversity.

Cover Crops in the National Organic Standards

§ 205.203 Soil fertility and crop nutrient management practice standard:

(b) The producer must manage crop nutrients and soil fertility through rotations, cover crops, and the application of plant and animal materials.

§ 205.205 Crop rotation practice standard.

The producer must implement a crop rotation including but not limited to sod, cover crops, green manure crops, and catch crops that provide the following functions that are applicable to the operation:

(a) Maintain or improve soil organic matter content;

(b) Provide for pest management in annual and perennial crops;

(c) Manage deficient or excess plant nutrients; and

(d) Provide erosion control.

Cover cropping: a Multi-purpose Tool for Organic Farming

Organic farmers use cover crops to:

- Protect and enhance soil and water resources.
- Feed and sustain soil life.
- Build soil structure and water holding capacity.
- Provide N via fixation (legumes) and recovery (deep-rooted crops).
- Improve P and K availability when needed.
- Displace and suppress weeds.
- Reduce pest and disease.
- Provide habitat for natural enemies of pests.




Above: winter cereal rye, hairy vetch, buckwheat. Left: sorghum-sudangrass.

Percentages of Farmers who Plant Cover Crops

Crop type	Organic	Non-organic
Specialty	92%	61%
Field	76%	10%

"Complex, multispecies cover cropping [on organic farms] suggests that cover crops have become an essential part of organic cropping systems"

Schoolman & Arbuckle, 2022.

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Cover Cropping Challenges and Strategies

Selecting the best cover crop for:

- Farmer objectives
- Rotation niche
- Challenging soils

Selecting Cover Crops to Stop Erosion and Crusting

Characteristics:

- Rapid establishment and canopy closure
- Persistent (high carbon) residues.

Examples:

- Buckwheat, southern pea, radish (canopy)
- Cereal grains, millets, sorghum-sudangrass (residues)

A cover crop of foxtail millet + southern pea has prevented post-harvest erosion in this organic vegetable field in Virginia. Photographed 53 days after planting.

Cover Crops Save Soil in Floyd, VA Community Garden

Spring 2015:Potato

Summer: Sorghum-sudan

Melissa Maynard

Sept. 29: Record 7-inch rainfall. River runs 3 feet deep through the garden.

Aftermath: Fence toppled … no soil lost

Selecting Cover Crops to Build SOM and Feed Soil Life, the Engine of Soil Fertility

Characteristics:

- High biomass, robust root systems
- Diversity of cover crop species
- Moderate C:N ratio (25-30:1)
- Long season or perennial

Examples:

- Cool season: cereal grains with vetch, peas, bell beans, clover, radish, and/or canola
- Warm season: millet or sorghum-sudangrass with sunn hemp, southern pea, or other tropical legumes and sunflower, safflower, or buckwheat
- Perennial grass-legume sod – soil restoration

A 

B 

C 

D 

Mustard, pea, oats and barley (A), rye, vetch, and peas (B), pearl millet and sunnhemp (C), and perennial sod (D).

Selecting Cover Crops to Improve Topsoil Structure

Characteristics:

- Extensive, fibrous root systems
- Moderate, balanced C:N ratio (25 – 30:1)

Examples:

- Ryegrass (right); cereal grains, millets, other grasses, buckwheat.
- Combine the grass with a legume or succulent broadleaf to provide organic N and support soil microbial activity.

Italian ryegrass cover crop near maturity (left). Ryegrass root mass (right).

Selecting Cover Crops to Relieve Hardpan and Retrieve Subsoil Nutrients

Characteristics:

- Deep taproot or deep, robust, fibrous root system.

Examples:

- Tillage radish, canola, sunflower, sunn hemp, alfalfa, sweetclover, chicory (taproot).
- Pearl millet, sorghum-sudangrass, winter rye (fibrous).
- Mow millet or sorghum-sudan when 3-5 ft tall to enhance root development.

Pearl millet, sorghum-sudan, and radish send roots five feet or deeper, opening hardpan and retrieving nutrients.

Selecting Cover Crops to Provide and Manage Nutrients

Characteristics:

- N fixation
- N-scavenging
- Mobilizing insoluble P and K.
- Slow-release N to match need of next crop.

Examples:

- Legumes to fix N
- Deep-rooted, N-demanding crops to take up excess N: radish, sorghum-sudangrass, etc.
- Mycorrhizal crops, buckwheat (P), grasses (K)
- Grass-legume ~50-50 for slow-release N

Rye alone ties up N; vetch alone can leach N when terminated. A rye + vetch mix provides slow-release N and mobilizes P and K.

Selecting Cover Crops to Suppress Weeds

Characteristics:

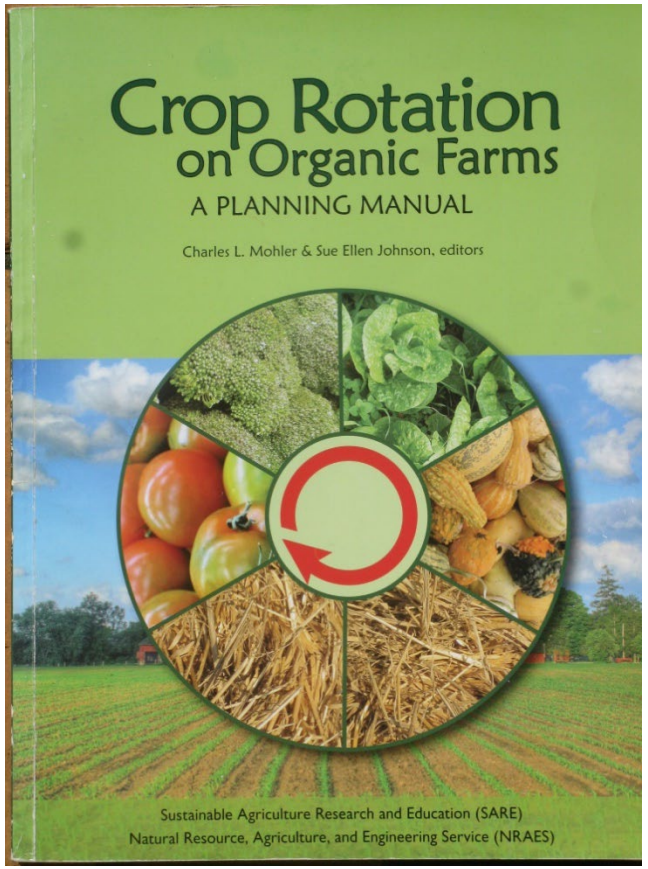
- Rapid early growth and canopy closure
- Aggressive competition for nutrients
- Complementary growth habits to fully occupy niche

Examples:

- Buckwheat, southern pea, radish (rapid cover)
- Rye, sorghum-sudangrass (nutrients)
- Cereal grain + climbing legume (growth habit)
- Mixes include at least one fast-growing species

'Iron-Clay' southern pea 37 days after planting (left). Oats + bell bean (right).

Selecting Cover Crops to Deter Pests and Pathogens



Characteristics:

- Non-host for pests and pathogens of cash crops in rotation
- Suppressive toward nematode pests

Examples:

- Cover crops unrelated to preceding or following cash crops
- Cover crop that suppress target nematodes

Use the SARE Crop Rotation Manual (left) to help design a crop rotation to deter prevailing pests and diseases .

Selecting Cover Crops for Biological Pest Control

Characteristics:

- Abundant, accessible nectar and pollen
- Provides cover for ground beetles, spiders, and other generalist predators.
- Hosts alternate prey (e.g., aphids).

Examples:

- Buckwheat, phacelia, vetches, mustard, sunflower, clovers, southern pea
- White clover, alyssum (ground cover).
- Cereal grains (alternate prey – aphids).

NCAT / ATTRA

Soldier beetle feeding on buckwheat nectar (left). Its larvae prey on many pests. Sunflower (center) and phacelia (right) provide abundant pollen and nectar for pollinators and pest natural enemies.

Selecting cover crops for different rotation niches

Timing of cover crop → cash crop	Suggested cover crop selections
Early fall cover → early spring cash crop	Cool season grains, grasses, legumes, crucifers, and other forbs that will winter-kill in the farm's locale
Fall-planted winter cover → late spring cash crop	Cereal grains, winter annual legumes, and crucifers that are winter-hardy in the farm's locale
Winter cover for northern locale with short growing season	Shade-tolerant species relay-planted into cash crop: red or white clover, hairy vetch, field pea, ryegrass, cereal rye, winter wheat.
Early spring cover → midsummer cash crop	Spring oats, barley, fava bean, vetches, field peas, crimson or berseem clover, mustards.

Selecting cover crops for different rotation niches

Timing of cover crop → cash crop	Suggested cover crop selections
Late spring cover → late summer cash crop	Forage soybean, foxtail millet, Japanese millet, buckwheat
Mid-late summer cover → early spring cash crop	Sorghum-sudangrass, buckwheat, sunflower, millets, soybean, southern pea, sunnhemp, tropical legumes
Brief fallow periods during frost-free season	Buckwheat, southern pea, foxtail millet, Japanese millet
Whole-season summer cover crop	Sudangrass, sorghum-sudan hybrid, or pearl millet with southern pea, sunnhemp, or tropical legume Mow to 6-12” stubble and let regrow (deeper roots).

Cover Crops for Challenging Soils and Climates

For cool, wet soils:

- Japanese millet, oats, annual ryegrass, alsike clover

For low-fertility soils:

- Sunn hemp, millets, southern pea, buckwheat, legumes (for low N)

For acidic soils:

- Oats, rye, vetch, southern pea, sunn hemp, buckwheat

For alkaline soils:

- Barley, crucifers

For hot, dry weather and soil conditions:

- Pearl and foxtail millets, sorghum-sudangrass, southern pea, sunn hemp, tropical legumes

Wet, slow-draining soils often have poor tilth and favor weeds like yellow nutsedge (left). Japanese millet (center) tolerates wet soils and chokes out weeds. Pearl millet and sunn hemp (right) are highly resilient to heat and drought.

Cover Cropping Challenges and Strategies

- Timely establishment and termination
- Terminating cover crops without herbicides
- Optimizing nitrogen release for the next crop

Tips for Timely Cover Crop Establishment

- Plant promptly after harvest – or sooner.
- Use fresh, high-vigor seed.
- Apply manure or compost if soil fertility is low.
- Use recommended seeding rates and depths.
  - 1.5 – 2X for late planting or weedy field.
  - For a mix: divide sole-seeding rates by number of species; adjust as needed.
- Use best planting equipment and technique.
  - No-till drill .
- Irrigate if needed.

High quality seed gives a good soybean cover crop (left) while poor seed leads to a weedy stand (right)

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Example of Cover Crop Planting with Shallow Tillage

4 DAP

11 DAP

Charlie Maloney of Dayspring Farm (coastal plain, VA) broadcasts rye + vetch at 50 + 25 lb/ac with a spin seeder (left), then rototills one inch deep to take out small weeds and plant the cover (center). Result: prompt establishment and excellent stands (right).

Example of Organic No-till Cover Crop Planting

Klaas Martens

New York organic grain farmer Klaas Martens drills winter rye + Austrian winter field peas into sorghum-sudangrass stubble immediately after a late summer forage harvest. In this system:

- The stubble provides a better microclimate for rye and pea emergence than a clean-tilled field.
- The pea enhances rye biomass by providing N, thereby improving weed control in soybean planted into roll-crimped cover.

Organic Farmer's Cover Crop Termination Dilemma

WashingtonState U

Washington State U

Terminating a cover crop without herbicides can be tricky. Plowing an all-legume green manure (A) releases N to the next crop but undoes some of the soil health benefits of the cover crop and may leach N or emit N_2O. The spading machine (B) mixes rather than inverting and reduces subsurface hardpan yet soil disturbance remains substantial. No-till termination with the roller crimper (C) maximizes soil health but may delay N mineralization, resulting in crop N deficiency (D).

Cover Crop Termination Options for Organic Systems

Many organic farmers terminate cover crops by mowing followed by shallow (2-4”) rototilling (A). Soil health impacts can be lessened by reducing the rotary speed of the tiller, or by using a high-speed disk (B). Strip tilling (C) prepares a narrow planting strip, leaving 70-80% of the field undisturbed and residue-covered. Occultation – covering mowed or roll-crimped cover crop with opaque tarp or landscape fabric for a few weeks – ensures termination and reduces weeds. Georgia organic farmer Breyan Hager replaces the tarp with fabric with planting holes for season-long no-till weed control (D).

Cover Crop Termination by Winterkill

Non-winter-hardy crops like millet and radish can be planted in late summer and terminated by freezes. Leaving residues on the soil surface:

- Protects the soil over winter.
- Gives ground beetles and other weed seed feeders time to reduce the weed seed bank.
- Improves soil health and can increase yield of the next crop.
- Facilitates early spring planting after shallow tillage to incorporate weathered residues.

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Termination Timing: a Soil Health / Yield Tradeoff?

Young cover crop

Cash crop

Soil Life

Active SOM Organic N

Organic C

N

Mature cover crop

Cash crop

Soil Life

Active SOM Organic N

Mature Cover Crops Build Soil Capacity to Provide N

Young cover crop

Cash crop

Soil Life

Active SOM Organic N

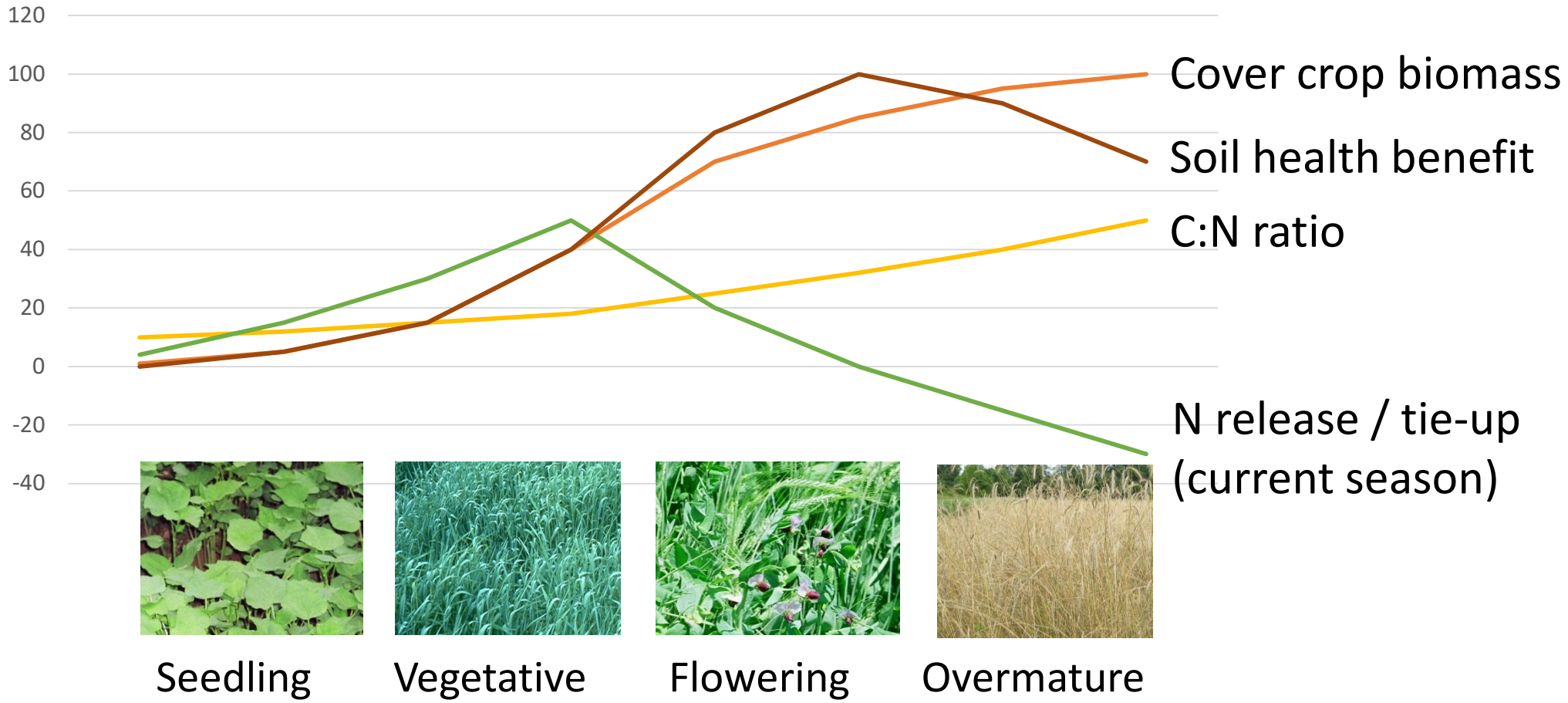
Mature cover crop

Cash crop

Soil Life

Active SOM Organic N

Cover Crop Maturity and N Dynamics



Cover Crop Types and N Dynamics

Mix and match cover crops to manage nitrogen for production and environmental goals.




	Legume	Crucifer	Grass-Legume Mix	Grass
N fixation potential	Mod-high	None	High	Limited
N recovery (also P and K)	Low-mod	Very high	Moderate to high	High
Residue C:N ratio	Low	Low	Moderate	High
Available N release	Rapid	Rapid	Slow	N tie-up
N leaching & N_2O risk	High	High	Low to moderate	Low

Can This Cover Crop Mix Meet N Needs of the Next Crop?

No ←

<u>Slower N mineralization</u>:

- Cool or dry climate
- No-till termination
- Heavy soil texture
- Waterlogged, dry, or compacted soil
- Low soil biological activity
- Early in organic transition

Mix of sorghum-sudan, pearl millet, southern pea, sunflower, and buckwheat.
Balanced C:N ratio

→ Yes

<u>Faster N mineralization</u>:

- Warm rainy climate
- Terminated by tillage
- Light soil texture
- Moist, well-aerated, well-aggregated soil
- Biologically active soil
- Long-term organic

N Tie-up Can Favor N-fixing Crops over Weeds

Organic no-till soybeans thrive in roll-crimped cereal rye

- Rye residue hinders weed emergence.
- Low soil soluble N slows weed growth without affecting soybean.
- Rye suppresses white mold disease.
- Higher rye seeding rate enhances weed control.
- Promising results with dry bean.

Menalled et al., 2021; Pethybridge and Ryan, 2022

Photo credit: USDA

Regional Cover Cropping Challenges and Strategies

- Short growing season – Northeast, North Central
- Limited moisture – Great Plains, interior West
- Mediterranean climate – West coast
- Intense heat and rainfall – South

Northeast and North Central Regions
Leading challenge: short growing season

- Limited time to grow cover crop biomass and fix N.
- Delayed cash crop planting.
- Cool, wet soil under rolled covers can hinder stand establishment.

Strategies:

- Interseed or overseed cover into cash crop (*right*).
- Plant cash crop before terminating cover ("planting green").

Clover overseeded into rye becomes well established as rye nears maturity.

Making the Best of a Short Growing Season

Soybean interplanted with sweet corn (left) will winter-kill and contribute organic N to balance corn residues and build SOM. Red clover interseeded with tomato (center) will grow into the next season and fix substantial N. Potato (right) was "planted green" into standing rye + vetch, which was roll-crimped three weeks later as potatoes emerged.

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

Midwest Cover Crop Council https://www.midwestcovercrops.org/.

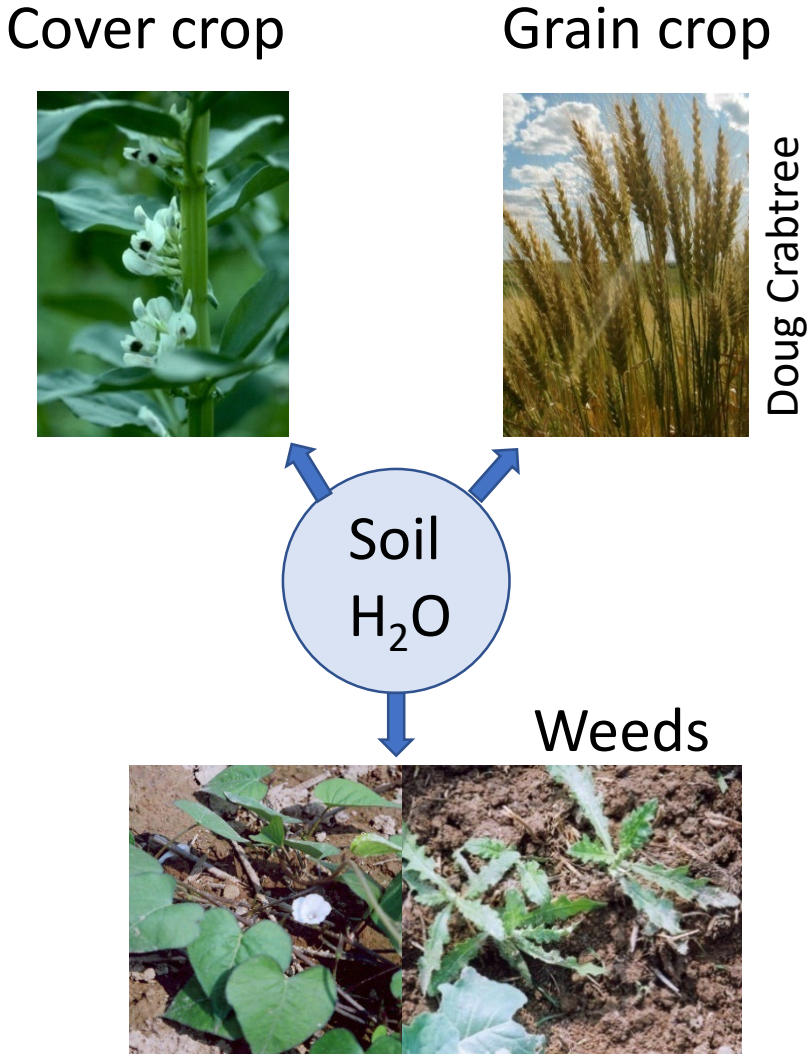
Interior Western Region
Leading challenge: limited water

In dry regions, cover crops may:

- Produce less biomass.
- Become weed-infested.
- Take moisture from cash crops.

During fallow without cover, dryland soils are prone to:

- Wind erosion.
- SOM loss.
- Reduced fertility.



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Cover Crops for Semiarid Climates

Characteristics:

- Drought hardy
- Good biomass
- Low moisture demand
- Residue cover in dry season

Examples:

- Pearl millet, foxtail millet, southern pea
- Barley, winter pea

New Mexico Stat U

Pearl millet (left) combines high biomass and moisture efficiency. Field pea (right) performs well as a winter cover crop in dryland rotations.

Western Cover Crop Council https://westerncovercrops.org/.
USDA Cover Crop Chart
https://www.ars.usda.gov/plains-area/mandan-nd/ngprl/docs/cover-crop-chart/.

Coastal Pacific Northwest – Mediterranean Climate

Leading challenge: Dry summer / rainy winter

Early fall planting:

- Moisture may be limiting.

Late planting:

- May be too wet to plant.
- Low cover crop biomass.
- Weeds get head start.

Strategy:

- Interplant covers into cash crops.

Cool season cover crops like oats and bell bean (left) barley and crimson clover (center) or triticale and pea (right) will thrive in a coastal Pacific Northwest winter – *if* they can be planted on time!

Interplanting Cover Crops into Organic Vegetables



Legumes interplanted with kale in Coastal Washington State (left); eggplant oversown with oats (center) and butternut squash oversown with red clover in western Oregon (right). Photo credits: (left) Washington State U; (center and right); Nick Andrews Oregon State U, provided by NCAT/ATTRA.

Southern Region

Leading challenge: summer heat

- Most crops are stressed by prolonged heat above 90°F.
- Pest and weed pressures are intense.
- Dry spells can thwart cover crop establishment.

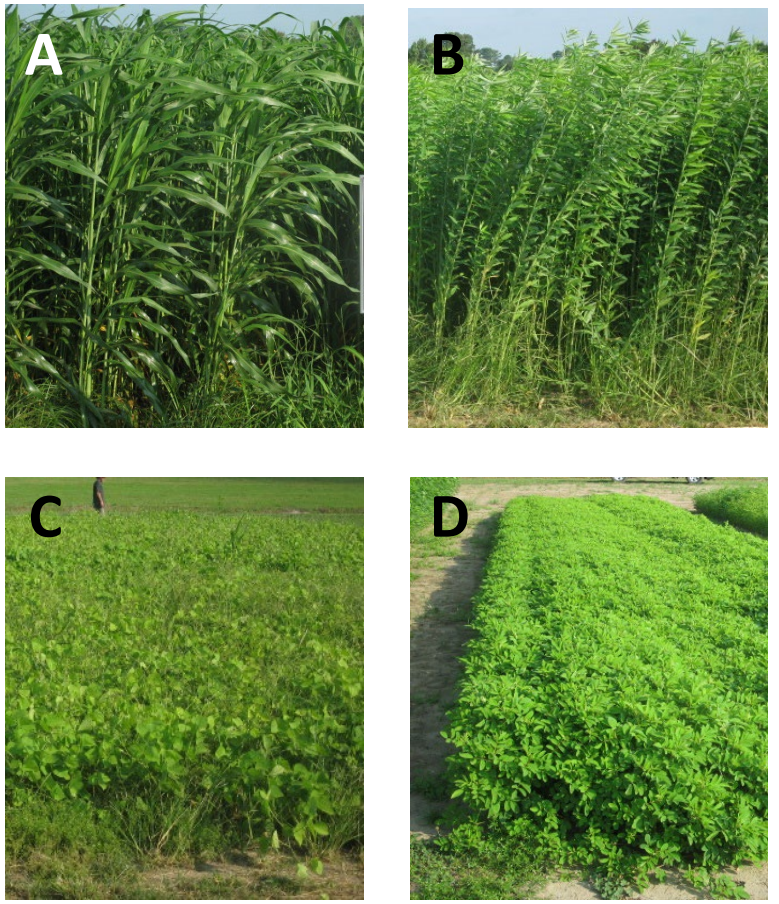
Strategy:

- Protect and feed the soil with heat-loving , drought-resilient cover crops during summer.

Warm climate advantages:

- Cover crops grow actively in all seasons.
- Can grow a high biomass cover crop *and* one or more cash crops per calendar year.

Southern Cover Crop Council:
https://southerncovercrops.org/



Sorghum sudangrass (A), sunn hemp (B), lab lab bean (C), and hairy indigo (D) thrive in heat and tolerate drought.

Southern Region
Additional challenge: low fertility soils

- Highly weathered soils (Ultisols); clays and nutrients leached from topsoil (A horizon) to subsoil (B).
- Sandy, coastal plain soils have very low SOM, and compacted E horizon between A and B.
- Limited root depth restricts cash crop access to moisture, and nutrients

Strategy:

- Grow deep rooted, high biomass cover crops to build SOM, break hardpan, and retrieve nutrients.

A winter rye cover crop relieves subsurface compaction and allow the next crop to send roots deeper.

Cover Crops in Context

- Multiple synergistic practices → soil health system
- Farm story: adaptive cover cropping in complex rotation
- Farm story: cover crops for organic dryland grain rotation
- Farm story: cover cropping in short growing season
- Farm story: cover cropping in livestock integrated system

Cover Crops in Synergy with Other Soil Health Practices

Cover crops

+

Diverse rotation

+

Compost

+

Reduced till

=

More SOM, and microbial activity

Living cover, organic soil amendments, and reduced tillage work together to:

- Build active and total SOM.
- Enhance microbial activity and functional diversity.
- Cycle and deliver nutrients, reduce fertilizer needs.
- Enhance soil moisture infiltration and storage.
- Suppress weeds and plant pathogens.

Diversified Crop Rotation at Twin Oaks Farm

- Louisa, VA – central Piedmont
- Two acres mixed vegetables for community of 100, managed by farmer-author Pam Dawling.
- Masada fine sandy loam and Tatum silt loam (Ultisols) with prior history of erosion.

Cover cropping practices:

- 10-year diversified crop rotation with one full year in green (cover cropped) fallow.
- Knowledge-intensive cover crop usage.

Kathryn Simmons

Sweet corn undersown with a soybean + oats cover crop at Twin Oaks Farm

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Adaptive Cover Cropping at Twin Oaks Farm

Strategies to maximize coverage, biomass, and N fixation:

- Timing so legumes flower before termination.
- Undersowing with precise timing for “niche-sharing” and irrigation if needed.
- Winterkill cover crops (oats, soybean, etc.) ahead of early spring vegetables.
- Filling short gaps in with buckwheat (4 wks), soybean (6 wks), or oats (early spring, 8 wks).

Nina Gentle

Red and white clovers undersown into fall broccoli initiate year-long green fallow in the 10-year rotation.

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Twin Oaks Farm
Cover Crop Contingency Plans

- Mix cereal grain with buckwheat or soybean for late March cover crop – one will thrive in either warm or cold spring.
- If a vegetable crop fails or ends early, sow cover crop for the season and time window.
- If green fallow clovers are thin and weedy, till and plant sorghum-sudangrass, cut and regrow to increase root mass.

Soil Health Outcome:

- Continued good production, keeping a kitchen for 100 residents well stocked.

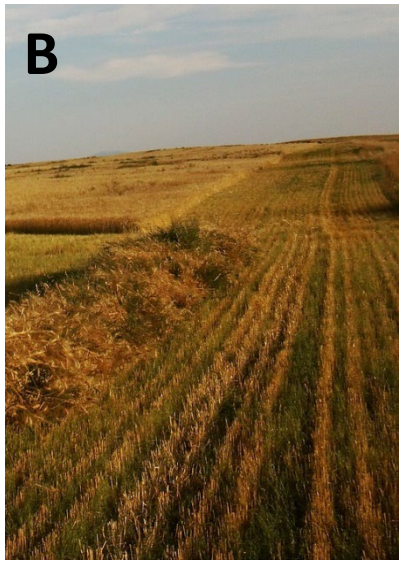
Sorghum-sudangrass is Pam's choice to fill in when a summer vegetable fails. Its huge biomass and 5-ft deep root system (right) build SOM and fracture subsurface hardpan.

Cover Crops for Dryland Organic Grains at Vilicus Farms

- Havre, MT – Northern Great Plains, long severe winters, average 11.7”/year rainfall.
- Challenging, erosion-prone soils.
- Region’s dominant system is wheat-fallow.
- Vilicus Farms: 12,566 acres, certified organic wheat, specialty grains, peas, lentils, oilseeds.
- Seven-year flexible rotation including two years in cover crops (“green fallow”).
- Reduced tillage saves moisture and SOM.
- Integrating livestock – grazing green fallow.

Doug and Anna-Jones Crabtree of Vilicus Farms in grain field with residues protecting the soil

Vilicus Farms: 7-year Rotation in the Land of Wheat-Fallow



A: Year 1, spelt or other ancestral wheat or barley (light feeders).

B: Sweetclover undersown into grain establishes green fallow for Year 2.

C: Manure applied (not shown) just before terminating green fallow in June of Year 2.

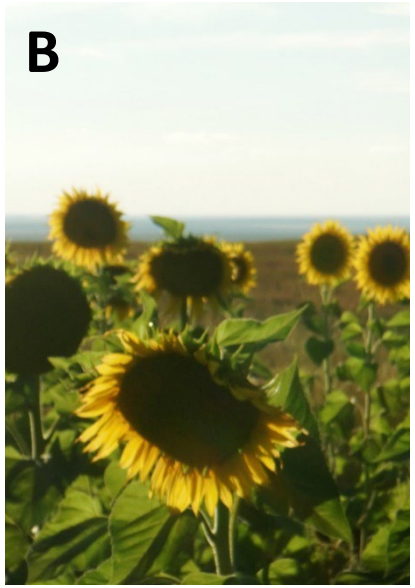
D: Year 3, modern cultivar of winter or spring wheat (heavy feeders).

E: Year 4, buckwheat (shown) or oilseed (safflower, flax, mustard, etc) or oats.

Photo Credits: Doug and Anna Jones Crabtree (A, B, D, E); Drew Lyon, University of Nebraska (C)

Vilicus Farms: 7-year Rotation in the Land of Wheat-Fallow

Doug Crabtree



Montana State Extension

Doug Crabtree

A: Year 5, black lentil (shown) or other pulse crop

B: Year 6, broadleaf oilseed crop (sunflower shown) or oats.

C: Year 7, green fallow of annual legume or mix of annual cover crops.

D: Prairie strips (20-30’ wide) alternate with 240 ft production strips for pollinator habitat.

Soil Health Outcomes: increased SOM, snow capture for moisture, greatly reduced erosion.

Cover Crops Save and Improve Soil at Burnt Rock Farm

- Justin Rich grows organic vegetables on 35 acres in Huntington, VT.
- Short growing season.
- Sandy, low-SOM soils.
- Intensive use of eight different cover crop species.
- Crop rotation includes year-long cover crop every third or fourth season.
- Cover crops are flail-mowed and incorporated with a high-speed disk.

Sorghum-sudan, Japanese millet, peas, and oats, planted to restore a depleted hayfield for vegetable production. Photo 57 DAP.

Cover Crops Save and Improve Soil at Burnt Rock Farm

Example of crop rotation:

- Year 1: rye → sweet corn → oats + peas (winterkill)
- Year 2: early vegetables → high biomass summer cover crop mix
- Year 3: oats + red clover, oats mowed at heading.
- Year 4: clover→ potatoes, onions, or squash

Cover crops and corn stalks mowed and disked.

"In a tilled system, we prioritize cover crops and aim to keep something growing all the time."

Justin works in a frost-killed cover crop and prepares a seedbed in a single pass with a high-speed disk (forward speed 7-8 mph, depth 3-4") which he finds easier on the soil than rototilling.

Innovative Livestock-crop System at Keenbell Farm

- Rockville, VA in the Chesapeake Bay watershed.
- Ultisols with clayey B horizon and history of erosion; some poorly drained acreage near river.
- Grass fed beef, pork, poultry, eggs, specialty grains, popcorn, milling corn, and soybeans.
- Crop rotation:
  - Winter grazing mix: rye, crimson clover, radish.
  - Summer grazing mix: sorghum-sudan, soybean, sunnhemp, sweetclover, sunflower, millets.
  - Specialty grain for market every few years, undersown with clover.

C. J. Isbell

Pastured hogs at Keenbell Farm, 340 acres managed by C. J., Isbell, 2020 Virginia Farmer of the Year

Grazing Cover Crops at Keenbell Farm

Beef cattle graze a mature summer cover crop.

- No tillage. Seeds are drilled or broadcast depending on moisture.
- Rotational grazing: graze one day, rest 30-45 days. Annual covers grazed 3-4 times.
- Pastured poultry and hogs add diversity and cycle nutrients.
- Steeper land in permanent pasture.

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After mob-grazing the cover crop for 24 hours (front), the cattle are move to a fresh paddock (back).

Keenbell Farm Soil Health Outcomes

C. J. Isbell

Cover crops that are not grazed are roller-crimped.

- Soil organic matter % has nearly doubled.
- Nutrient and water holding capacity have increased.
- Erosion and runoff are greatly reduced.
- Livestock integration enhances soil health:
  - Running cattle immediately after grain harvest breaks stover, feeds soil, builds SOM.
  - SOM and soil biology increase more rapidly in crop-livestock system than with crops alone.

Nationwide Information Resources

Cover Cropping in Organic Farming Systems

eOrganic articles and videos at https://eorganic.org/menu/872.

National Center for Appropriate Technology – ATTRA Sustainable Agriculture

Cover crops at https://attra.ncat.org/topics/cover-crops/.

SARE Learning Center – Cover Crops Topic Room
https://www.sare.org/Learning-Center/Topic-Rooms/Cover-Crops/

Articles, decision tools, farmer surveys, links to other resources

Questions?