

Introduction to Cover Crops for Vegetables

Practical Farmers of Iowa Annual Conference

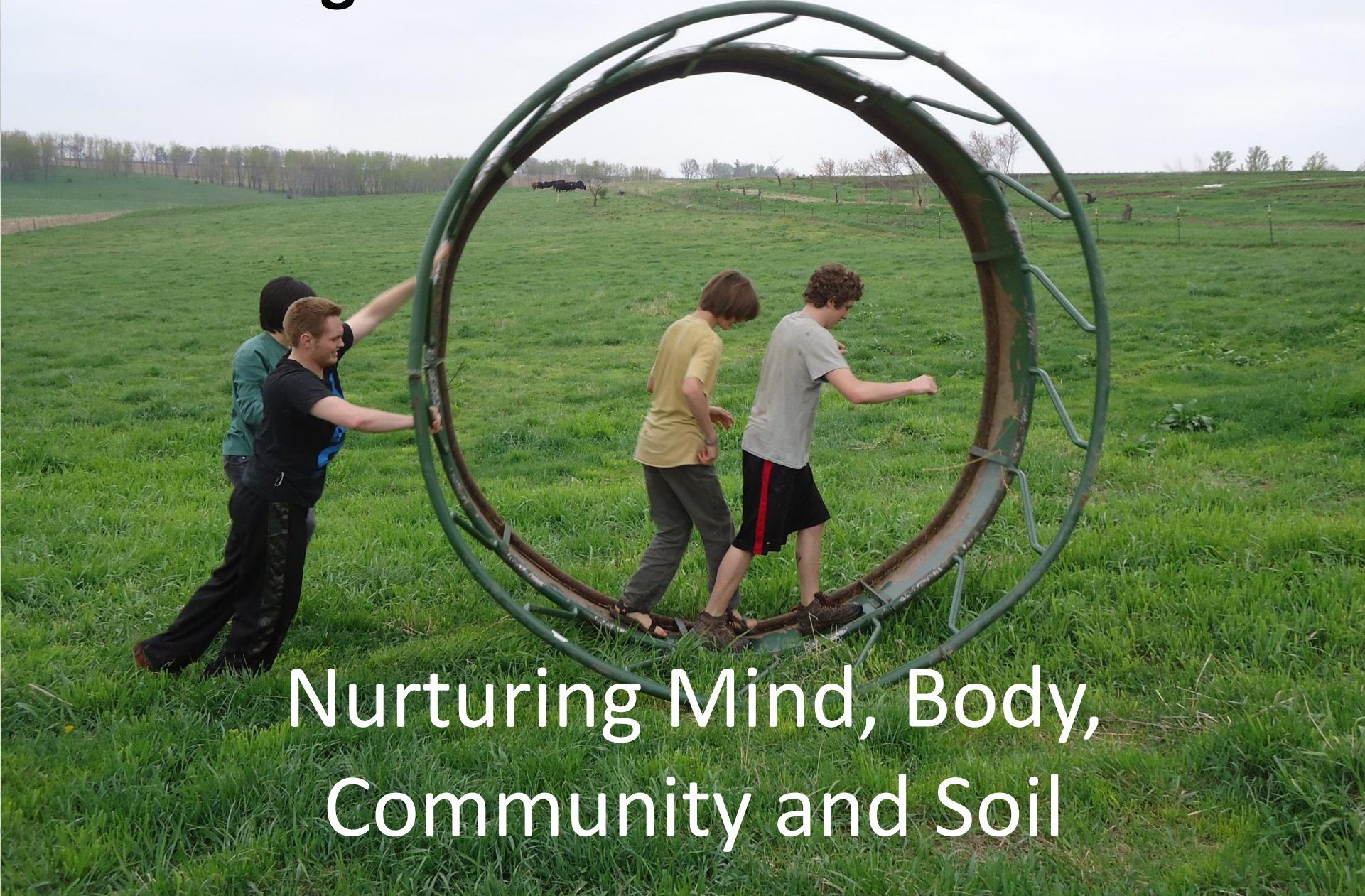
January 21, 2017

Mark Quee

Scattergood Friends School

farm@scattergood.org

Scattergood Friends School and Farm



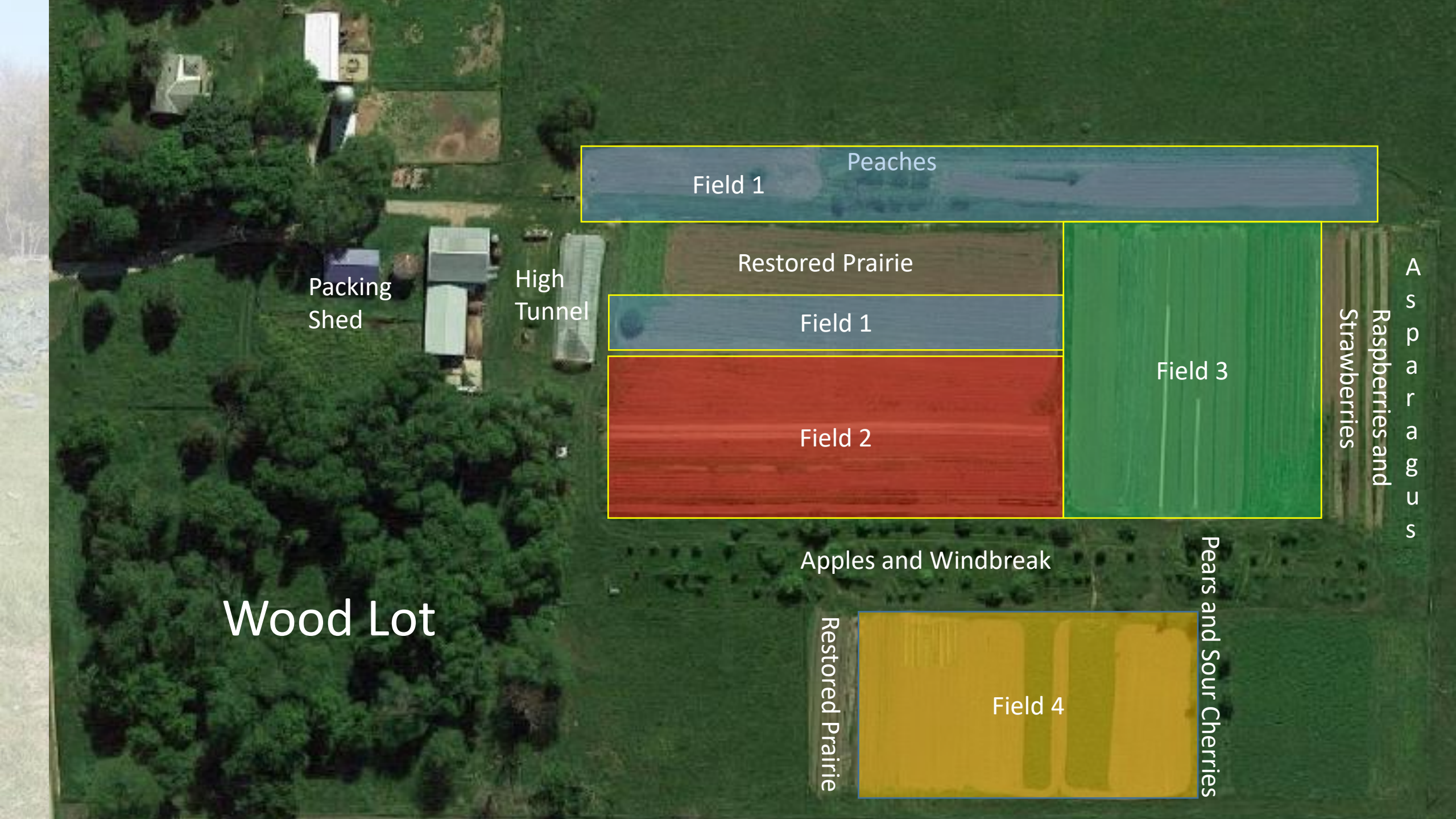
Nurturing Mind, Body,
Community and Soil











Wood Lot

Packing
Shed

High
Tunnel

Field 1

Peaches

Restored Prairie

Field 1

Field 2

Field 3

Apples and Windbreak

Restored Prairie

Field 4

Pears and Sour Cherries

Asparagus
Raspberries and
Strawberries

Field 1 2017: Cover 2018 Brass/Cuke/Corn	2019: Nightshades/Pots/SweetPots 2020: Legume/Roots/Allia/Salad/Herbs	Field 5 Campus Overflow
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Pollinator Habitat	Field 3 2017: Brass/Cuke/Corn 2018: Nightshades/Pots/Sweet Pots 2019: Legume/Roots/Allia/Salad/Herbs 2020: Cover	
Field 1		
Field 2 2017: Nightshades/Pots/Sweet Pots 2018: Legume/Roots/Allia/Salad/Herbs 2019: Cover 2020: Brass/Cuke/Corn		
		Erosion Zone

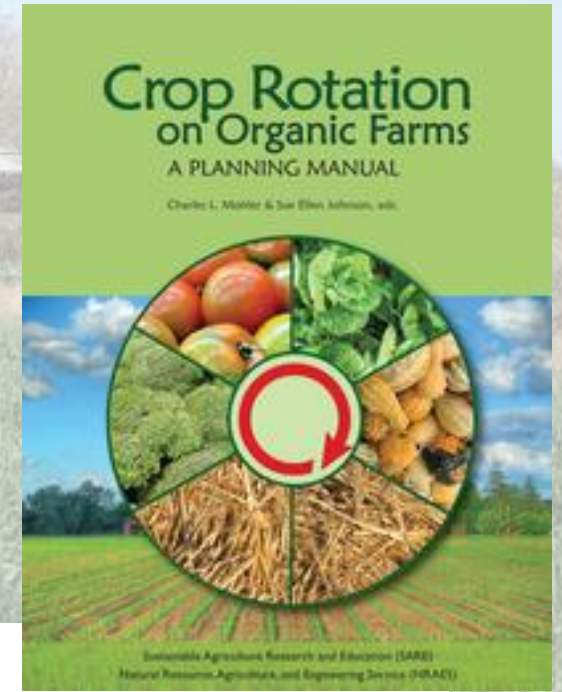
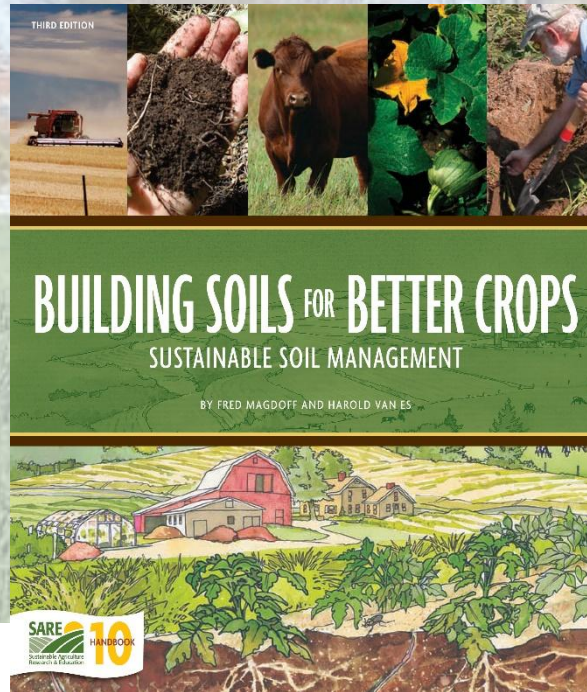
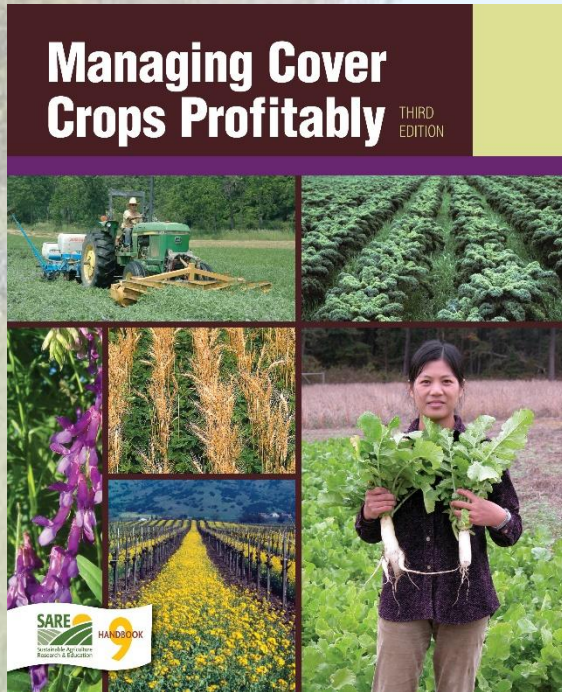
Trees


Trees

Prairie	STRAWBERRIES	Field 4 old SARE Experiment 2017: Legumes/Roots/Allia/Salad/Herbs 2018: Cover 2019: Brass/Cuke/Corn 2020: Nightshades/Pots/Sweet Pots	Erosion Zone/ Pollinator Habitat

Group together: Brass/Cuc/Corn/Herbs:::
Legumes/Roots/Allia/Salad/Cilantro::: Nightshades/Potatoes/Sweet
Potatoes:::approximately 1/4-1/3 of the gardens will be in covercrops

Resources:



- 
- Why?
 - What?
 - Fallow Year
 - Cash Crop Year
 - How/When?
 - Resources



- Why?

- What?

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- Cash Crop Year

- How?

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Important considerations:

Know why you're using cover crops.

Don't treat cover crops as an afterthought. Treat them as you do your cash crops:

Schedule plantings. Map your fields. Group together plantings with similar terminal dates. Order your seeds.

Know how you're going to terminate cover crops.

Mowing with a bush hog and tilling works for us.

Be aware of allelopathic and disease host issues.

Why does Scattergood use cover crops?

- Add Organic Matter and fix Nitrogen
- Protect the soil from erosion
- Encourage pollinators and beneficials
- Weed control
- Forage for sheep/pigs/turkeys

SARE's Benefits of Cover Crops:

- **Cut fertilizer costs** (fix N + scavenge nutrients)
- **Reduce the need for herbicides/pesticides** (weed suppression + natural herbicidal effects + host beneficial microbial life)
- **Improve yields by enhancing soil health** (OM, compaction)
- **Prevent soil erosion** (surface protection, better infiltration)
- **Conserve soil moisture** (increased infiltration, less evaporation)
- **Protect water quality** (less erosion, sequestering nutrients)
- **Help safeguard personal health** (use fewer chemical inputs)



- Why?

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Cover Crops Scattergood Currently Uses

Spring: Chickling Vetch/Oats (March-April)

Summer: Field Peas/Oats

Buckwheat

Sorghum Sudangrass (late May)

Fall: Hairy Vetch/Oats (before Sept 20)

Field Peas/Oats

Oats

Other Cover Crop species that we have tried:

Tillage Radish

Oilseed Radish

Japanese Millet

Berseem Clover

Sweet Clover

Crimson Clover

Red Clover

Sunn Hemp

Cereal Rye

Cow Peas



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Field 1 2017: Cover 2018 Brass/Cuke/Corn 2019: Nightshades/Pots/SweetPots 2020: Legume/Roots/Allia/Salad/Herbs	Field 5 Campus Overflow
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Pollinator Habitat	Field 3 2017: Brass/Cuke/Corn 2018: Nightshades/Pots/Sweet Pots 2019: Legume/Roots/Allia/Salad/Herbs 2020: Cover Erosion Zone	
Field 1		
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Trees

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Prairie	STRAWBERRIES	Field 4 old SARE Experiment 2017: Legumes/Roots/Allia/Salad/Herbs 2018: Cover 2019: Brass/Cuke/Corn 2020: Nightshades/Pots/Sweet Pots Erosion Zone/Pollinator Habitat

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Fallow Year Cover Cropping

Fall Prior(September): sow hairy vetch/oats mix where possible (sometimes cash crops are in the way).

March/April: sow chickling vetch or field peas/oats in places with no hairy vetch.

Mid May: mow and till; sow sorghum sudangrass.

Summer: graze/mow up to 3 times.

Fall: mow in September, till strips for early spring planting. Drill hairy vetch/oats where later crops are going (corn, pumpkins and late brassicas).















**SARE-
Sponsored
Green/
Brown
Manure
Trial 2011-
2015**

		2012				
		TIME	BED 1	BED 2	BED 3	BED 4
East		April-July	Beets	Broccoli	Zucchini	Zucchini
		July-Aug	Chickens			None
		Aug-April	Oats/field peas grazed by sheep then hogs			None
			(CONTROL)			
		April-July	Beets	Broccoli	Zucchini	Zucchini
		July-Aug	Till and drill Buckwheat			None
		Aug-April	Oats/field peas			None
		North				
		2013				
		TIME	BED 1	BED 2	BED 3	BED 4
East		May-August	Zucchini	Beets	Broccoli	Broccoli
		August-Sept	Turkeys			
		Sept-May	Hairy Vetch/Oats + 1-2 loads of composted manure			
			(CONTROL)			
		May-August	Zucchini	Beets	Broccoli	Broccoli
		August-Sept				None
		Sept-May	Hairy Vetch/Oats			None
		North				



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SARE's mission is to advance—to the whole of American agriculture—innovations that improve profitability, stewardship and quality of life by investing in groundbreaking research and education. SARE's vision is...

Green Manure vs. Brown Manure in an Organic Vegetable System

Final Report

[PDF](#)

Summary

PROJECT DESCRIPTION AND RESULTS

Project Duration: This is an on-going experiment, though for purposes of the grant, it will conclude on March 15, 2012

Background and description of previous sustainable agriculture activities: I have been the Farm Manager at Scattergood Friends School since 2003. We raise 10

[YENC10-023](#) ↩

Project Type:
Youth Educator

Projected End Date:
2013

Funds Awarded:
\$1,991

Region: North Central
State: Iowa

Coordinators:



- Why?

- What?

- Fallow Year

- Cash Crop Year

- How?

- Resources

Cover Crops used after/between cash crops

**Chickling Vetch in areas that might have a N deficit--
where hairy vetch died or didn't fit (March-April)**

**Buckwheat or Field Peas/Oats when spring and
summer cash crops come out (June-Aug).**

**As things wind down late summer/early fall, Hairy
Vetch/Oats where the following year allows a later
spring sowing, or Field Peas/Oats for an early spring
sowing.**



Quick Turnaround Cover Crops

2013, 2014

Buckwheat
Japanese Millet
Sorghum Sudangrass
Cowpeas
Sunn Hemp
Chickling Vetch
Oats/Field peas





Horticulture Research



Quick Turnaround Cover Crops for Horticulture -- Update 2014

Staff Contact:

Liz Kolbe – (515) 232-5661
liz@practicalfarmers.org

Web Link:

http://bit.ly/pfi_horticulture

Cooperators:

- Rob and Tammy Faux – Tripoli
- Rick and Stacy Hartmann – Minburn
- Nicholas Leete and Alice McGary – Ames
- Mark Quee – West Branch

Funding By:

The Ceres Foundation



In a Nutshell

- Fruit and Vegetable farmers use cover crops to improve nutrient cycling and control weeds for increased production efficiency.
- Summer cover crops can be challenge due to dry conditions.
- Four farms evaluated summer cover crops to determine aboveground biomass production, carbon and nitrogen produced, effects on subsequent cash crop germination and effects on subsequent weed seed germination.

Key findings:

- Summer-seeded cover crops produced between 192 and 14,157 lb of



Transplanting into mowed rye: 2015







- Why?

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Approximate Planting Times (east-central Iowa, Zone 5a)

Chickling Vetch/Oats:	March 1-April 15
Field Peas/Oats:	April 15-Sept 15
Buckwheat:	May 1-Aug 15
Sorghum Sudangrass:	May 15-June 1
Hairy Vetch/Oats:	Aug 15-Sept 15
Oats:	Sept 15-Oct 15



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- Why?

- What?

- Fallow Year

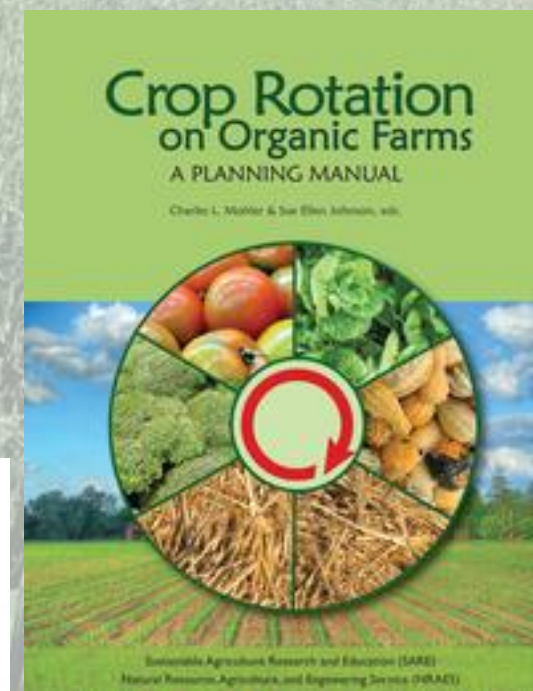
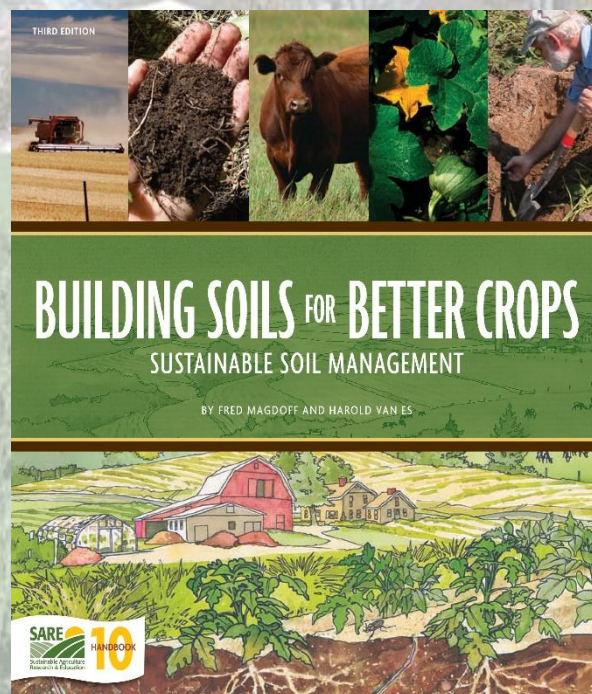
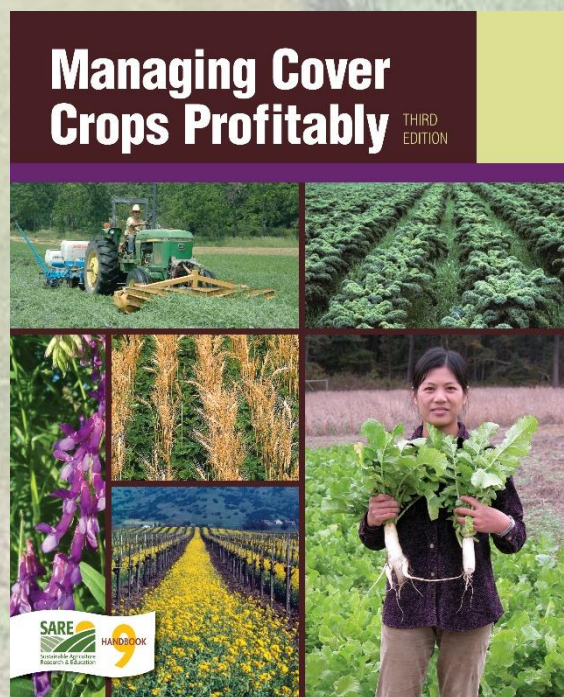
- Cash Crop Year

- How?

- Resources

Resources:

(most of our seeds come from Welter Seeds in Onslow, IA)





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PFI co-founder Dick Thompson
of Boone, IA.

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Research reports are written by Practical Farmers staff to ensure consistency and quality, and are available to view or download for free below.

Search Member Priorities

Clear

Title ↕	Date ↕	Member Priorities ↕
+ Oat Cover Crop vs. Straw Mulch for Garlic ...	11/18/16	CC BF FC H L LF OE P SG RD
+ Summer Squash Following Winter Rye With Strip ...	11/30/15	CC BF FC H L LF OE P SG RD
+ Quick Turnaround Cover Crops for Horticulture	12/05/14	CC BF FC H L LF OE P SG RD
+ Role of Cover Crops in Converting Perennial ...	01/31/12	CC BF FC H L LF OE P SG RD
+ Assessing Tillage Radish for Weed Control in ...	06/09/11	CC BF FC H L LF OE P SG RD
+ Effectiveness of White Mustard on Spring Weeds	02/07/11	CC BF FC H L LF OE P SG RD
+ Tillage Radish to Control Weeds in Horticulture ...	11/03/10	CC BF FC H L LF OE P SG RD

Managing Cover Crops Profitably

THIRD EDITION

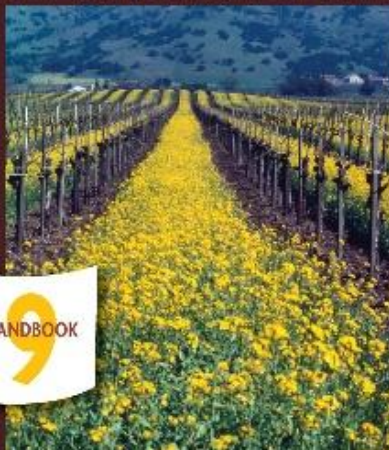
























































Chart 2 PERFORMANCE AND ROLES

NON LEGUMES

Species	Legume N Source	Total N (lb./A) ¹	Dry Matter (lb./A/yr.)	N Scavenger ²	Soil Builder ³	Erosion Fighter ⁴	Weed Fighter	Good Grazing ⁵	Quick Growth
Annual ryegrass <i>p. 74</i>			2,000-9,000						
Barley <i>p. 77</i>			2,000-10,000						
Oats <i>p. 93</i>			2,000-10,000						
Rye <i>p. 98</i>			3,000-10,000						
Wheat <i>p. 111</i>			3,000-8,000						
Buckwheat <i>p. 90</i>			2,000-4,000						
Sorghum-sudan. <i>p. 106</i>			8,000-10,000						
Mustards <i>p.81</i>		30-120	3,000-9,000						
Radish <i>p. 81</i>		50-200	4,000-7,000						

SSICAS

Chart 3A CULTURAL TRAITS

	Species	Aliases	Type ¹	Hardy through Zone ²	Tolerances					Habit ³	pH (Pref.)	Best Established ⁴	Min. Germin. Temp.
					heat	drought	shade	flood	low fert				
NON LEGUMES	Annual ryegrass <i>p. 74</i>	Italian ryegrass	WA	6						U	6.0–7.0	ESp, LSu, EF, F	40F
	Barley <i>p. 77</i>		WA	7						U	6.0–8.5	F, W, Sp	38F
	Oats <i>p. 93</i>	spring oats	CSA	8						U	4.5–7.5	LSu, ESp W in 8+	38F
	Rye <i>p. 98</i>	winter, cereal, or grain rye	CSA	3						U	5.0–7.0	LSu, F	34F
	Wheat <i>p. 111</i>		WA	4						U	6.0–7.5	LSu, F	38F
	Buckwheat <i>p. 90</i>		SA	NFT						U/SU SU	5.0–7.0	Sp to LSu	50F
CAS	Sorghum-sudan. <i>p. 106</i>	Sudax	SA	NFT						U	6.0–7.0	LSp, ES	65F
	Mustards <i>p.81</i>	brown, oriental white, yellow	WA, CSA	7						U	5.5–7.5	Sp, LSu	40F

Chart 3B PLANTING

	Species	Depth	Seeding Rate				Cost (\$/lb.) ¹	Cost/A (median) ²		Inoc. Type	Reseeds ³	
			Drilled		Broadcast			drilled	broadcast			
			lb./A	bu/A	lb./A	bu/A						oz./100 ft ²
NON LEGUMES	Annual ryegrass	0-1/2	10-20	.4-.8	20-30	.8-1.25	1	.70-1.30	12	24		U
	Barley	3/4-2	50-100	1-2	80-125	1.6-2.5	3-5	.17-.37	20	27		S
	Oats	1/2-1 1/2	80-110	2.5-3.5	110-140	3.5-4.5	4-6	.13-.37	25	33		S
	Rye	3/4-2	60-120	1-2	90-160	1.5-3.0	4-6	.18-.50	25	35		S
	Wheat	1/2-1 1/2	60-120	1-2	60-150	1-2.5	3-6	.10-.30	18	22		S
	Buckwheat	1/2-1 1/2	48-70	1-1.4	50-90	1.2-1.5	3-4	.30-.75	32	38		R
	Sorghum-sudangrass	1/2-1 1/2	35	1	40-50	1-1.25	2	.40-1.00	26	34		S
BRASSICAS	Mustards	1/4-3/4	5-12		10-15		1	1.50-3.00	16	24		U
	Radish	1/4-1/2	8-13		10-20		1	1.50-2.50	22	32		S
	Rapeseed	1/4-3/4	5-10		8-14		1	1.00-2.00	11	16		S

Chart 4A **POTENTIAL ADVANTAGES**

	Species	Soil Impact			Soil Ecology				Other		
		subsoiler	free P&K	loosen topsoil	nematodes	disease	allelopathic	choke weeds	attract beneficials	bears traffic	short windows
NON LEGUMES	Annual ryegrass <i>p. 74</i>										
	Barley <i>p. 77</i>										
	Oats <i>p. 93</i>										
	Rye <i>p. 98</i>										
	Wheat <i>p. 111</i>										
	Buckwheat <i>p. 90</i>										
	Sorghum-sudangrass <i>p. 106</i>										
ICAS	Mustards <i>p.81</i>										

Chart 4B POTENTIAL DISADVANTAGES

Note change in symbols ○ = problem ● = not a problem

NON LEGUMES

AS

Species	Increase Pest Risks			Management Challenges					Comments Pro/Con
	weed potential	insects/nematodes	crop disease	hinder crops	establish	till-kill	mow-kill	mature incorp.	
Annual ryegrass	○ ¹	●	●	●	●	●	●	●	If mowing, leave 3-4" to ensure regrowth.
Barley	●	●	●	●	●	●	●	○	Can be harder than rye to incorporate when mature.
Oats	●	●	●	●	●	●	●	●	Cleaned, bin-run seed will suffice.
Rye	●	●	●	●	●	●	●	○	Can become a weed if tilled at wrong stage.
Wheat	●	●	●	●	●	●	●	●	Absorbs N and H ₂ O heavily during stem growth, so kill before then.
Buckwheat	○	●	●	●	●	●	●	●	Buckwheat sets seed quickly.
Sorghum-sudangrass	●	●	●	●	●	●	●	●	Mature, frost-killed plants become quite woody.
Mustards	●	●	●	●	●	●	●	●	Great biofumigation potential; winterkills at 25° F.

HAIRY VETCH

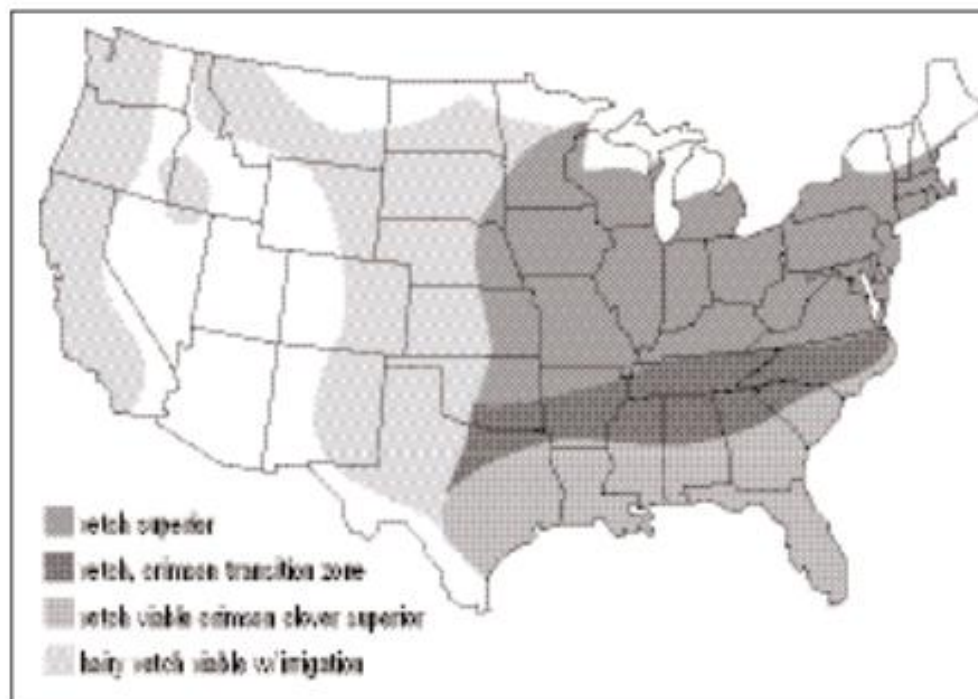
Vicia villosa

Type: winter annual or summer annual legume

Roles: N source, weed suppressor, topsoil conditioner, reduce erosion

Mix with: small grains, field peas, bell beans, crimson clover, buckwheat

See charts, p. 66 to 72, for ranking and management summary.



Few legumes match hairy vetch for spring residue production or nitrogen contribution. Widely adapted and winter hardy through Hardiness Zone 4 and into Zone 3 (with snow cover), hairy vetch is a top N provider in temperate and subtropical regions.

The cover grows slowly in fall, but root development continues over winter. Growth quickens in spring, when hairy vetch becomes a sprawling vine up to 12 feet long. Field height rarely exceeds 3 feet unless the vetch is supported by another crop. Its abundant, viney biomass can be a benefit and a challenge. The stand smothers spring

Corn planting date comparison trials with cover crops in Maryland show that planting *as late* as May 15 (the very end of the month-long local planting period) optimizes corn yield and profit from the system. Spring soil moisture was higher under the vetch or a vetch-rye mixture than under cereal rye or no cover crop. Killed vetch left on the surface conserved summer moisture for improved corn production (80, 82, 84, 85, 173, 243).

Even without crediting its soil-improving benefits, hairy vetch increases N response and produces enough N to pay its way in many systems.

Thank You!



Mark Quee

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