

# Cover Crops for Florida Gardens

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# What is a Cover Crop?

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- A cover crop is not harvested for profit, but rather is included in the farm or garden to provide *one or more ecosystem services*.
- Cover crops can reduce fertilizer and pesticide use, serve as wildlife habitat and food, and improve *soil health*.

# FLORIDA AGRICULTURAL Experiment Station.

DEPARTMENT OF

## Horticulture and Botany.

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### Cover Crops.

(BY H. HAROLD HUME.)

The benefits derived from cover crops in Florida are briefly as follows:

They add nitrogen and humus to the soil, dry out the soil during the summer months and prevent the leaching and wasting of fertilizer materials in the soil. Any soil which is deficient in humus cannot be considered fertile, not that humus as such can be used by plants but its presence may always be taken as an index of fertility.

How can the fertility of the soil be maintained and increased? By the addition of fertilizers and by grow-

# Historic Use of Cover Crops In Florida

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During the 1870s, Mucuna, or **velvet bean** (*Mucuna pruriens* L.) was introduced in Florida as a forage crop and by 1897 it was used by hundreds of citrus growers as an affordable alternative to improve soil fertility while it was also used as a forage crop (Tracey and Coe 1918).

Later, cover crops such as: **beggarweed**; **crotalaria** (*C. spectabilis* L. and *C. striata* L.); **velvet bean** cultivars including 'F', 'Lyon Velvet', Chinese Velvet', 'Georgia or early speckled Velvet', and 'Osceola Velvet'; **pigeon pea** (*Cajanus cajan* (L.) Millsp.); **cowpea** (*Vigna unguiculata* (L.) Walp. 'Brabham' and 'Iron'), **oats** (*Avena sativa* L.), **rye** (*Secale cereale* L.), **Austrian pea** (*Pisum sativum* subsp. *arvense* L.), and **hairy vetch** (*Vicia villosa* L.) were widely used (Scott, 1927).

**Lupine** (*Lupinus augustifolius* L.), sweet and bitter blue were used as a forage and as a cover crop (Warner, 1939, Hamilton, 1948, and Ritchie, 1968).

# Why Plant Cover Crops?

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## Cover crops improve soil quality

Physical, chemical and biological characteristics

## Cover crops improve nutrient cycling

Legumes add nitrogen, other species capture and return nutrients

## Cover crops manage pests

Weeds, insects, diseases, and nematodes can be reduced with cover crops.

# Diversity of Species *Above-Ground*



Provides Diversity of Roots *Below-Ground*

Howard J. Dittmer, 1937. A Quantitative Study of the Roots and Root Hairs of a Winter Rye Plant (*Secale cereale*). Amer. J. Botany. 24 (7): 417-420

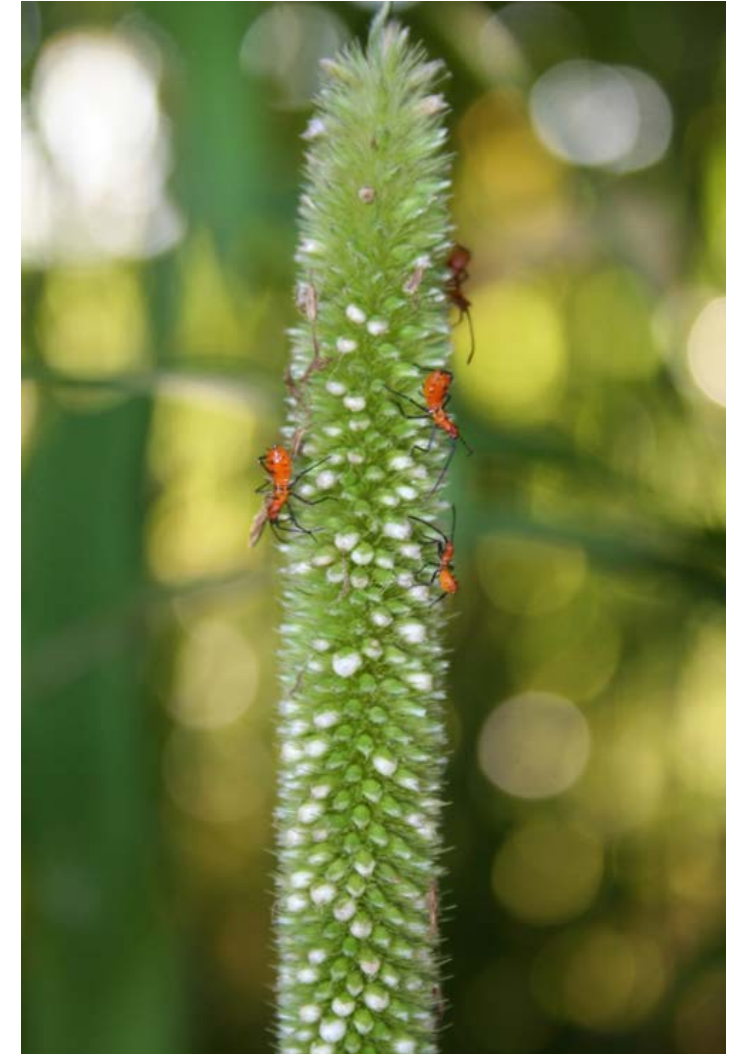
**Table 1. Roots**

Root Categories	Number of roots per unit*	Total number of roots by categories	Average length (inches)	Total root length by categories (feet)	Total root surface, by categories (sq. feet)
Main	1.0	143	18.0	214.50	1.53
Secondary	249.0	35,607	6.0	17,803.50	45.06
Tertiary	16,060.5	2,296,651	3.0	574,162.75	758.60
Quaternary	80,302.6	11,483,271	1.5	1,452,075.60	1,748.90
<b>TOTALS</b>	<b>97,613.1</b>	<b>13,815,672</b>		<b>2,044,256.50</b>	<b>2,554.09</b>

\*A unit includes one main root with all secondary, tertiary, and quaternary roots. There were 143 such units on this plant.

# Above-Ground Biodiversity

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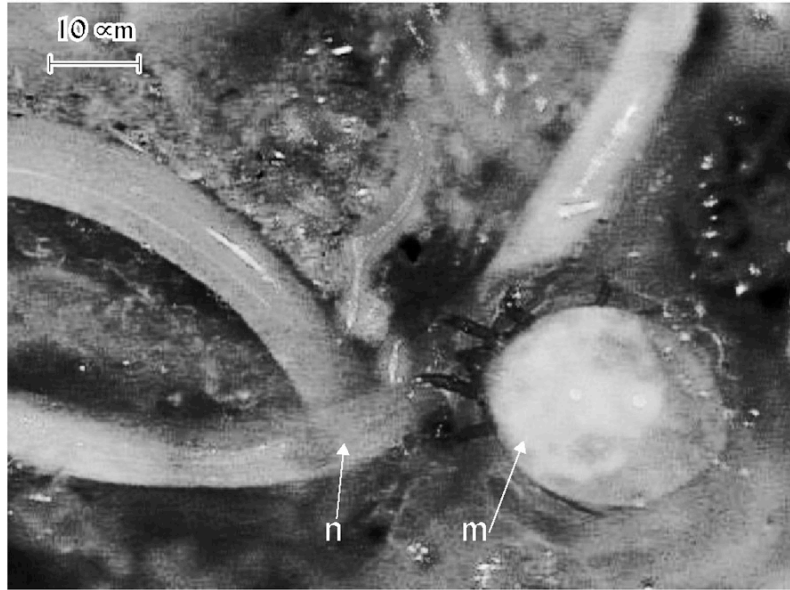
*Spined soldier bug  
w/ tachnid fly egg.*

*Photo by Debbie  
Roos*



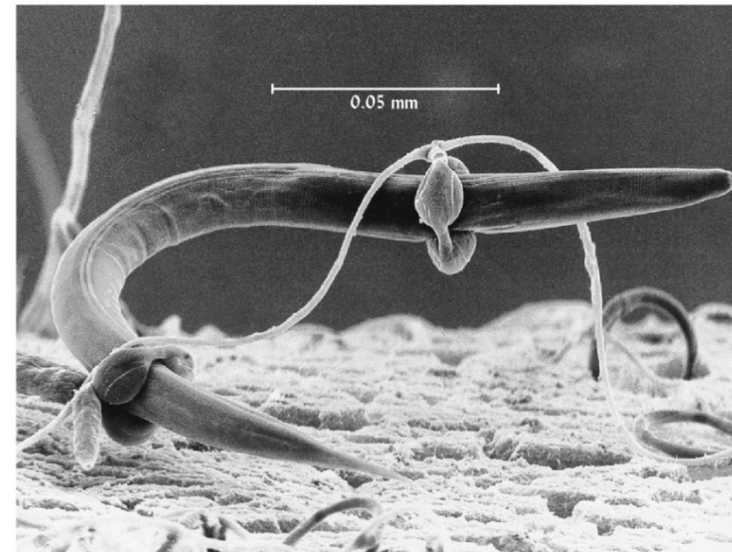
# Below Ground Biodiversity

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**A mite feeding on a nematode  
(Marie Newman, NCSU)**

Biologically active soil is  
a management goal.



**Fungi attacking and digesting a nematode  
(George Barron, Univ. of Guelph)**

# Opportunities for Cover Crops in the Garden

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## 1. In an established production area

- Benefits occur during cover crop life, and after cover crops are killed
- Can be planted in understory in perennials, or in sequence with annuals, or side by side

## 2. In a new area you are preparing

- To remediate “old” land, covers can improve soil quality

## 3. In areas you wish to keep for wildlife

- Cover crops provide nectaries, forage, and habitat for wildlife

# What kind of cover crops to use?

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## 1. MANY species and cultivars are available

Grouped according to botanical classification:

- GRASSES (CEREAL GRAINS)
- LEGUMES
- NON-LEGUMES

## 2. Choose a cover crop based on:

- Your system and objective(s)
- The time of year
- Your tools and if any, equipment

# How to plant cover crops?

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1. Seedbed preparation important.
2. Seed cover crops by:
  - Broadcast on a rough surface, lightly incorporate with a rake, shallow tiller, or roller. Increase seeding rate by 20% if broadcasting
  - Drill
3. Garden rate: for every POUND/ACRE of seed recommended, use 0.35 ounces (10g) of seed for 1,000 ft.

Ex.) If the recommended rate is 50 lb/acre:  
 $50 \times 0.35 = 17.5$  ounces per 1,000 ft<sup>2</sup>; or  $17.5\text{oz}/16\text{oz} = 1.1$  pounds

# How to plant cover crops?

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When several species are planted together, adjust the seeding rates of each with the following formula:

$$\frac{\text{Monocot seeding rate}}{(\text{number of species in the mixture} - 1)}$$

**Repeat for each species in the mixture.**

Example – You want to plant three species of cover crops, and each one has a different recommended rate.

Cover crop #1 at 40 lb/acre / (3-1 = 2) = 20 lb/a

Cover crop #2 at 50 lb/acre / (3-1 = 2) = 25 lb/a

Cover crop #3 at 10 lb/acre / (3-1=2) = 2 lb/a

# How to plant cover crops?

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If you have mixed several species of cover crops together, then seed all of them to the greatest recommended depth.

The largest seeds will emerge first, breaking the way for the smaller seeds to emerge next.

# Monocultures



**Plant architecture and carbon form and content will influence termination method.**

# Polyculture (mixed) Species



**Polycultures reduce the period of time needed for soil biota to return to equilibrium but may differ in maturity rates, complicating termination plans.**





# Tried and True Summer Cover Crops

<b>COMMON NAME</b>	<b>LATIN NAME</b>	<b>CULTIVARS</b>
Sunn hemp	<i>Crotalaria juncea</i> L.	'Tropic Sun'
Cowpea	<i>Vigna unguiculata</i> (L.) Walp	'Iron Clay'
Velvet bean	<i>Mucuna puriens</i> var. <i>utilis</i> (Bort) Merr.	
Sesame	<i>Sesamum indicum</i> L.	
Pearl millet	<i>Pennisetum glaucum</i> (L.) R. Br.	'Tifleaf 3',
Lablab	<i>Lablab purpureus</i> (L.)	'Alba'
Sunflower	<i>Helianthus annuus</i>	'Mammoth'

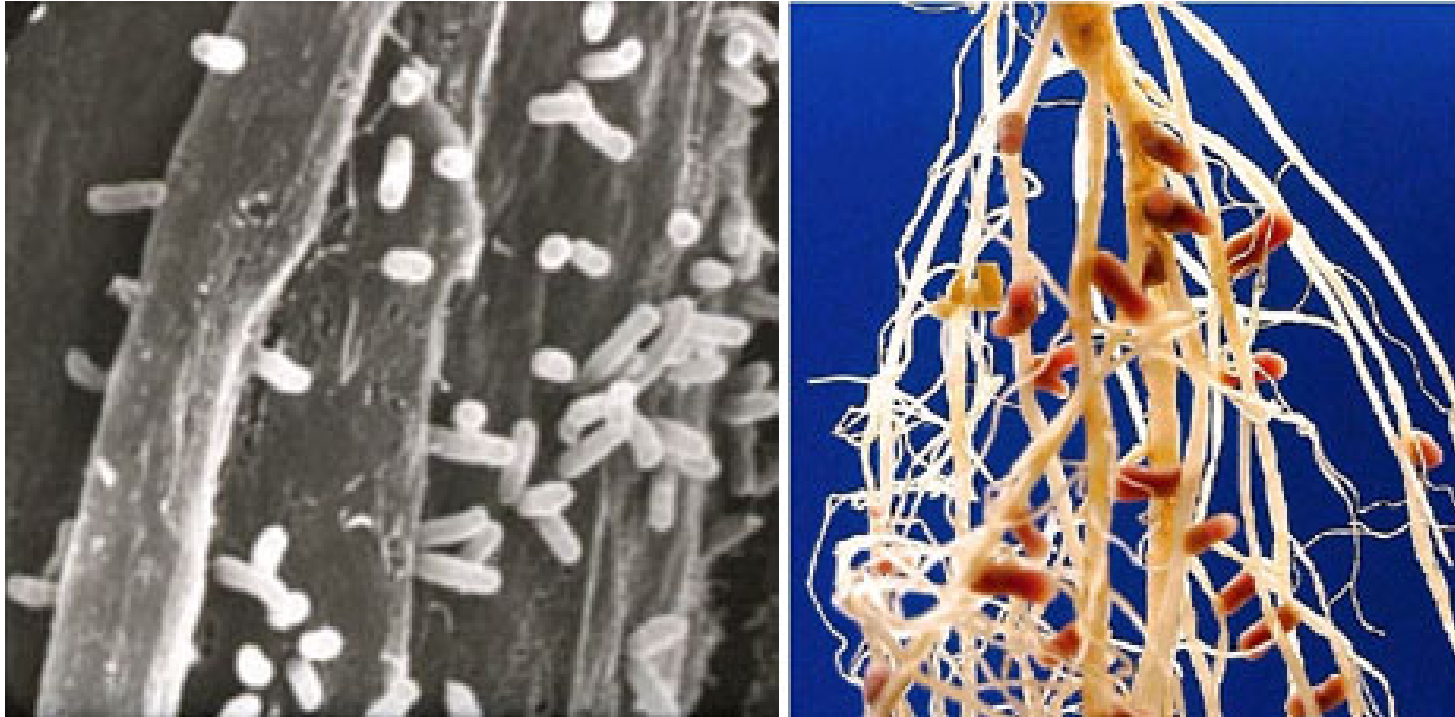
# Tried and True Winter Cover Crops

COMMON NAME	LATIN NAME	CULTIVARS
Crimson clover	<i>Trifolium incarnatum</i> L.	'Dixie'
Alyce clover	<i>Alysicarpus ovalifolius</i>	
Austrian Winter pea	<i>Pisum sativum</i> spp. <i>Arvense</i> (L.) Poir.	'Frost'
Daikon radish	<i>Raphanus sativus</i> L.	'Niger', Soilbuster <sup>®</sup>
Triticale	<i>Triticum aestivum</i> X <i>triticosacale</i>	'Tamcale', 'Tri-Cal'
Cereal rye	<i>Secale cereale</i>	'FL 401'

# Inoculants for Legume Covers

<b>Cover Crop</b>	<b>Inoculant Type</b>
Vetch and peas	pea/vetch
Clover	alfalfa/sweet clover
Lupine	lupine
Soybean	soybean
Lablab bean	lablab
Cowpea	Cowpea/peanut/mung bean/lespedezas

# *Rhizobium* sp. on clover



*Photo: K. Todar, Univ. Wisconsin*

1 package of inoculant treats about  
1,000 pounds of seed.

# Which one is which?

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Rhizobia nodules



Nematode galls

# How to Estimate N from Cover Crops

1. Cut legume at the soil level in a known area. (For example, 2 ft<sup>2</sup>)
2. Dry until stems “snap”, or there is no detectable moisture, or until dry weight remains constant. Weigh.
3. Use the table below to estimate your N concentration.
4. Apply formula:

$$\text{Total N (lb/area)} = \text{Dry Weight} \times \text{N as a decimal} (\%N \div 100)$$

Cover Crop Group	Percent (%) N at Cover Crop Growth Stage			
	Before Flowering	Early Flowering	Early Seed Set	Mature Seed
Non – Woody Legumes	3.5 – 4.0	3.0 – 3.5	2.0	1.5
Woody Legumes	2.5 – 3.0	2.0 – 2.5	1.0	0.75
Cereal Grains and Others	2.0 – 3.0	1.5 2.5	< 1.0	< 1.0

# *Crotalaria juncea* (L.) Sunn hemp

- Tropical nitrogen fixing legume from India used for fiber, paper
- ‘Tropic Sun’ (Univ. HI) low alkaloid, can be grazed repeatedly
- Erect, branching, fibrous root
- Seed ½ lb to 1 lb per 1,000 ft<sup>2</sup>
- Suppresses weeds, nematodes
- Contributes 100-240 lb a<sup>-1</sup> total nitrogen





# Sunn hemp

*(Crotalaria juncea L.)*

*Photo: Corey Cherr*



# *Vigna unguiculata* (L.) Walp. Cowpea

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- 'Iron and Clay'
- Tropical nitrogen fixing legume
- All plant parts can be eaten
- Erect, prostrate, climbing
- Day neutral, self pollinating
- Includes Crowder, clay, white acre, cream, brown eye and black eye/purple hull
- Seed ½ lb to 1 lb per 1,000 ft<sup>2</sup>



# *Lablab purpureus* (L.) Sweet lab lab

- Common in Africa, the Caribbean and Asia; edible dry seed and green leaves, pods, and beans.
- Seed ½ lb per 1,000 ft<sup>2</sup>
- Herbaceous, climbing, large tap root.
- ‘Rongai’ and ‘Highworth’
- ‘Highworth’ short-day, little hard seed, early seed.
- Works well when combined with other cover crops



Finegardening.com

# Lab Lab

*Lablab purpureus* (L.)

Hyacinth Bean



Lablab Bean (*Dolichos lablab*)

Jack Scheper © 2008 FloridaData.com

© Onalee's Seeds

# *Sesamum indicum* (L.) Sesame

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- Vigorous growth, outcompetes weeds, attracts beneficial insects
- Known for its drought and heat tolerance. Does not like wet feet.
- Deep tap roots
- Has shown to reduce root-knot nematodes
- Works well as an annual hedge
- Seed 1 ounce per 1,000 ft<sup>2</sup>



# *Sesamum indicum* (L.) Sesame

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Seedman.com



Hvgardenjournal.com

# *Fagopyrum esculentum* (Moench) Buckwheat

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- ‘Manor’
- Often called a pseudo-cereal – high in amino acids
- Seed up to 1 lb per 1,000 ft<sup>2</sup>
- Good weed suppressor
- Helps cycle phosphorus
- Thrives in poor soils
- Easy to manage with hand tools
- Excellent for beneficials



# *Triticum aestivum* - Triticale

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- Cross between wheat and rye
- Works well when mixed with legumes
- Grows similar to cereal rye
- Extensive root system, often used as a catch crop
- Produces moderate to high amount of biomass – grows to 4 ft
- Seed 1-2 lb per 1,000 ft<sup>2</sup>



# *Pisum sativum* spp. *Arvense* - Austrian Winter Pea

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- High N fixer, from 90 to 150 lb N/Acre
- Quick growth, uses water efficiently
- Incorporate or mow after full bloom
- Works well when mixed with grains or trained to a trellis
- Seed 1 lb per 1,000 ft<sup>2</sup>



[Southernexposureseedexchange.com](http://Southernexposureseedexchange.com)



# *Pisum sativum* spp. *Arvense* - Austrian Winter Pea

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Motherearthnews.com



www.HomeplaceEarth.com

# *Raphanus sativus* L. - Daikon/Tillage Radish

- Seeding rate is 2-3 ounces per 1,000 ft<sup>2</sup>
- Winter kills with temperatures in the 'teens.
- Root is edible of course!
- Forage and oilseed varieties



# Cover Crop Benefits and Risks

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- Trap /retain nutrient -enriched sediments and particulates
- Improve water infiltration and nutrient adsorption
- Extend growing season to use available nutrients
- Reduce in-field volume of runoff water



- A poor cover stand encourages weed establishment
- Alternative host for pests

# Cut and Carry Cover Crop Mulch

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- Producing biomass, harvesting straw for another location, and keeping stubble residue in place serves a dual purpose.
- Risk of contamination from weed seeds or pathogens. Herbicide residues may also be a concern.
- 4 tons/acre dry matter is the commonly accepted threshold for weed suppressive benefits (about 3 inches deep when dry), but more may be needed to suppress large seeded weeds or perennial weeds.

# Vegetable Management following “Cut and Carry”

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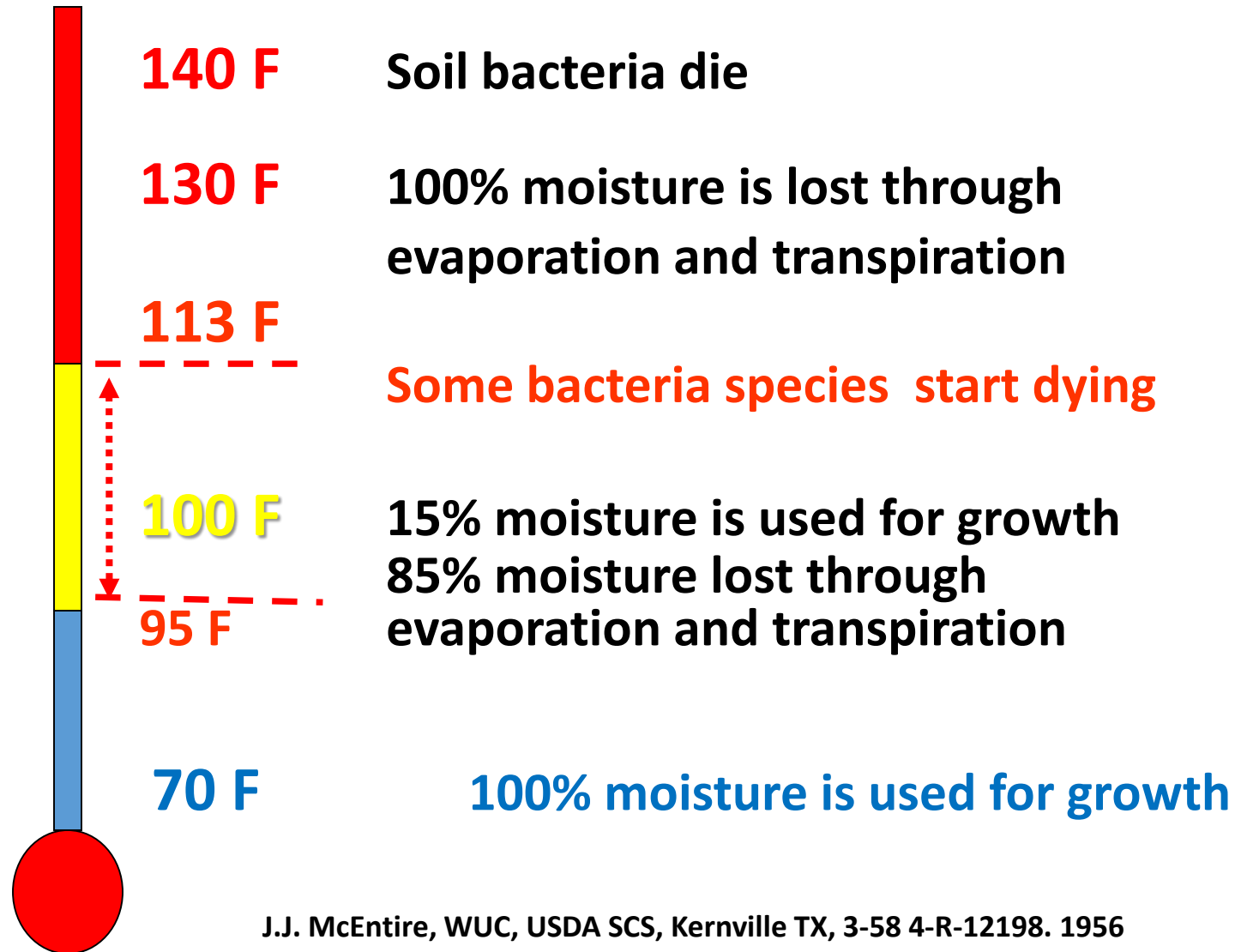
- In early spring, delay application of straw until after transplants/seeds have established their root systems, particularly if soil temperatures are less than optimal, or soil moisture is limiting
- Apply dry granular fertilizer and incorporate into soil via UF/IFAS BMP recommendations prior to applying straw
- If drip tape is used, apply before straw
- Fewer pests with cut and carry than “green” cover crop mulch, initially (mammals, birds, cutworms)

# Soil Temperatures



- Conserve moisture and reduce temperature.
- Crop yields are limited more often by hot and dry, not cool and wet.

# When soil temperature reaches:



# Vegetable Transplants or Seeds?

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- Larger transplants and seeds establish more readily in plant-mulch systems than smaller ones
- Small seeds and small transplants may be slow to establish (or perish) if planted in heavy plant residue.





# Terminating Your Cover Crops

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- Manage the growth of your cover crop during the season to avoid having to manage a lot of plant material at once later on.
- Only plant what you are willing to manage later! Some species get really large, like sunn hemp.
- Broadleaf cover crops will be easier to incorporate than grasses, and younger plants will be easier to incorporate than older ones.
- Nitrate leaching is possible after legume cover crop incorporation, so timing is critical.



# Costs: Potential for Reduced Productivity

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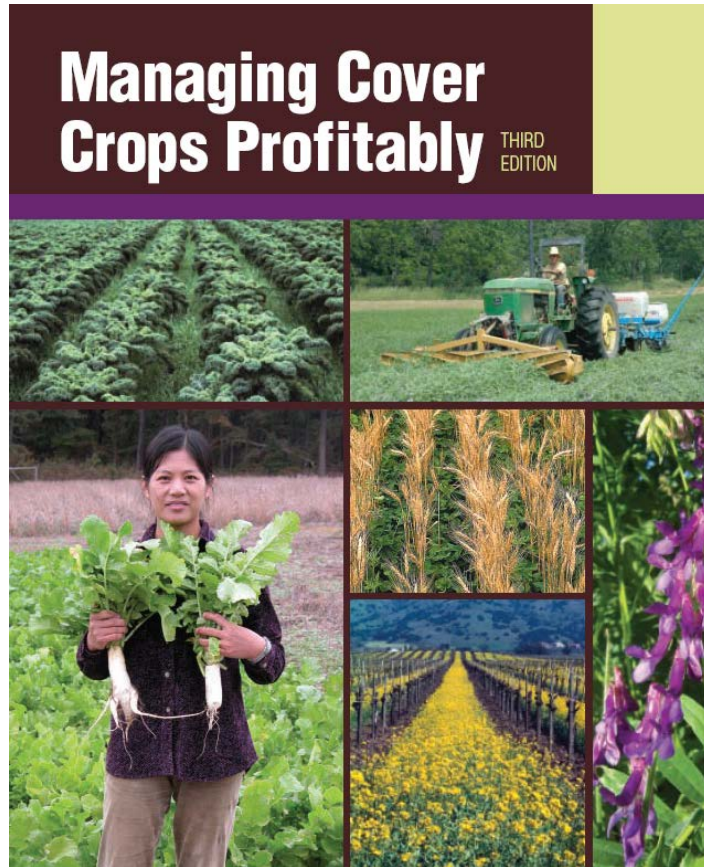
Broccoli with a living mulch of winter rye. Note the P deficiency in broccoli.



Dr. K at Peregrine Farm, Chatham Co., NC. Bell peppers transplanted into winter hairy vetch and rye.

# Additional Resources

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- Latest Edition (3<sup>rd</sup>) 2007.
- Available free PDF  
<http://www.sare.org>
- Order for \$20.00 + S&H

**Thank you!**

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Small Farms and Alternative Enterprises Program  
<http://smallfarms.ifas.ufl.edu>

