

Biological Control/ Farming Systems-based Technologies: Strawberries as a Model

DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
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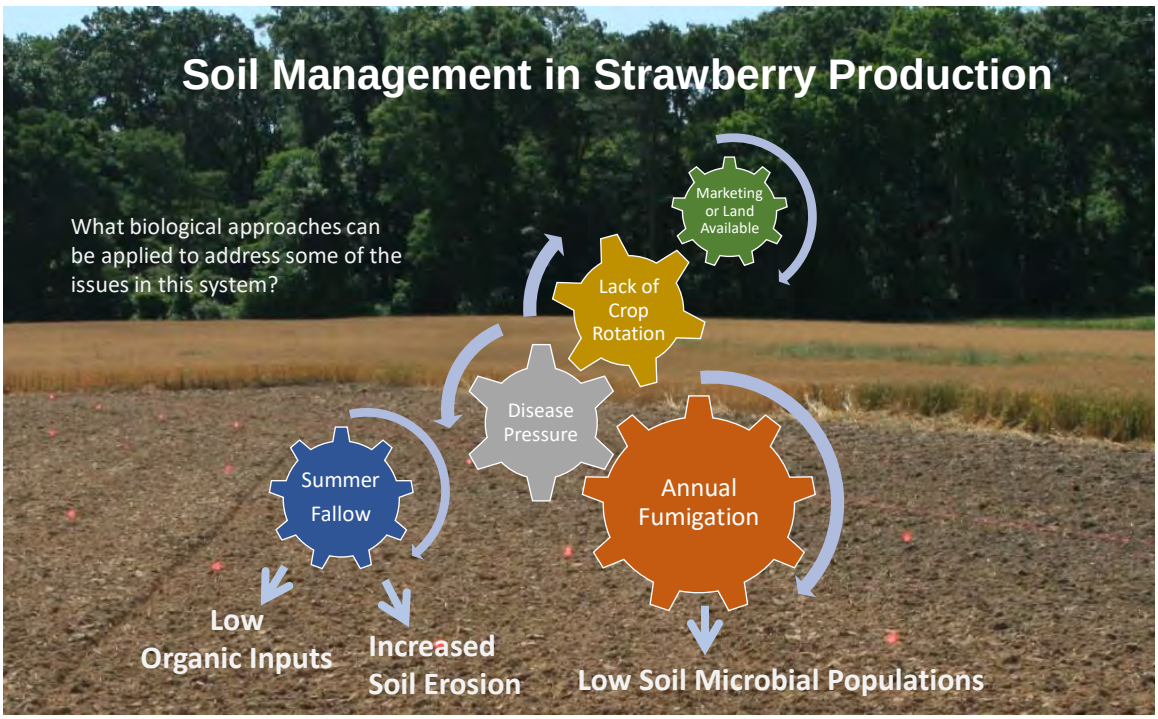

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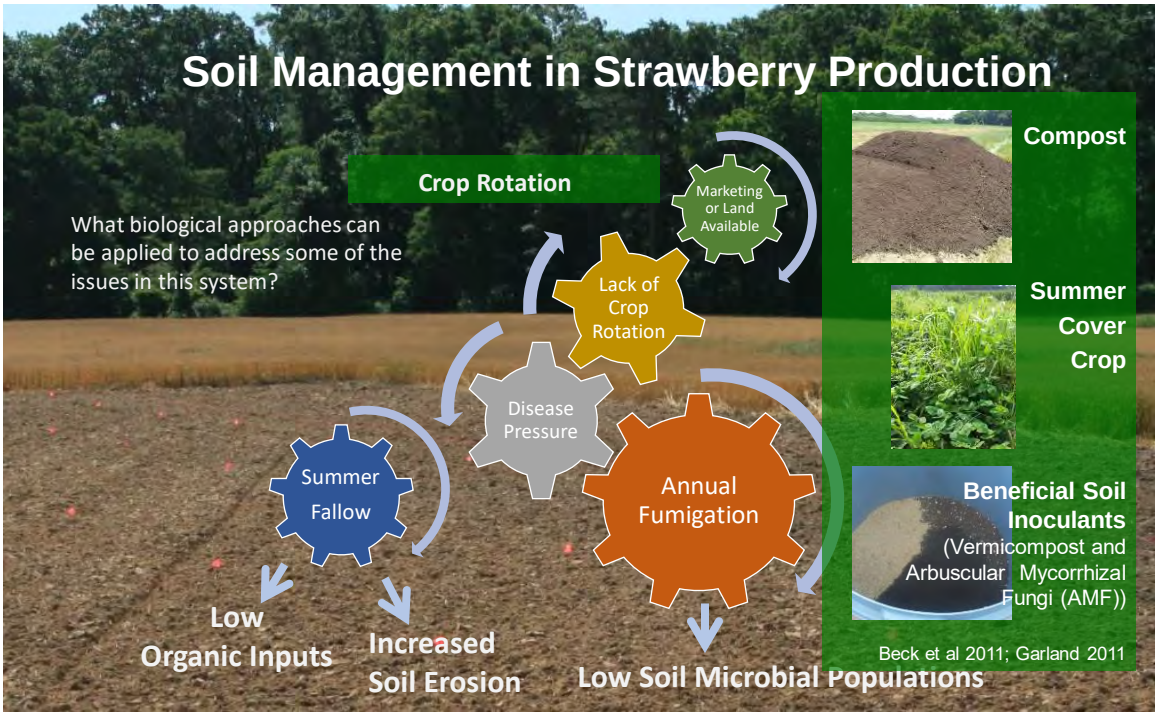

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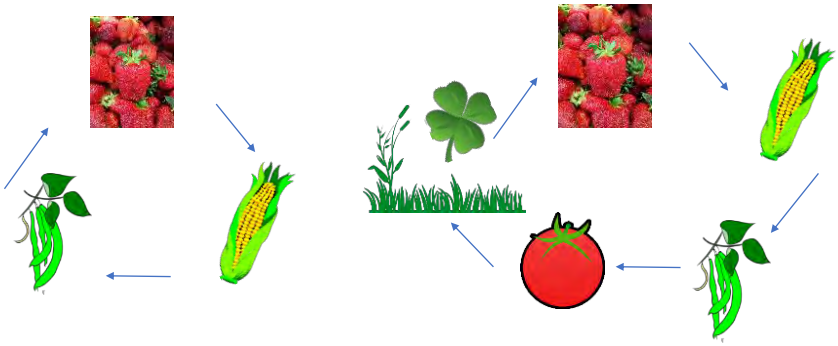
Crop Rotation

- Three to five year rotations are ideal



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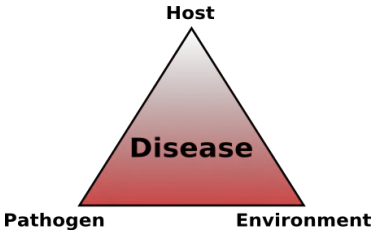
Planning Crop Rotations

1. Know what pest problems you have
   - Nematodes
     - Tend to be bigger problems on sandy soil
     - Soil sample, put sample in plastic bag
     - Timing spring or fall, when more likely to be at soil surface
   - Soil Borne Disease
2. Choose Timing
3. Choose plants to rotate with:
   - That aren't hosts to diseases, nematodes or pests
     - i.e. Aren't closely related, or in same family
   - That have different nutrient requirements
   - That root to different depths
   - Weeds as Hosts to Strawberry Pests
     - Green bridge between seasons *ex. Chickweed is a host to strawberry anthracnose*



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Summer Cover Crops

1. Don't share the same diseases as strawberries.
2. Root to different depths
3. Have different nutrient use requirements

Legumes can supply up to 100lbs of N to the following crop

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Cover Crops

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Compost

- **7.5 Tons/ acre**
- **Increases soil organic matter over time**
- **Research into 'suppressive soils'**
  - *Builds soil microbial populations*
- **Supplies N-P-K and micronutrients**
- **Possible salt content**
  - *Apply well in advance of transplanting*

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Pre-Plant Fertilizer

Pre-Plant Nutrients Supplied by Compost and Cover Crops

	Compost lbs/ acre			Cover Crop lbs/ acre			Total Nutrients Applied lbs/ acre		
	N	P	K	N	P	K	N	P	K
2014	40.1	29.9	62.1	46.8	2.2	12.638	86.9	32.1	74.7
2015	31.9	51.2	34.0	45.3	2.4	12.2	67.3	53.6	46.3

Comments:

- In both years compost and cover crops supplied sufficient pre-plant Nitrogen.

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Inoculating with Beneficial Soil Microbes

- **20% vermicompost + 10g AMF inoculum**

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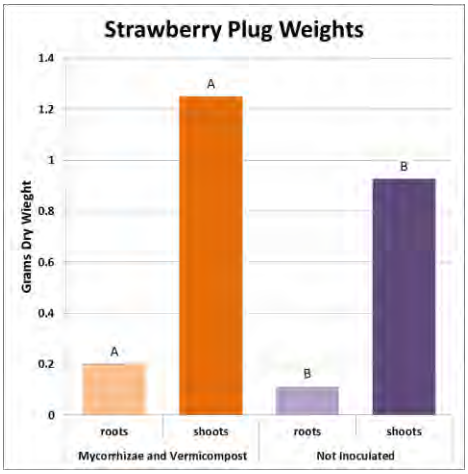
Plug Plant Growth



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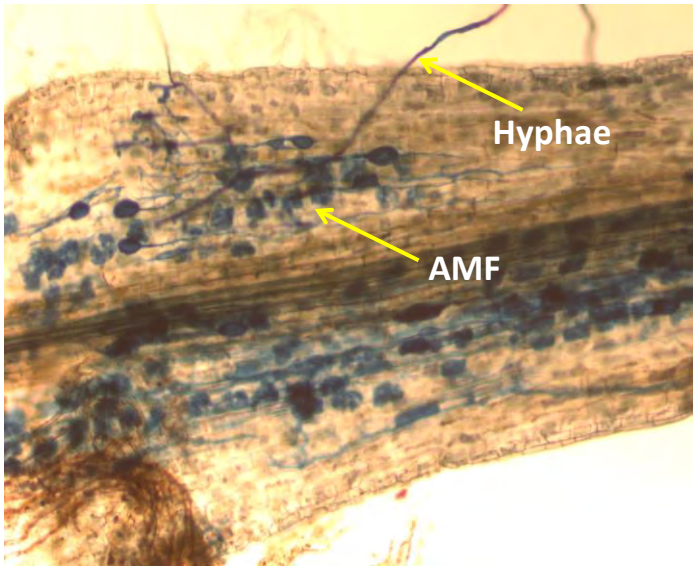
Strawberry Root Colonized by Mycorrhizae (AMF)



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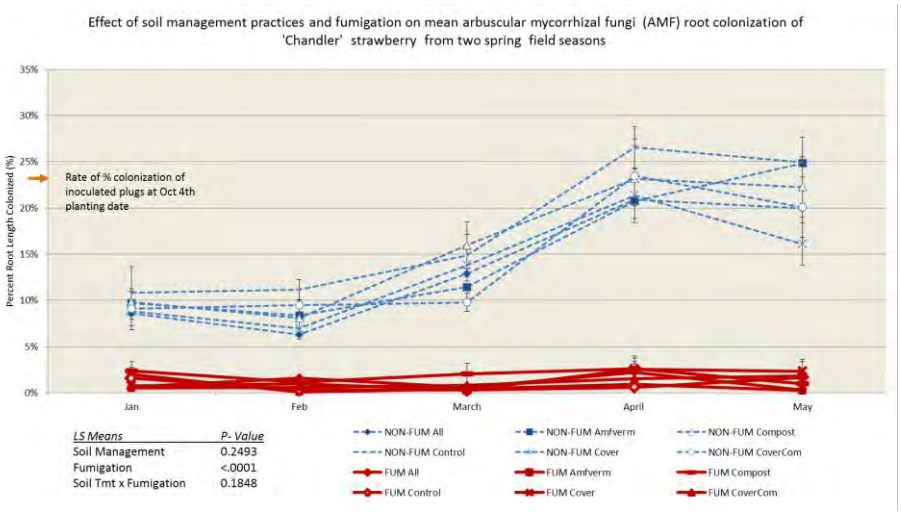
Arbuscular Mycorrhizal Fungi (AMF)



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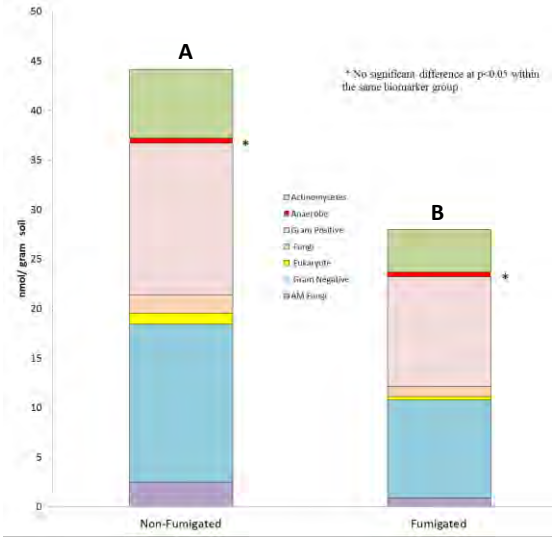
Soil Fumigation

- What are the season long impacts on soil microbes?
- 8 months after last fumigation event:
  - Nematodes
    - *None*
  - Total Soil microbial biomass
    - *Reduced all major groups*



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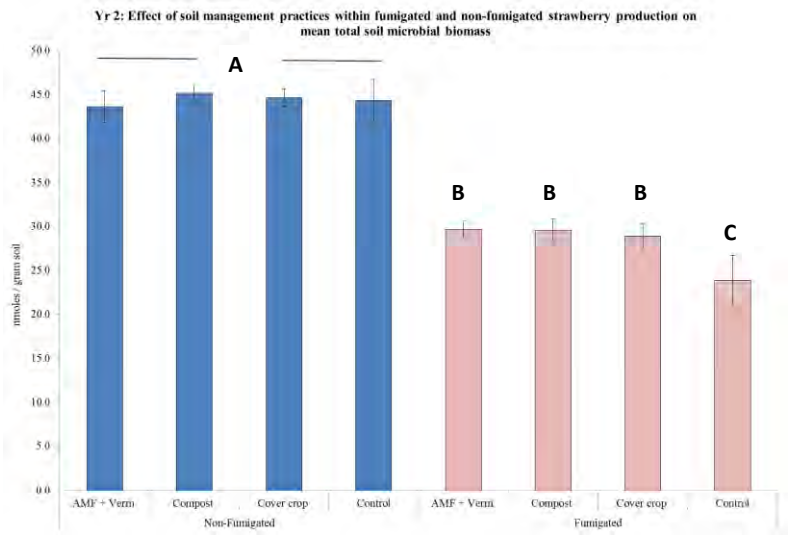
Total Soil Microbial Populations



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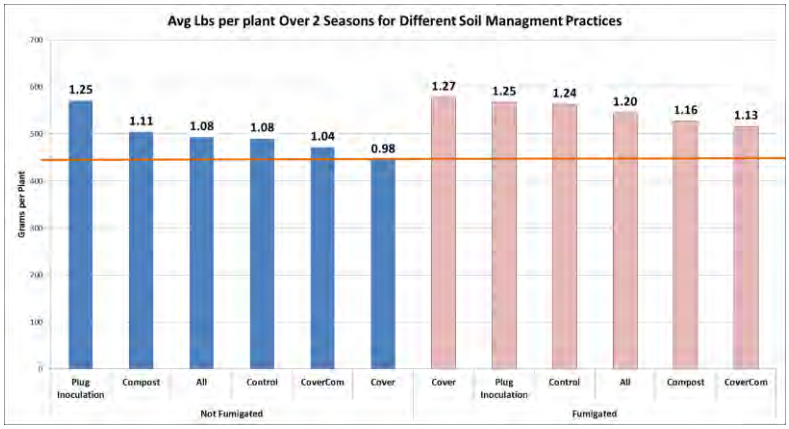
Average Strawberry Total Yields



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Economics Analysis cont.

Mycorrhizal Inoculants	Description	Estimated Cost	Amount	Estimated Number of plugs treated *	Cost per plug	Cost per Acre ◊
Mycorrhizal Products	Super fine endo	$ 25.00	8oz	2,000	$0.010	$142.50
Bio organic Endomycorrhizal Inoculant	OMRI approved	$ 85.00	3lb	12,000	$0.007	$106.25

Vermicompost	Description	Estimated Cost	Amount	Estimated Number of plugs treated **	Cost per plug	Cost per Acre ◊
Worm Power	OMRI approved	$ 38.00	15 lbs	2,000	$0.019	$285.00
Oregon Soil		$ 40.00	20 lbs	3,000	$0.013	$200.00

** Based on the highest label recommended rates*
*** If 20% by volume of media replaced*
◊ For 15,000 plants per acre

Combined Toal Cost per Acre ◊:	$ 306.25 to 427.50

(Cost of 2-3¢ / plug)

- If yield is increased **0.10 lbs/plant** will result in an net increase of 1,500 lbs per acre, at $1.67/lb a return of $2,505/acre.

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Economics Analysis cont.

Pre-Plant Nutrients Supplied by Compost and Cover Crops

	Compost lbs/ acre			Cover Crop lbs/ acre			Total Nutrients Applied lbs/ acre		
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Estimated Costs per Acre to Apply Compost and Summer Cover Crops

Cover crop $150 per acre

- *(includes seed, machinery and labor), Cowpea supplies on avg. 50 lbs of total N per acre available to strawberry crop*

Compost $234 per acre

- *(at 8 tons/ acre, includes material, delivery, machinery and labor). Can supply between 60 and 100 lbs of total N, 30-50 lbs of P and 30-70 lbs of K per acre.*

**** These nutrients additions and costs will vary based on locally available materials and farm labor costs.*

Pre-plant fumigation $700- $1,000 per acre

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Conclusions

Multiple strategies should be used together for a successful integrated pest management and soil health program

- ❑ Move where the crop is planted every years when possible
- ❑ Choosing rotation crops (cash or cover crops) that are non-hosts to strawberry pests
- ❑ Biological inoculants compost preferred, others recognize their limitations
- ❑ Chemical controls



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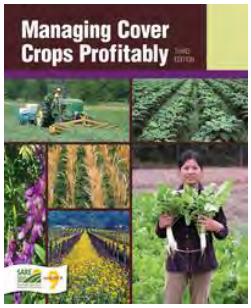
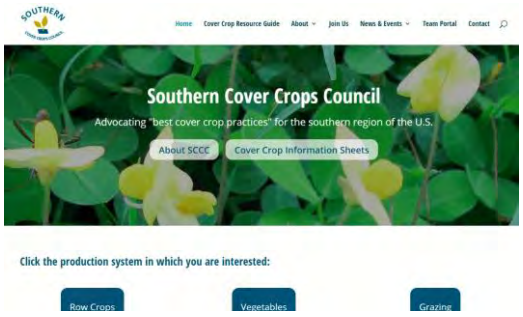
Cover Crop Resources

- SARE Publication
- Southern Cover Crop Council
  https://southerncovercrops.org/





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