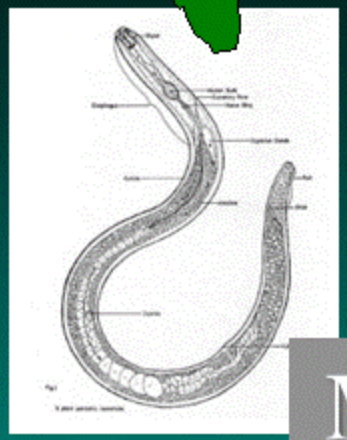
Plant Parasitic Nematodes

What I Will Talk About?



Minimizing Crop Impacts Using Vertical Management Zones for Nematode Control

Joseph W. Noling, Gary Vallad, Nathan Boyd

United States Department of Agriculture - NIFA supported project
Florida Strawberry Growers Association- REF supported project

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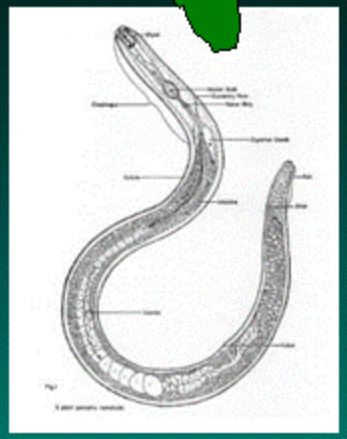

Minimizing Crop Impacts Using Vertical Management Zones for Nematode Control

Joseph W. Noling, Gary Vallad, Nathan Boyd

Dr.Johan Desaeger
Assistant Professor
Entomology and Nematology
Strawberry Nematology
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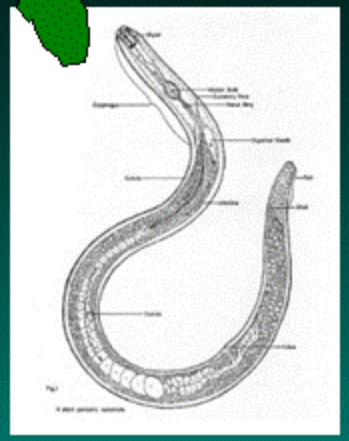
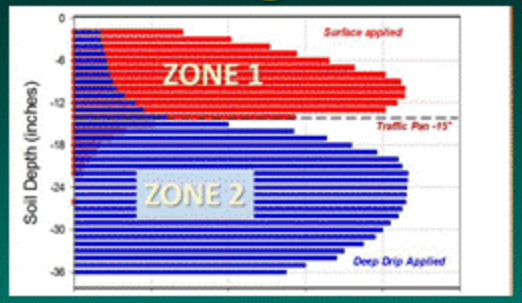
What I Will Talk About?

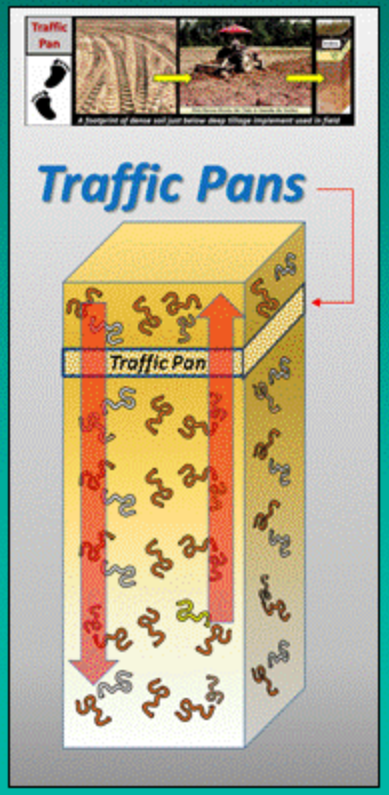
Plant Parasitic Nematodes



Vertical Management Zones



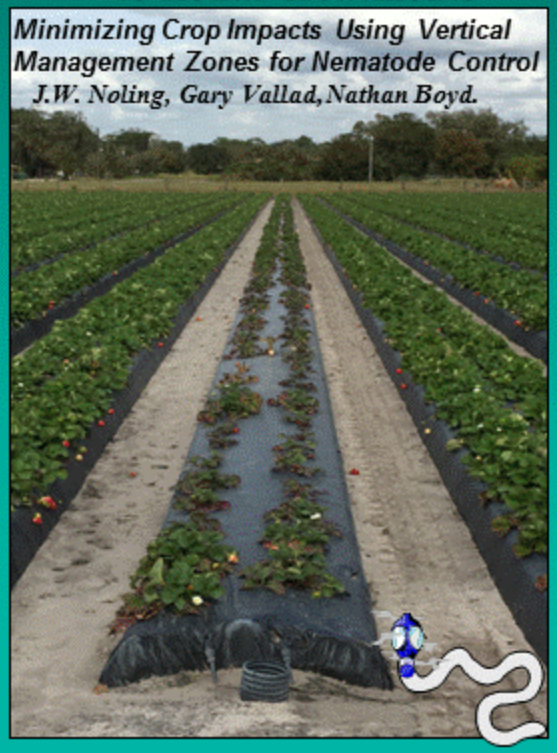
Traffic Pans Gas / Nematode Movement



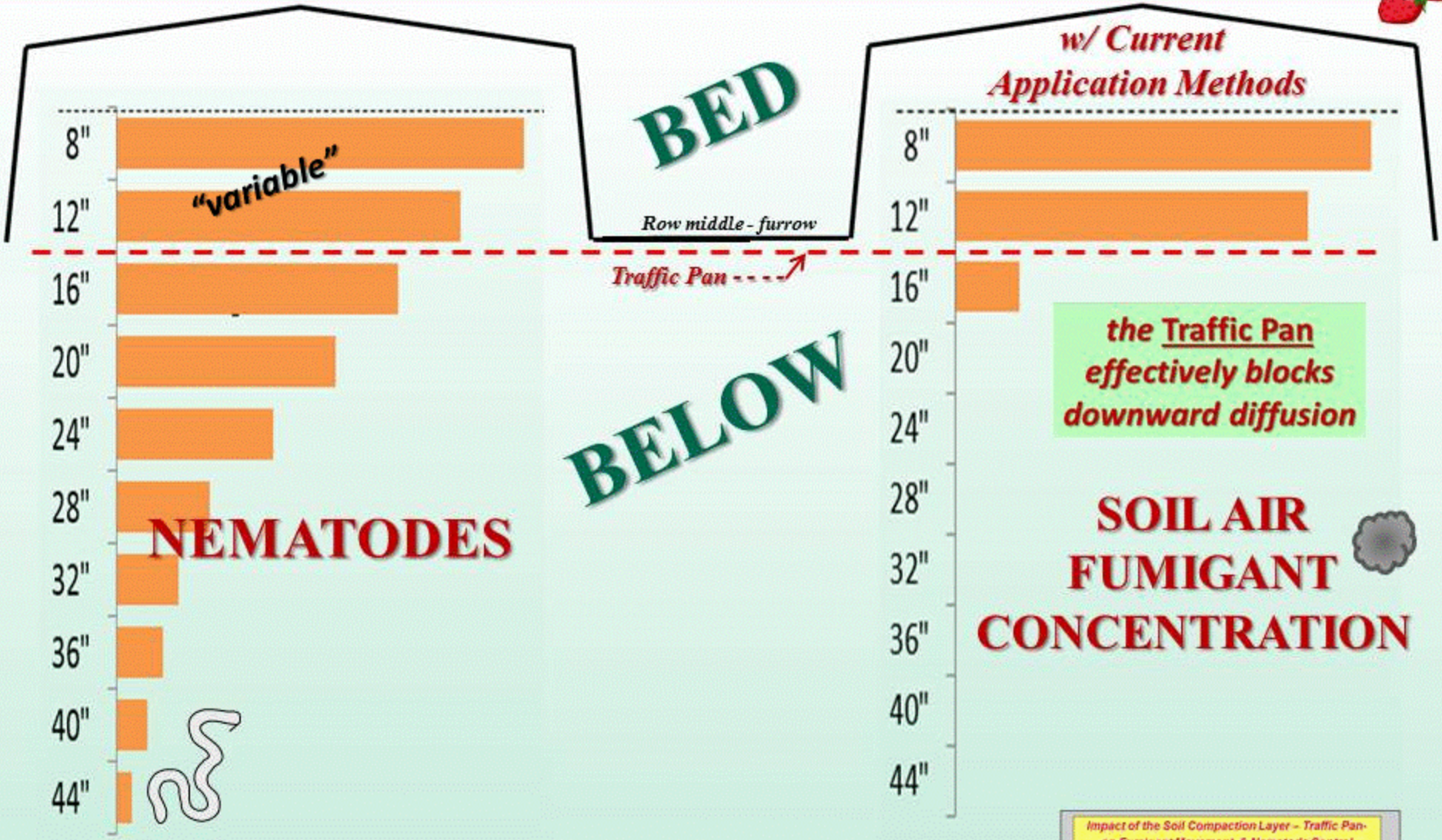
New Deep Placement Fumigant Application Systems

The Probinator: A New New Deep Soil Coring And Exploration Tool

New Findings/Crop Responses to Zonal Treatments

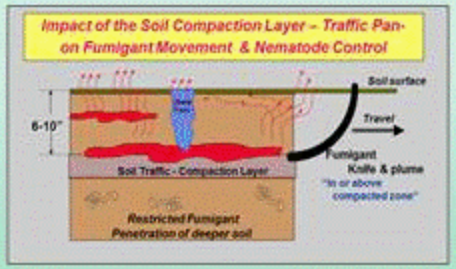


What has the Probinator told us about nematodes & fumigant gases?



SPATIAL DISTRIBUTION

VISUALLIZING NEED FOR NEW FUMIGANT STRATEGIES

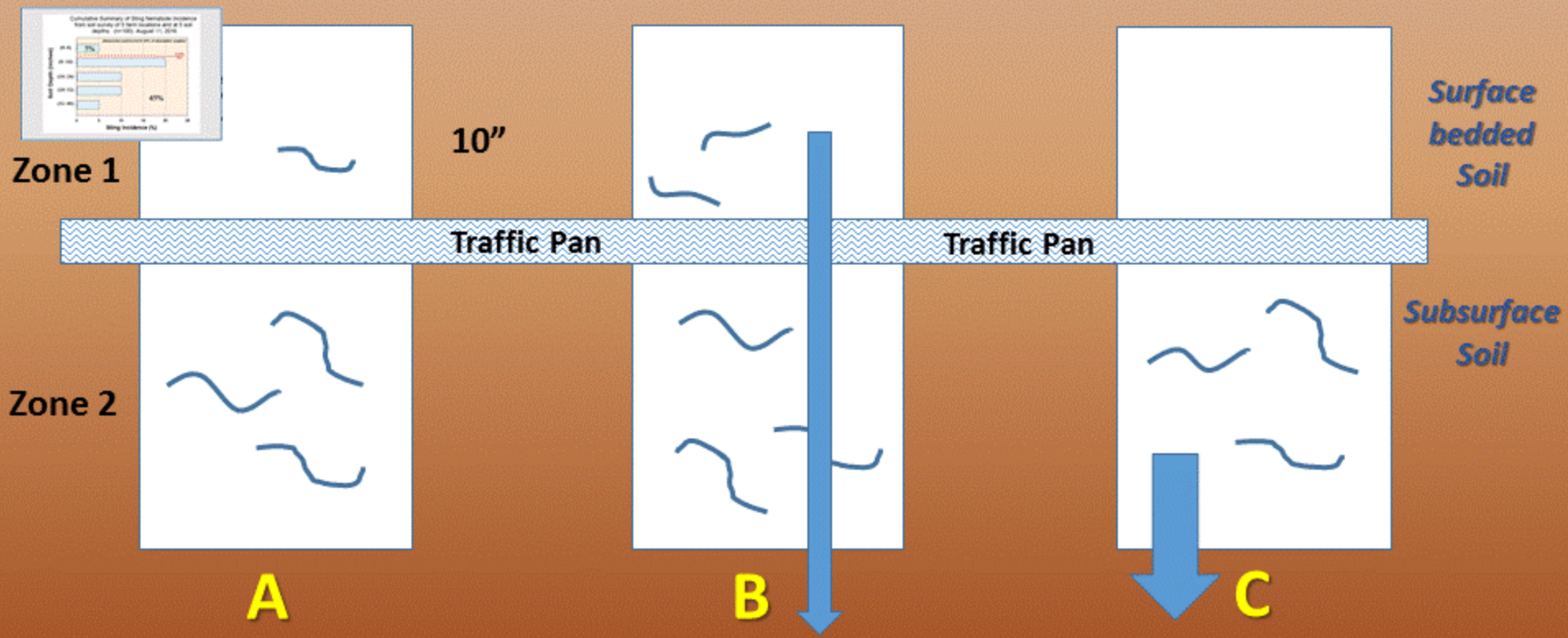


Where do nematodes come from when damage is expressed in the plant after fumigating?

Untreated Bed

The Established Dogma

The Reality



A

The Sun, Wind & Heat, combine to kill majority of nematodes in surface soil. Immigrants from below amplify problem.

B

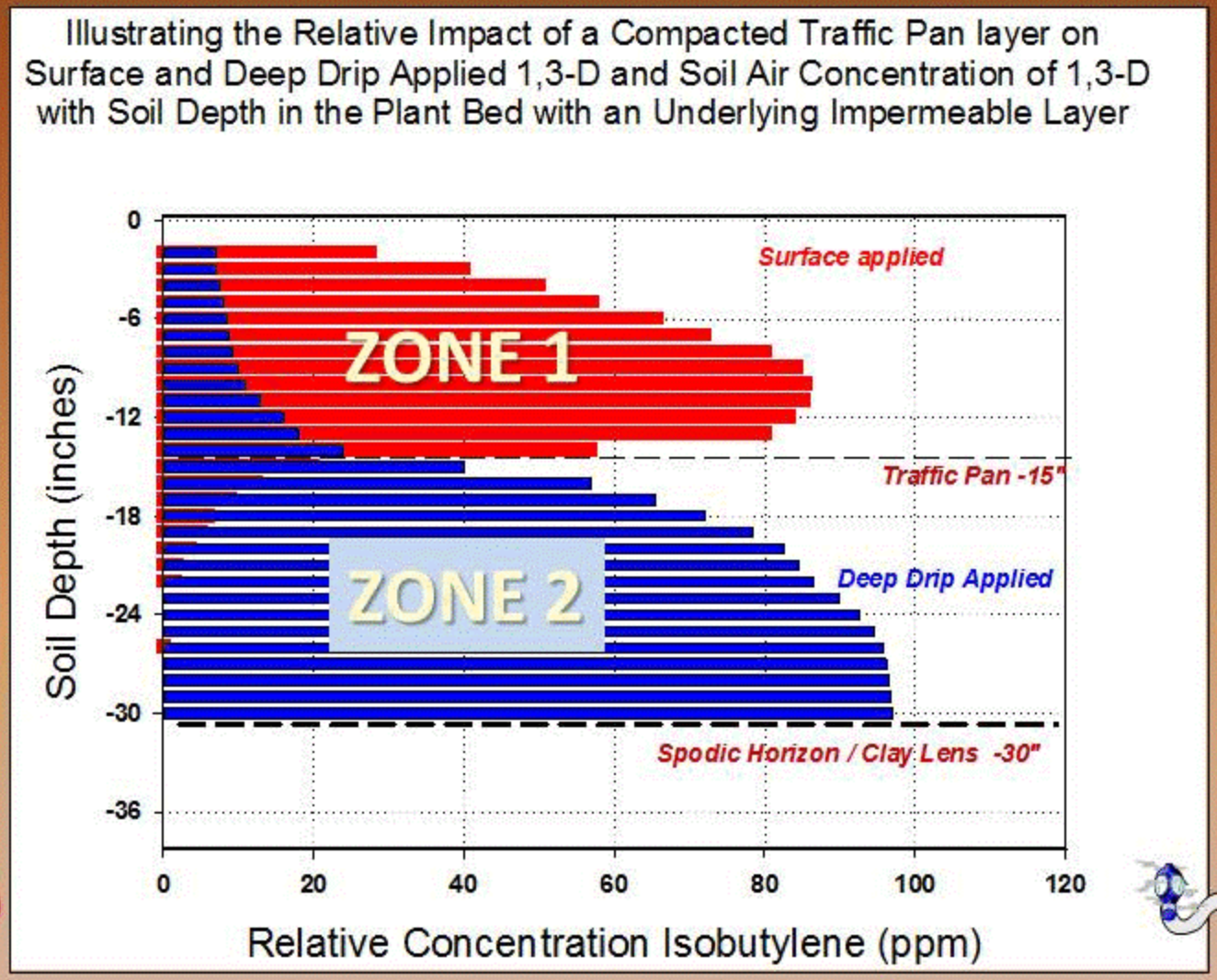
We have always thought that we did not kill all of them in the bed, and it was the survivors which we did not kill that infected the plant and caused the reappearance of the problem

C

The Sun, Wind, Heat, & Fumigant - All combined to Kill Bedded Nematodes. Reinfection comes From below the pan!

The Probinator has allowed us to question the need for:

Structuring Soil Pest & Disease Control As a Composite of Vertical Management Zones



ZONE 1

Surface Drip or Bed Shank

+

ZONE 2

Deep Drip or Deep Shank

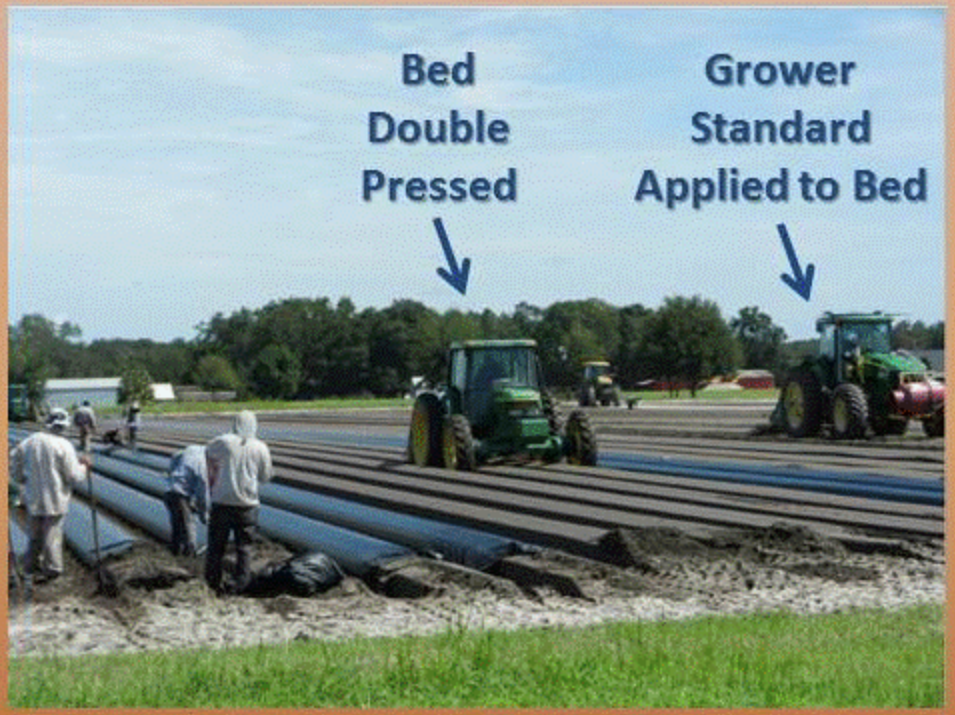
What is Needed: NEW TECHNOLOGY for DEEP APPLICATION

Auto Reset – Deep Drip

Auto Reset - Deep Shank w/ Wings

DEEP PREBED APPICATIONS

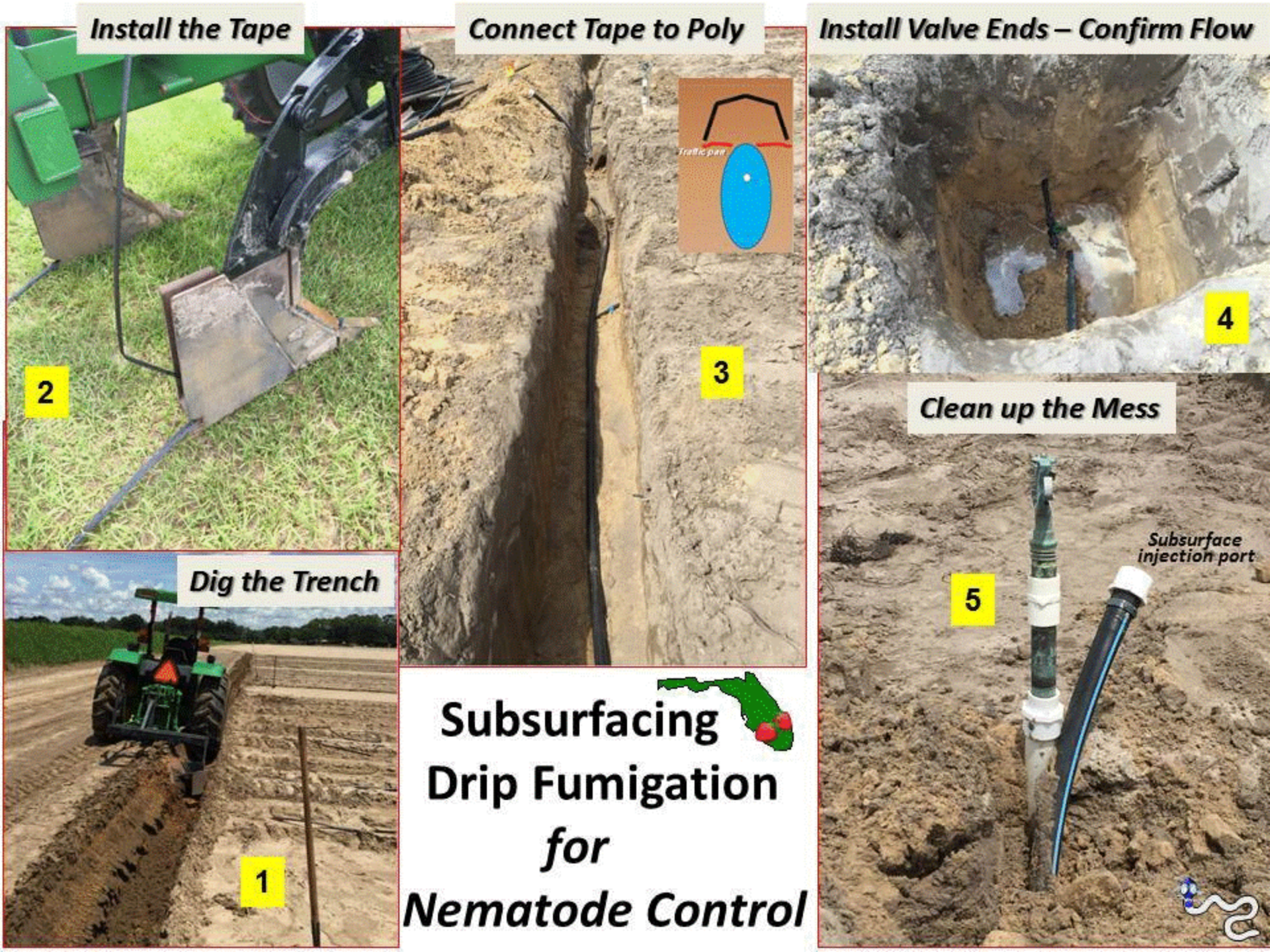
Place the Telone below the traffic pan where nematodes reside, and shortly before where the raised bed will be placed.



Triest Rig- Summer broadcast rig – 15 inch injection depth

SOIL SEALING

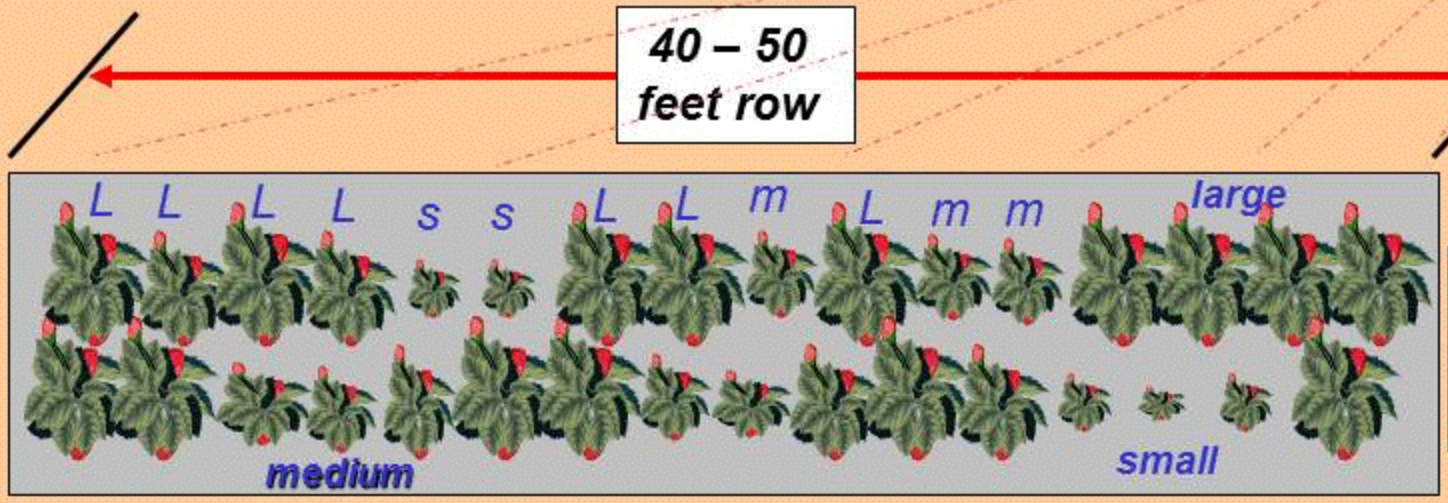
Summer BROADCAST APPLICATION

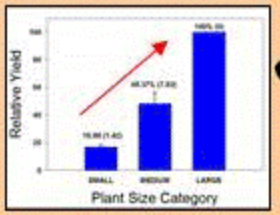

Install the Tape
2
Connect Tape to Poly
3
Install Valve Ends – Confirm Flow
4
Clean up the Mess
5
Subsurface injection port
Dig the Trench
1
Subsurfacing
Drip Fumigation
for
Nematode Control

No Deep Shank or Deep Drip Applications to Sprinkler Rows

At the end of the season we counted plants into sizes

PLANT SIZE DISTRIBUTIONS enumerated for All Fields and Chemical Treatments by Row and Sprinkler Section





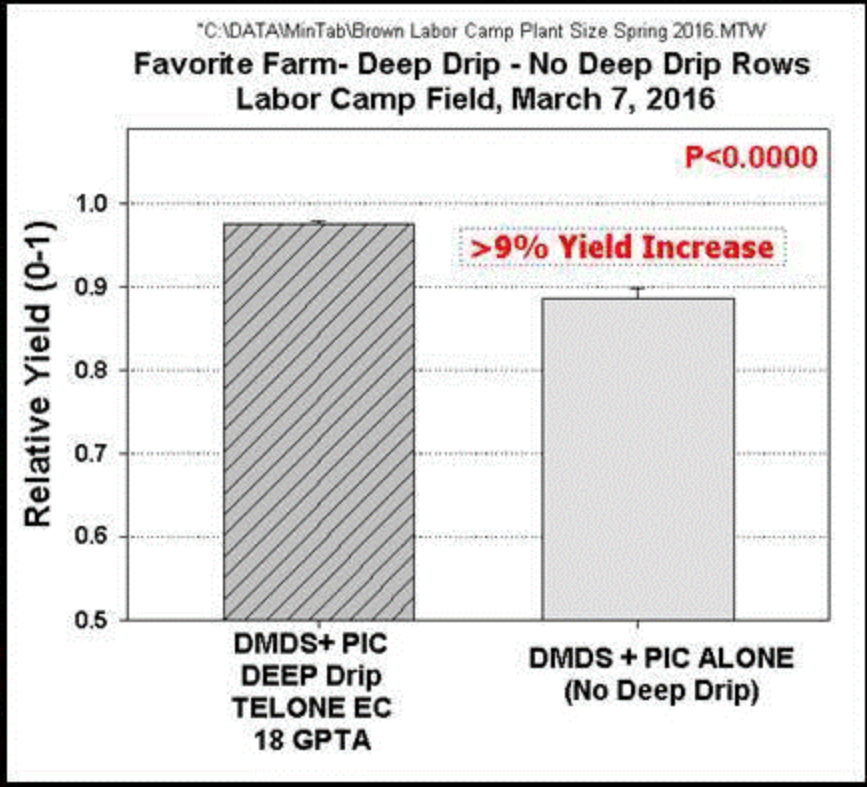
	Canopy Diameter	Relative Yield
Small	< 8 ”	17%
Medium	<12 ”	48%
Large	>12 ”	100%

and Dead = 0 %

RELATIVE YIELD computed as the sum contribution from all plant of different sizes within each sprinkler section

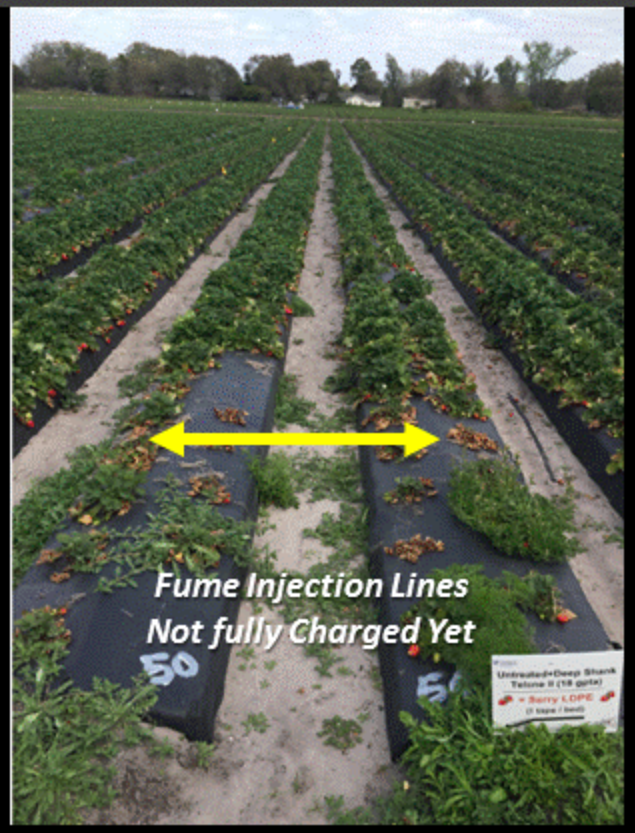
What might you expect from a deep placement fumigant?

Subsurface Deep Drip- Favorite Farms Spring 2016



9% Increase in Yield

Do we need any treatments other than In-Bed and Deep Shank fumigants to manage Sting Nematode?



Untreated Control

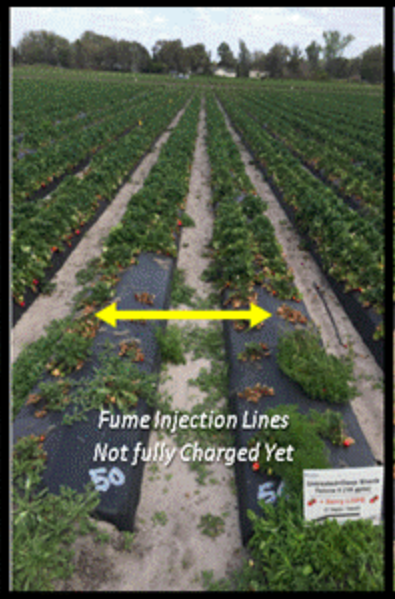
Only Deep Shank Telone (18gpta)

In-Bed Telone C35 + Deep Shank Telone (18gpta)

Florida Strawberry Growers Association Research Farm (FSGA) - March 10, 2016

The Deep Shank Treatment in this FSGA 2016 Field Trial contributed the Lions Share to Strawberry Yield Response

Untreated Control



Only Deep Shank Telone (18gpta)

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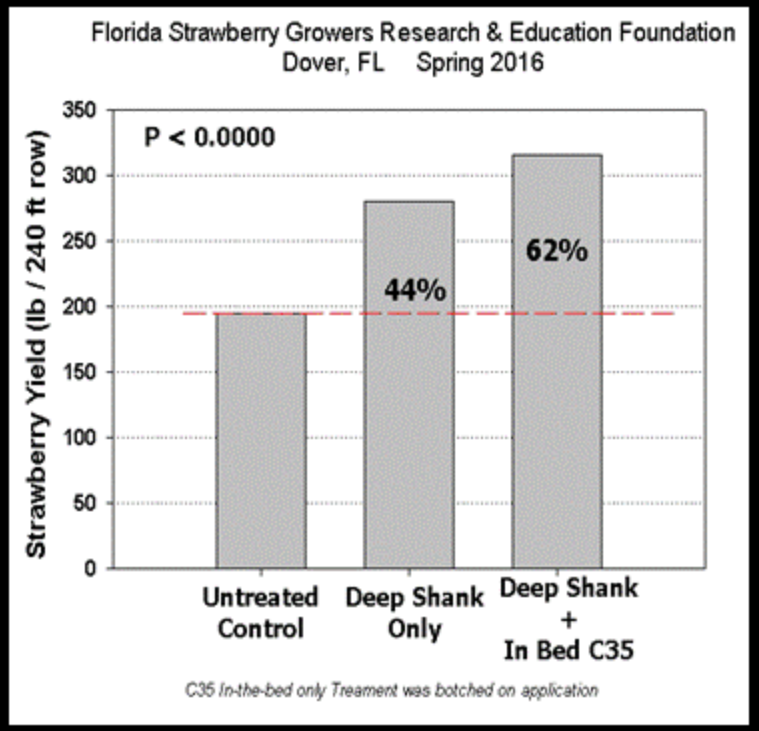
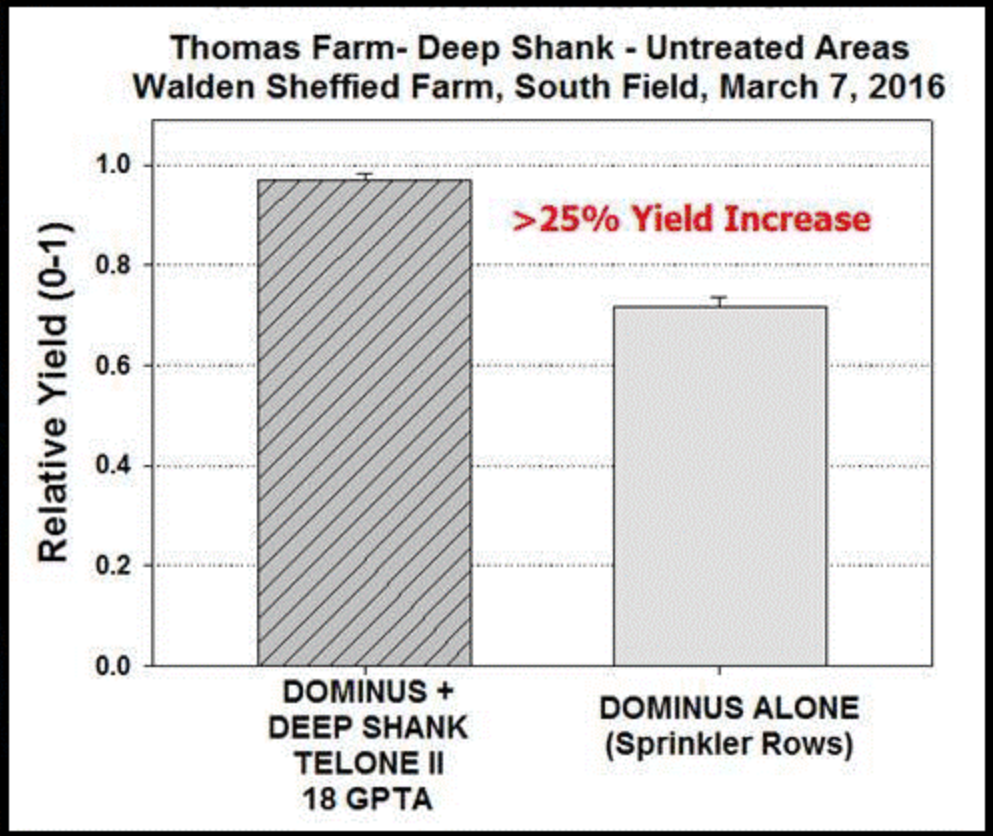


44% Yield Increase

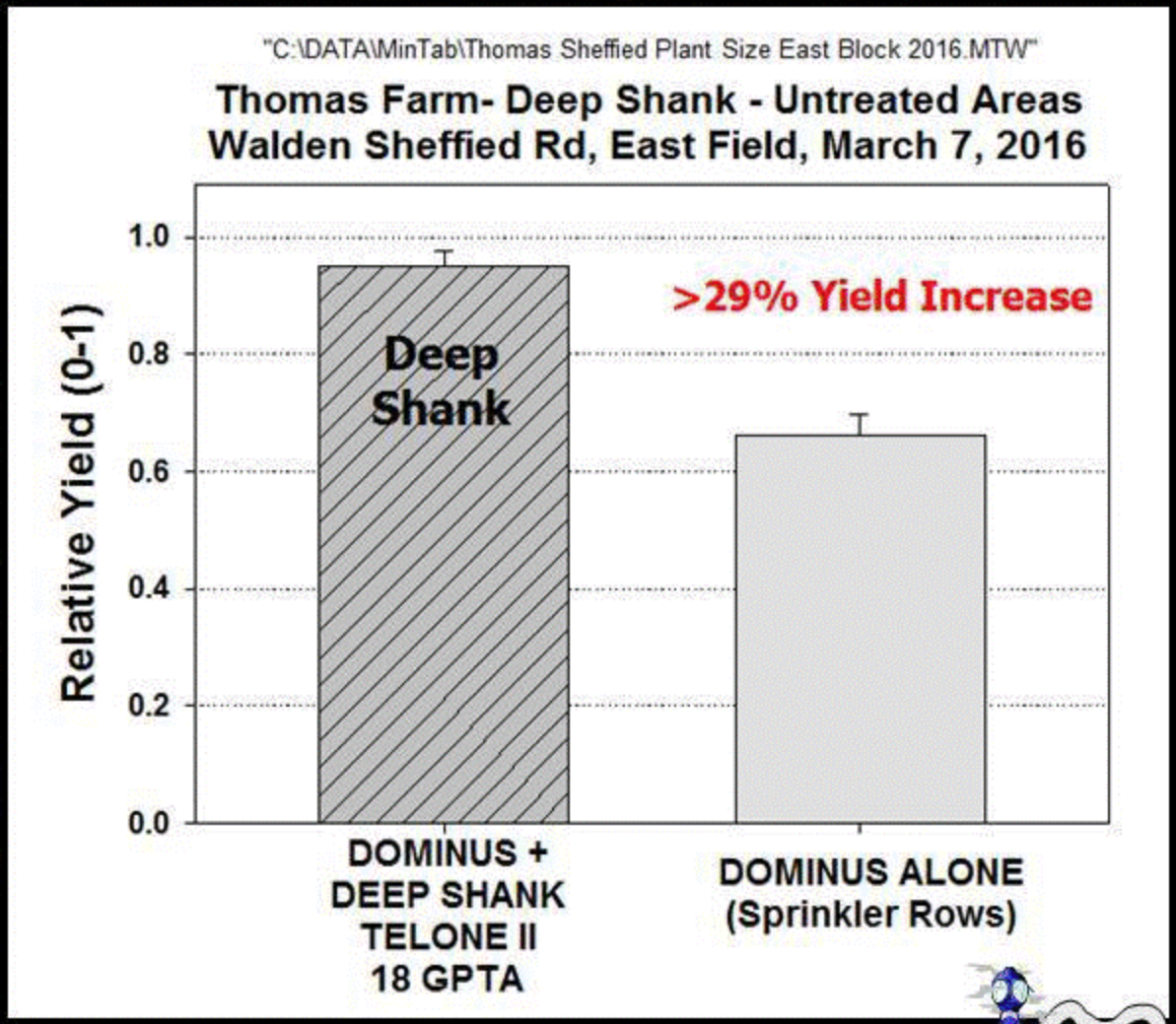
Florida Strawberry Growers Association Research Farm (FSGA) - March 10, 2016

Thomas South Field -Spring 2016



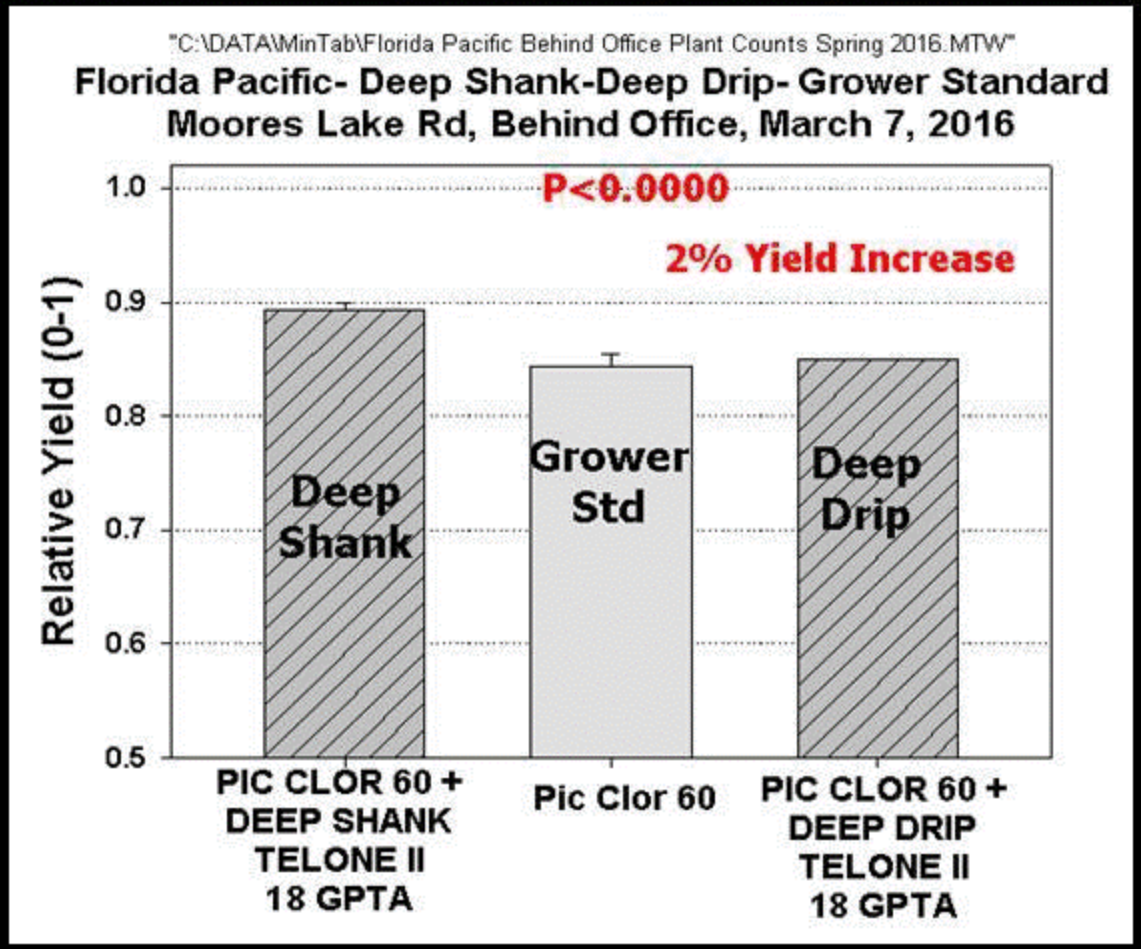
25% Increase in Yield

Deep Shank - Summer Broadcast
Thomas East Field WS - Spring 2016



29% Increase in Yield

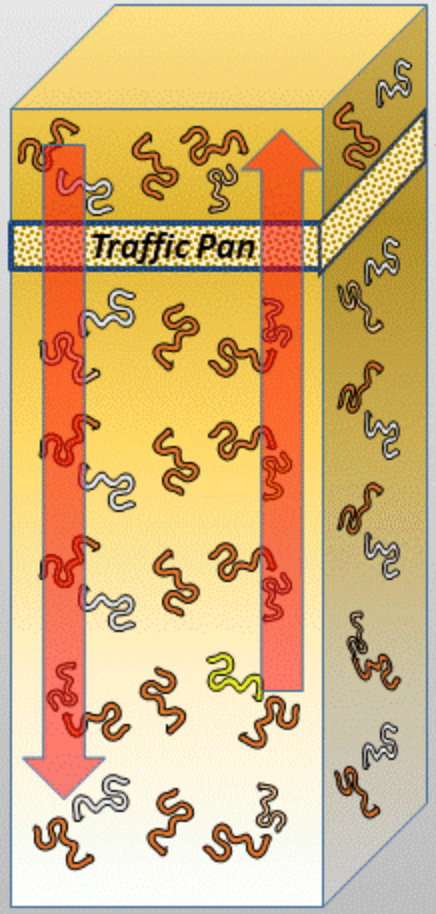
Deep Shank (In-Row) and Deep Drip
Florida Pacific Office Field - Spring 2016



2% Increase in Yield

Is the clay lens in this field shallow?

Root Causes of Fumigant Inconsistency



- **Every Field Contains a Traffic Pan, Depth of Deepest Tillage Implement**
- **Nematodes Distributed Deeply Throughout Entire Soil Profile**
- **Nematodes not impeded by Traffic Pan**
- **Fumigants (not MBr) greatly impeded by Traffic Pan**

- **Deeply placed fumigants are improving Nematicidal efficacy and Crop Yield Response**

Strategy is Gaining Traction!

A new rig on old nematode land, Dover, FL

Strategy is Gaining Traction!

Flat Land –Broadcast Deep Shank Fumigant Applications

Broadcast Flat Land –Turn Bottom-Switch Pl

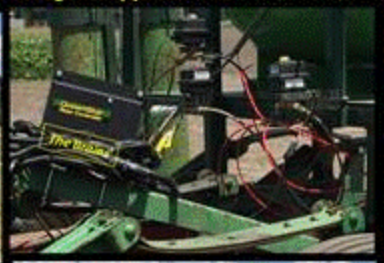
All Photos courtesy: Austin Hamilton, Southern Valley

PreBed Flat Land –Deep Shank Fumigant Applications

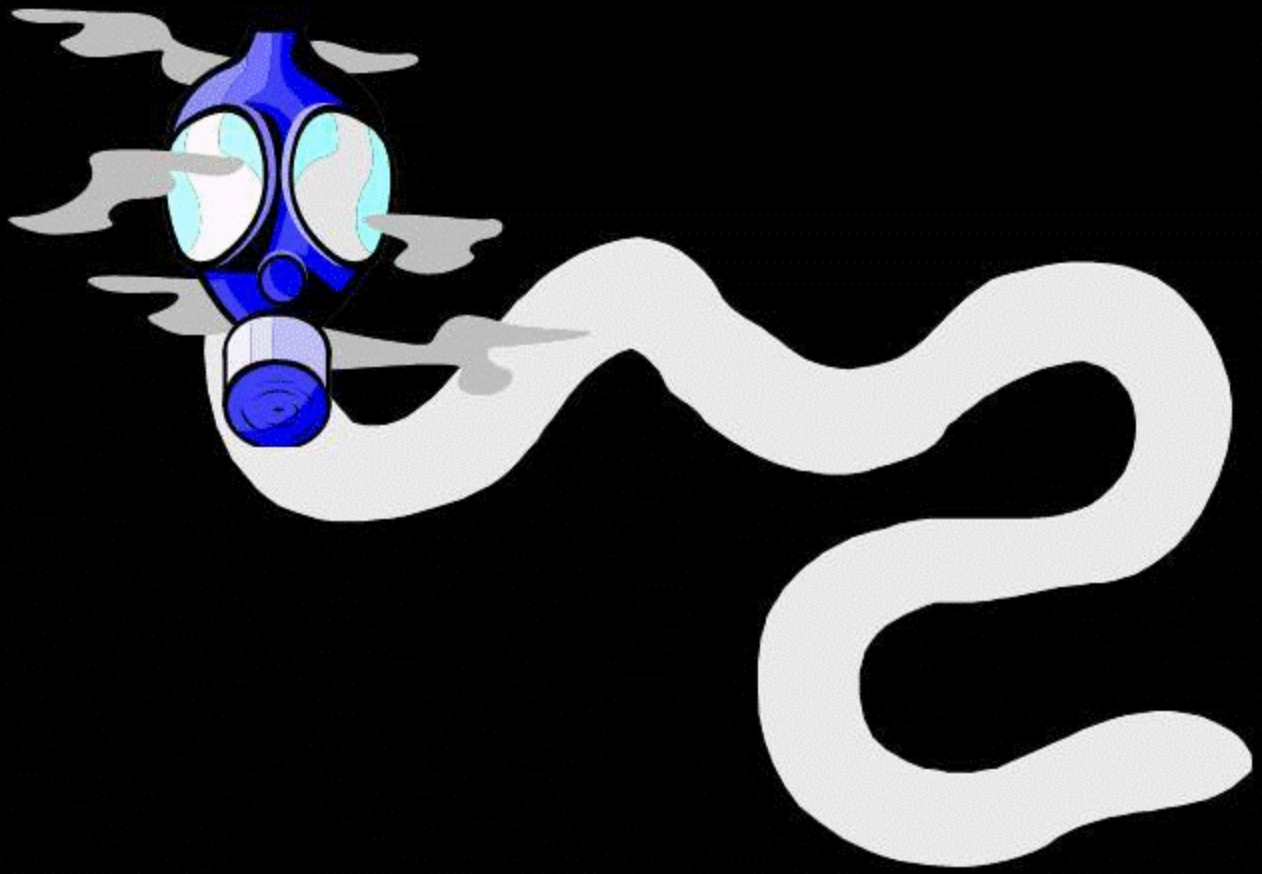
Grower & Cooperator: Austin Hamilton, Southern Valley Farms

Flat Land –Deep Shank Broadcast Fumigant Applications

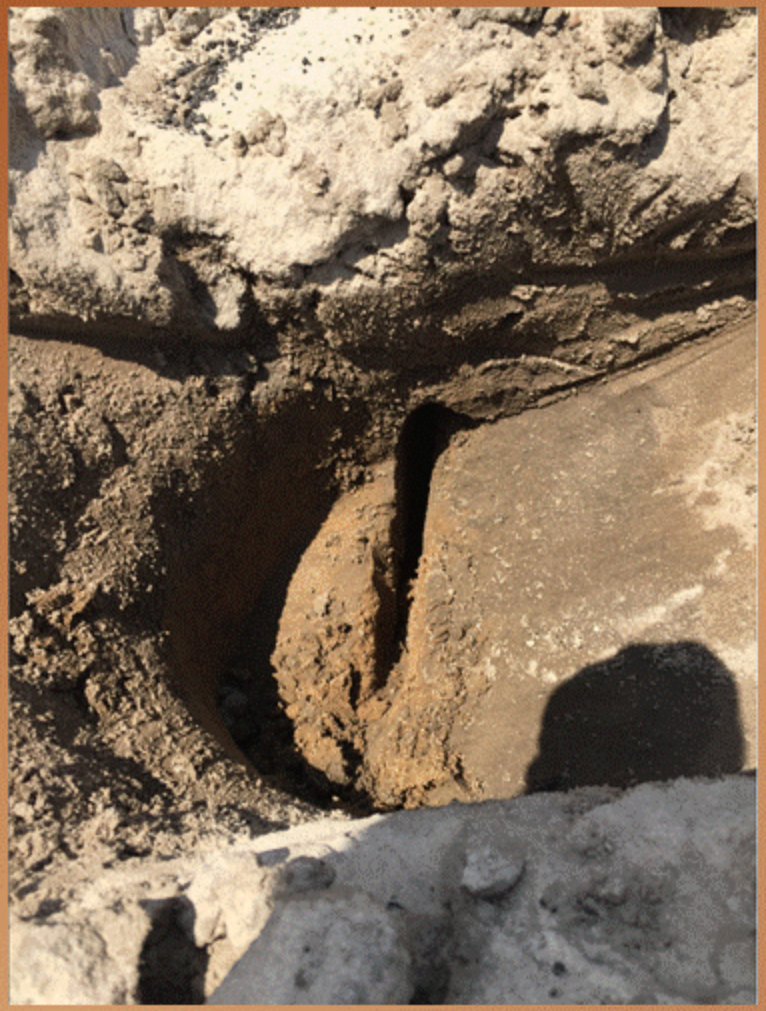
Dover, FL June, 2016



Thank you



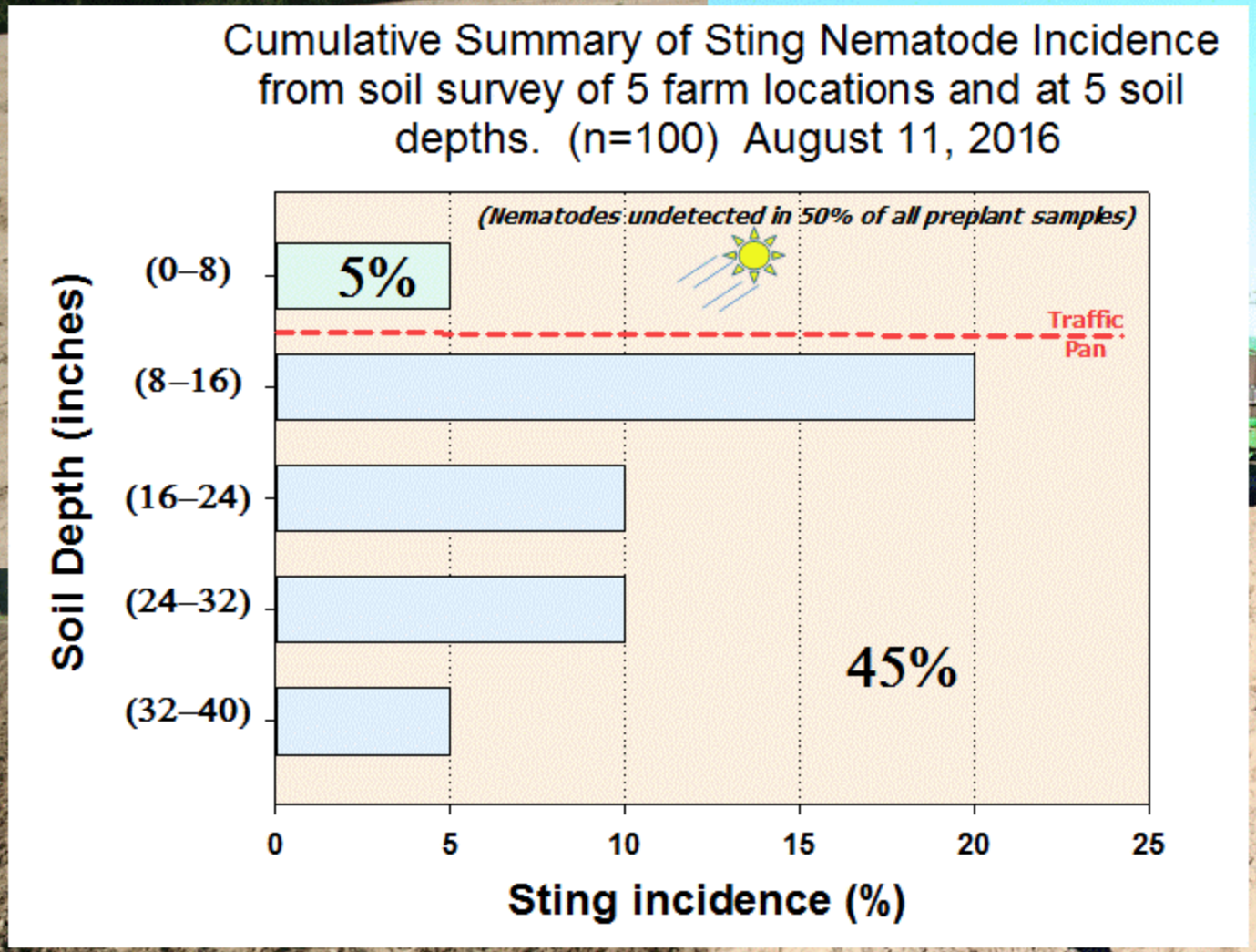
Closing the Shank Trace…….It ain't easy



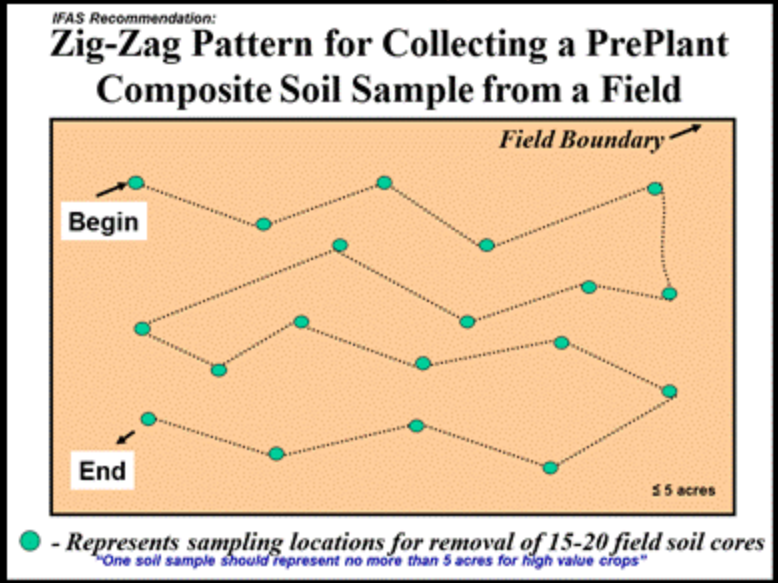
Is it any wonder fumigant movement is upward and out, on the Path of Least Resistance !

How Many Nematodes do you think there are in surface soil when you *'Bake and Turn'* the soil a few times over the summer?

How Many Nematodes do you think there are in surface soil when you *'Bake and Turn'* a few times over the summer?

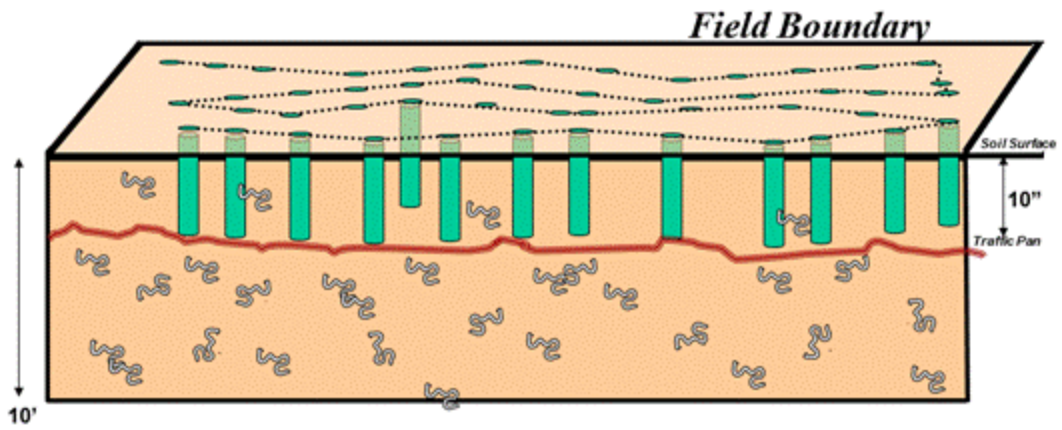


Two dimensional Approaches to population assessment & crop loss & risk assessment



There is a 3nd dimension requiring consideration !

In Reality: Nematodes distributed throughout soil profile while most sampling within surface strata (8-10"), vertically constrained by impenetrable traffic pan!



Do sample estimates represent entire population threat?

- Is it any wonder why Economic Thresholds are difficult to establish!

Research dealing with causes and explanations for reinfestation ....

Product Precautions & Disclaimers:

"will suppress and/or control pests that are in the fumigated zone at the time of treatment"

USE PRECAUTIONS

Keep children and pets out of treated areas. **Product X** uses described on this label are intended for pre-plant soil preparation only. All plant foliage and any established plants growing on the treatment sites will be either severely damaged or destroyed. Keep the product off of any desirable turf or plants. Do not apply within 3 feet of the drip line of desirable plants, shrubs, or trees. Do not use in confined areas without adequate ventilation or when fumes may enter nearby dwellings. Do not use in greenhouses. Keep container tightly closed when not in use. Do not store near feed or food. NOTE: **Product X** will suppress and/or control only those pests in the fumigation zone at the time of treatment. Reinfestation may occur subsequent to the fumigants degradation/dissipation from the soil.

"Will help manage certain soil borne pests that are present in the soil treatment zone at the time of Fumigation"

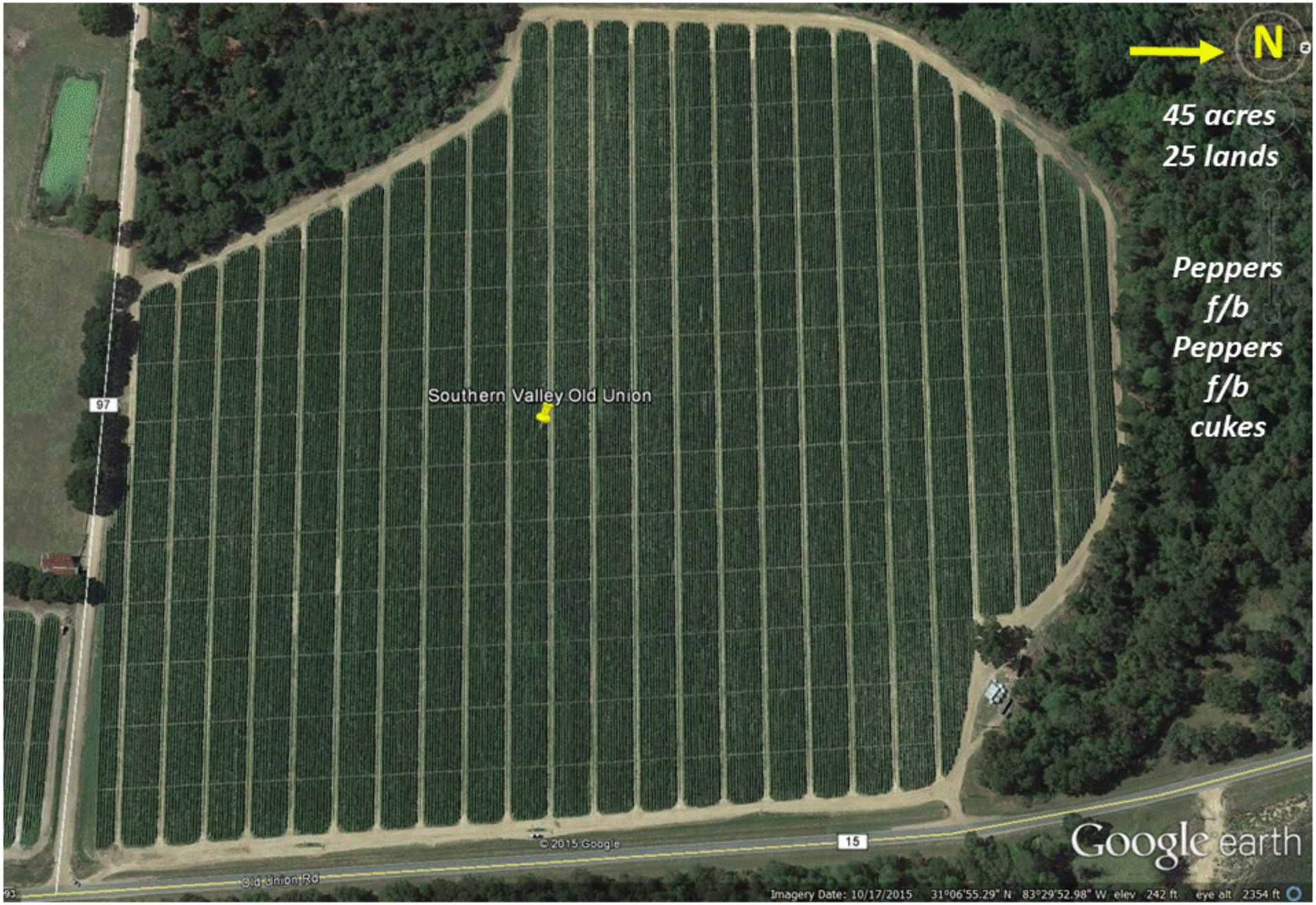
Use Precautions

Recontamination Prevention

Product Z will help manage certain soil borne pests that are present in the soil treatment zone at time of fumigation. It will not control pests that are introduced into soil after fumigation. To avoid reinfestation of treated soil do not use irrigation water, transplants, seed pieces, or equipment that could carry soil borne pests from infested land. Avoid contamination from moving infested soil onto treated beds through cultivation, movement of soil from below the treated zone, dumping contaminated soil in treated fields and soil contamination from equipment or crop remains. Clean equipment carefully before entering treated fields. Cultural practices which provide post-harvest destruction of crop residues and weeds prior to fumigation and practices which prevent weed infestation following fumigation and prior to planting will help prevent recontamination.

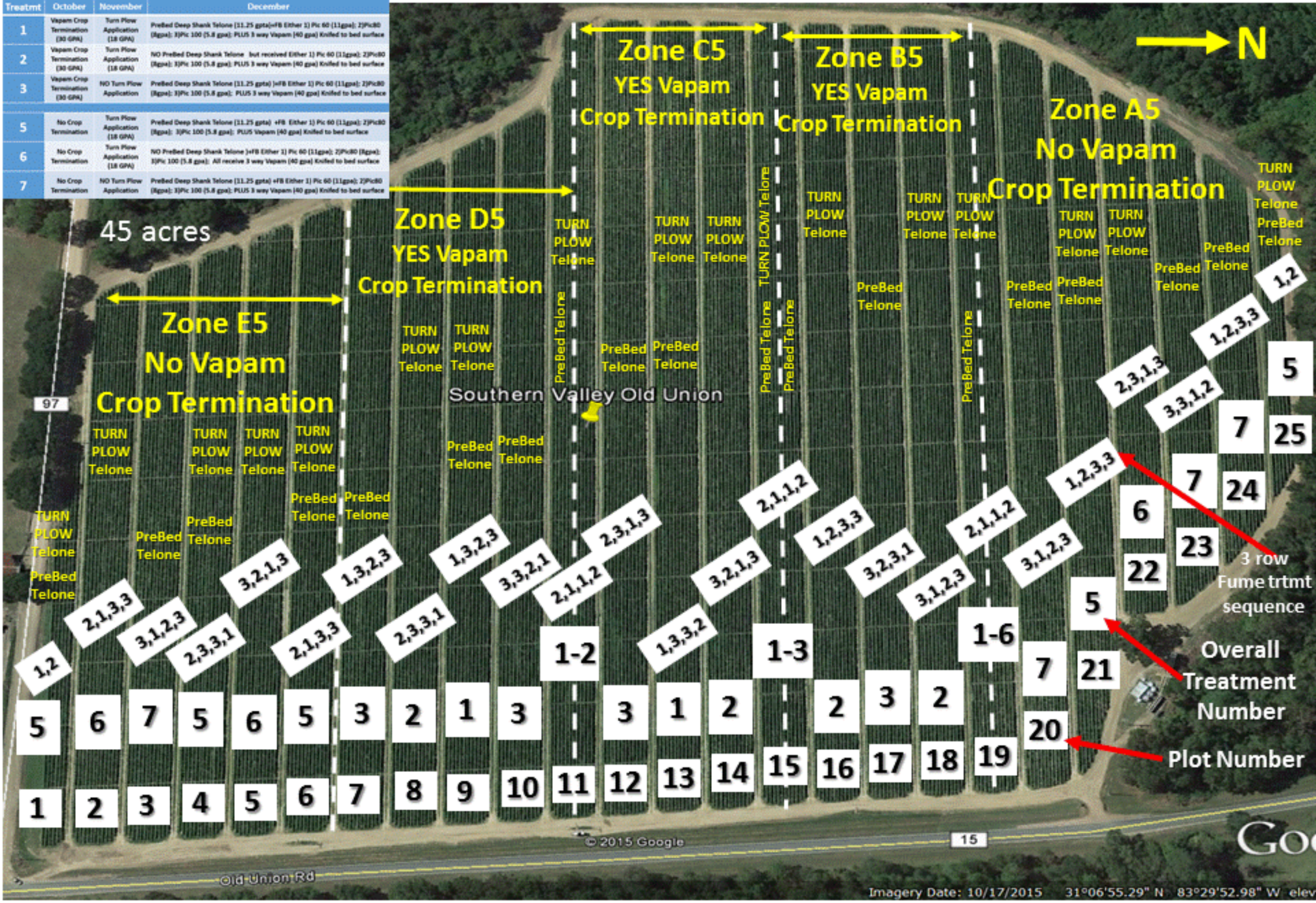
Avoid recontamination

- ***irrigation water***
- ***infested transplants***
- ***propagative materials***
- ***equipment***



Southern Valley Crop Termination / Deep Shank / PIC study - Adel, GA (Initiated Spring 2016)

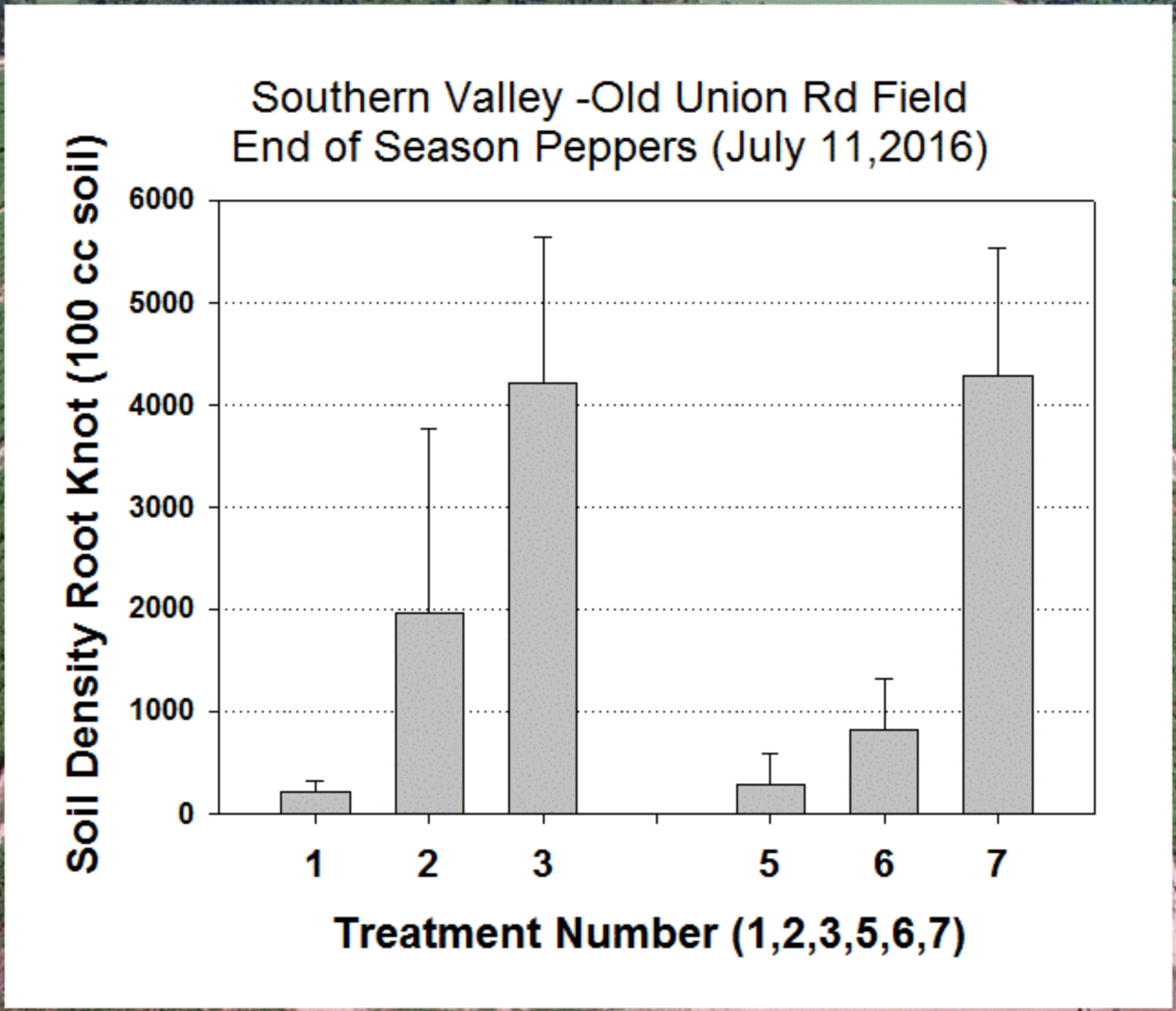
Treatmt	October	November	December
1	Vapam Crop Termination (30 GPA)	Turn Plow Application (18 GPA)	PreBed Deep Shank Telone (11.25 gpta)+FB Either 1) Pic 60 (11gpa); 2)Pic80 (8gpa); 3)Pic 100 (5.8 gpa); PLUS 3 way Vapam (40 gpa) Knifed to bed surface
2	Vapam Crop Termination (30 GPA)	Turn Plow Application (18 GPA)	NO PreBed Deep Shank Telone but received Either 1) Pic 60 (11gpa); 2)Pic80 (8gpa); 3)Pic 100 (5.8 gpa); PLUS 3 way Vapam (40 gpa) Knifed to bed surface
3	Vapam Crop Termination (30 GPA)	NO Turn Plow Application	PreBed Deep Shank Telone (11.25 gpta))+FB Either 1) Pic 60 (11gpa); 2)Pic80 (8gpa); 3)Pic 100 (5.8 gpa); PLUS 3 way Vapam (40 gpa) Knifed to bed surface
5	No Crop Termination	Turn Plow Application (18 GPA)	PreBed Deep Shank Telone (11.25 gpta) +FB Either 1) Pic 60 (11gpa); 2)Pic80 (8gpa); 3)Pic 100 (5.8 gpa); PLUS Vapam (40 gpa) Knifed to bed surface
6	No Crop Termination	Turn Plow Application (18 GPA)	NO PreBed Deep Shank Telone)+FB Either 1) Pic 60 (11gpa); 2)Pic80 (8gpa); 3)Pic 100 (5.8 gpa); All receive 3 way Vapam (40 gpa) Knifed to bed surface
7	No Crop Termination	NO Turn Plow Application	PreBed Deep Shank Telone (11.25 gpta) +FB Either 1) Pic 60 (11gpa); 2)Pic80 (8gpa); 3)Pic 100 (5.8 gpa); PLUS 3 way Vapam (40 gpa) Knifed to bed surface



Southern Valley Crop Termination / Deep Shank / PIC study - Adel, GA –Austin Hamilton

1. Pic Clor 60 (11 gpa)
2. Pic Clor 80 (8 gpa)
3. Pic 100 (5.8 gpa)

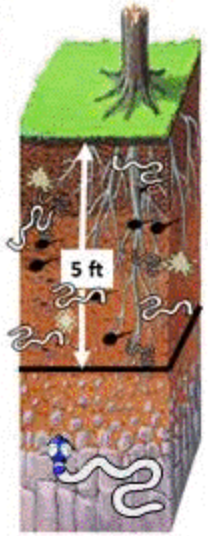

ISO: 100
Shutter: 400
EV:+1/3
Fnum: f2.8
Altitude: 200
End of Harvest Season -1st crop Green Bell Pepper
Plant Mortality attributed to Phytophthora blight
Phytophthora capsici

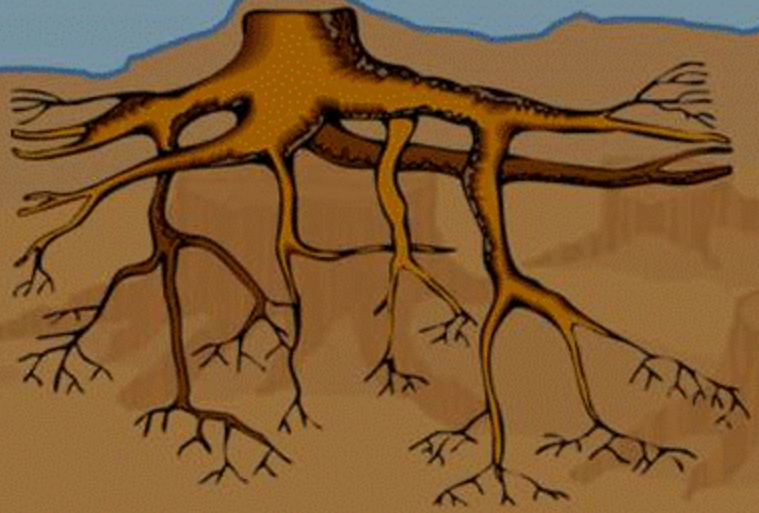


ISO: 100
Shutter: 400
EV:+1/3
Fnum: f2.8
Altitude: 200

End of Harvest Season -1st crop Green Bell Pepper
Plant Mortality attributed to Phytophthora blight
Phytophthora capsici

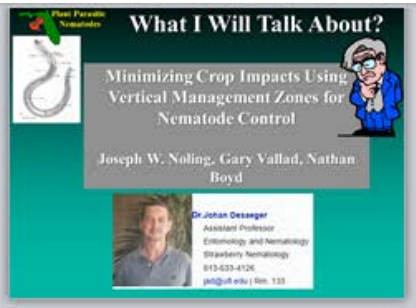
STILL....





HUGE OBSTACLES to OVERCOME !

1



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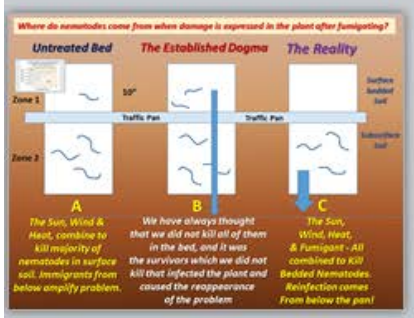

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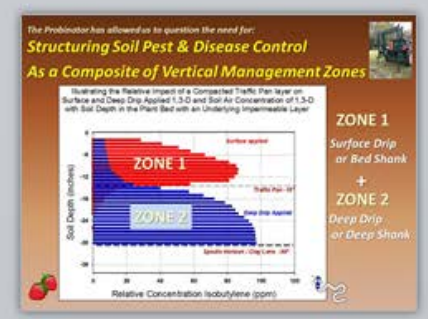

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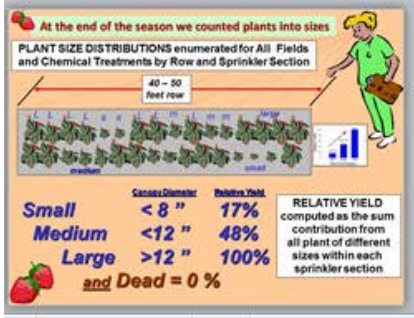

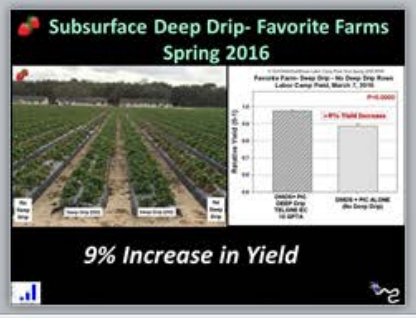

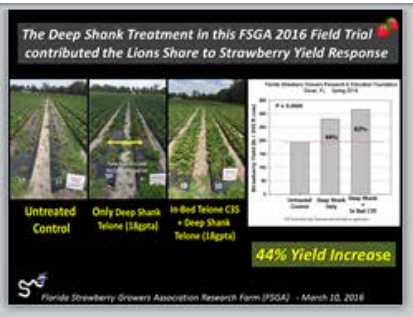

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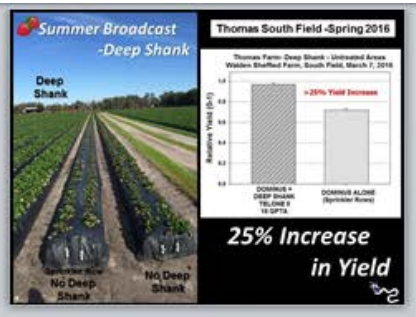

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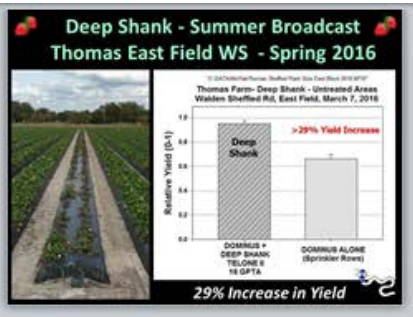

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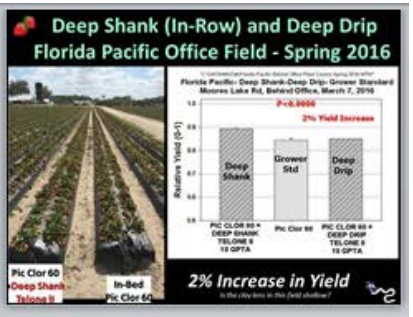

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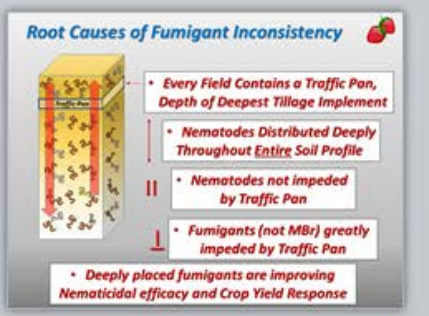

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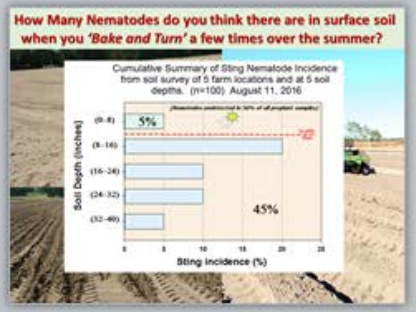

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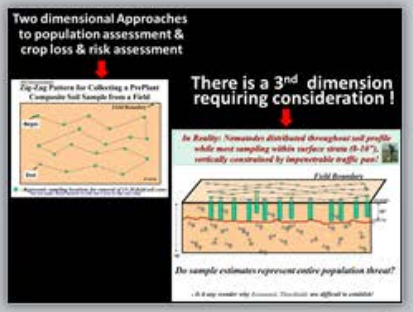

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