Fumigation Programs and Considerations for Rubus

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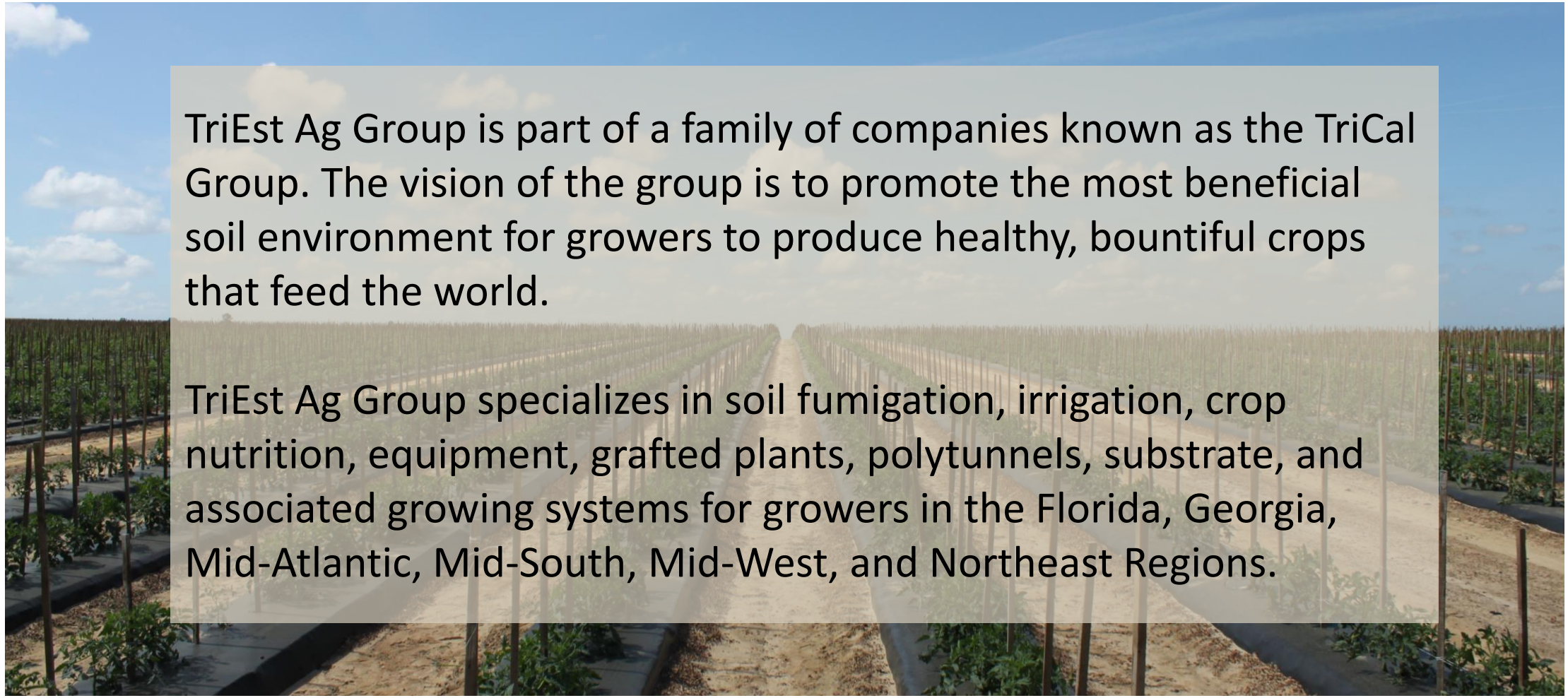
TriEst™ Ag Group



TriEst Ag Group is part of a family of companies known as the TriCal Group. The vision of the group is to promote the most beneficial soil environment for growers to produce healthy, bountiful crops that feed the world.

TriEst Ag Group specializes in soil fumigation, irrigation, crop nutrition, equipment, grafted plants, polytunnels, substrate, and associated growing systems for growers in the Florida, Georgia, Mid-Atlantic, Mid-South, Mid-West, and Northeast Regions.

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Why Fumigate?

- Fumigation objectives: Manage targeted pathogens and nematodes to help growers meet cropping objectives
- Cropping objectives
  - Uniform crop
  - Healthy plants
  - Optimal growth
  - Superior crop quality
  - Increase production
  - **Success in reduced rotations**
  - **Maximize economic return**

Root-Knot Nematode Damage

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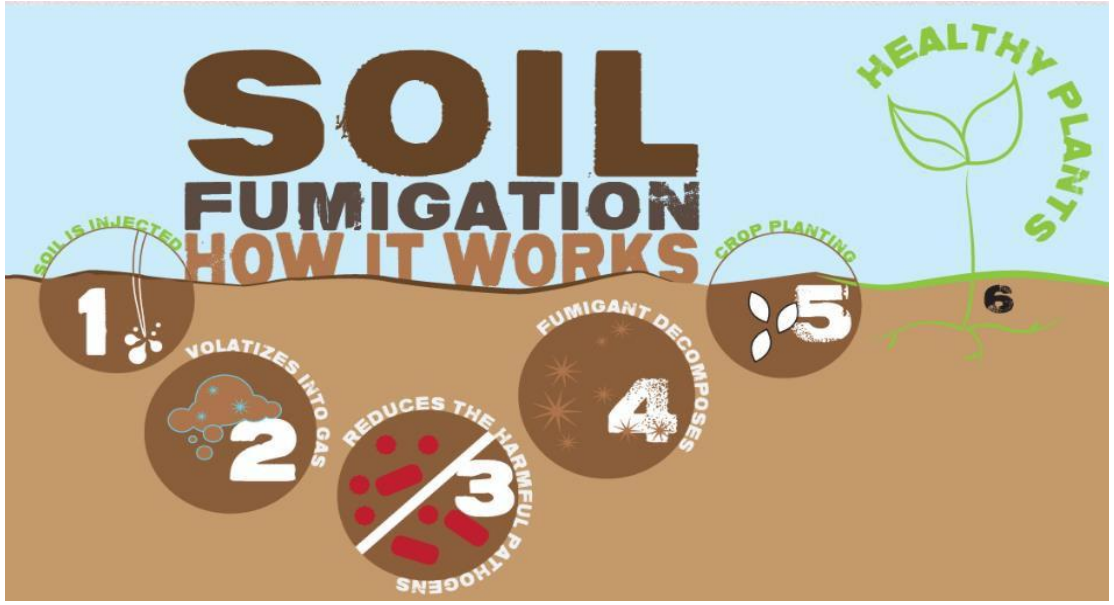
Soil Fumigation: *How it works*

1. Fumigants are injected as liquids into the soil

2. The fumigant volatizes into gas diffusing through the soil air space , radiating out from the points of injection

3. The treatment significantly reduces harmful pathogens and nematodes, rebalancing the native beneficial soil microbial population, conditioning it for planting.



4. Fumigant decomposes rapidly in the soil *(Chloropicrin actually biodegrades into plant nutrients)*

5. Crop planting takes place in newly condition soil

6. Healthy plants are able to maximize their water and nutrient use and grow full yield potential with no uptake into the root or residue on the plant

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HOW SOIL HEALTH HAS SHAPED OUR PERSPECTIVE OF FUMIGANTS

"What is sustainable or healthy about me trying to build a better farm for someone else's children or family? Because I can't afford to keep this land without producing a successful crop."

-North Carolina tobacco and sweet potato grower

The major challenge here is that a "healthy" soil can result in a poor yield. Farms must stay profitable. Industry standard yields aren't enough, we must get better. "Healthy" soil isn't enough, it has to be healthy and FINANCIALLY sustainable.

FACTORS AROUND DISEASE SUPPRESSION

- Microbial populations are in constant conflict for position around the root system

You can not reason with a tiger when your head is in its mouth!

-Winston Churchill

WHAT HAPPENS TO THE SOIL MICROBIOME WHEN YOU FUMIGATE? IT DEPENDS.

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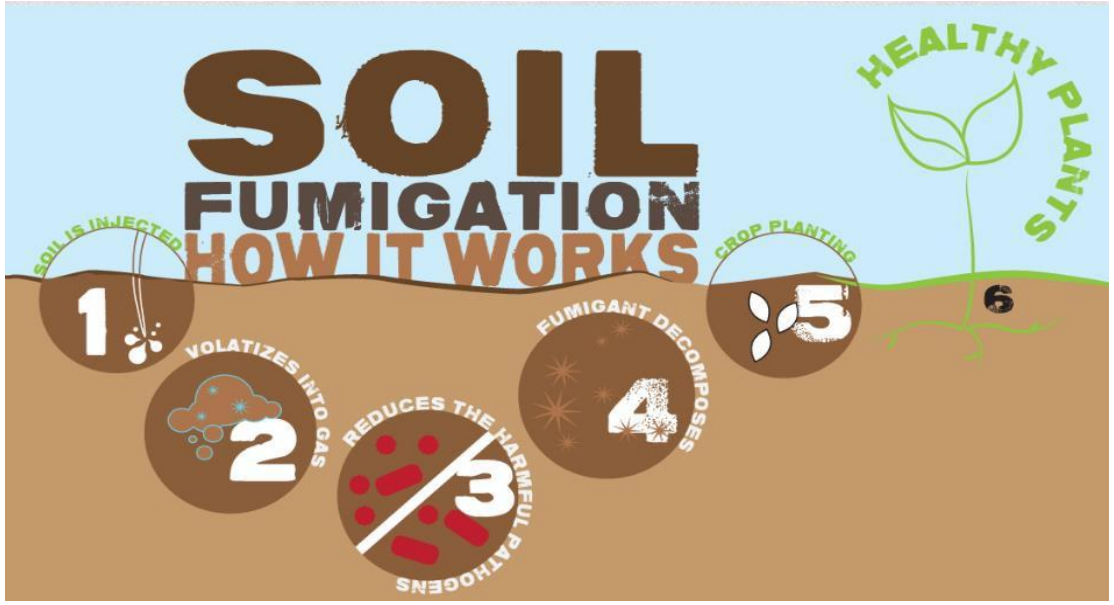

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PIC100

Chloropicrin

- Rapid diffusion through soil
- Quick acting and suppresses target pest within 48hrs
- Rapidly degrades in sunlight and microbial pathways. Is not considered persistent. **No residue**
- Breaks down into Nitrogen, Carbon, Oxygen and Chlorine, which can all be used by plants
- Temporarily increases presence of ammonia due to the breakdown of pathogens, microbes and nematodes
- **Does NOT sterilize soils**, but shifts the microbial community temporarily (I won't steal Sarah's thunder)

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Chloropicrin and Disease Management

Chloropicrin is a multipurpose fumigant used to manage soil borne diseases and pests including:

- Fusarium
- Phytopthora
- Verticillium Wilt
- Streptomyces (Scab)
- Bacterial Wilt
- Phoma (Pink Root)
- Pythium
- Rhizoctonia
- Nematodes (Telone*)

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1,3-Dichloropropene (1,3-D)

- Telone II is an excellent nematicide
  Broad range control includes root knot, lesion, stubby root, dagger, ring, and cyst nematodes
- 2nd most widely used fumigant in the US
- True Fumigant, unlike other nematicides … It moves through the soil profile in a gas state.
- Mode Of Action
  - Contact
  - Attacks the nervous system causing paralysis then death
- Modes of Dissipation
  - Gaseous diffusion throughout the soil and flux through soil/air interface

Formulations

- PicClor 80 – 80% Pic/ 20% Telone II
- PicClor 60: 60% Pic/ 40% TeloneII
- Telone C-35: 35% Pic/ 65% Telone II
- Pic Plus: 85% Pic/ 15% solvent

**there are many ratios consult local sales managers for specifics*

- Chloropicrin can be formulated with other fumigants to optimize desired disease/ nematode management.
- Most common is Telone II and Methyl Bromide.

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Keys to Successful Fumigation: *Ex. Soil Preparation*

- Soil should be in good seedbed condition prior to fumigation
- Break up clods and loosen soil by
- cultivation one week before application.
- Work soil deeper than intended fumigation.
- Soil should be free of trash to reduce fumigant “tie up” in organic matter.

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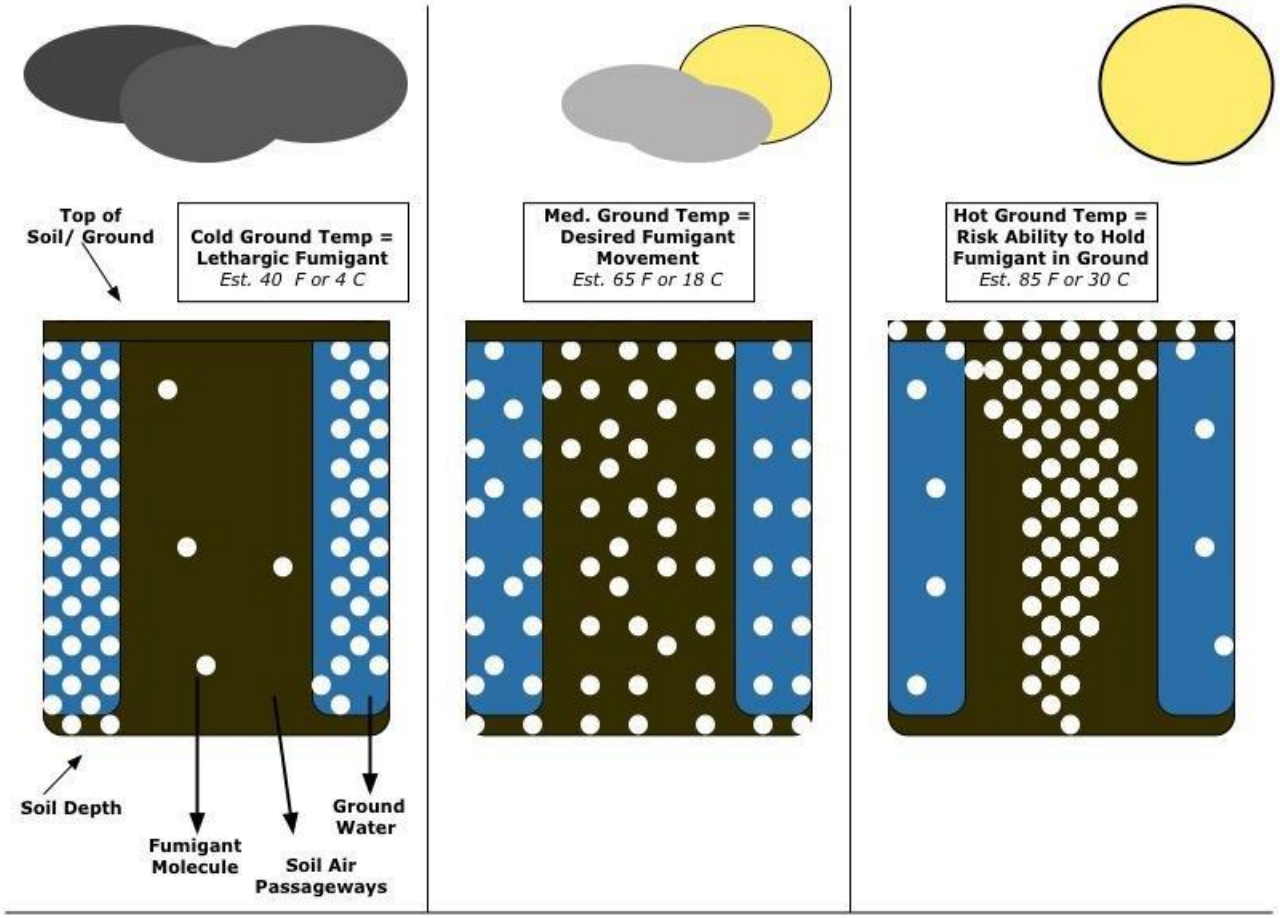
Keys to Successful Fumigation: *Ex. Soil Temperature*



Effects of Soil Temperature on Fumigation Applications

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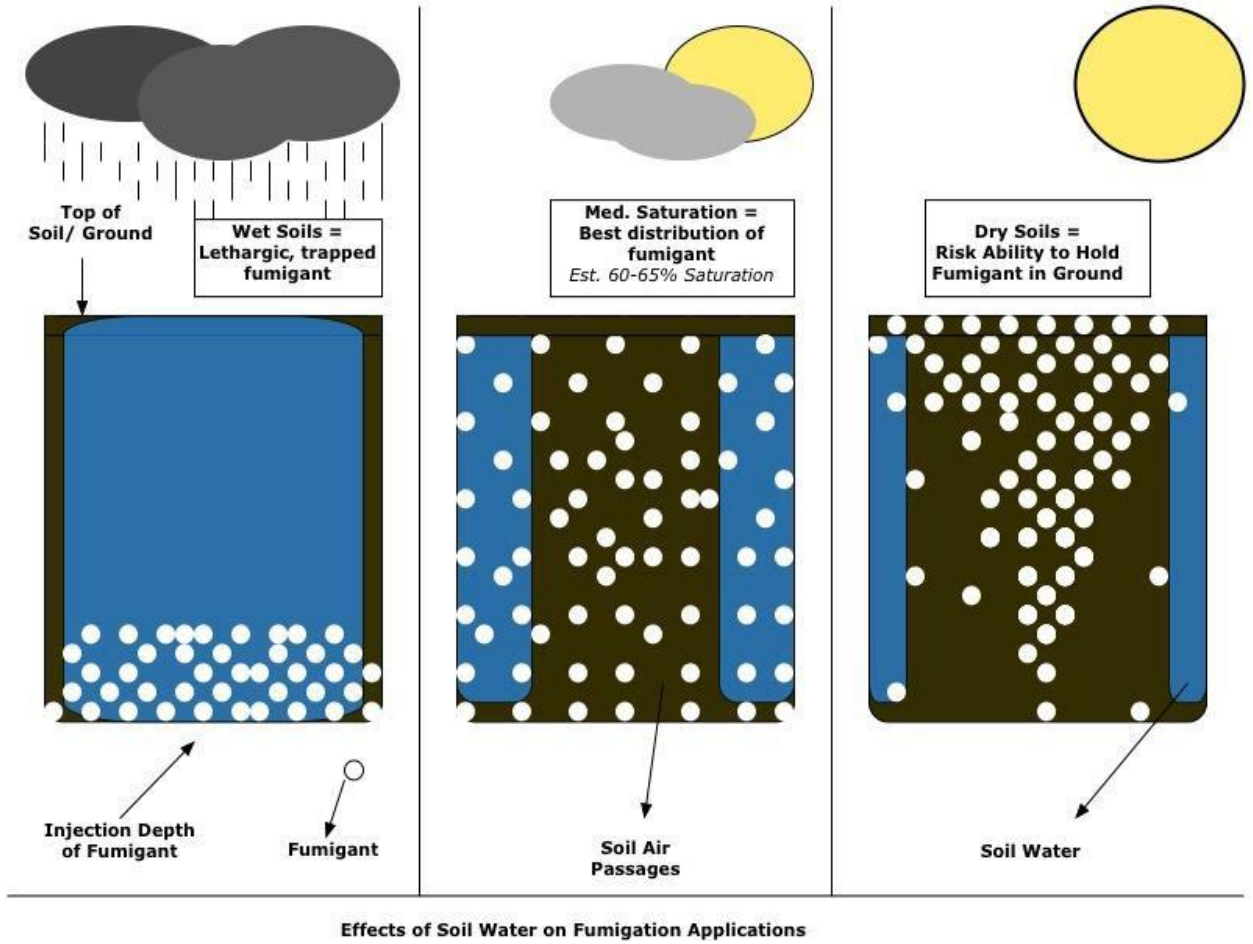
Keys to Successful Fumigation: *Ex. Soil Moisture*



Effects of Soil Water on Fumigation Applications

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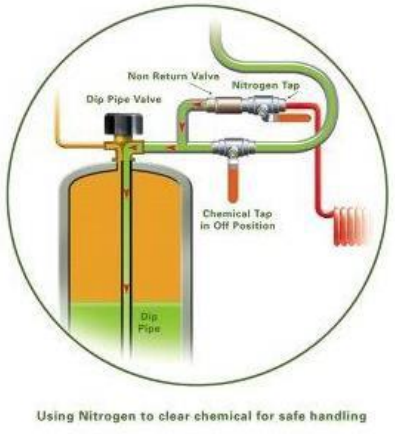
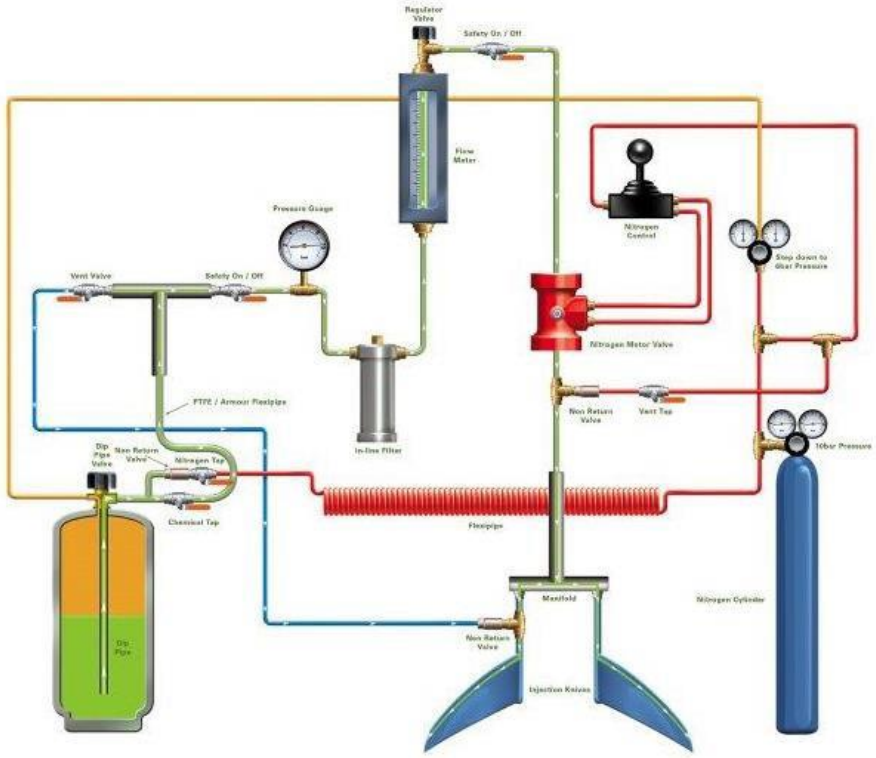
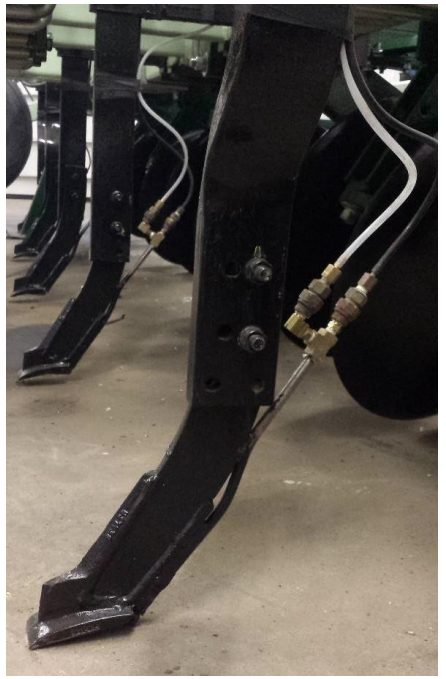
Methods of Application: *Ex. Fumigation Equipment*



Using Nitrogen to clear chemical for safe handling



Generic Pressurized Fumigation Rig



Self Sealing Knife

Methods of Application:

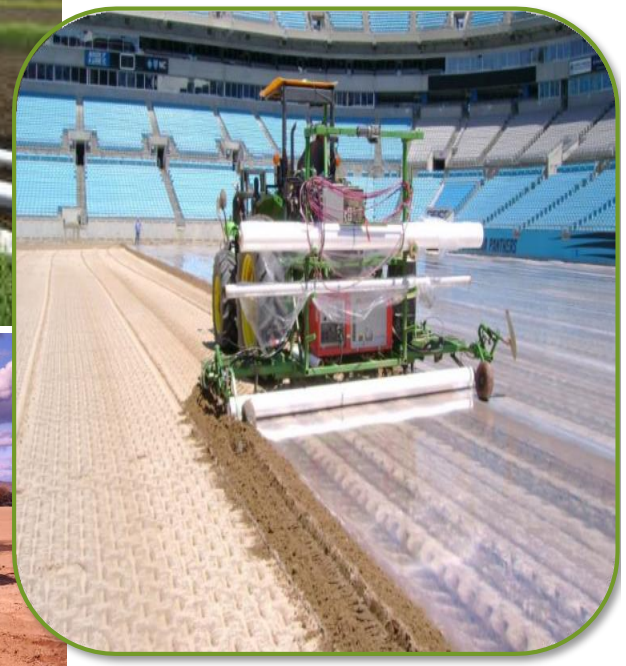
Determine what is best for you

<u>OPTIONS</u>

- Tarp, Broadcast Fumigation
- Tarp, Bed Row Fumigation
- Non Tarp Applications
- Drip Injection
- Spot Injection

<u>CONSIDERATIONS</u>

- Land/ terrain
- Disease pressure
- Drainage/irrigation issues
- Cultural practices



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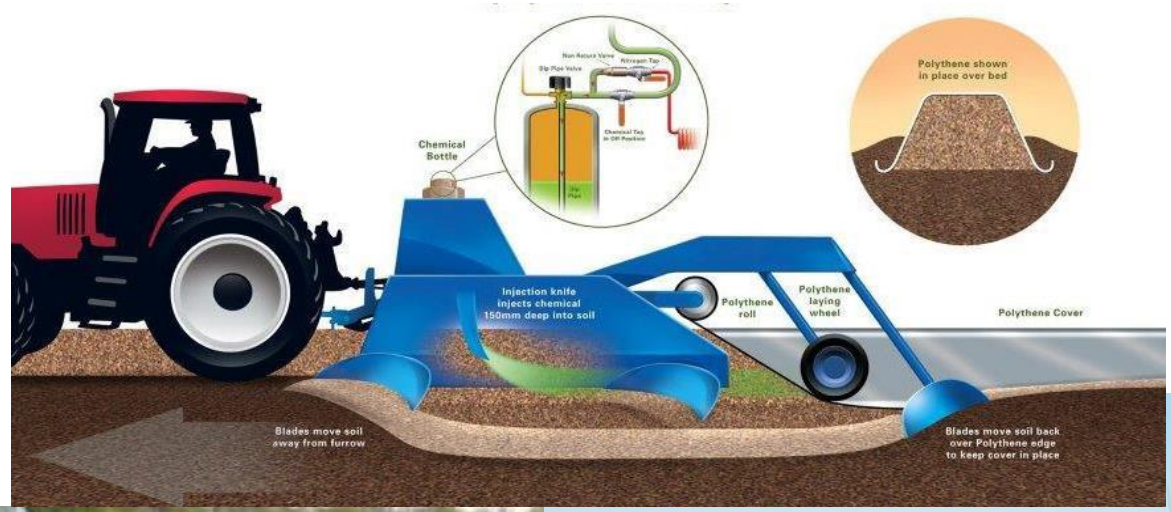
Methods of Application: *Ex. Tarp, Bed-row fumigation*



Fumigant Application – Berry Bed Fumigation

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Methods of Application: *Ex. Drip Fumigation*

Common Fumigation Programs

- 300# Broadcast of Pic60 (60% Chloropicrin and 40% Telone) if nematodes are an issue
- 300# Broadcast of Pic100 if no nematodes are present
- 2.5’ bedtop x 9’ centers = 28% of an acre
- 300# x .28 = 84# applied rate
- Product blends and rates are always site and situation dependent

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- You’ve got one opportunity to establish a crop well
- Fumigants provide a broad spectrum of pathogen and nematode suppression
- Once roots grow out of the treated zone and fumigant has broken down in the soil profile, problems still creep in over time. FUSARIUM!
- Subsidize application costs across a multi-year crop

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THANK YOU FOR YOUR TIME

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