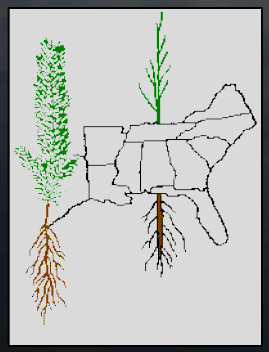
Area-wide Demonstration of Methyl Bromide Alternatives: Loblolly Pine Production in Southern Forest Tree Nurseries



Auburn University
School of Forestry & Wildlife Sciences
Southern Forest Nursery Management Cooperative

Paul Jackson, Tom Starkey, & Scott Enebak

AUBURN
FORESTRY AND WILDLIFE SCIENCES

Objective of the Methyl Bromide Alternatives Research :

- To test alternative fumigants to methyl bromide (MBr) in large-scale trials to determine effects on loblolly pine production and control of soil-borne fungi, weeds, and nematodes.

- So far, trials have been completed in:
  - Plum Creek, Jesup, GA, 2007-2008 (RR: 09-06)
  - Rayonier, Glennville, GA, 2007-2008 (RR: 09-07)
  - SC Forestry Commission, Trenton, SC, 2008-2009 (RR: 10-07)
  - Arborgen, Blenheim, SC, 2008-2009 (RR: 10-09)
  - Rayonier, Glennville, GA, 2010 (RR: In Prep.)
  - Joshua Timberlands, Elberta, AL, 2009-2010 (RR: In Prep.)

We Will Discuss….

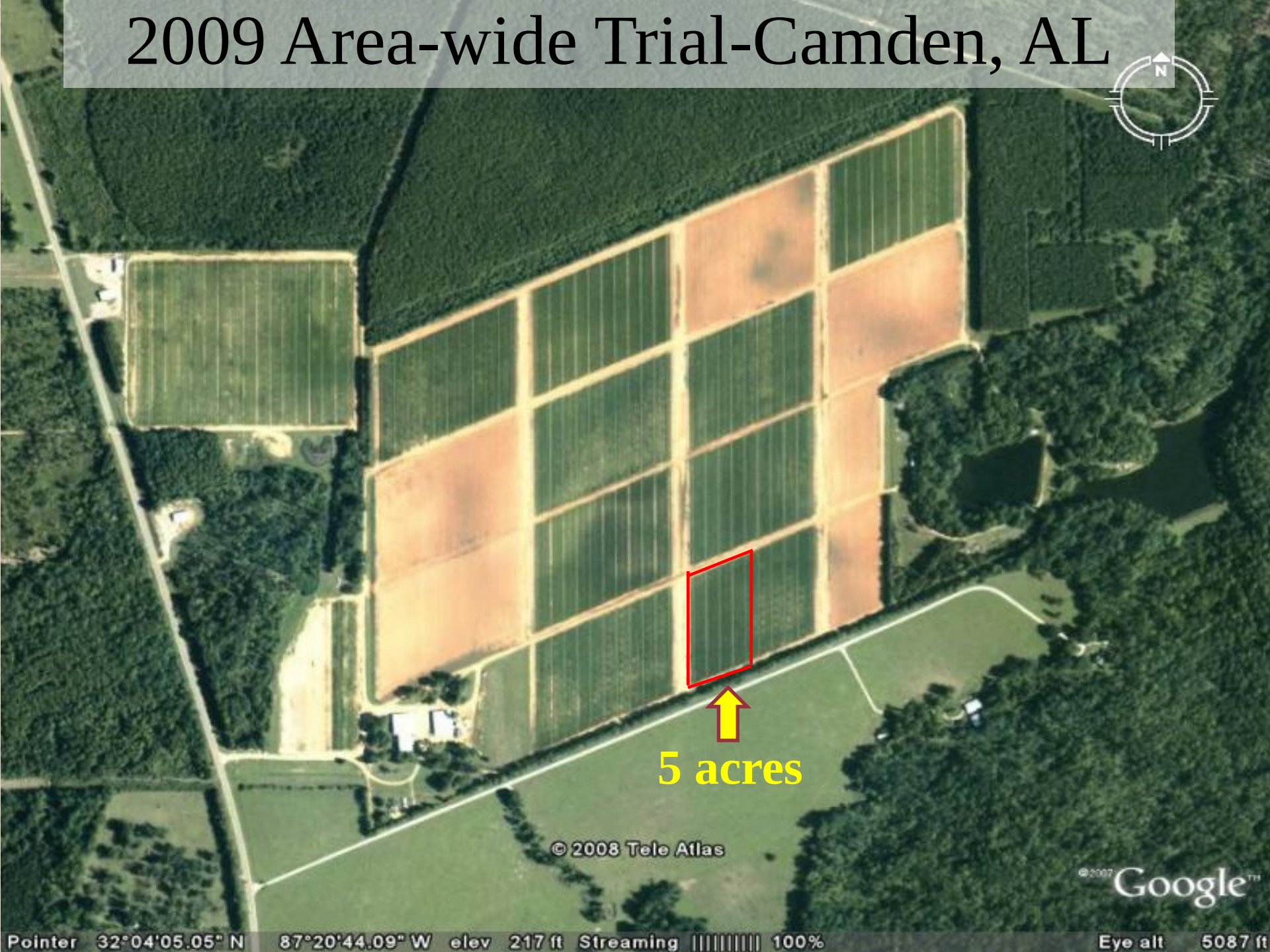
- Current Area-wide Trials:
  - Weyerhaeuser, Camden, AL, 2009-2011 (in 3rd year)
  - Weyerhaeuser, Camden, AL, 2010-2012 (in 2nd year)

- Recently Completed Area-wide Trials:
  - Rayonier, Glennville, GA, 2010
  - Joshua Timberlands, Elberta, AL, 2009-2010

Cooperators in Research

- Steve Godbehere, TriEst Ag Group, Inc (formerly Hendrix and Dail), Tifton, GA
- Sam Campbell, Joshua Timberlands, Elberta, AL
- Ralph Bower, Weyerhaeuser, Camden, AL
- Kelly Dougherty, Rayonier, Glennville, GA
- Shan Brooks, Arysta Life Science, Lake Worth, FL
- John Mirusso, Mirusso Enterprises Inc, Delray Bch, FL
- USDA-ARS Area-Wide Pest Management Project for Methyl Bromide Alternatives – South Atlantic Region

2009 Area-wide Trial-Camden, AL



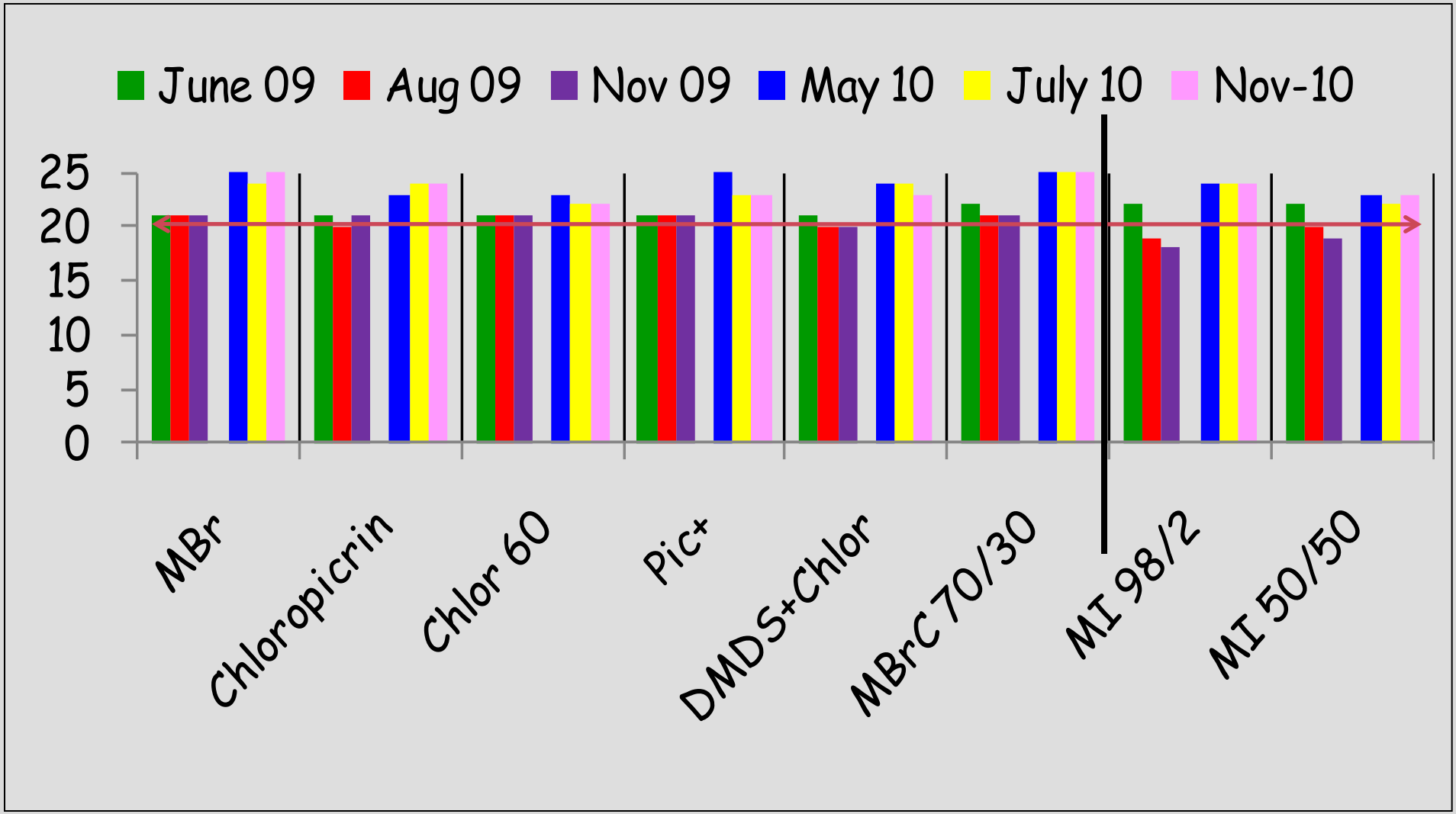
Camden 2009 Trial Information

Fumigation Date	March 23, 2009
Fumigation Type	Shank injected Broadcast/flat tarp
Area in Trial	5 acres
Air Temperature	61 – 77 F
Wind Speed	5 – 9mph
Soil Moisture	7.6%
Soil Series	Lenoir silt loam
Plastic in Place	14 days

Camden 2009 Fumigation Treatments

Fumigant	Rate	Components
MBr	350 lbs/acre	67% MBr + 33% Chloropicrin
Chloropicrin	300 lbs/acre	100% Chloropicrin
MBrC 70/30	400 lbs/acre	70% MBr (98/2) + 30% Solvent
Chlor 60	400 lbs/acre	60% Chloropicrin + 40% 1,3-D
Pic+	300 lbs/acre	85% Chloropicrin + 15% Solvent
DMDS + Chlor	70 gal/acre	79% DMDS + 21% Chloropicrin
Midas 50/50	160 lbs/acre	50% Iodomethane + 50% Chloropicrin
Midas 98/2	100 lbs/acre	98% Iodomethane + 2% Chloropicrin

Camden 2009 Seedling Density

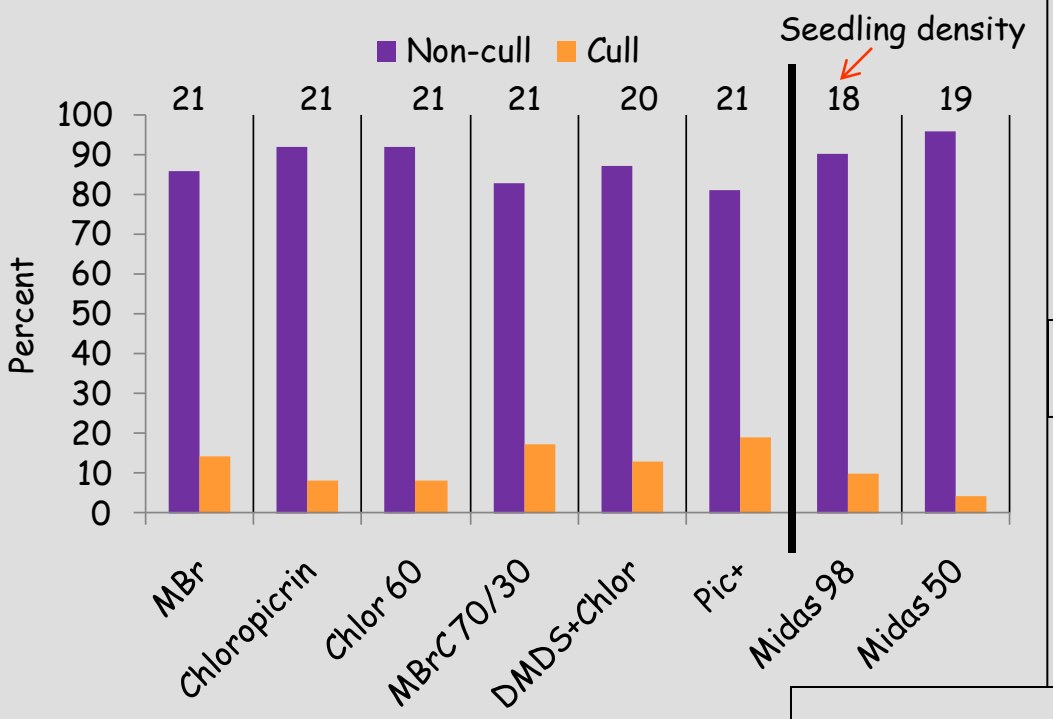


= Target seedling density 21/ft²

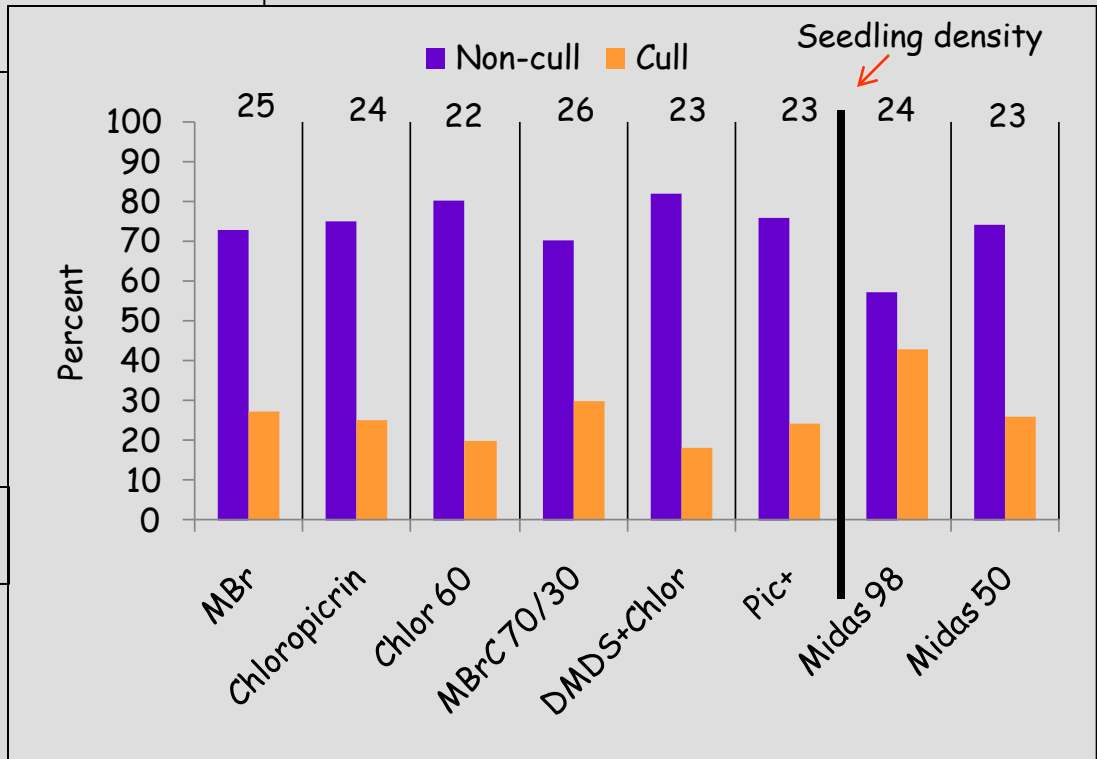
Camden 2009
Culls vs. Non-culls

1st Year-2009

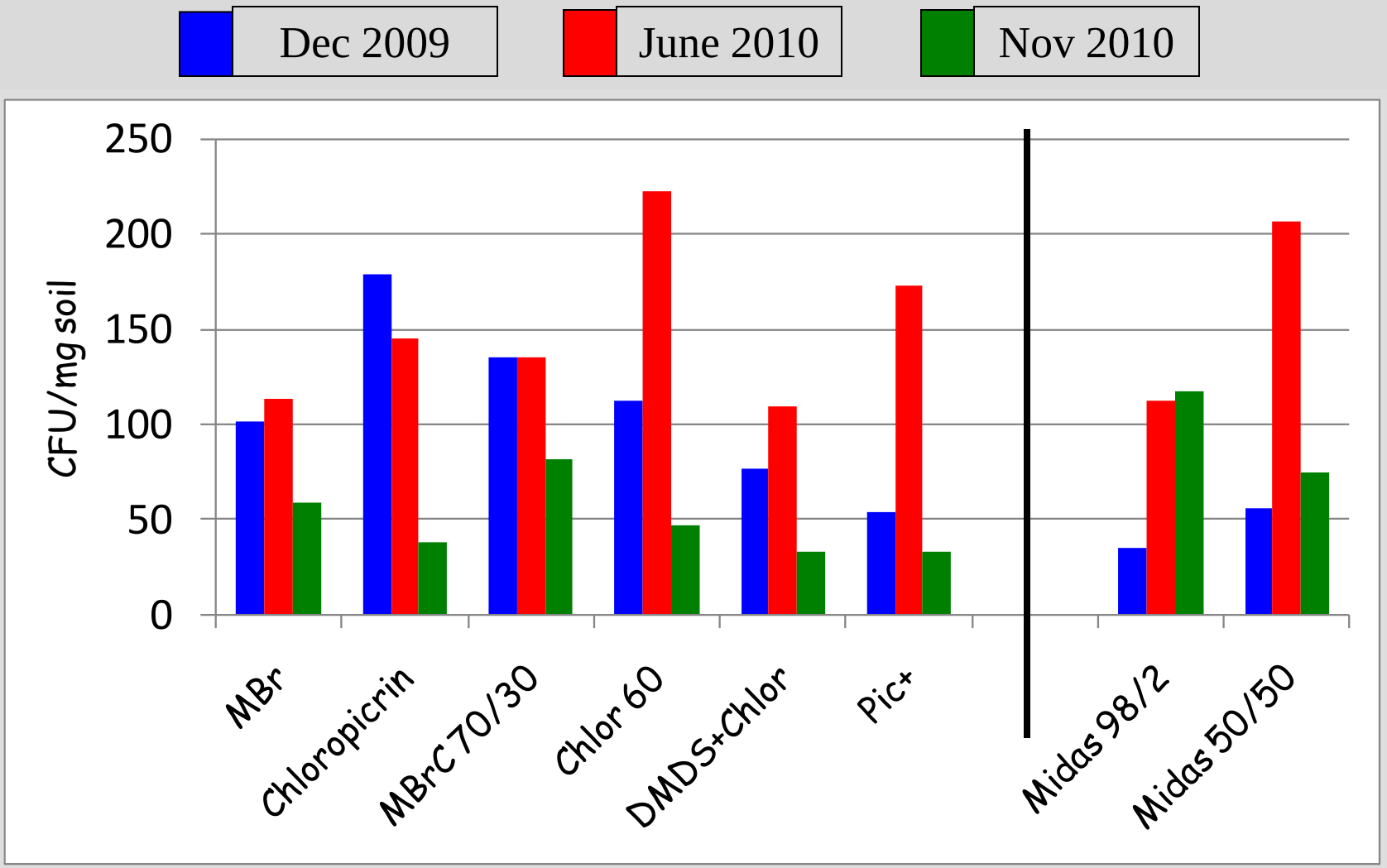
Cull = < 3.2 mm



2nd Year-2010



Camden 2009 *Trichoderma*

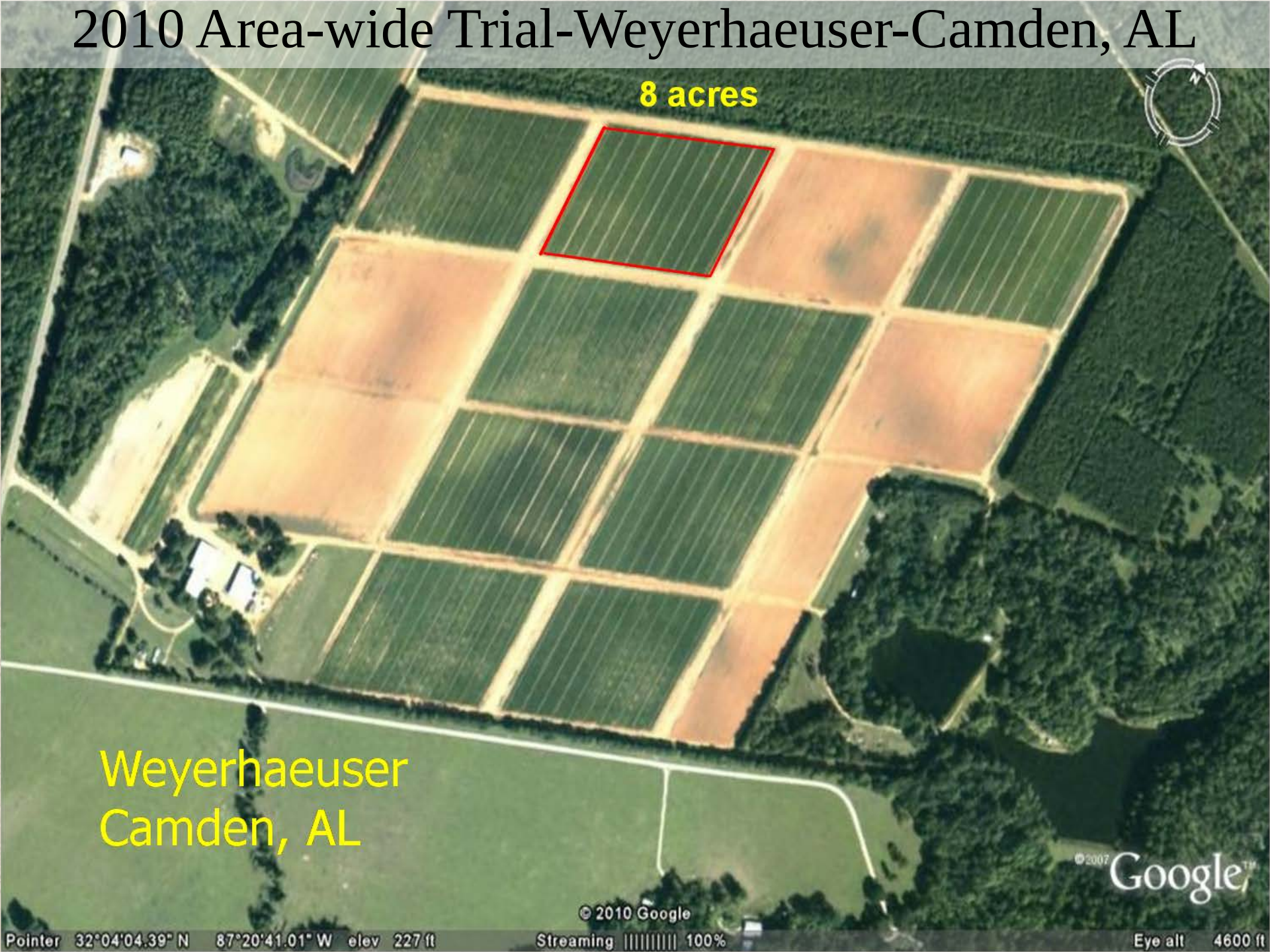


Camden 2009 Trial: Observations to Date

- Seedling density and root morphology (data not shown) for all MBr alternatives were similar to the 67% MBr/33% Chloropicrin (350 lbs/acre) treatment at the end of the second growing season.

- Midas 98/2 had more culls than other MBr alternatives that shared a similar seedling density.

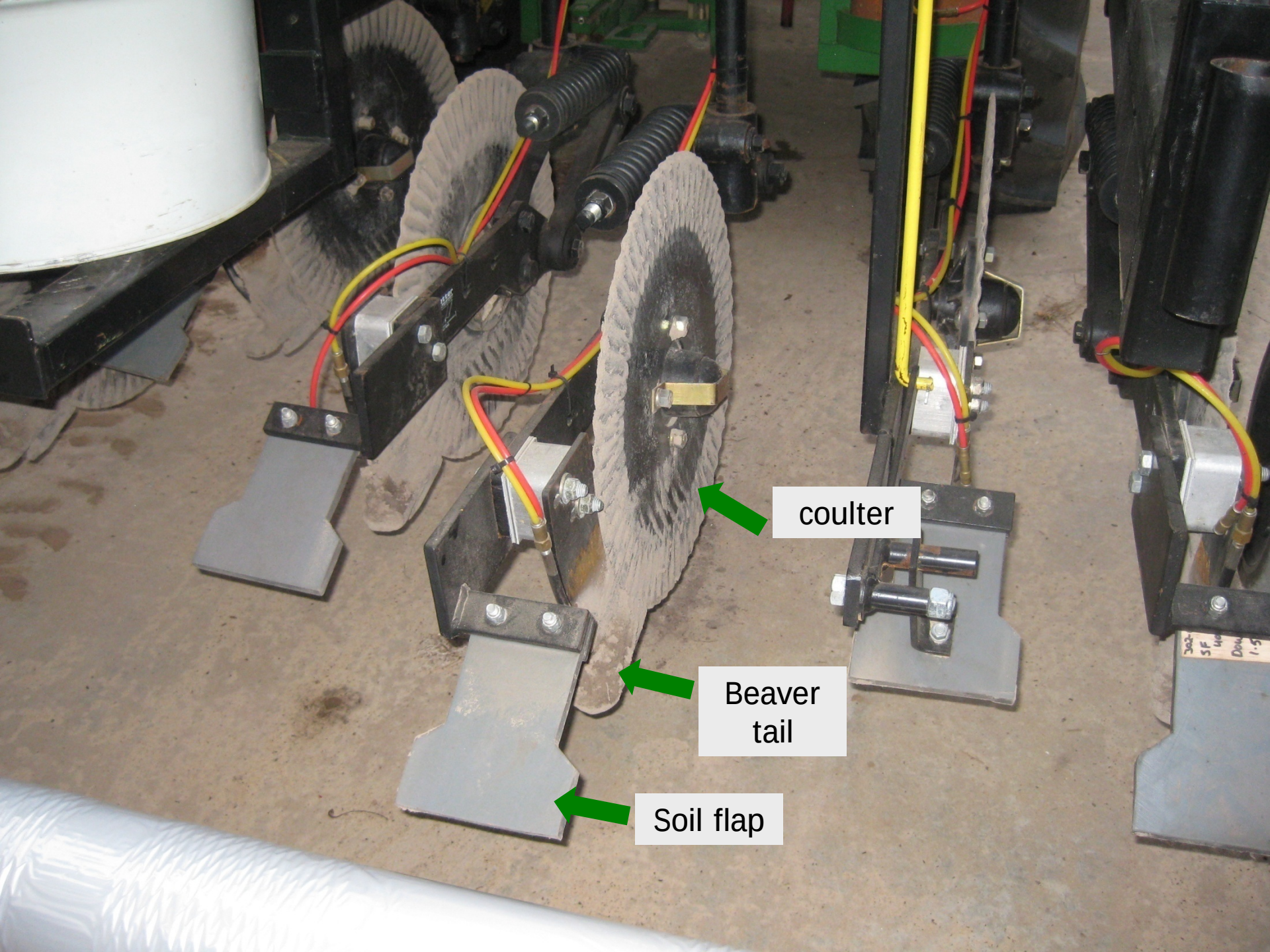
2010 Area-wide Trial-Weyerhaeuser-Camden, AL



Camden 2010 Trial Information

Fumigation Date	March 23, 2010
Fumigation type	**No-till coulter injected & shank injected with beaver tails & hot glue; Broadcast/flat tarp**
Area in trial	8 acres
Air temperature range	55 - 73 F
Wind speed	0 – 10 mph
Soil moisture	7.8%
Soil series	Lenoir silt loam
Plastic in place	10 days
Plastic	HDPE & TIF


USDA Low Impact Rig


coulter
Beaver tail
Soil flap


USDA rig has shallower
injection point vs.
deeper shank injection

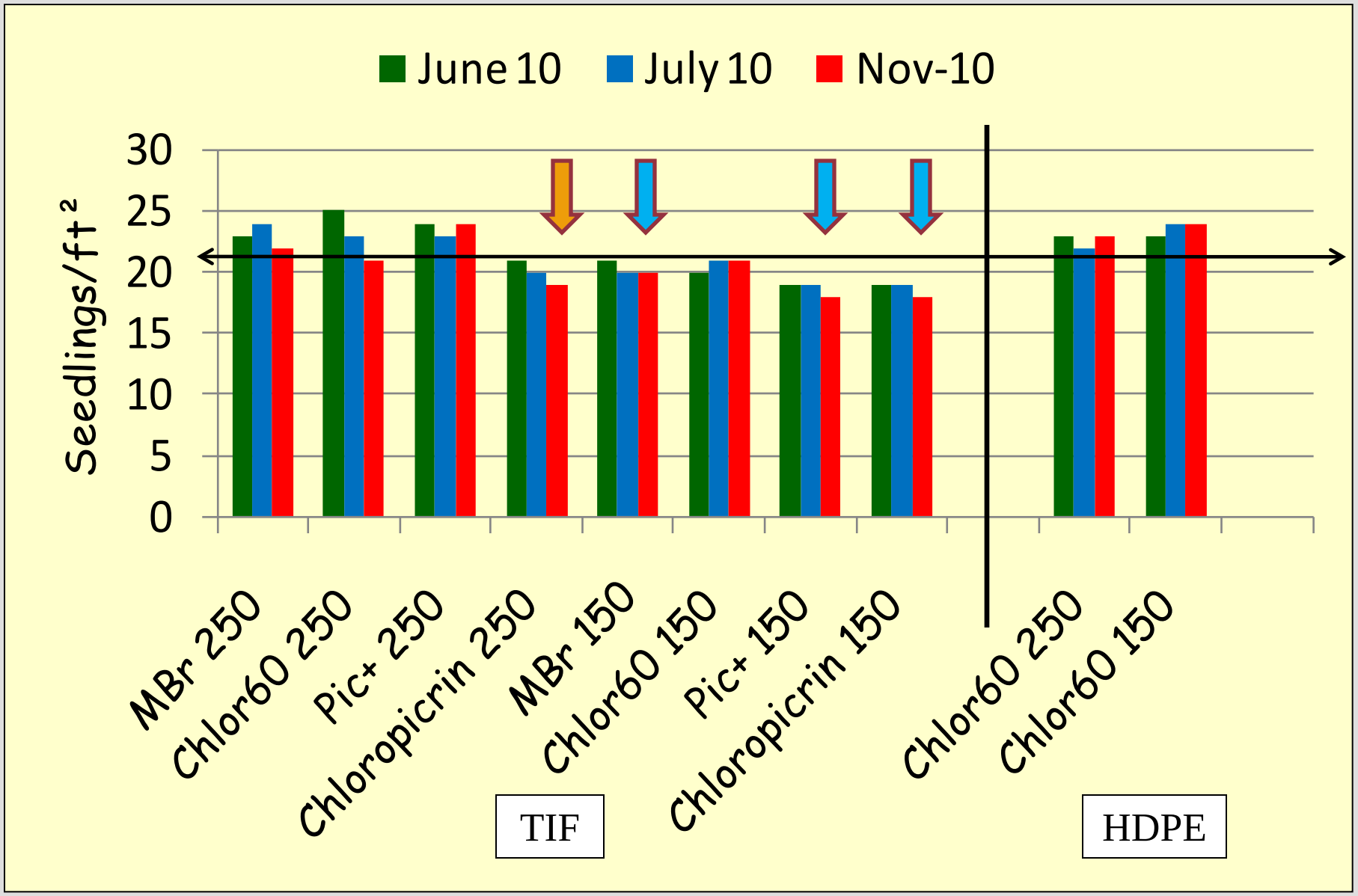
The standard shank injected rig uses a cultivated (tilled) soil surface prep

The low impact rig uses a rolled, compacted soil surface prep

Camden 2010 Fumigation Treatments

Fumigant	Rate	Component	Plastic
Chlor 60	250 lbs/acre	60% Chloropicrin + 40% 1,3-D	TIF
	150 lbs/acre		
Chloropicrin	250 lbs/acre	100% Chloropicrin	TIF
	150 lbs/acre		
MBr	250 lbs/acre	80% MBr + 20% Chloropicrin	TIF
	150 lbs/acre		
Pic+	250 lbs/acre	85% Chloropicrin + 15% Solvent	TIF
	150 lbs/acre		
Chlor 60	250 lbs/acre	60% Chloropicrin + 40% 1,3-D	HDPE
	150 lbs/acre		

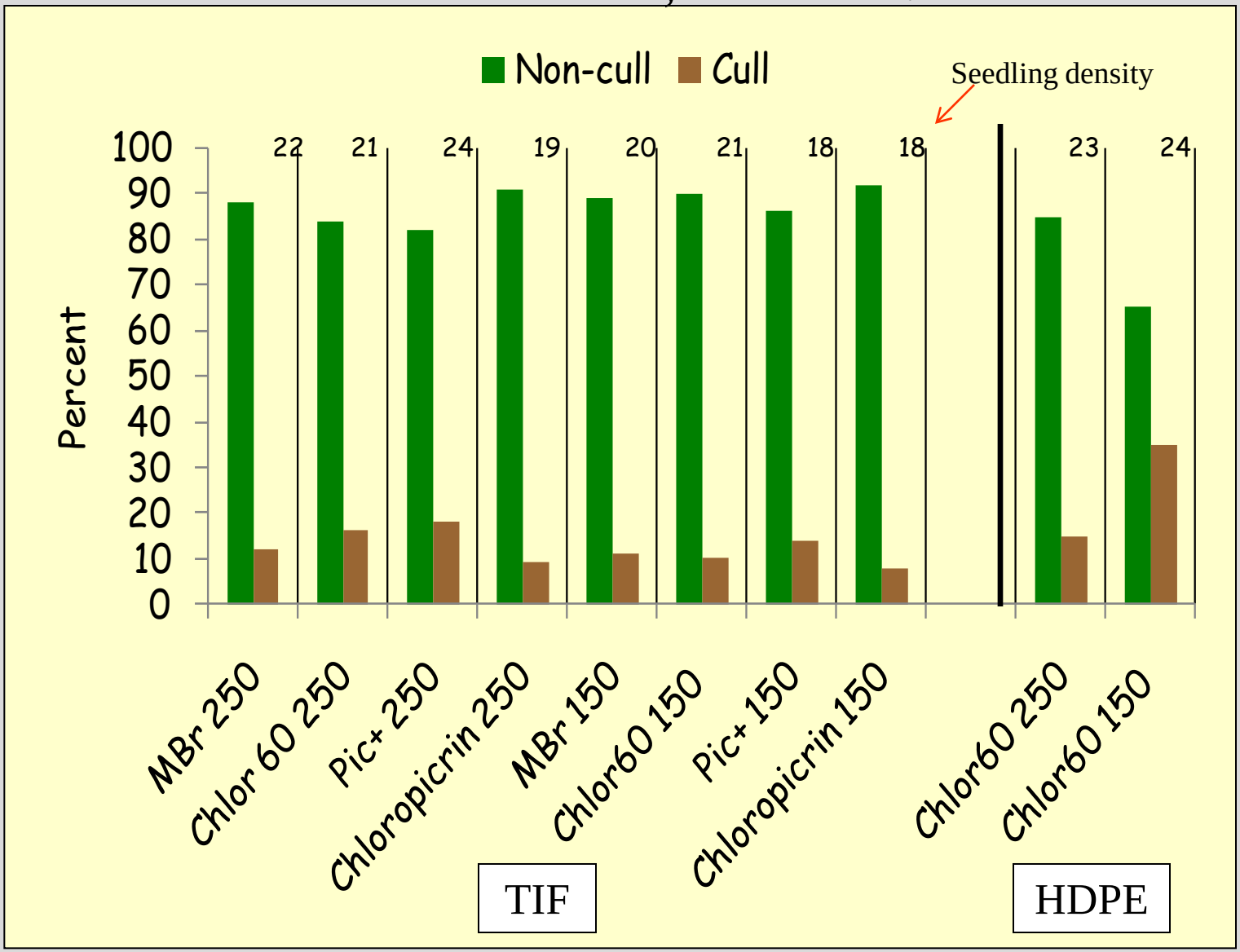
Camden 2010 Seedling Density



→ = Target seedling density 21/ft²

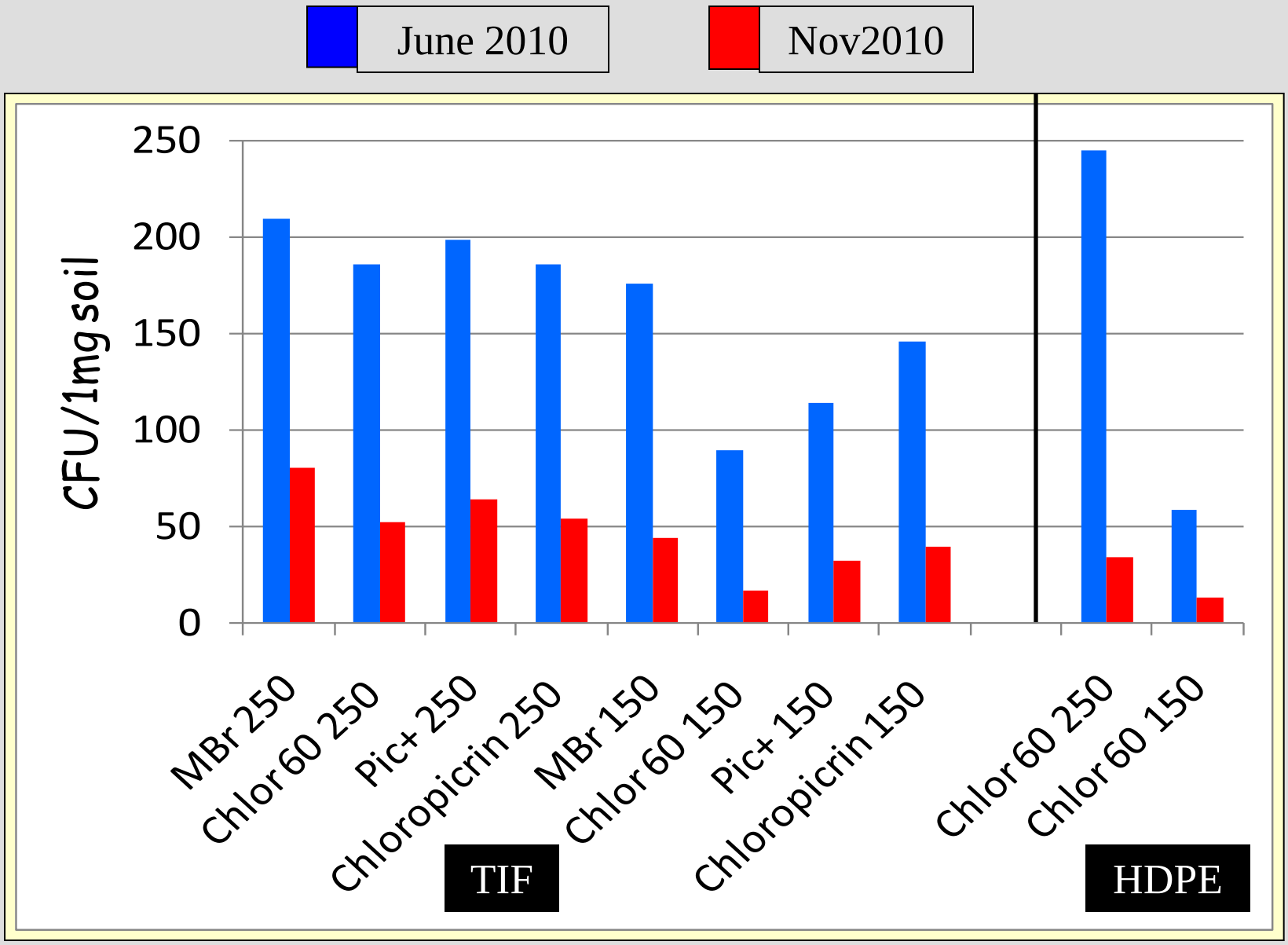
Camden 2010: Culls vs. Non-culls

November 2010; Cull = < 3.2 mm



1st Growing Season

Camden 2010 *Trichoderma*



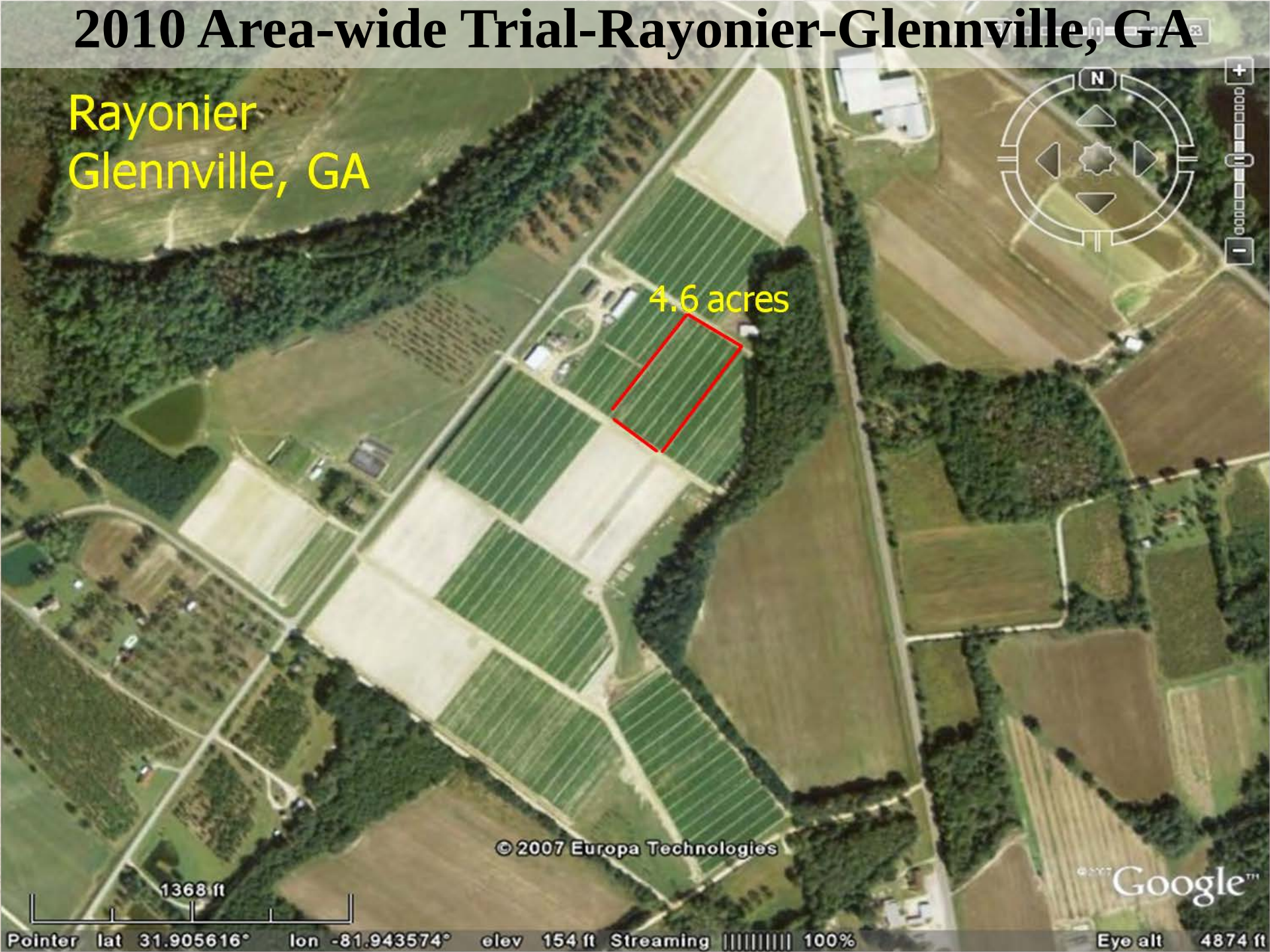
Camden 2010 Trial: Observations to Date

- The 150 lb/acre MBr alternative fumigant rates did not provide target seedling densities under TIF.

- 150 and 250 lbs/acre of Chlor 60 under HDPE exceeded 21 seedlings per ft^2 but the lower rate had > 30% culls.

- Seedling root morphology for MBr alternative treatments under TIF was similar to MBr at 250 lbs/acre (data not shown).

2010 Area-wide Trial-Rayonier-Glennville, GA



Glennville 2010 Trial Information

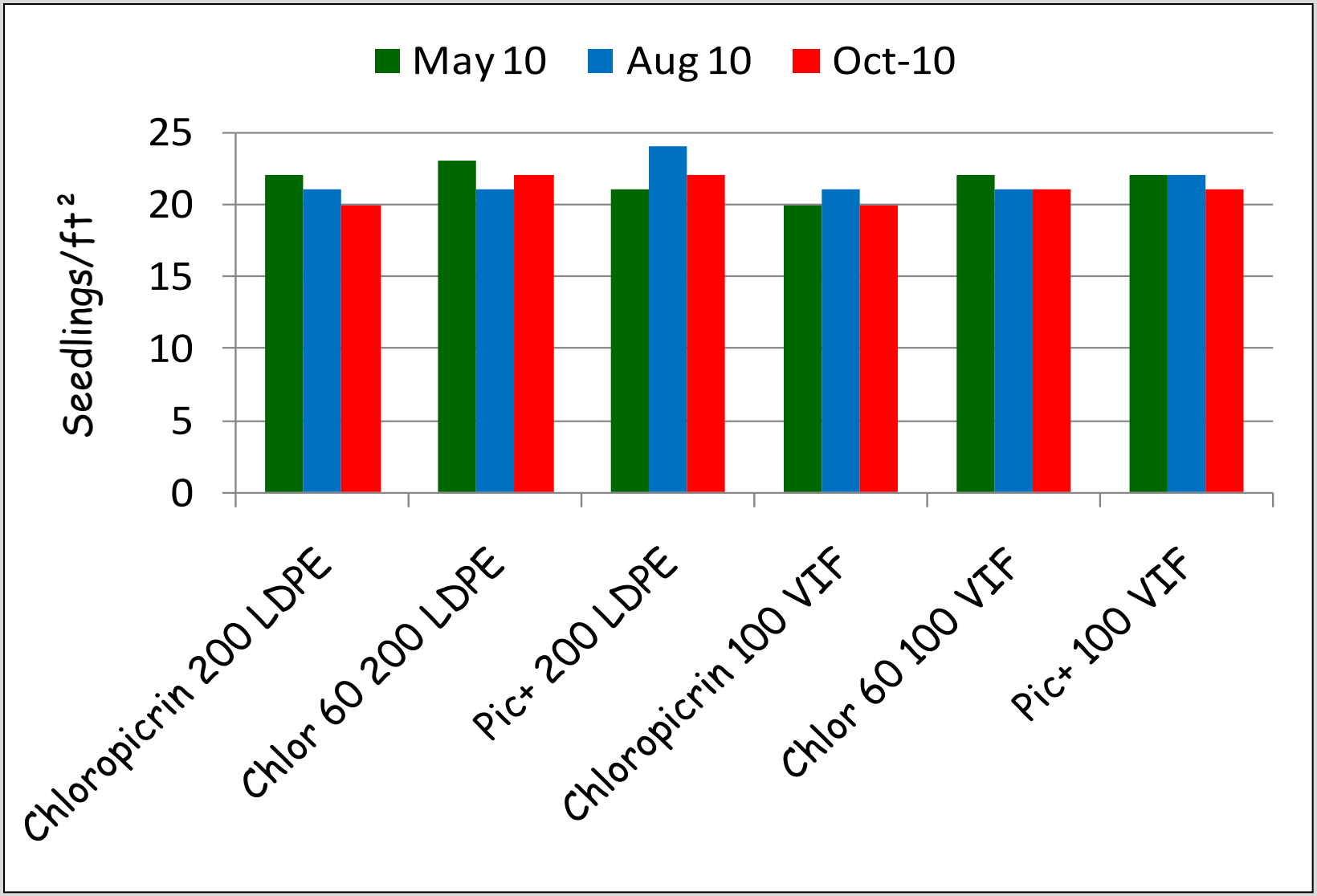
Fumigation Date	October 22, 2009
Fumigation type	No-till coulter injected Broadcast/flat tarp
Area in trial	4.6 acres
Air temperature range	62 – 81 F
Wind speed	0 – 9 mph
Soil moisture	7.8%
Soil series	Tifton loamy sand
Plastic in place	10 days
Plastic	LDPE & VIF

Glennville 2010 Fumigation Treatments

Fumigant	Rate	Component	Plastic
Chlor 60	200 lbs/acre	60% Chloropicrin+40% 1,3-D	LDPE
	100 lbs/acre		VIF
Chloropicrin	200 lbs/acre	100% Chloropicrin	LDPE
	100 lbs/acre		VIF
Pic+	200 lbs/acre	85% Chloropicrin + 15% Solvent	LDPE
	100 lbs/acre		VIF

USDA Rig

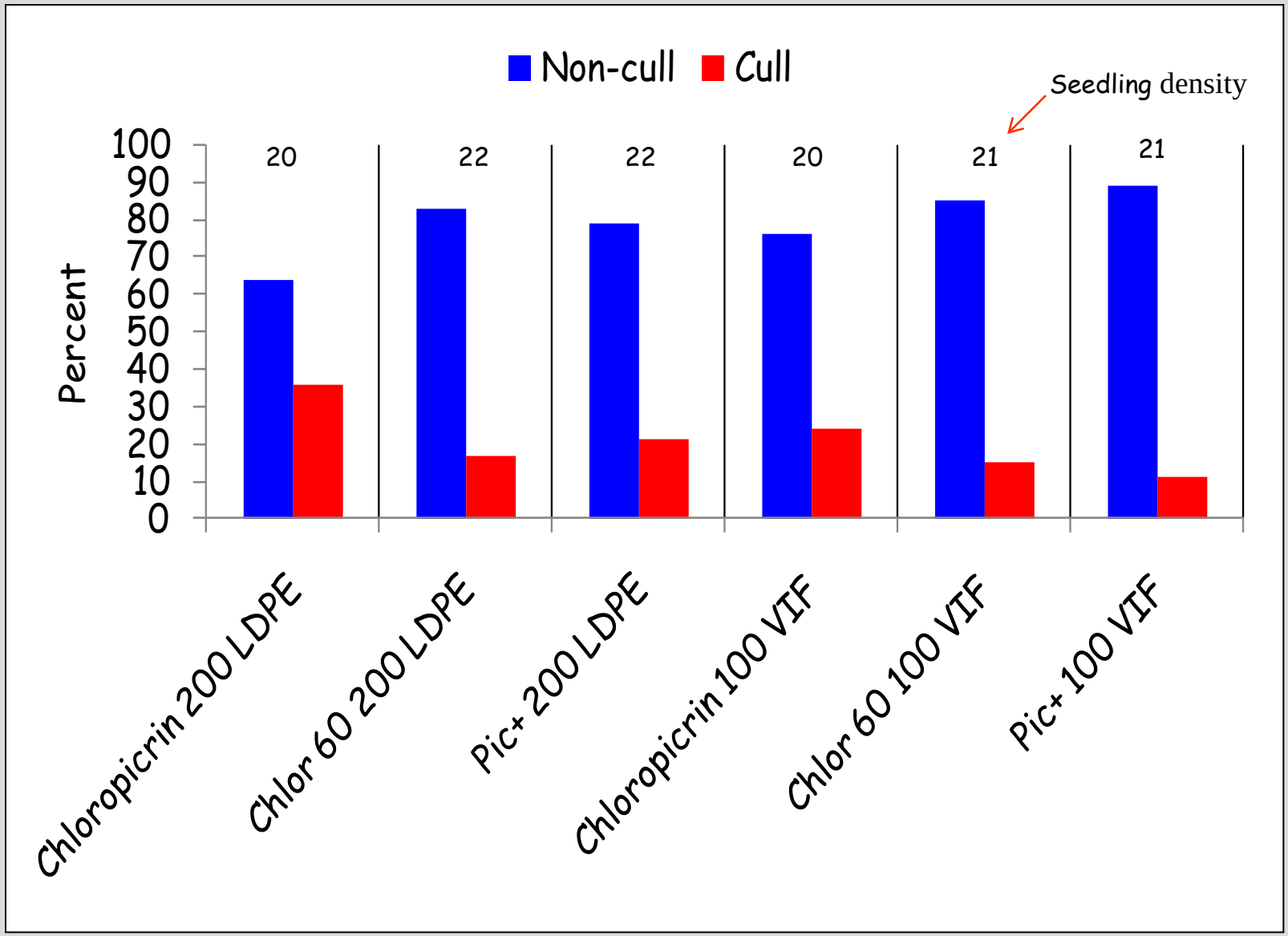
Glennville Seedling Density



Target seedling density = 20/ft²

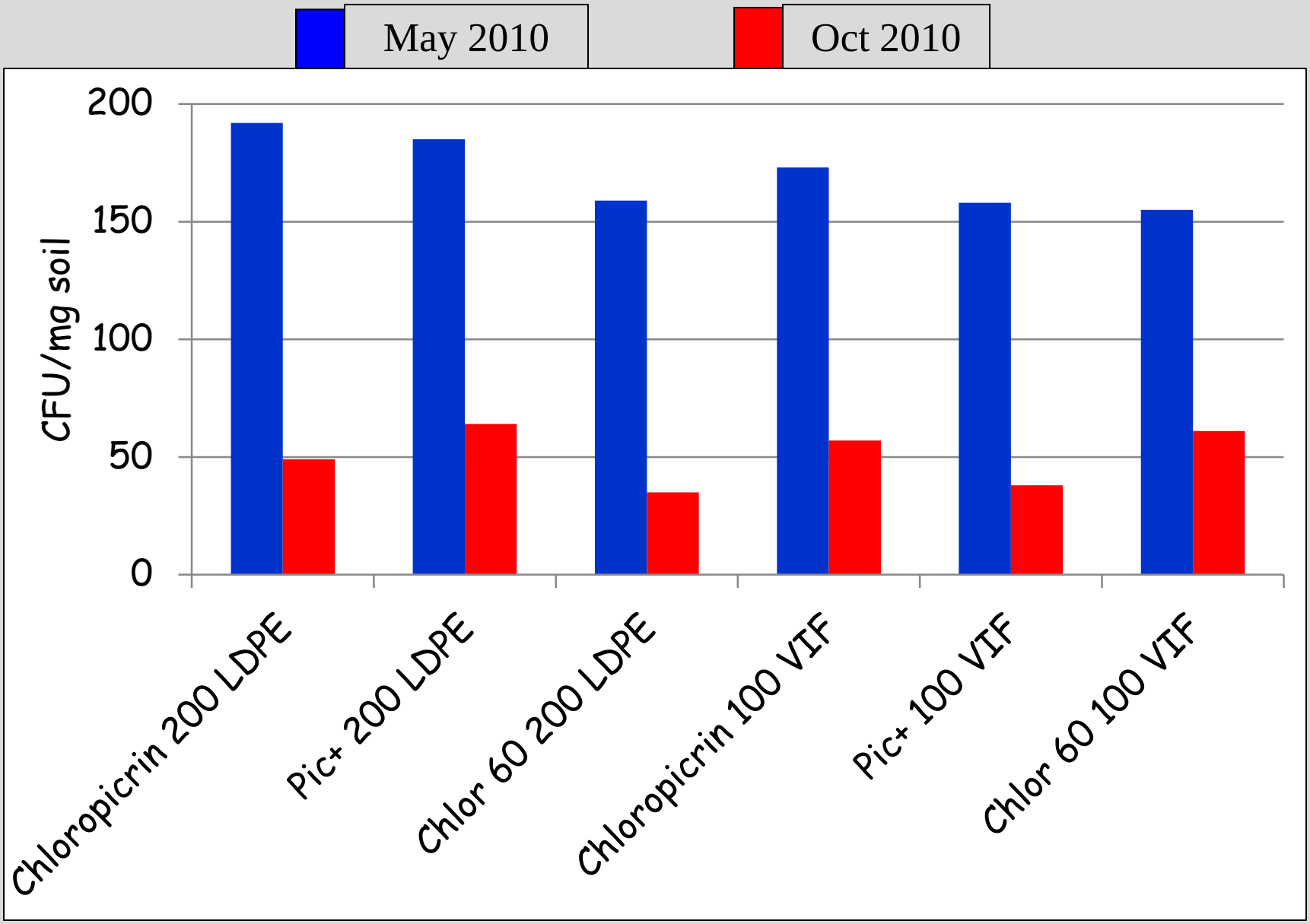
Glennville 2010: Culls vs. Non-culls

Cull = < 3.2 mm



1st Growing Season-2010

Glennville *Trichoderma*



Soil Analyses Revealed ……

Glennville Stunt nematodes/100 cc soil

May

Treatment	Plastic	Rep 1	Rep 2	Rep 3	Rep 4
Chlor 60 100	VIF	334(VH)	88 (H)	172(VH)	66 (M)
Chlor 60 200	LDPE	54 (M)	434(VH)	24 (L)	242(VH)
Chloropicrin 100	VIF	174(VH)	0	112 (H)	136 (H)
Chloropicrin 200	LDPE	58 (M)	0	118 (H)	4 (T)
Pic+ 100	VIF	108 (H)	4 (T)	132 (H)	152(VH)
Pic+ 200	LDPE	72 (M)	4 (T)	254(VH)	394(VH)

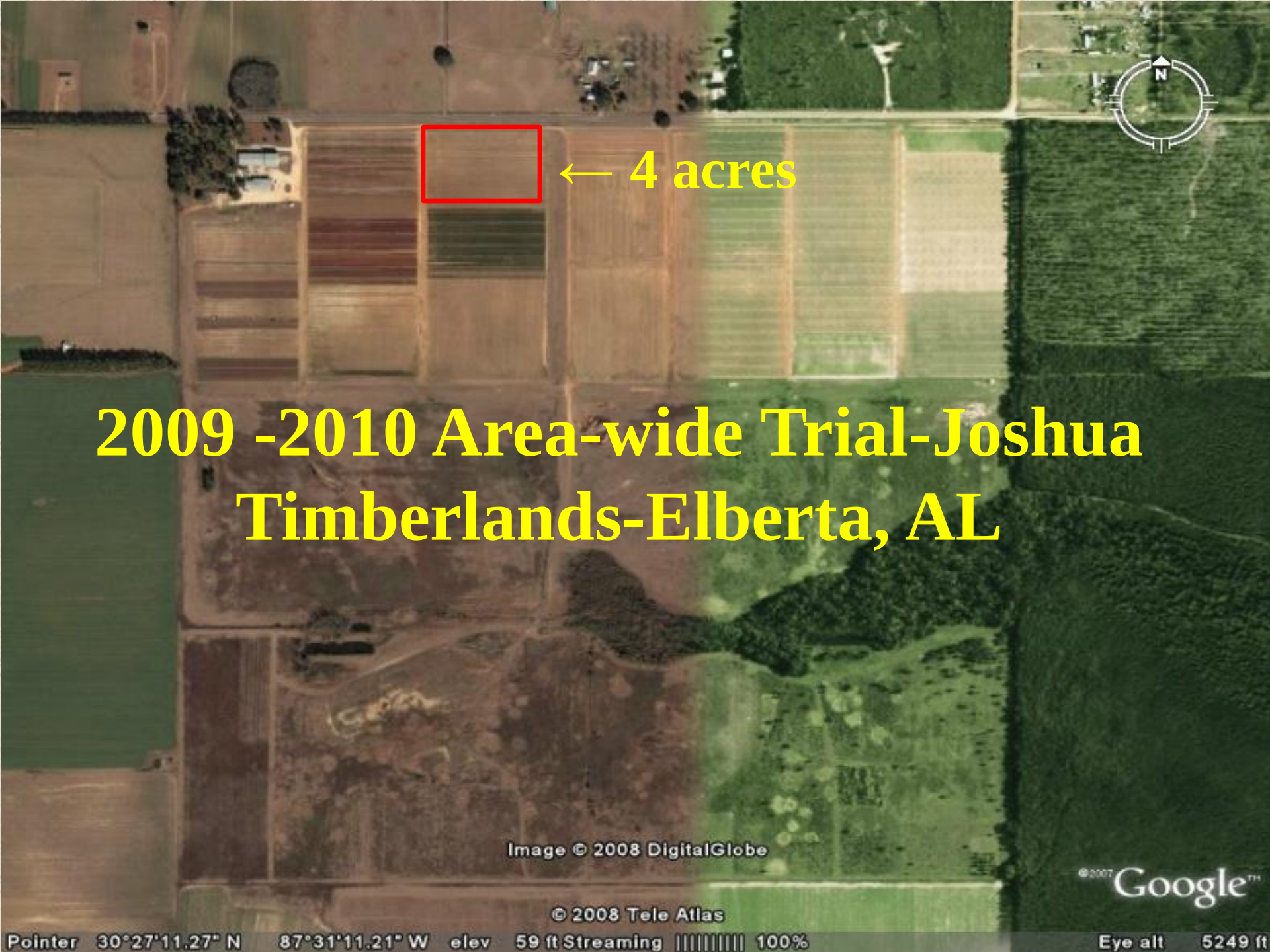
August

Possible reasons for lack of efficacy using Low Impact Rig

- Reduced rates of fumigant used (200/100 lbs/a).
- Low impact rig injects fumigants at a shallow depth compared to standard shank injected rig.
- The soil moisture content may have reduced 1,3-D (Telone) movement through soil.
- Compaction (rolling) of the area prior to fumigation may have prevented gas movement through the soil.

This is not a stunt!

The Glennville trial was not continued in 2011.


← 4 acres
2009 -2010 Area-wide Trial-Joshua
Timberlands-Elberta, AL
Image © 2008 DigitalGlobe
© 2008 Tele Atlas
Google
Pointer 30°27'11.27" N 87°31'11.21" W elev 59 ft Streaming 100%
Eye alt 5249 ft

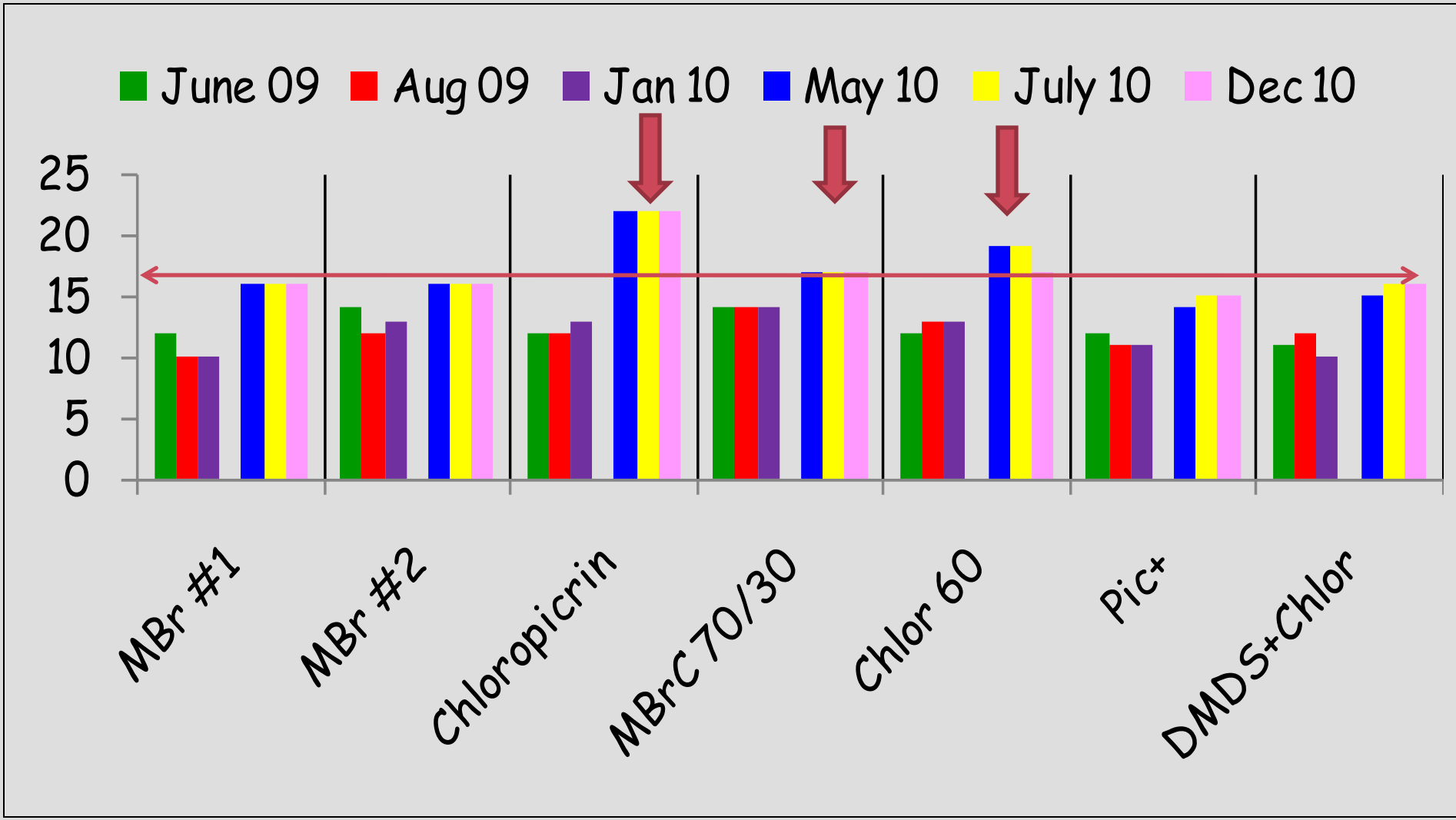
Elberta Trial Information

Fumigation Date	October 22, 2008
Fumigation Type	Shank injected Broadcast/flat tarp
Area in Trial	4 acres
Air Temperature	67 – 75 F
Wind Speed	3 – 10 mph
Soil Moisture	8.1%
Soil Series	Eustis loamy fine sand Red Bay fine sandy loam
Plastic in Place	HDPE-9 days

Elberta Fumigation Treatments

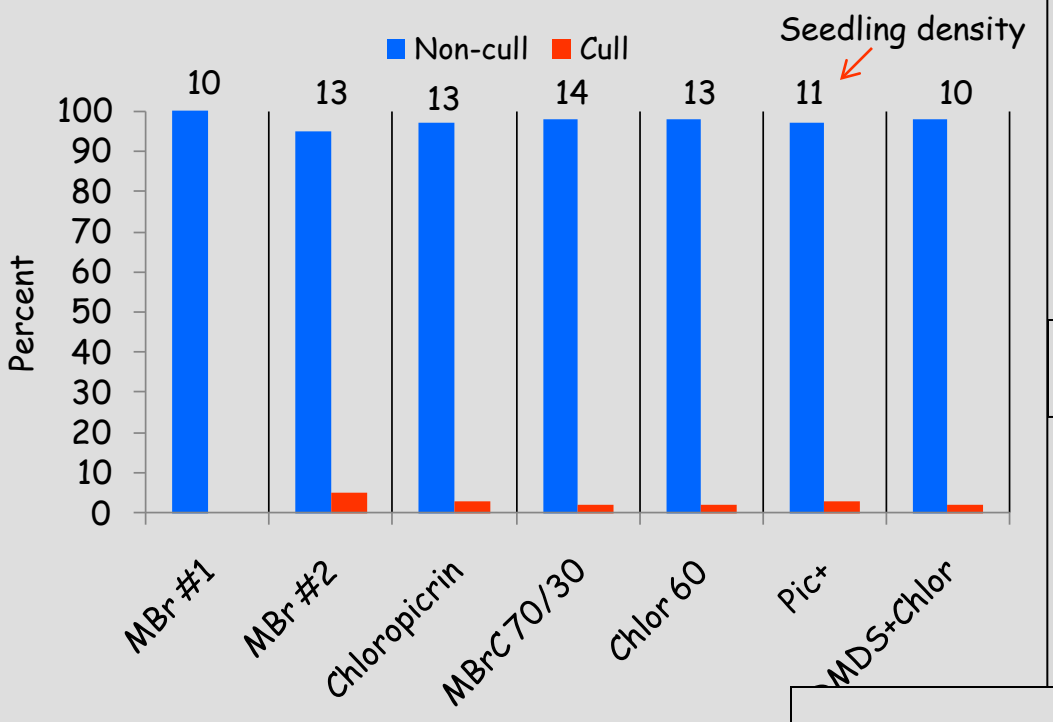
Fumigant	Rate	Components
MBr #1	400 lbs/acre	98% MBr + 2% Chloropicrin
MBr #2	235 lbs/acre	98% MBr + 2% Chloropicrin
Chloropicrin	300 lbs/acre	100% Chloropicrin
MBrC 70/30	400 lbs/acre	70% MBr (98/2) + 30% Solvent
Chlor 60	400 lbs/acre	60% Chloropicrin + 40% 1,3-D
Pic+	300 lbs/acre	85% Chloropicrin + 15% Solvent
DMDS + Chlor	70 gal/acre	79% DMDS + 21% Chloropicrin

Elberta Seedling Density



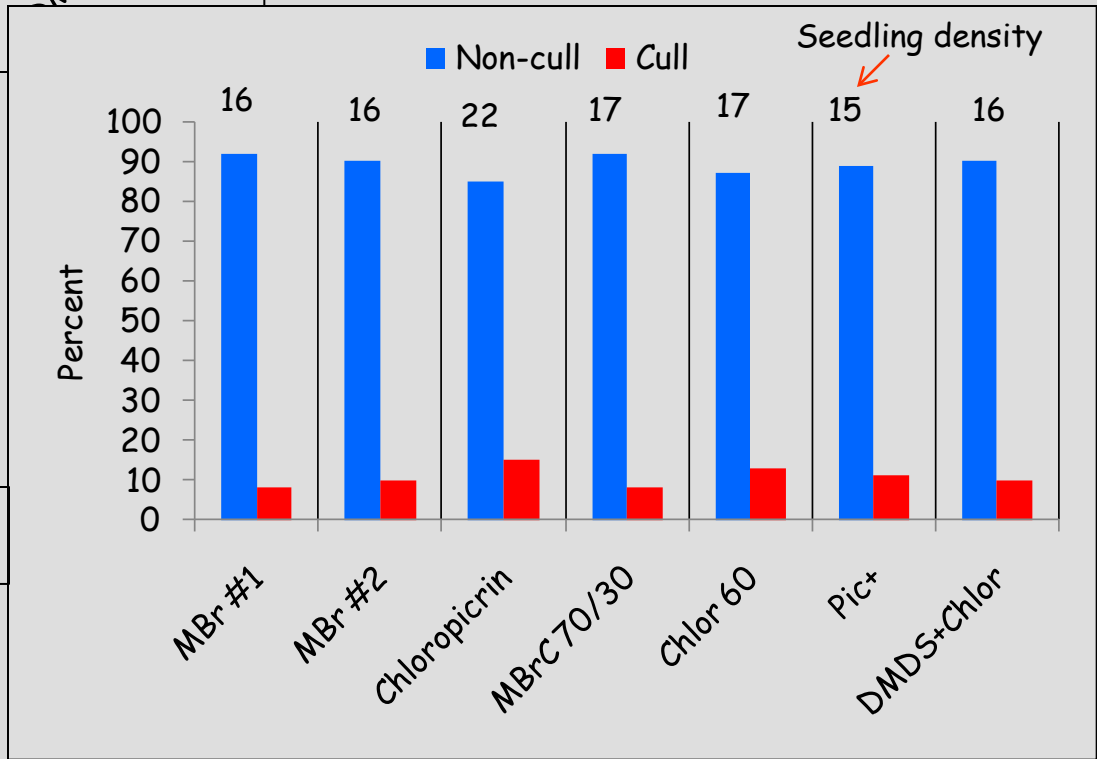
= Target seedling density 17/ft²

Elberta
Culls vs. Non-culls



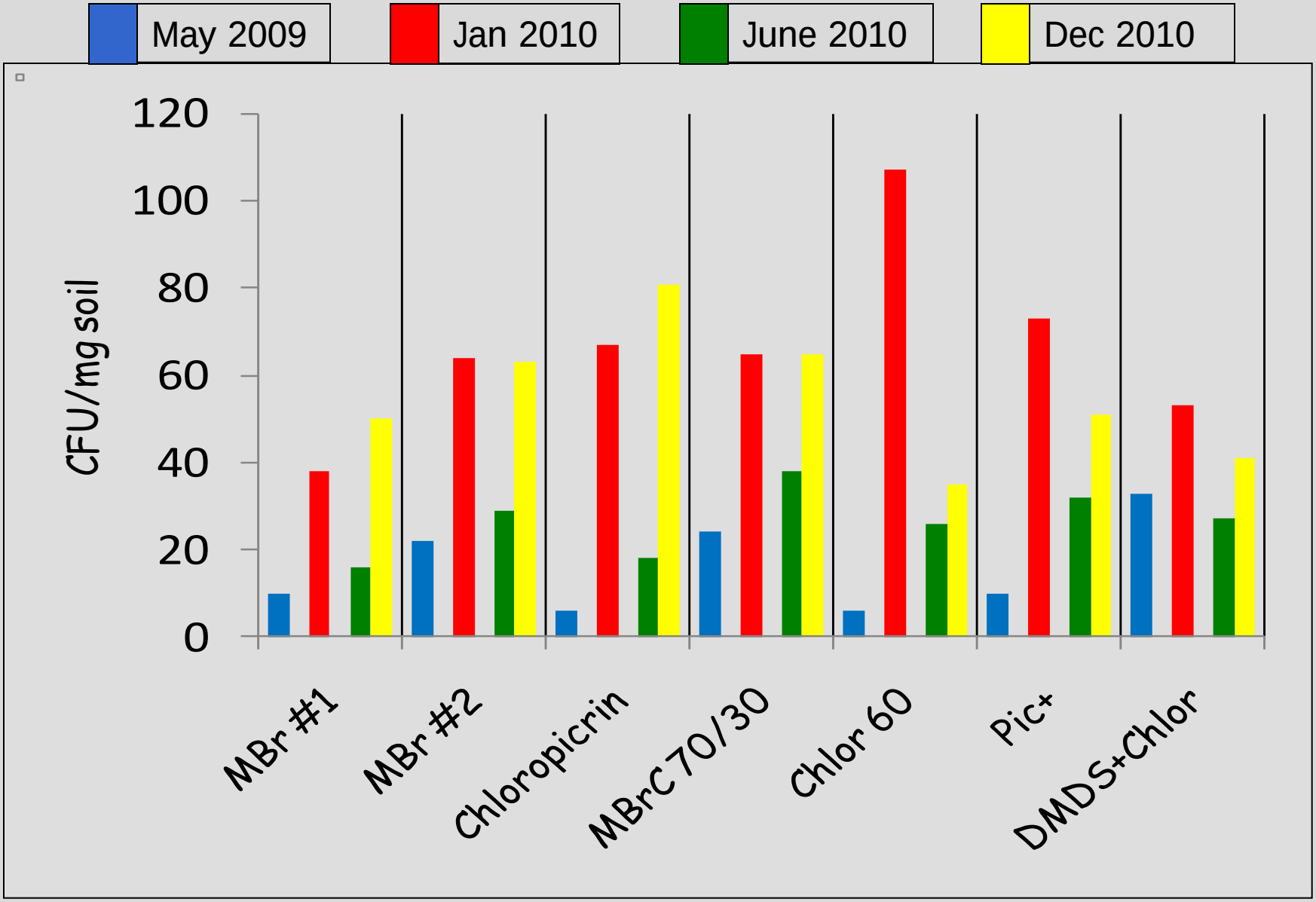
1st Year-2009

Cull = < 3.2 mm



2nd Year-2010

Elberta *Trichoderma*



Elberta 2009 Trial: Conclusions

- Fumigation with 100% Chloropicrin yielded the best seedling density.

- New root tip growth was similar between MBr at 400 lbs/acre and the alternative treatments (data not shown).

Paul Jackson
Email: paul.jackson@auburn.edu
Phone: 334-844-4917

Any Questions?