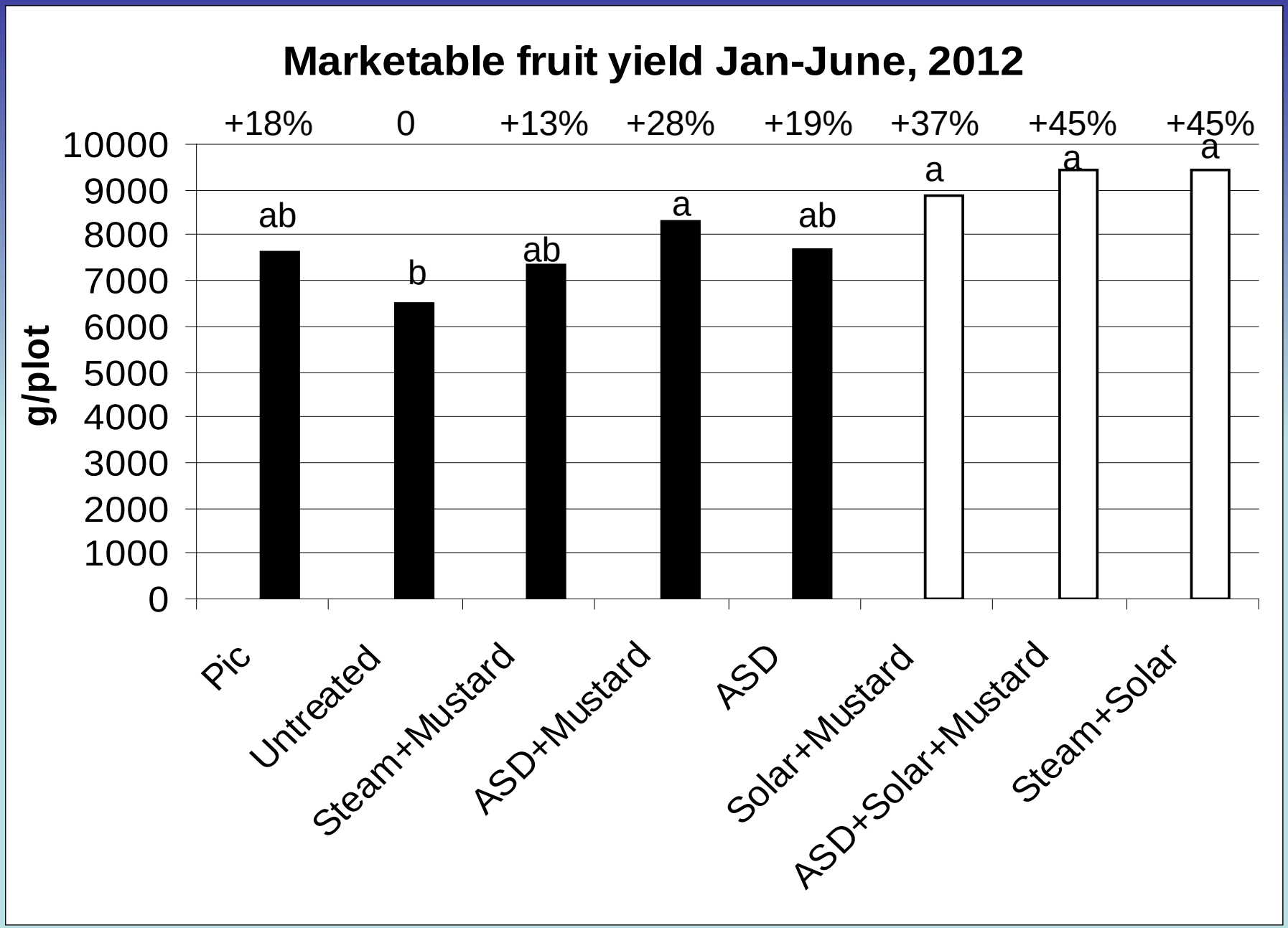
# Soil management to sustain strawberry production

Oleg Daugovish, Anna Howell, Bill Rutan, Steve Koike (UC-ANR), Joji Muramoto and Carol Shennan (UCSC), Tom Gordon (UC-Davis), Ruijun Qin (USDA), Husein Ajwa, J. Gerik , S. Gao (USDA, B. Hansen, UC –Davis)


ASD




Treatments with the same letter are statistically similar (*P*=0.05)

## *Macrophomina phaseolina*

**Steam + Mustard**

**ASD + Mustard + Solar**

**June 8. 2012**

# Adding rice bran to soil for ASD

Anaerobiosis

Organic acids

pH reduction

Micronutrient availability

Available Nitrogen

Infiltration and salt leaching

Available Phosphorus

Microbial population shifts

Interaction with pathogenic organisms?

Short vs long term?

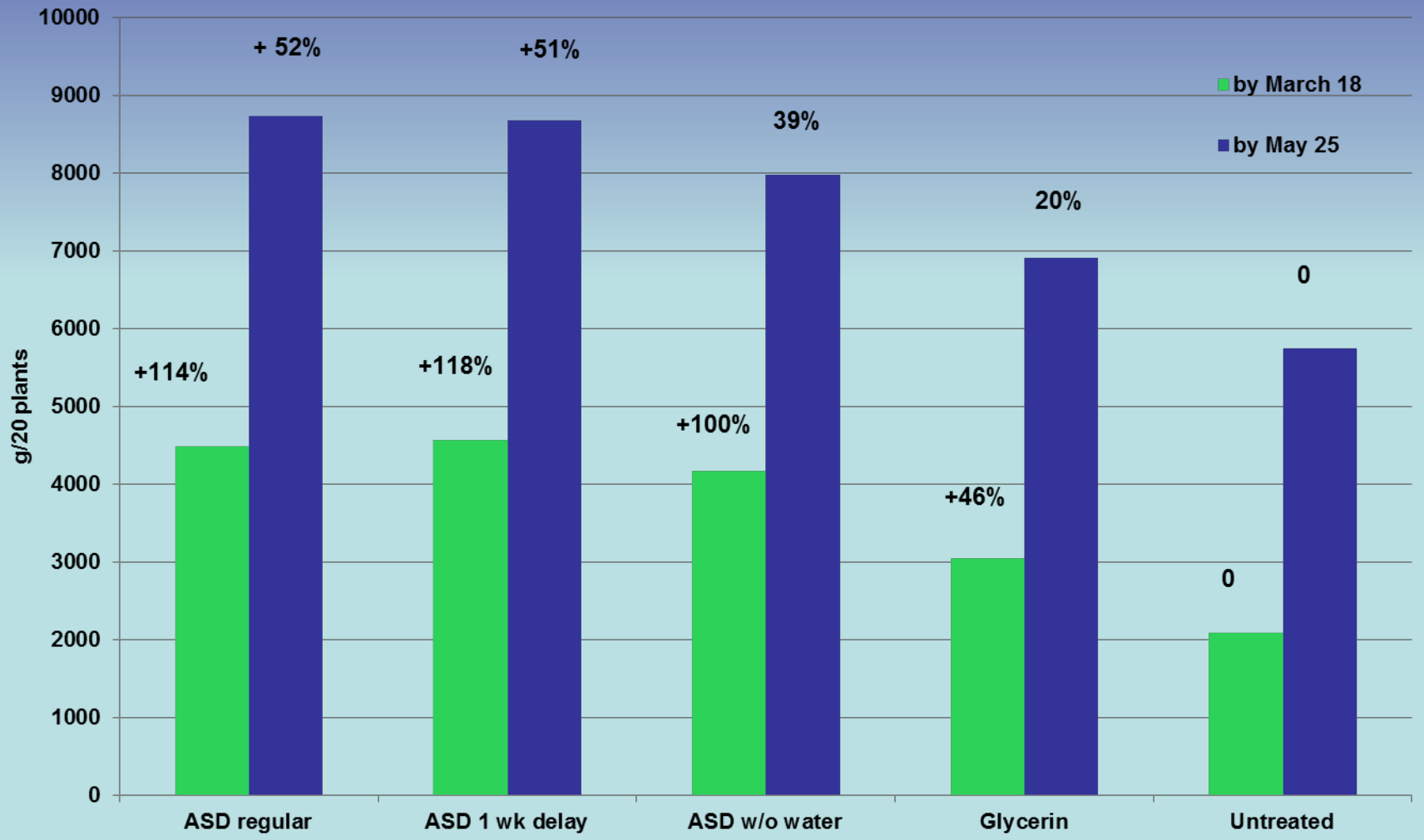
Other C-sources and soil environments?

# Effective ASD = C-source + water + plastic mulch

(and $3,000 /acre for 9 t Rice Bran ASD)

- 30 + trials of optimizing ASD since 2007 in berries
- Mulch types, water needs, duration of anaerobiosis, C-sources and effects on: pH and nutrients, soil properties, weeds and pathogens and crop performance
- Yields: ASD~fumigated soil or 30-50% more than untreated organic

# Last season: Marketable yield in clay loam soil



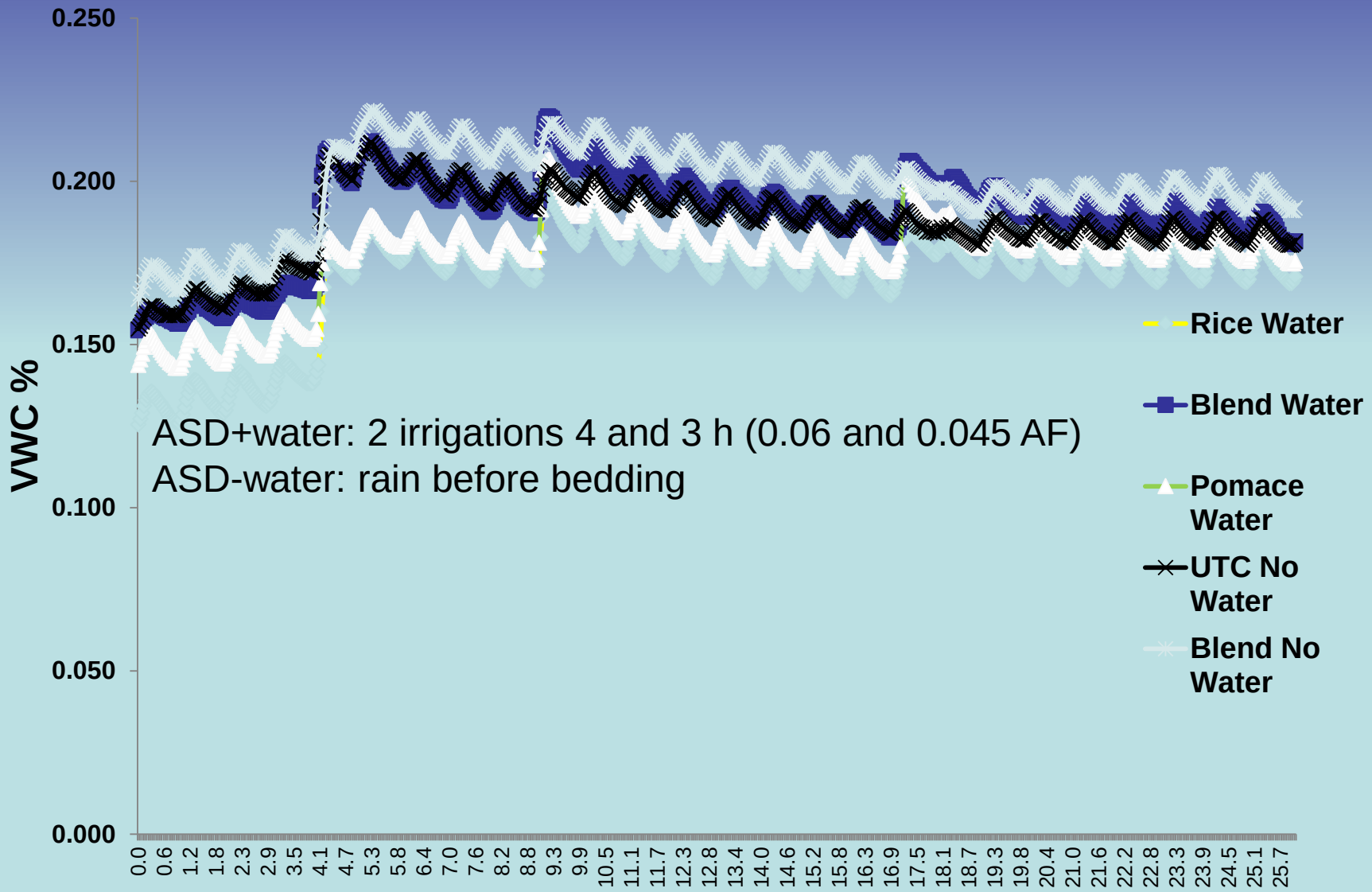
# For C-source:

- Rice bran
- Glycerin
- Grape pomace
- Molasses
- Coffee grounds
- Grass clippings
- Spent grain
- And other

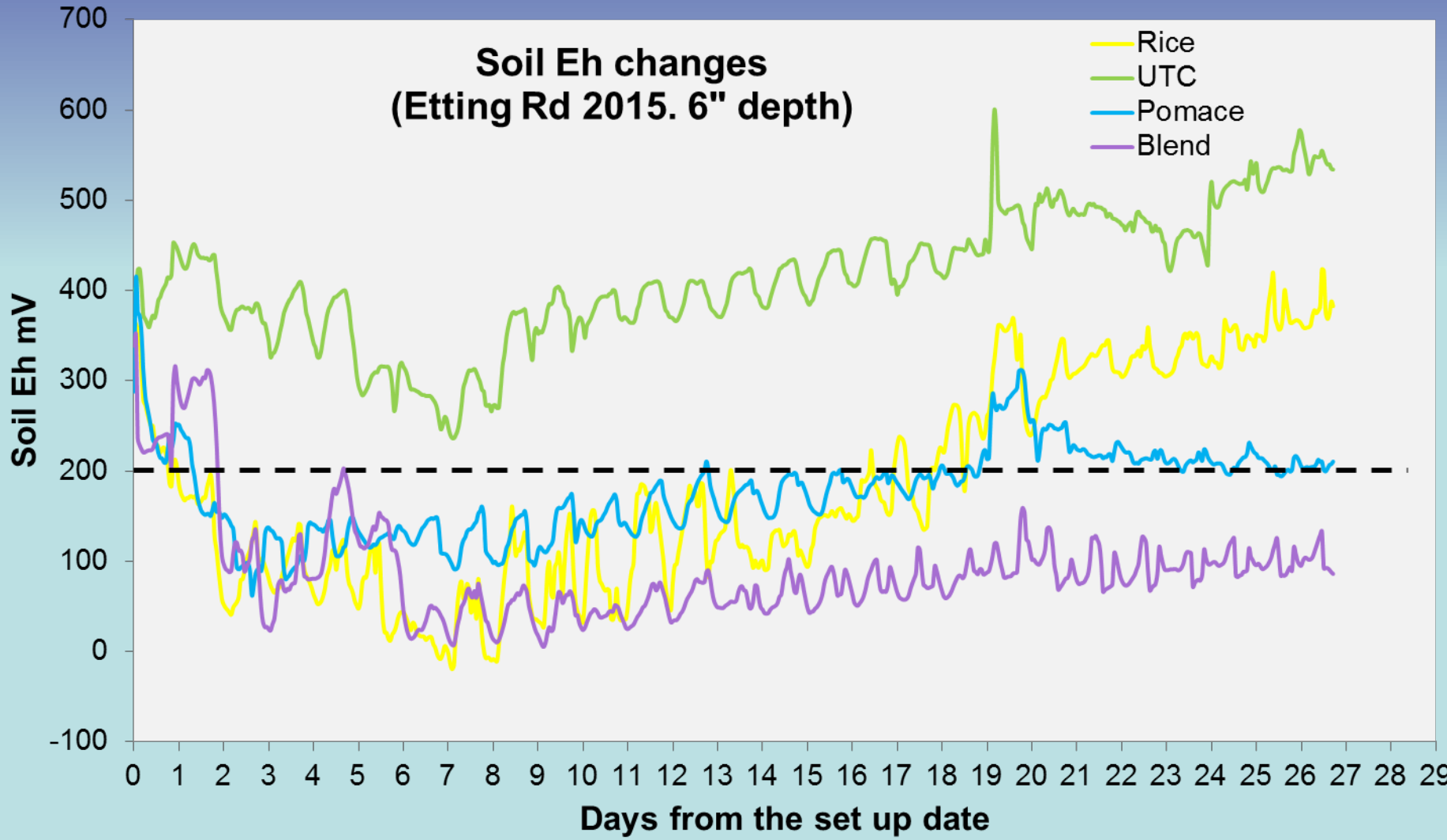
- Favorable C/N
- Easy to apply
- Cheap or Free and Available
- Min.Transportation
- Works consistently

# Grape pomace, rice bran and blend (rice+almond mix) in organic field

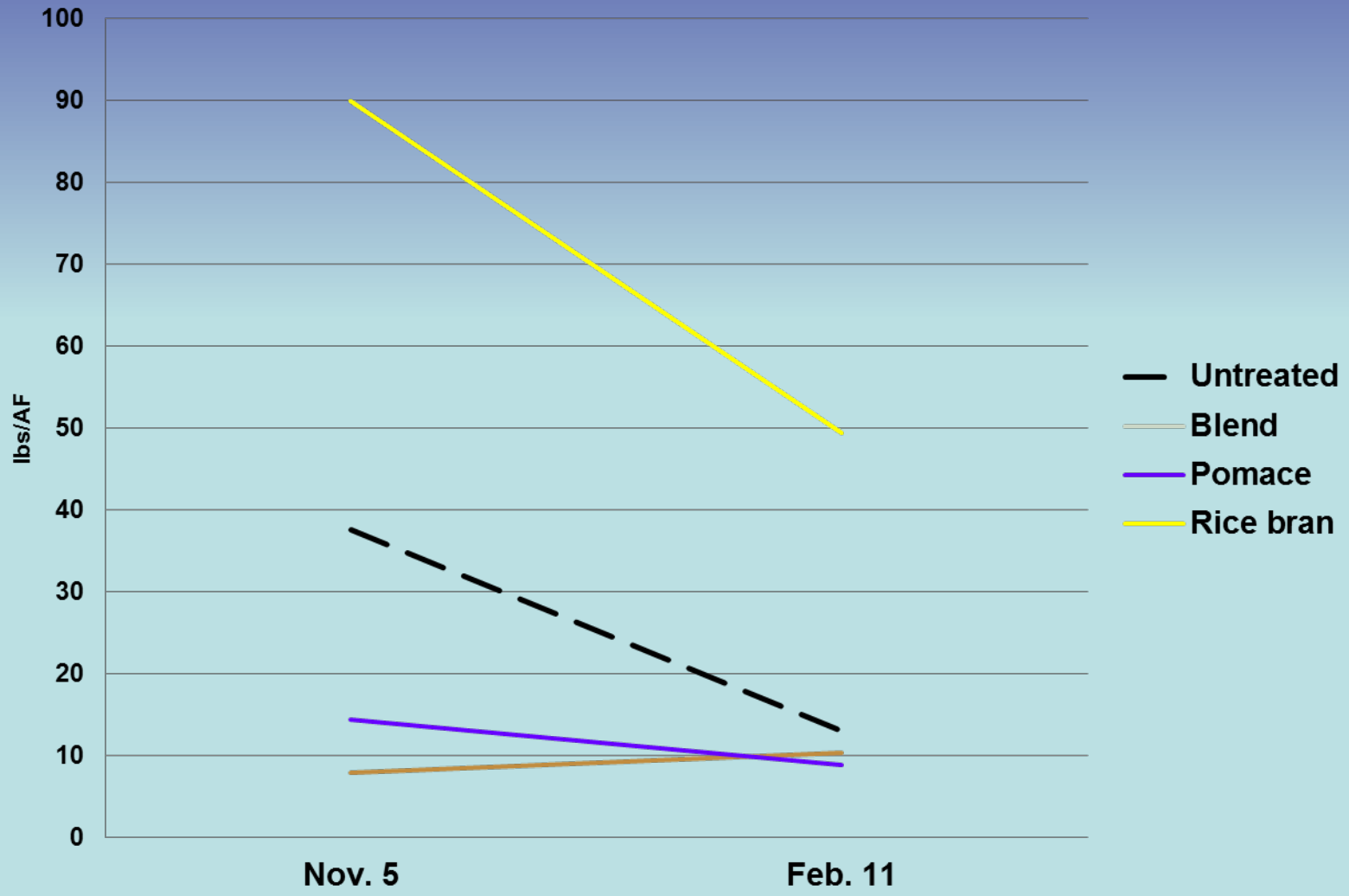
# Etting Rd Trial Soil Moisture



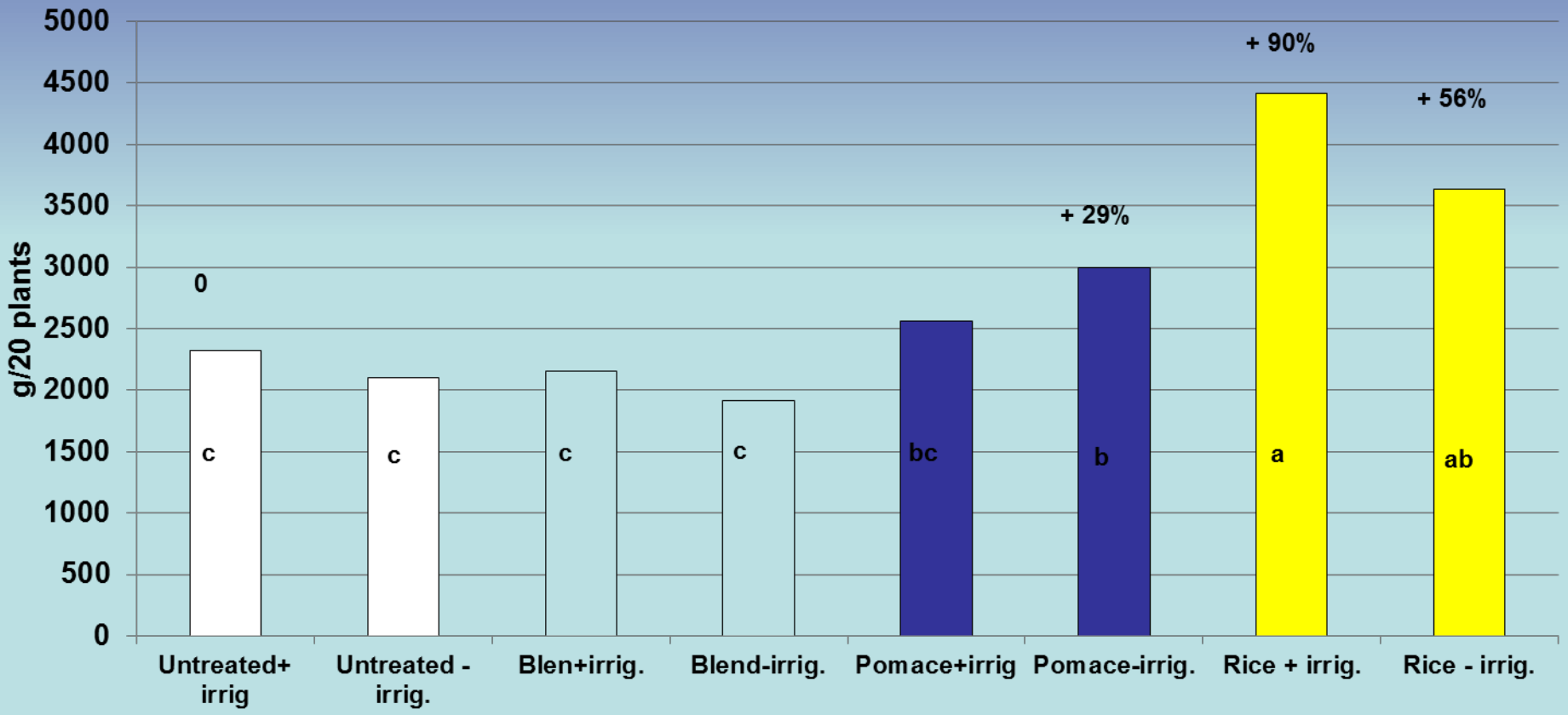
# Anaerobic conditions in sandy soil



# $NO_3$-N at 0 -12”

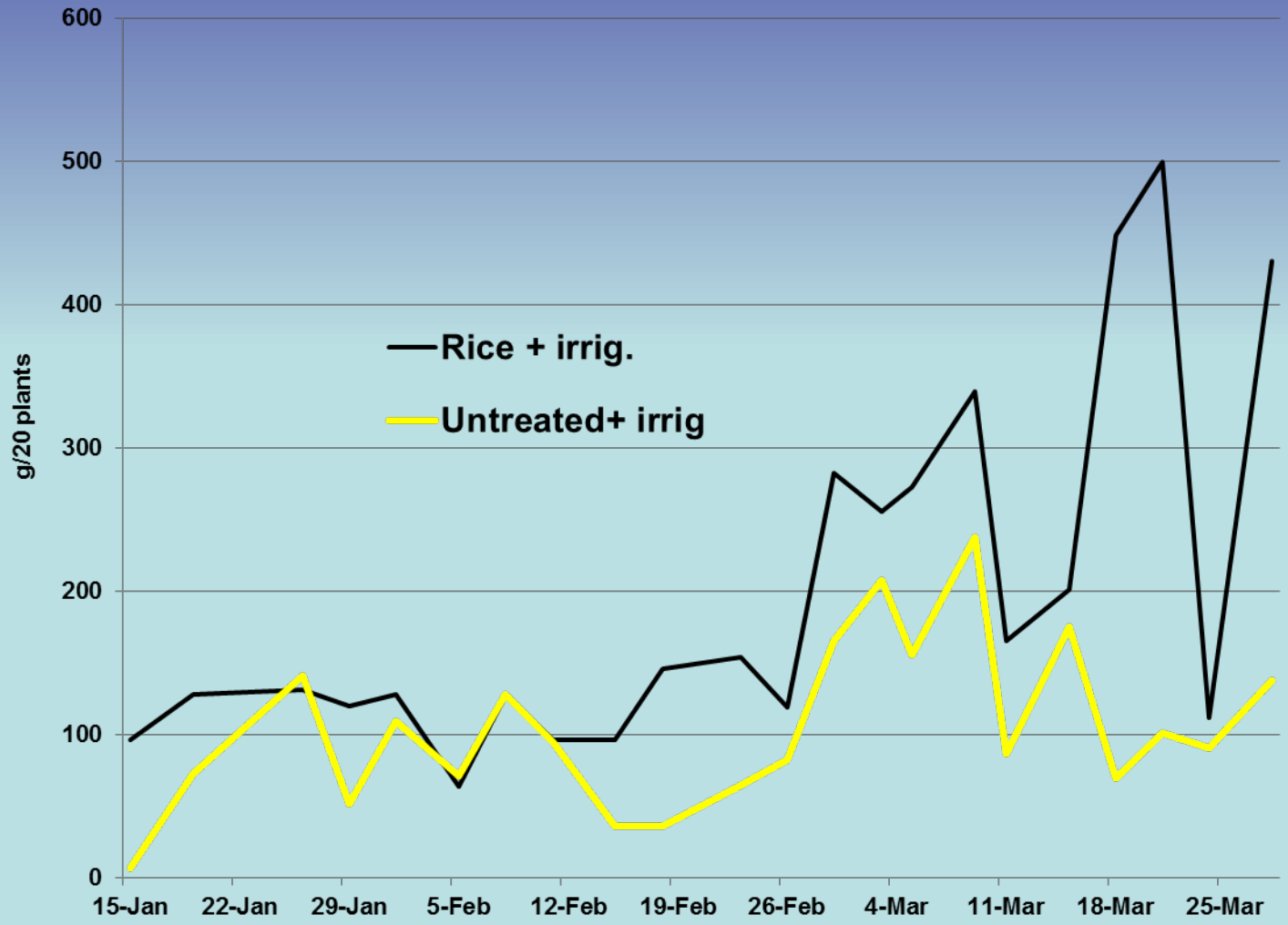

100
90
80
70
60
50
40
30
20
10
0
lbs/AF
Nov. 5
Feb. 11
Untreated
Blend
Pomace
Rice bran

# Marketable fruit yield, Dec-March

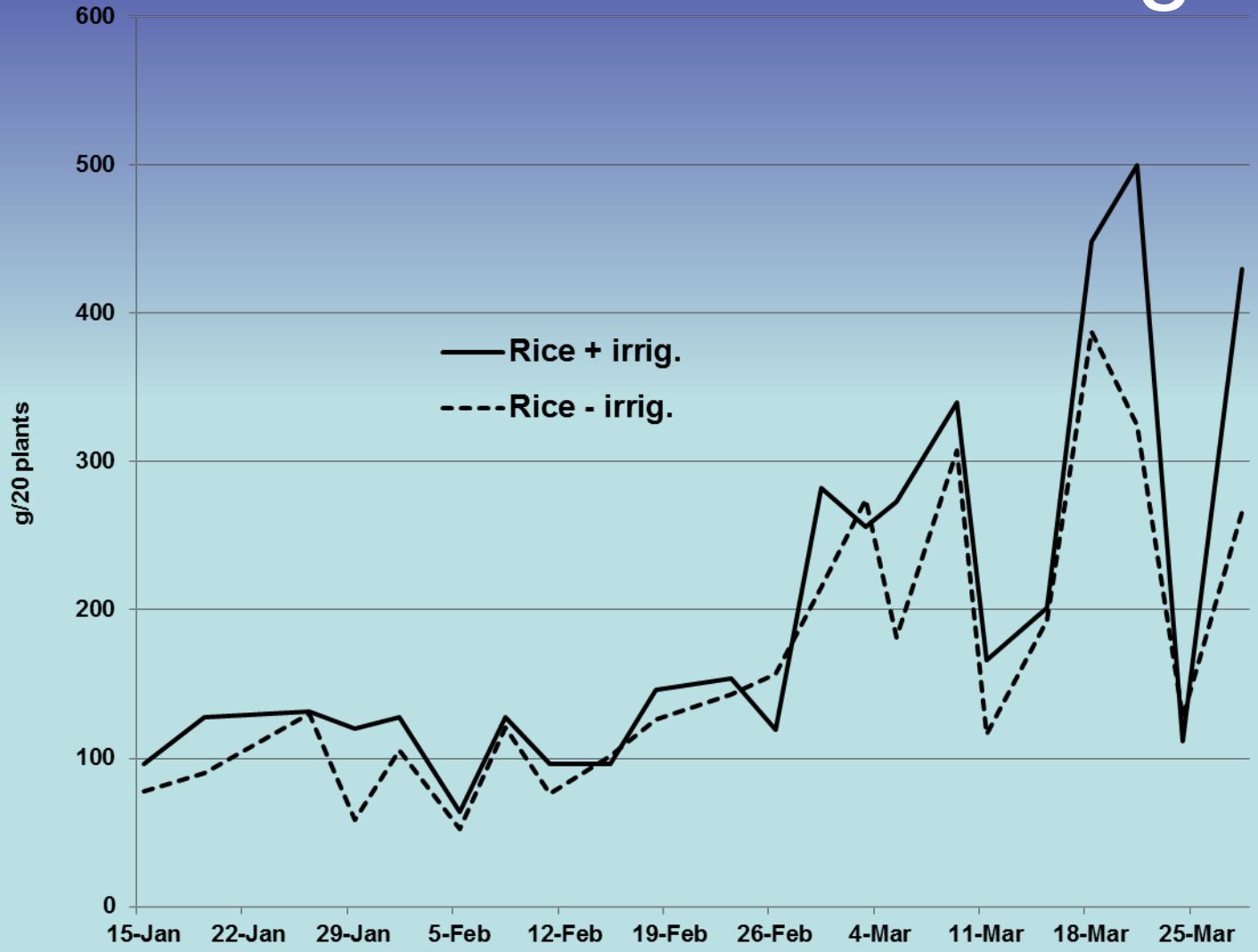



*Tretements with the same letter are not signif. different at P=0.05*

# Yield: Rice vs Untreated



# Yield: Rice with or w/o irrigation



## Blend 9T (almonds shells, rice etc.)

**Strong anaerobic conditions, but N deficiency, poor growth, susceptibility to spider mite damage**

## Rice bran 9T

**Fewer cumulative anaerobic hours than blend, but sufficient NO3-N availability for 2 months**

March 14, 2016

# ~~MB~~ Rice bran alternatives

## C-sources:

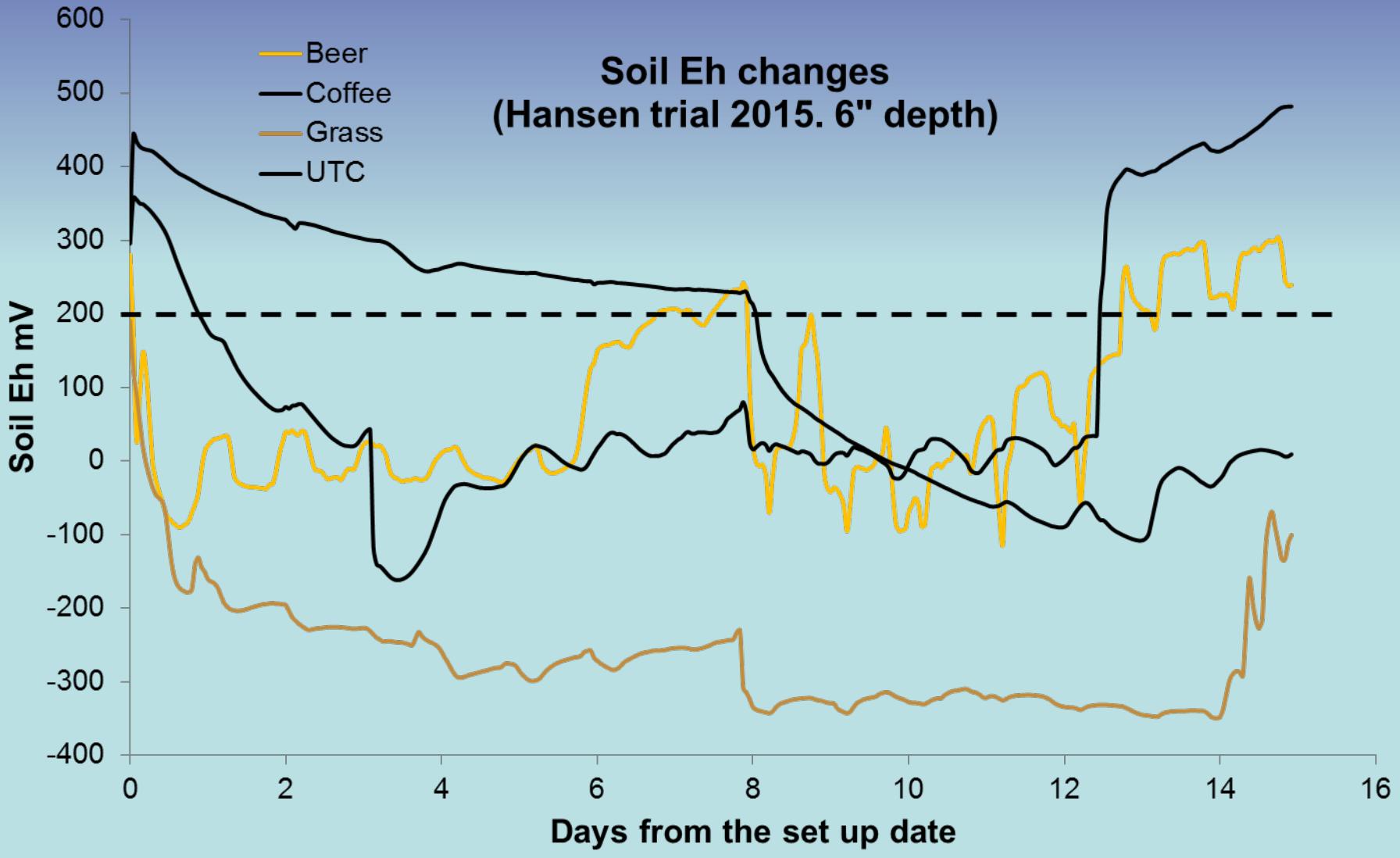
**favorable C/N ratio, local, available, cheap**

Coffee grounds
(Roasting plant at Camarillo)

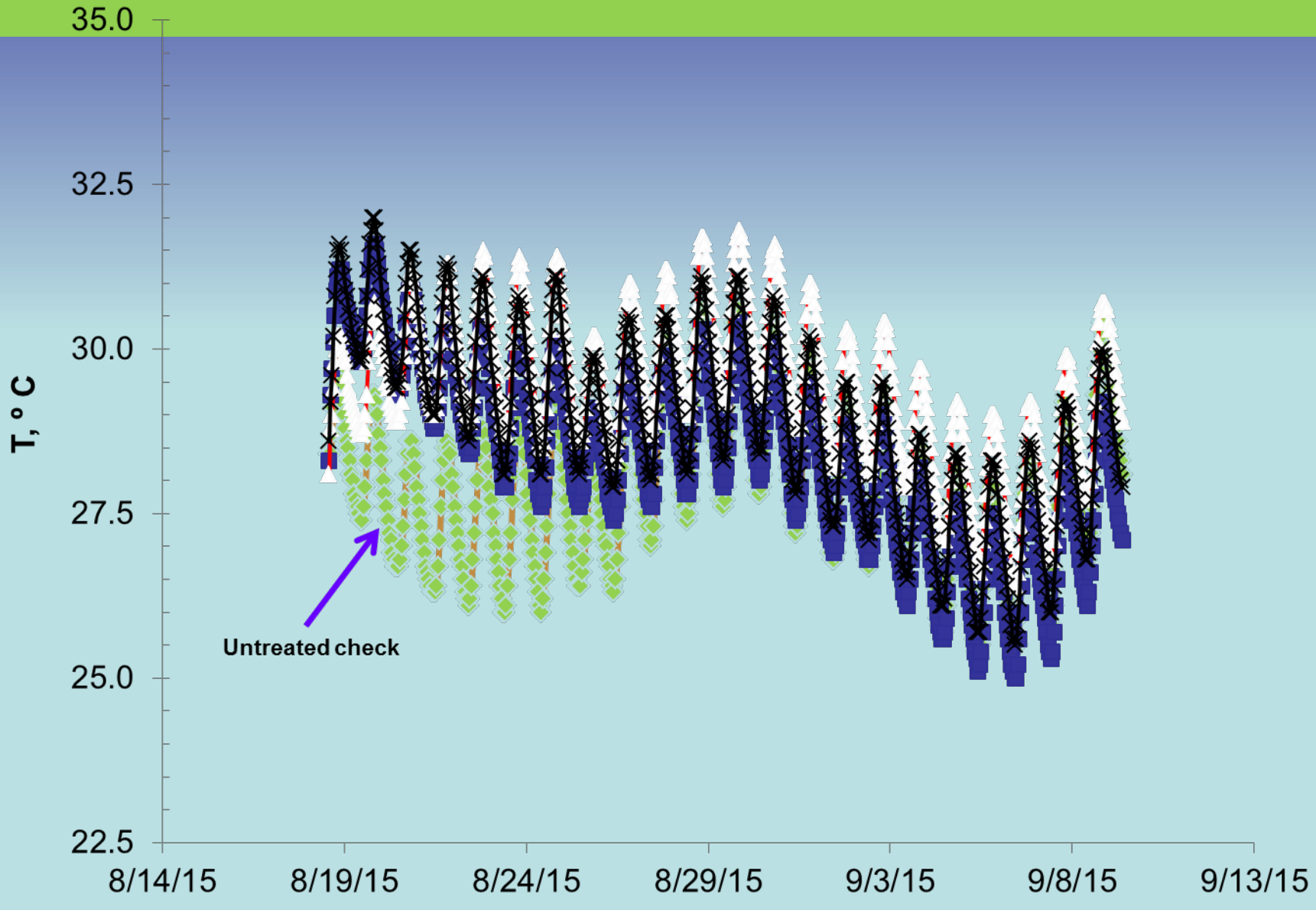
Spent grain
(Surf Brewery, Ventura)

Grass clippings
(Southland Sod at Camarillo)

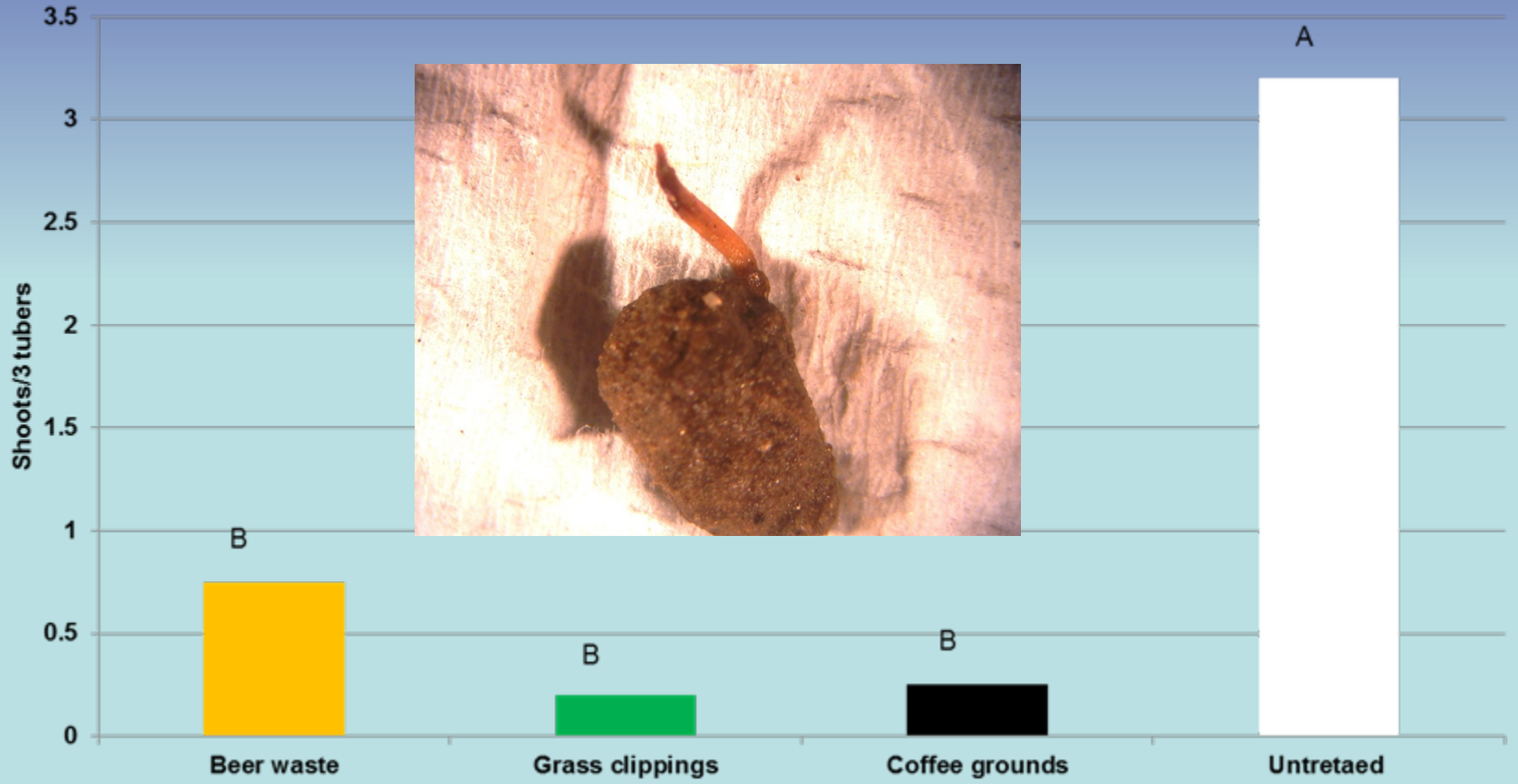
# Anaerobic conditions in clay loam soil (9 t dry weight /acre)



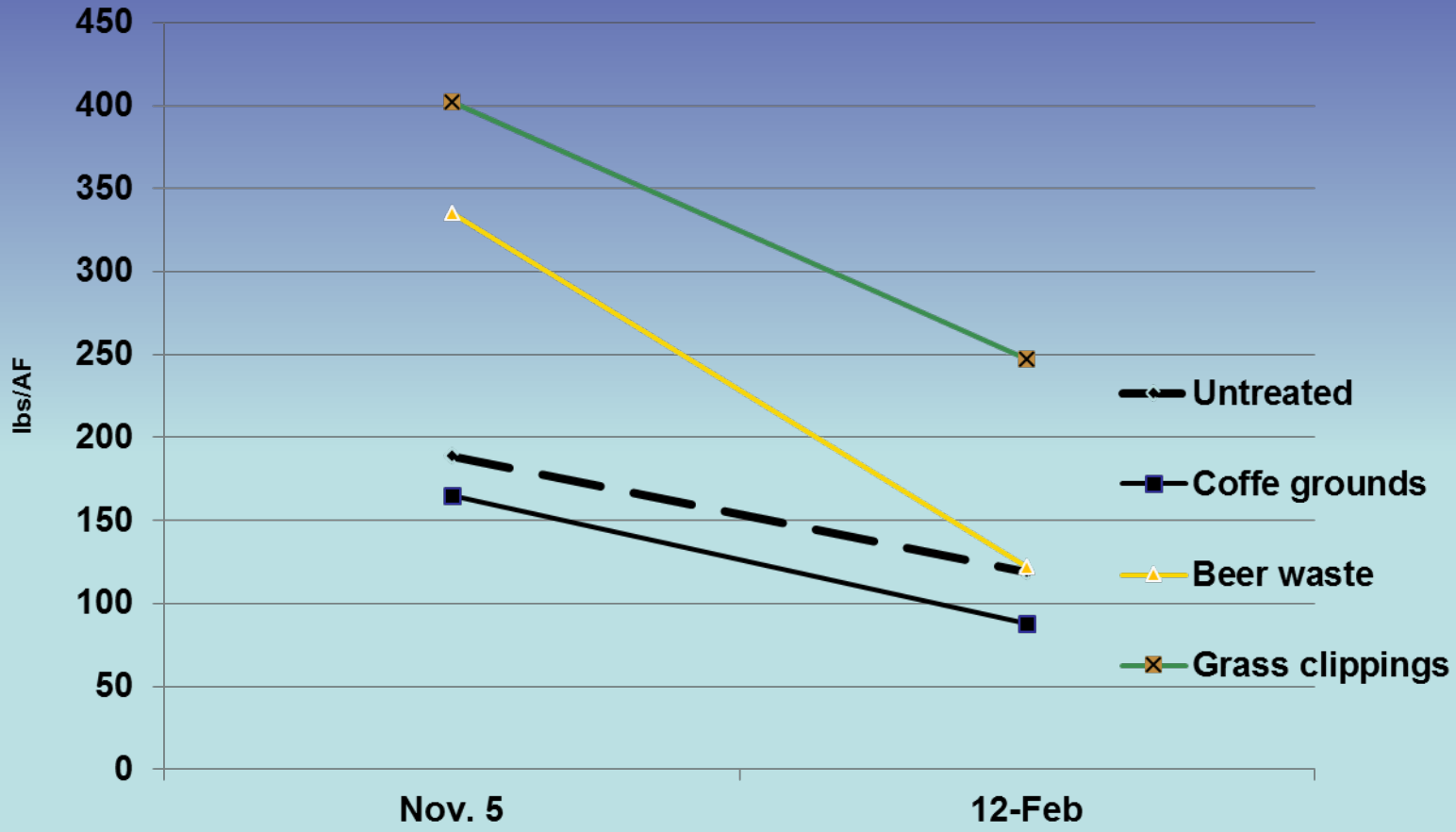
# Soil temperature at 15 cm in clay loam soil



# Yellow nutsedge shoots from buried tubers

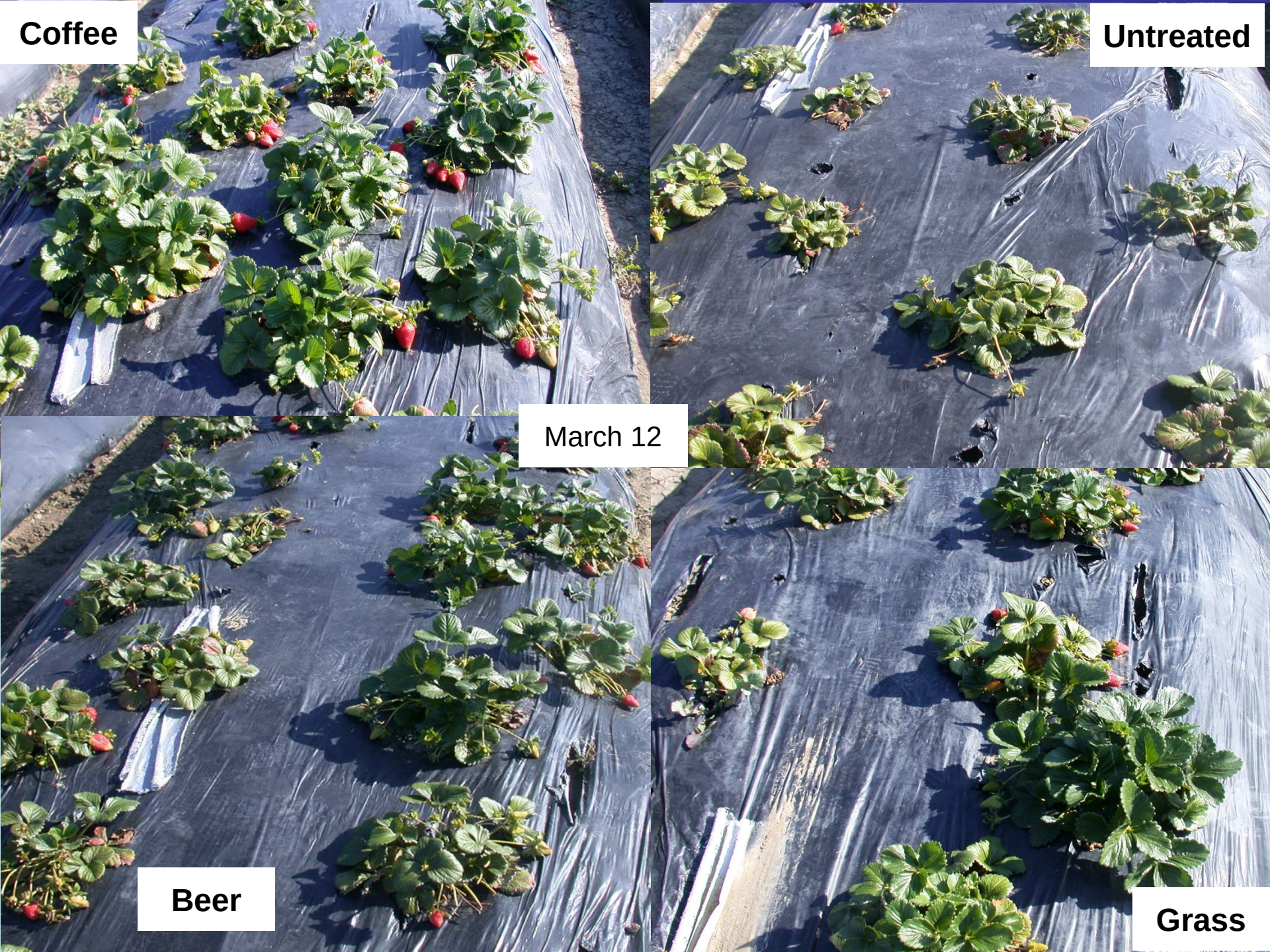


# $NO_3$-N
## at 0 -12”

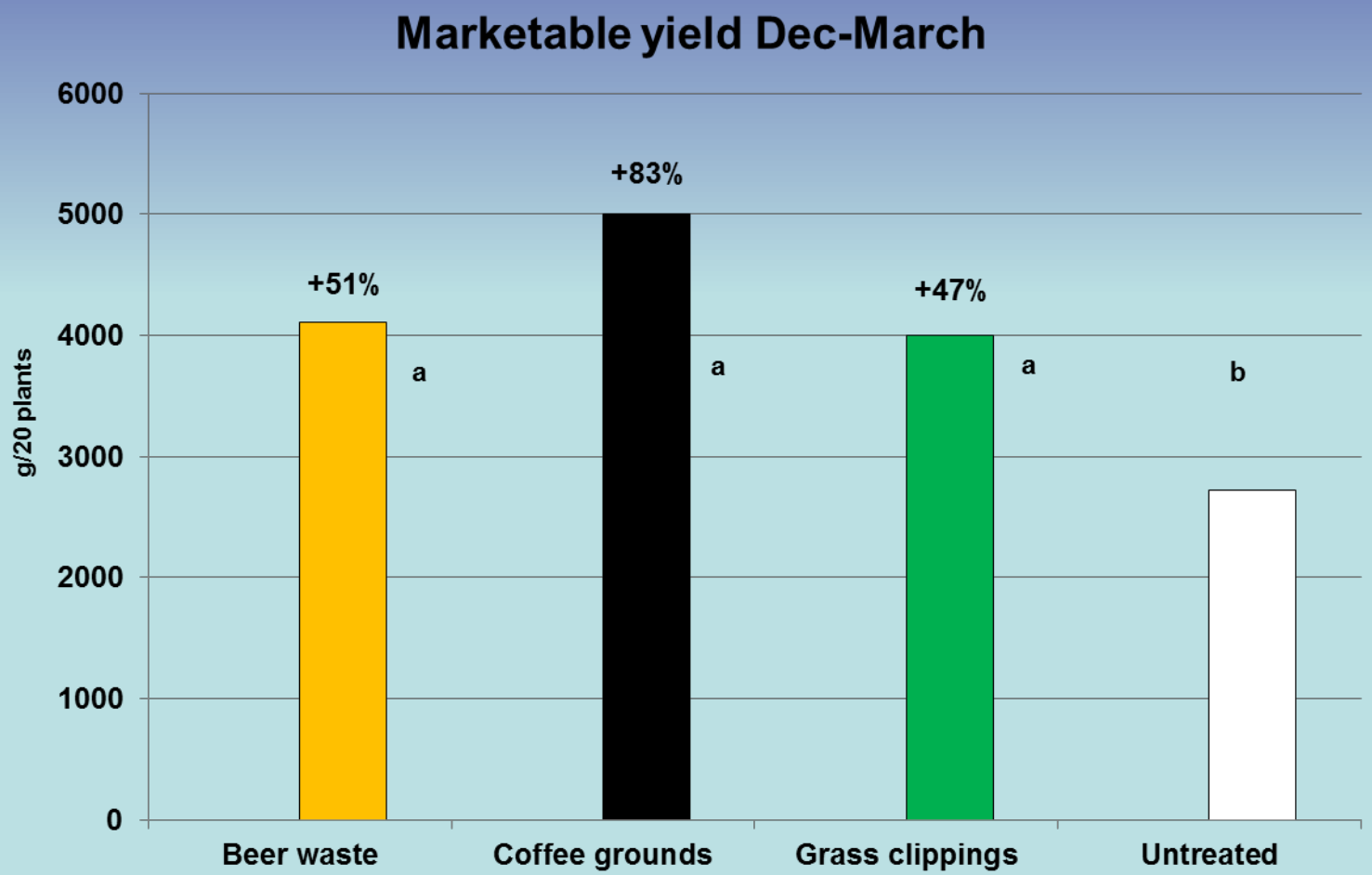



**Untreated check beds received 500 lbs/A of 18-6-8 pre-plant**


Untreated
Grass clippings
Nov 30, 2015
Beer waste
Coffee grounds


Coffee
Untreated
March 12
Beer
Grass

# Marketable yield: Dec-March



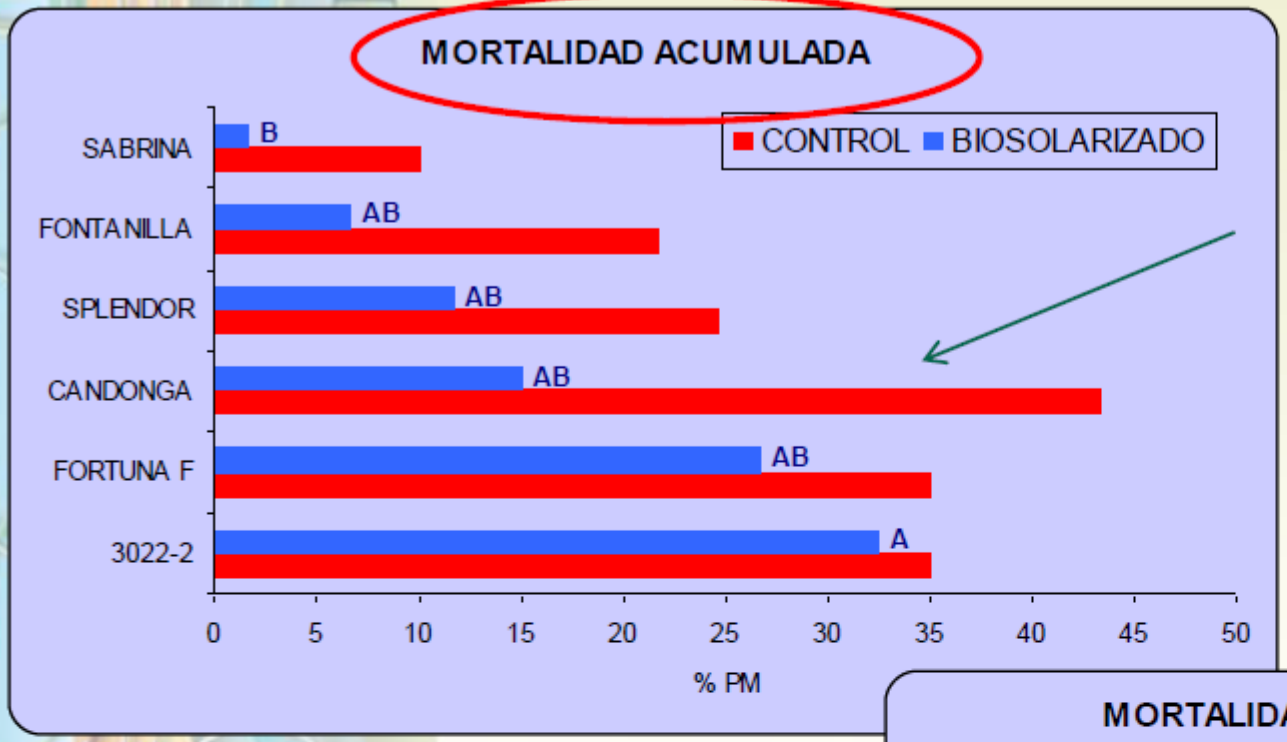
# Continuation of soil disinfestation work

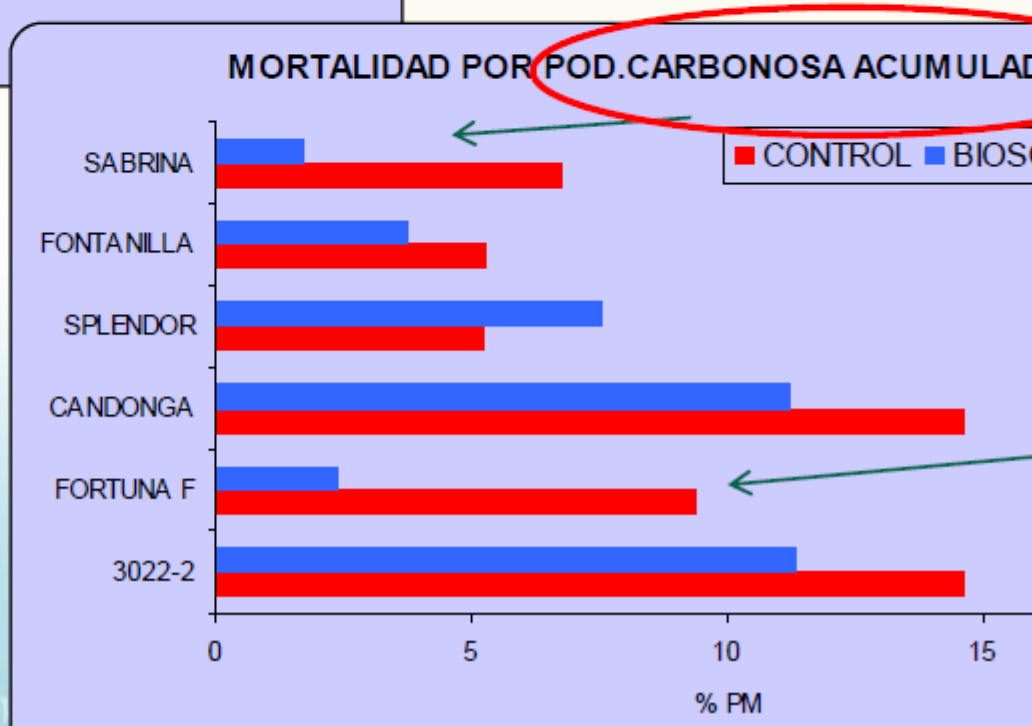
- C-sources that are cheap, abundant, local and cater to particular microbial groups?
- Changes in soil physical properties over time
- Since we don’t eradicate the problems:

  - intergrade ASD with other strategies (rotation, fumigation, steam, varieties)

  - Site-specific, variable rate applications:

  Molecular tools for rapid onsite pathogen identification



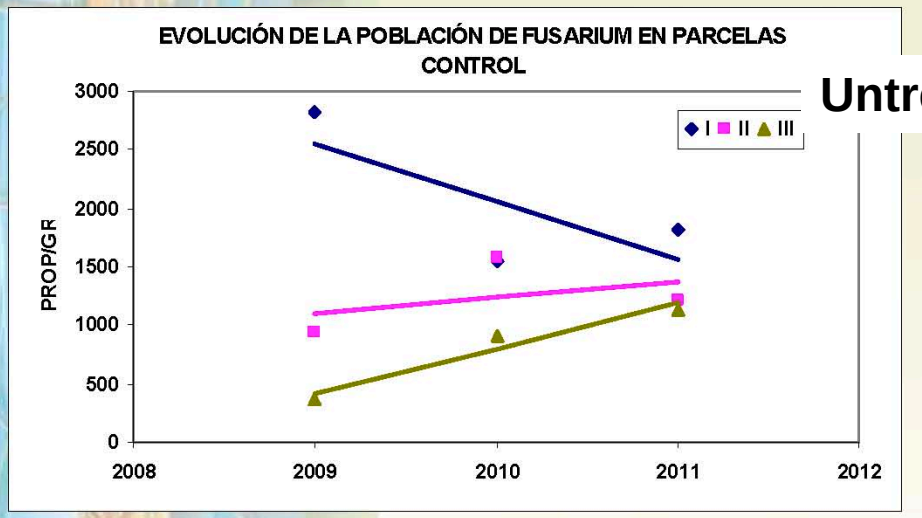

# POD. CARBONOSA
## *M. phaseolina*

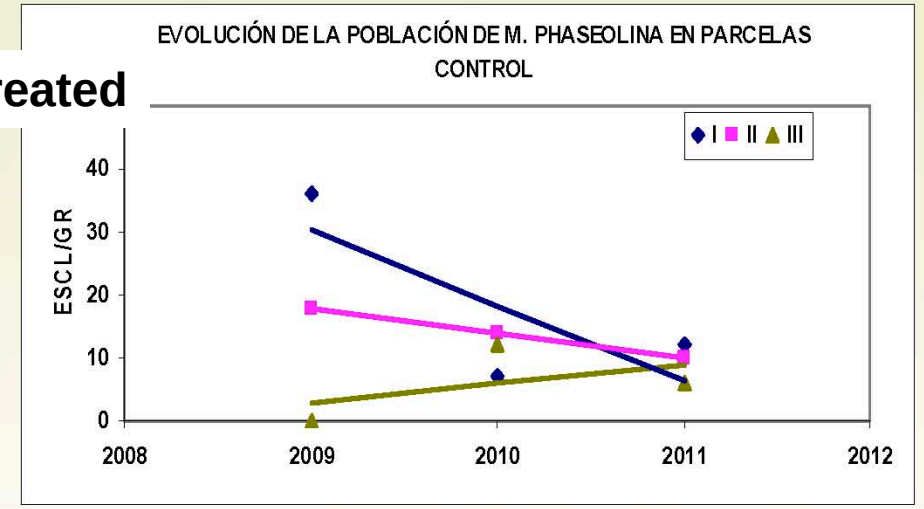
# OCCIFRESA

## Fusarium

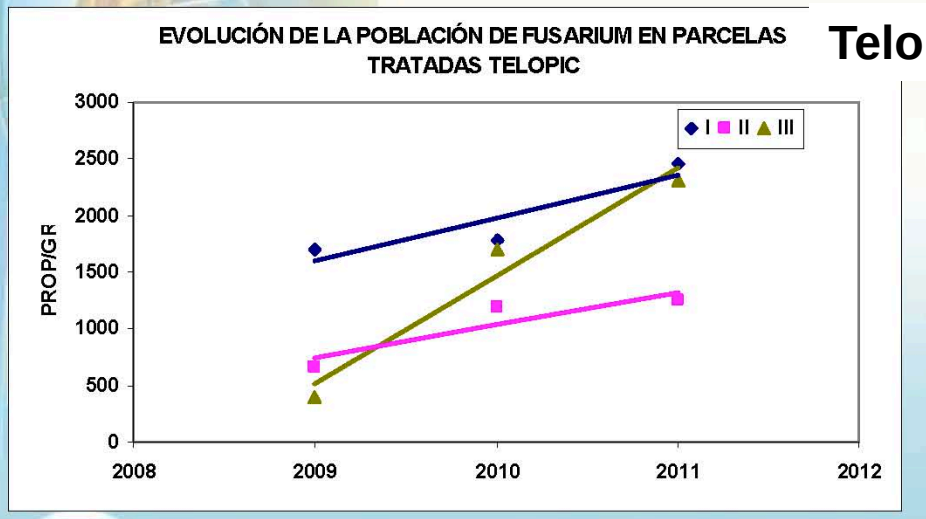
## Macrophomina

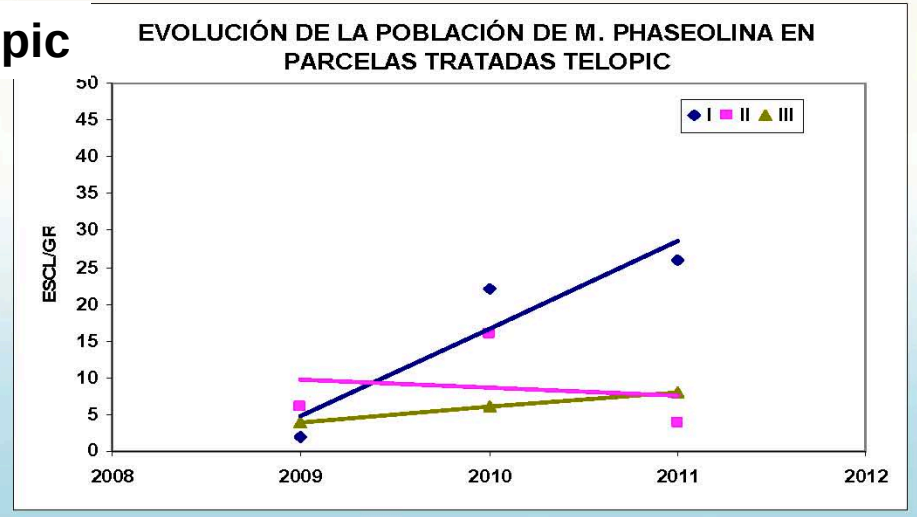
**Untreated**




**Telopic**



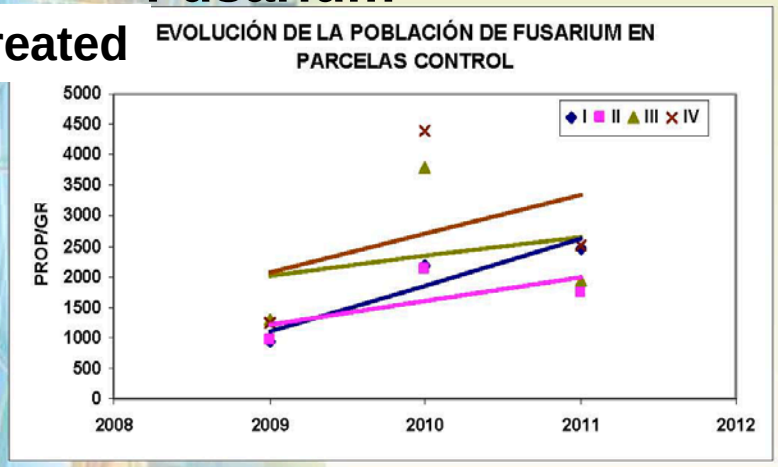

**DATOS DEL MUESTREO PRE-TTO**

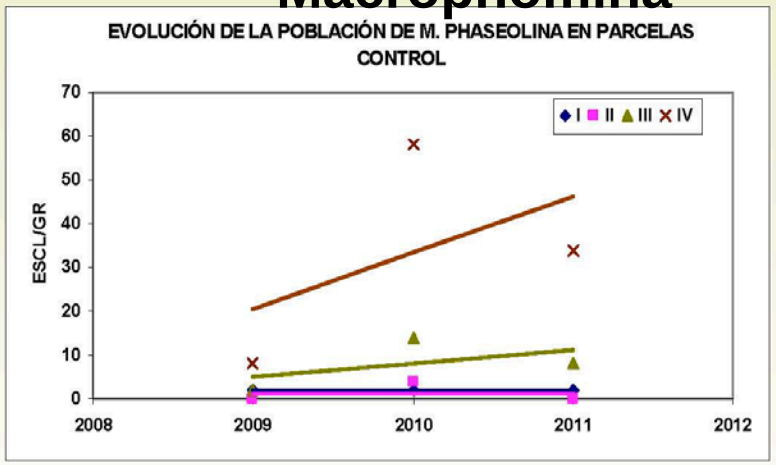
# ALTERNATIVAS BIOLÓGICAS

## Fusarium

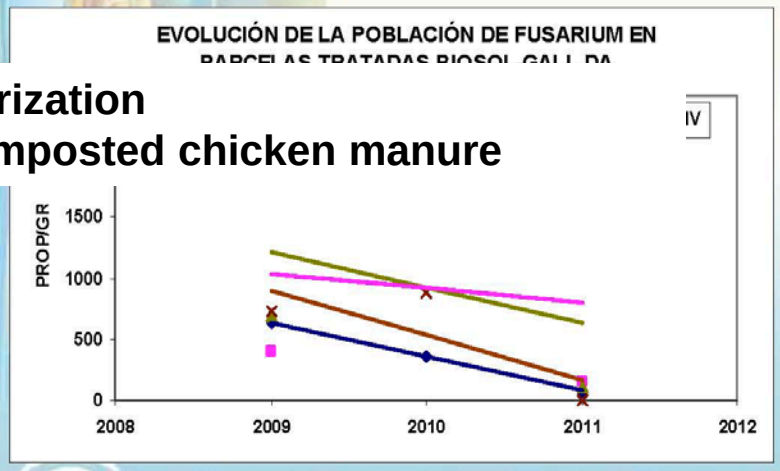
## Macrophomina

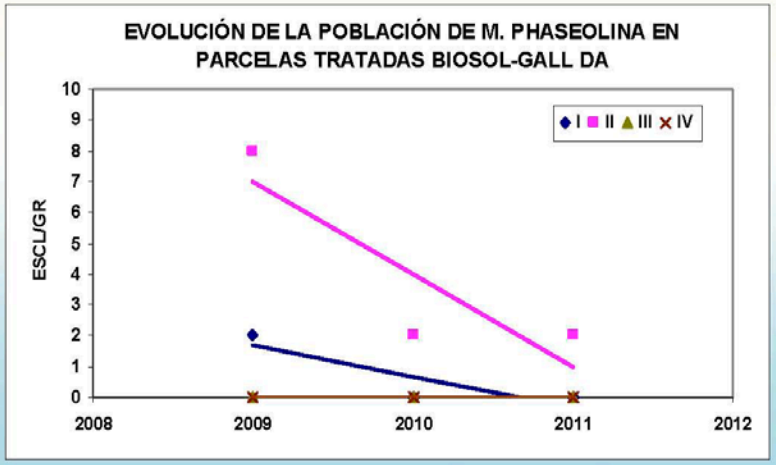
**Untreated**




**Biosolarization with composted chicken manure**




DATOS DEL MUESTREO PRE-TTO

# *Acknowledgements:*


- Jose Romero and Hector Gutierrez
- UC Hansen staff
- UCCE Master Gardeners
- CSC
- Solimar Farms
- Farm Fuel
- IFAPA-Spain