

NONFUMIGANT STRAWBERRY PRODUCTION

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MAIN TOPICS

- I. California Department of Pesticide Regulation - **Nonfumigant strawberry production action plan.**
- II. **Steam** as a nonfumigant alternative in strawberry

THE NONFUMIGANT COMMITTEE – GILROY AUG. 8 & 9, 2012



NONFUMIGANT ACTION PLAN 2013

- ❖ **Discovery**
- ❖ **Research and Evaluation**
- ❖ **Adoption and Demonstration**
- ❖ **Summary**

I. DISCOVERY – PLANT BREEDING

- ❖ **Breed for genetic resistance**
- ❖ **Screen for resistance to major California strawberry diseases – a long term solution!?**
- ❖ **Identify markers associated with disease resistance genes – marker assisted selection.**
- ❖ **Try grafting as a method of enhancing disease resistance.**

I. DISCOVERY: BREEDING FOR VERTICILLIUM RESISTANCE

- ❖ Breeding for increased resistance is being conducted by the University of California and private breeders. See Shaw et al. 2010 California Agriculture 64:37-41.**
- ❖ Thus far Verticillium wilt tolerance in strawberry is not adequate.**

SCREENING FOR VERTICILLIUM RESISTANCE – UC BREEDING PROGRAM



Since 1994, the UC strawberry breeding program has screened more than 480 genotypes for *V. dahliae* resistance. *Left*, a resistant cultivar; *right*, a susceptible breed.

Shaw et al. 2010

I. DISCOVERY – MANAGE SOIL HEALTH

- ❖ Identify & evaluate soil microorganisms that influence strawberry plant health.
- ❖ Explore how soil microbial ecology is influenced by the cropping environment.
- ❖ Develop treatments for managing soil microbial populations.
 - ❖ Anaerobic soil disinfestation (ASD)
 - ❖ Mustard seed meals
 - ❖ Cover crops & composts

II. RESEARCH AND EVALUATION – FOCUS AREA 1. IMPROVE VIABILITY OF MANAGEMENT OPTIONS

- ❖ Strawberry production in substrates**
- ❖ Biological pesticides**
- ❖ Anaerobic soil disinfestation (ASD)**
- ❖ Soil disinfestation with steam**

II. RESEARCH & EVALUATION: FOCUS AREA 2. INTEGRATE NF SYSTEMS WITH IPM PRACTICES

❖ Improve understanding of nonfumigant options + IPM practices

- ❖ Removal of old plants from field to reduce inoculum load
- ❖ Crop rotations
- ❖ Use of soil amendments such as mustard seed meals

❖ Explore IPM practices that combine fumigant and nonfumigant options

- ❖ Combine fumigant use in high disease pressure areas with nonfumigant treatments

II. RESEARCH & EVALUATION: FOCUS AREA 3. PROMOTE COLLABORATION

- ❖ Develop workshops designed to foster collaboration between growers and researchers to develop nonfumigant options.**
- ❖ Increase number of field facilities focused on collaborative strawberry research.**
- ❖ Promote interdisciplinary collaborative research**
- ❖ Fund more research and extension positions to develop nonfumigant production systems**

III. ADOPTION AND DEMONSTRATION: FOCUS AREA 1. OUTREACH & INFORMATION DELIVERY

- ❖ Ensure rapid dissemination of information on nonfumigant alternatives
- ❖ Develop information on economics and efficacy of nonfumigant production systems
- ❖ Create a comprehensive producer-oriented online resource
- ❖ Expand on-farm training and education opportunities for growers
- ❖ Network and collaborate with public and private groups that support growers



III. ADOPTION AND DEMONSTRATION: FOCUS AREA 2. RISK MITIGATION

- ❖ We must recognize the risk of significant losses to growers that adopt nonfumigant production practices.**
- ❖ Appropriate incentives and protections are needed to protect growers from the risk of catastrophic loss.**

SUMMARY

❖ **Conversion of even a fraction of the California strawberry industry to nonfumigant systems is a significant commitment that will take time and money to implement.**

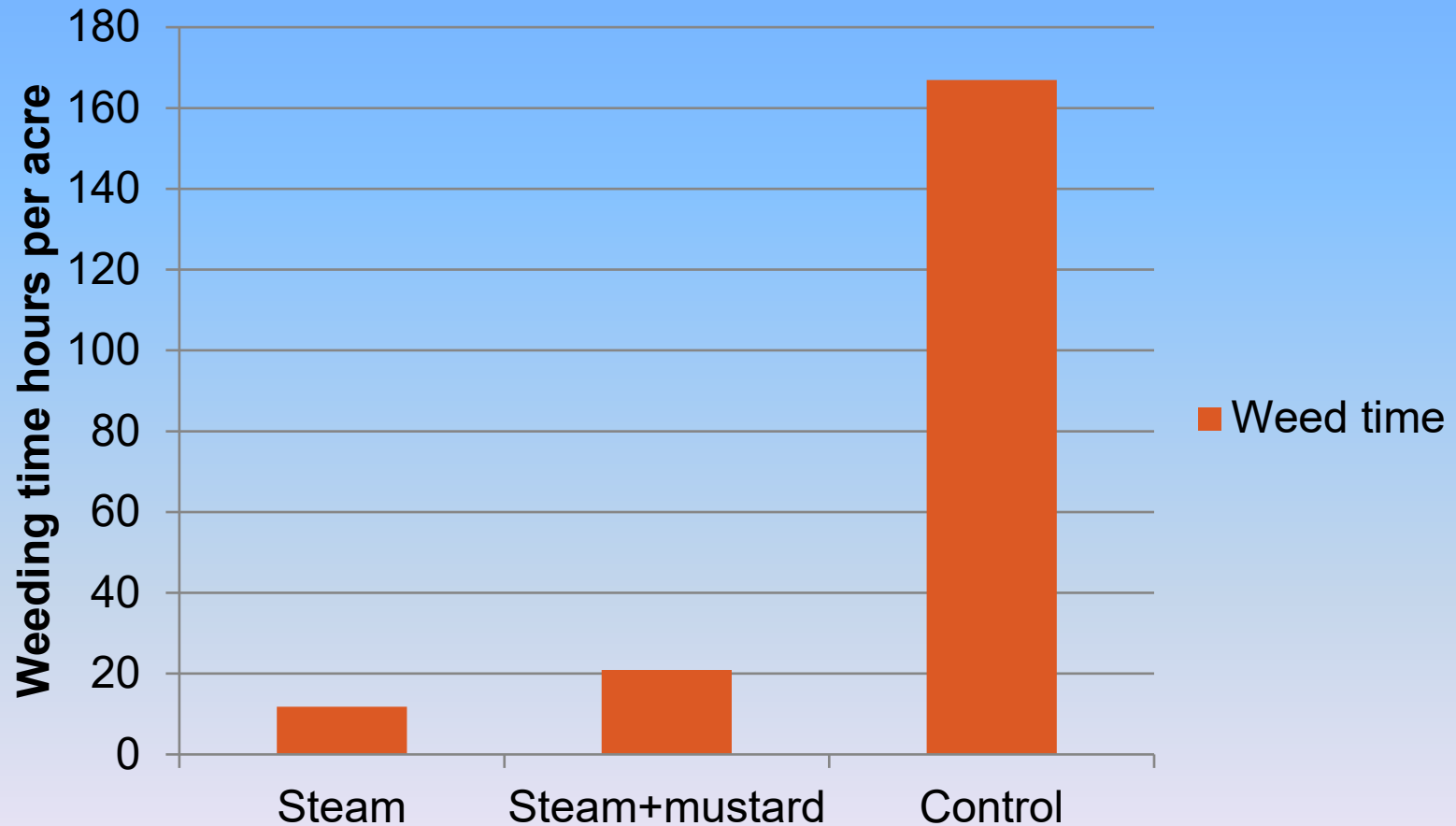
STEAM APPLICATION- WATSONVILLE SEPTEMBER 2012



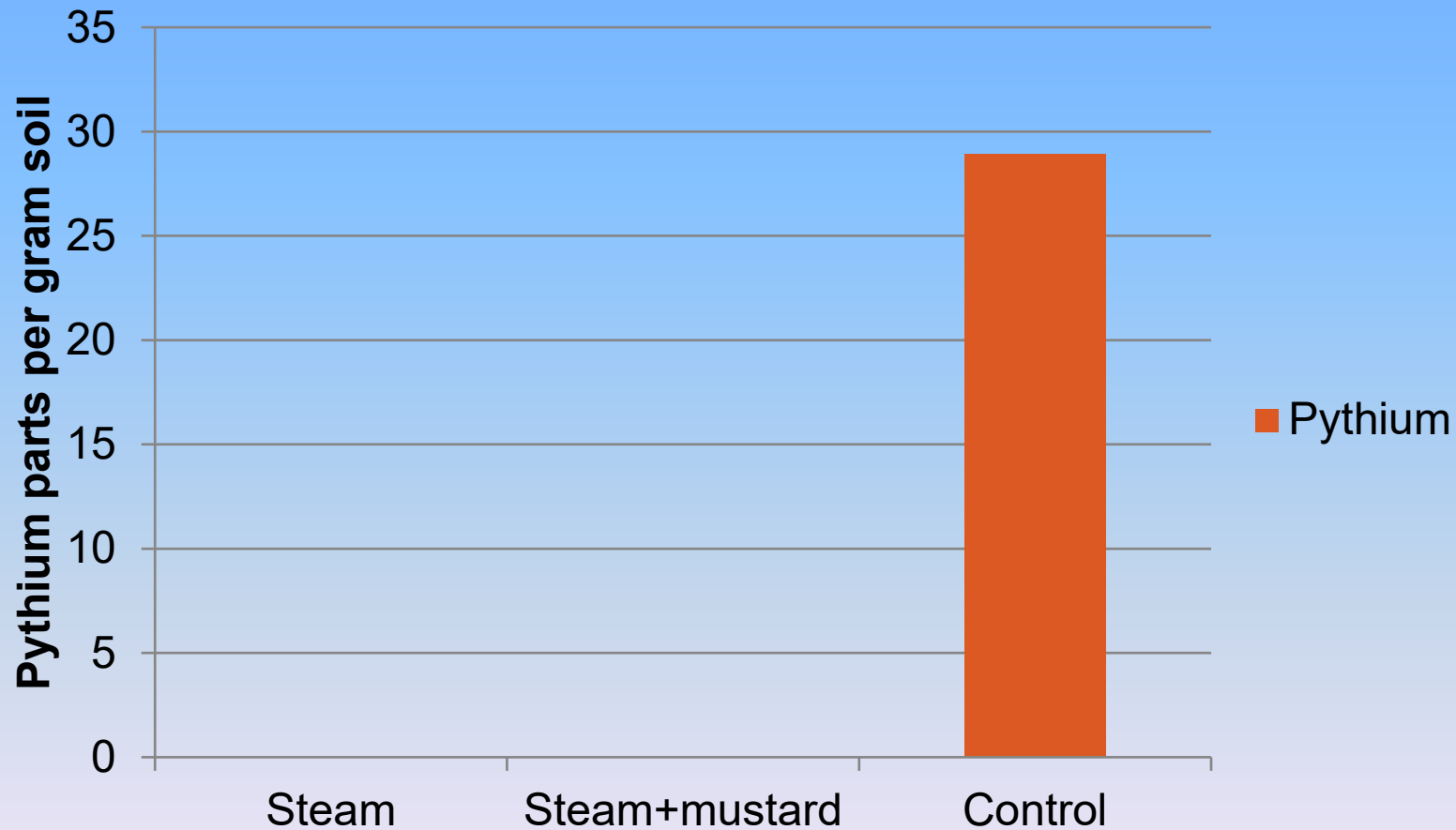
STEAM – WHY IT MAKES SENSE

- ❖ There is a new method of steam generation (new in 2013)
- ❖ Physically mixing steam with soil speeds up application time
- ❖ Steam use is compatible with fumigants – fumigate outside buffer zones, steam inside buffer zones
- ❖ Use of compressed natural gas for fuel will probably allow lower costs
- ❖ Additives to steam may allow faster application times
 - ❖ Mustard seed meal
 - ❖ Quicklime
 - ❖ Short half-life antiseptics compliment steam

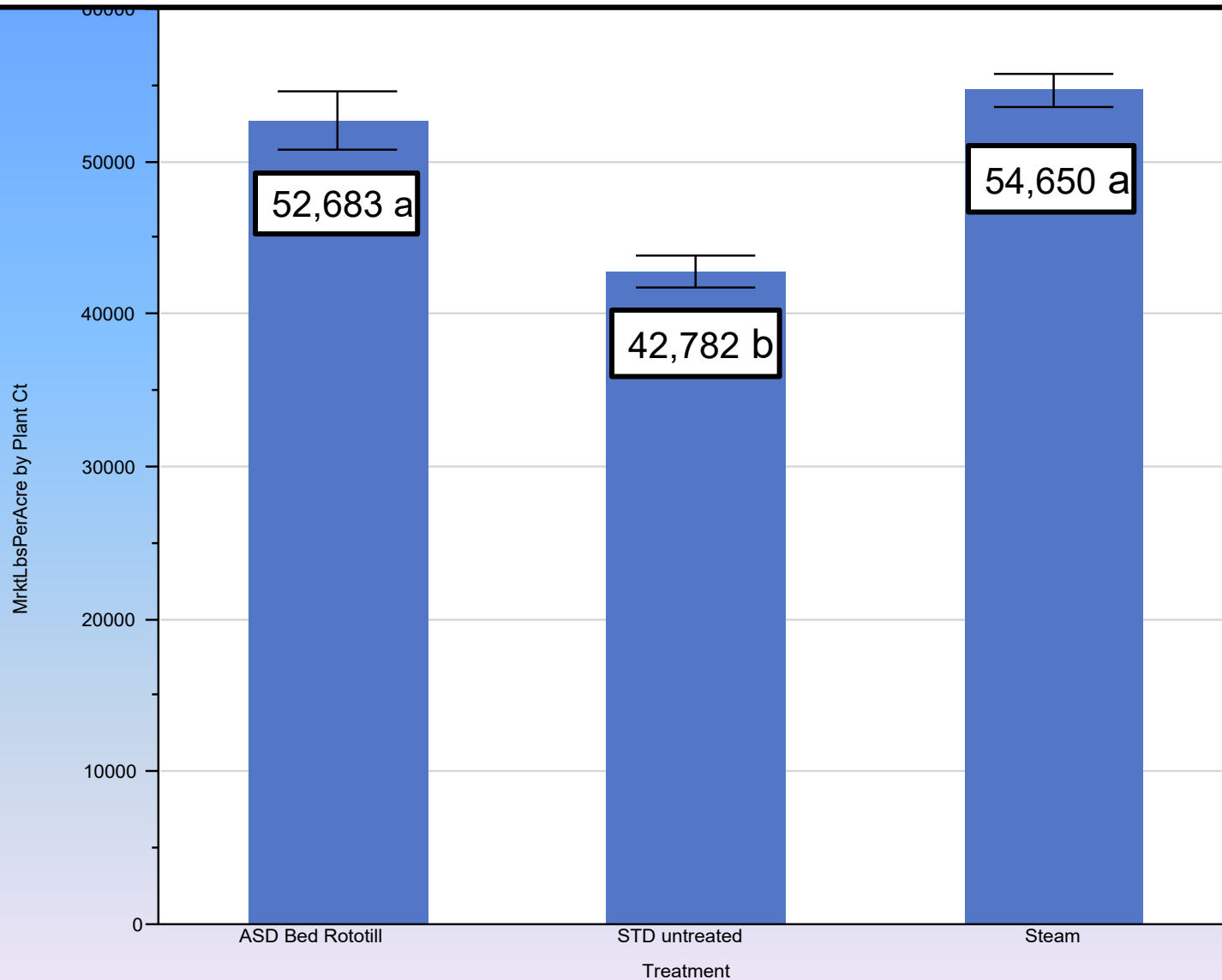
SEASON-LONG WEEDING TIMES THE COMPANY RANCH 2012-13



PYTHIUM CONTROL CASSIN RANCH 2012



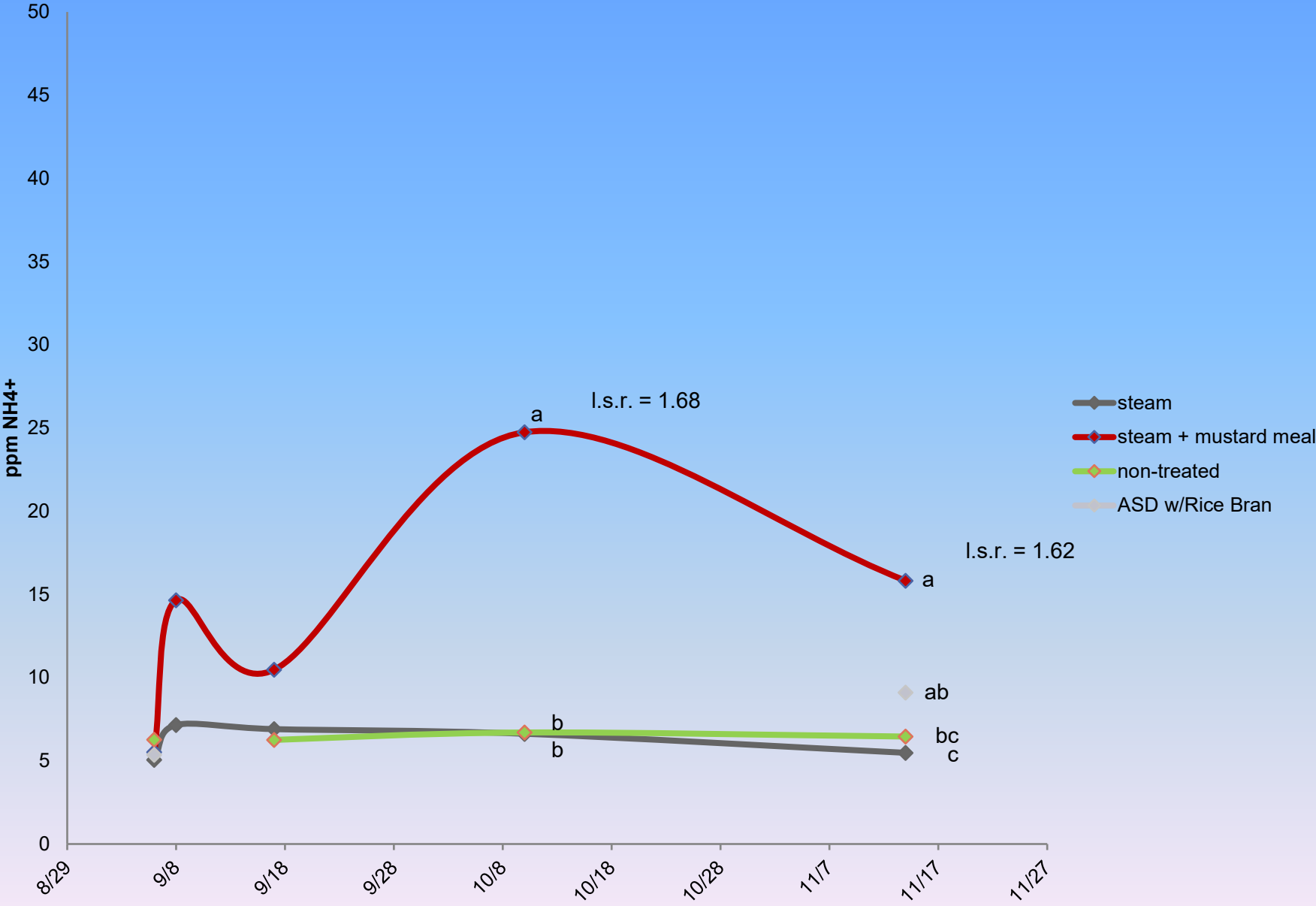
Proprietary Variety 273M171 Organic Marketable Yield 2012 Watsonville



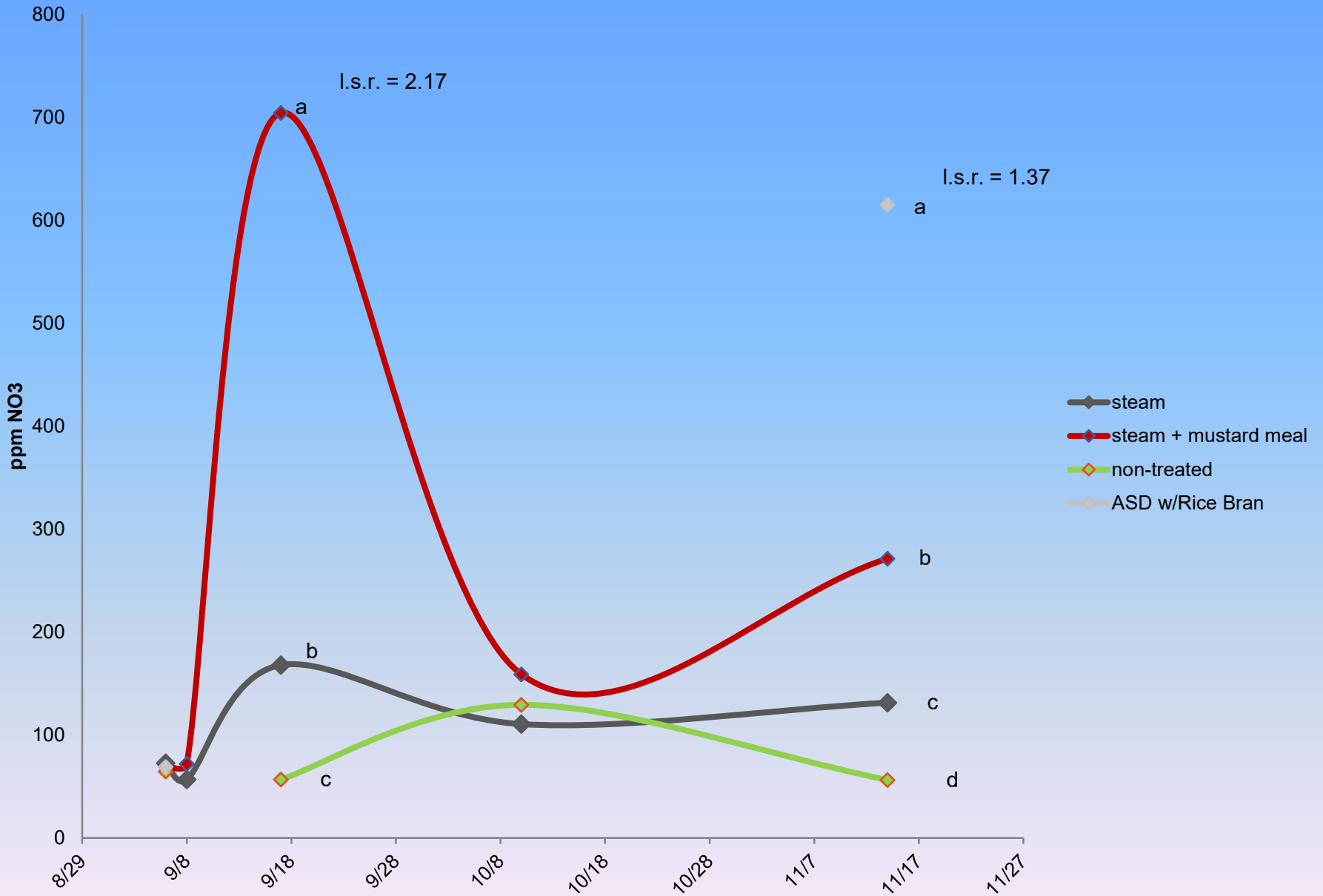
Broome
2012

*Means with the same letter are not significantly different by Tukey-Kramer HSD.

NH₄⁺ The Company Ranch



NO₃⁻ The Company Ranch





steam

the company
ranch

steam +mustard

ASD+ rice bran

control



steam

North Cassin
Ranch

steam + mustard

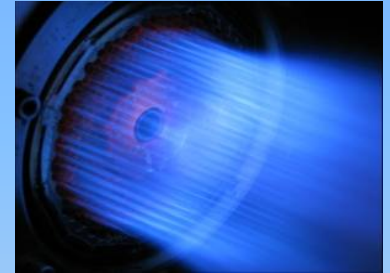
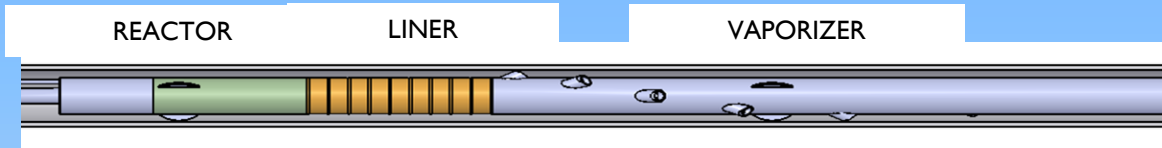
ASD + rice bran

ASD + molasses

control

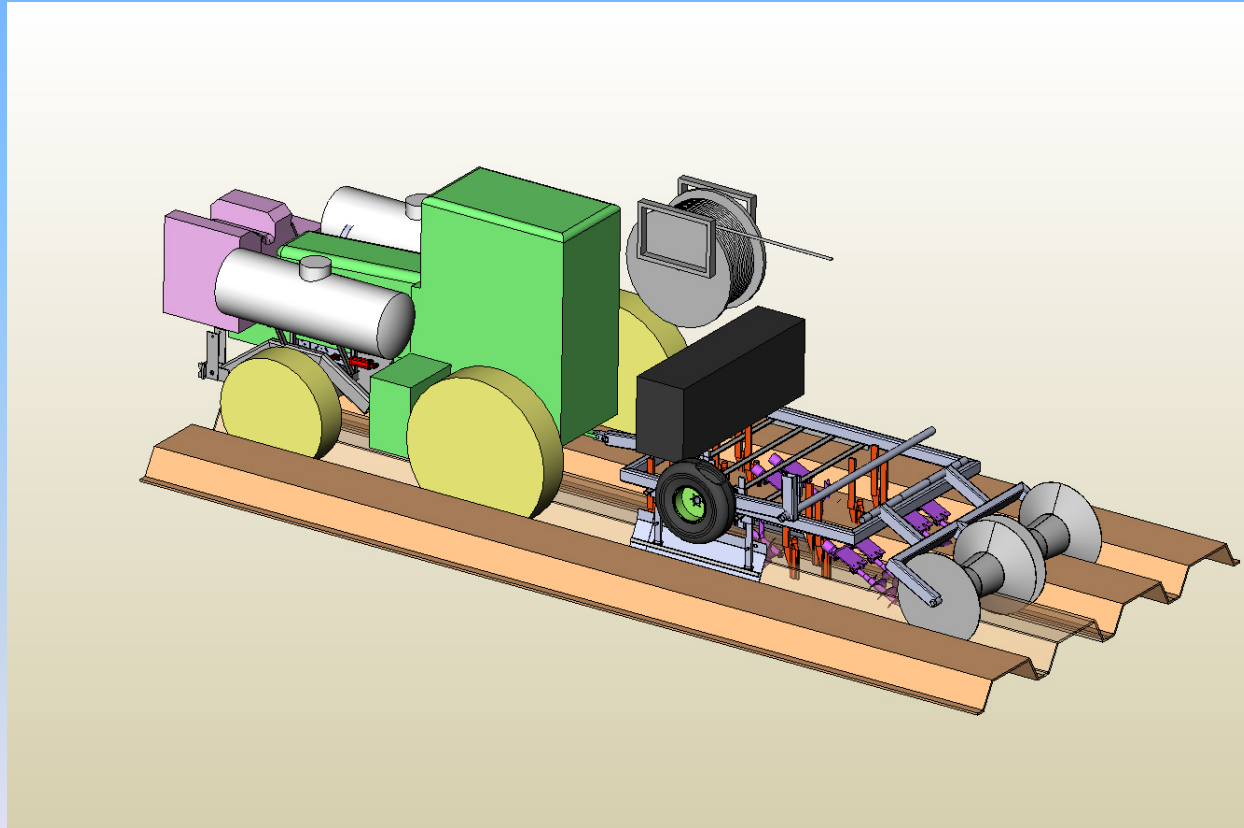
NEW STEAM GENERATION TECHNOLOGY

Down hole steam generator – oil field technology. <http://www.precision-combustion.com/cdownhole.html>

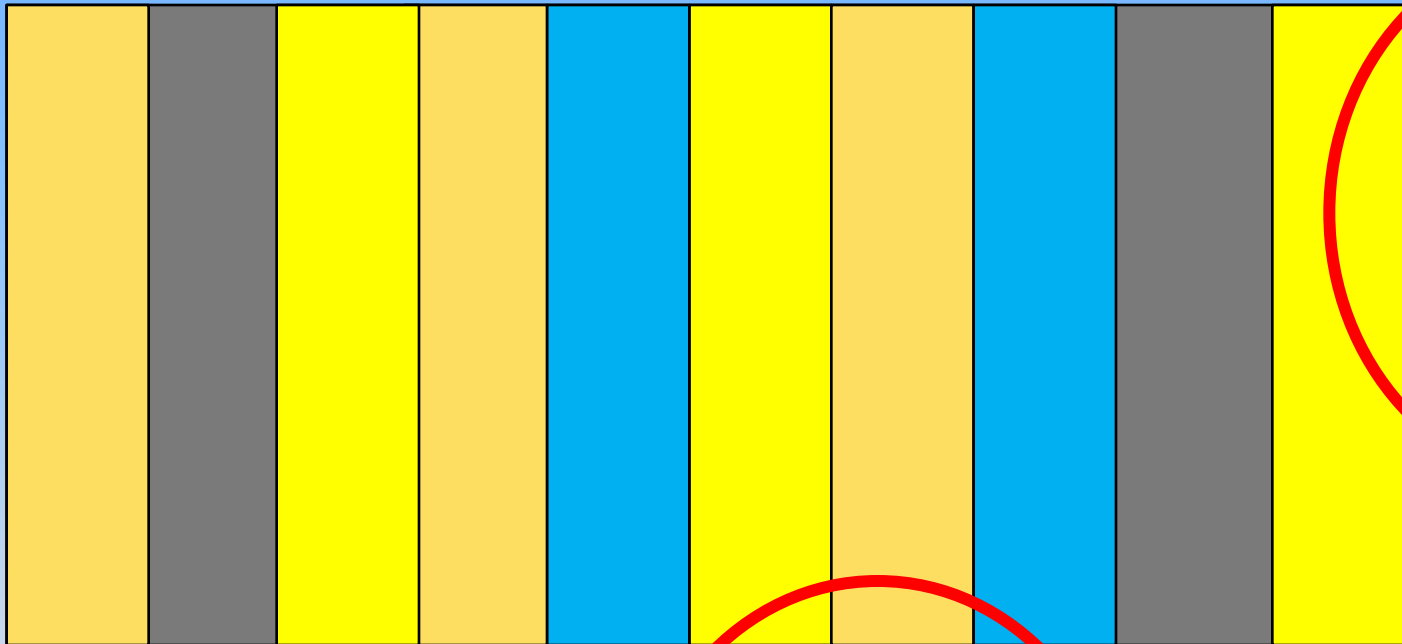


The advantage to this technology is that it does not use a steam boiler, water hardness is not the problem it is with steam boilers. Fewer pumps, lighter ect.

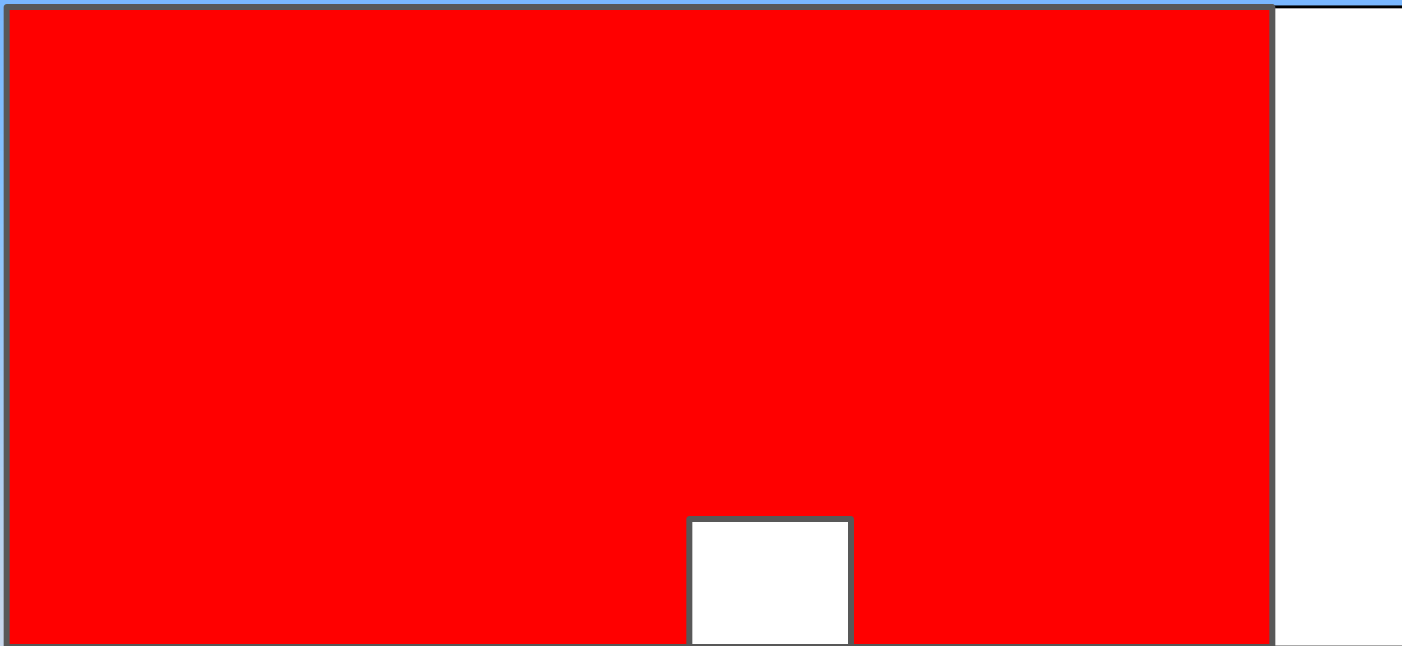
COMMERCIAL TWO BED MODEL DESIGN



AN 80 ACRE FIELD IMPACTED BY SENSITIVE SITES



AN 80 ACRE FIELD IMPACTED BY SENSITIVE SITES



White = steam 7 acres
Red = fumigate 65 acres

A BUSINESS ROLE FOR STEAM

An 80 acre farm with 72 acres farmable

65 acres can be fumigated, 7 acres cannot be fumigated

Fumigant cost \$1,350/A or \$87,480; steam costs \$5,000/A or 35,000 for total treatment cost of \$1,701/A or \$122,480.

The farm gross value is \$44,168/A * 72 A = \$3.2 M or \$44,168 * 65 A = \$2.9 M

Dara et al. 2011.

http://coststudies.ucdavis.edu/files/Strawberry_SC_SMV2011.pdf

STEAM – WHY IT MAKES SENSE SUMMARY

- ❖ We have not reached the limits of technology with steam – we are still making progress on lowering costs and improving performance.
- ❖ Steam is a compatible treatment for a custom fumigation company.
- ❖ Steam is a compatible treatment for strawberry growers - strawberries grown on fumigated beds and steamed beds can be managed the same way.



FINANCIAL SUPPORT

USDA NIFA Methyl Bromide Transitions 2010-51102-21648

California Strawberry Commission

Propane Education and Research Council

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