People, Place, Promise

UH Extension

MĀNOA | College of Tropical Agriculture and Human Resources

Evolution of Pest Exclusion Systems to Exclude Agricultural Pests

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College of Tropical Agriculture and Human Resources

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Field Day Presentation

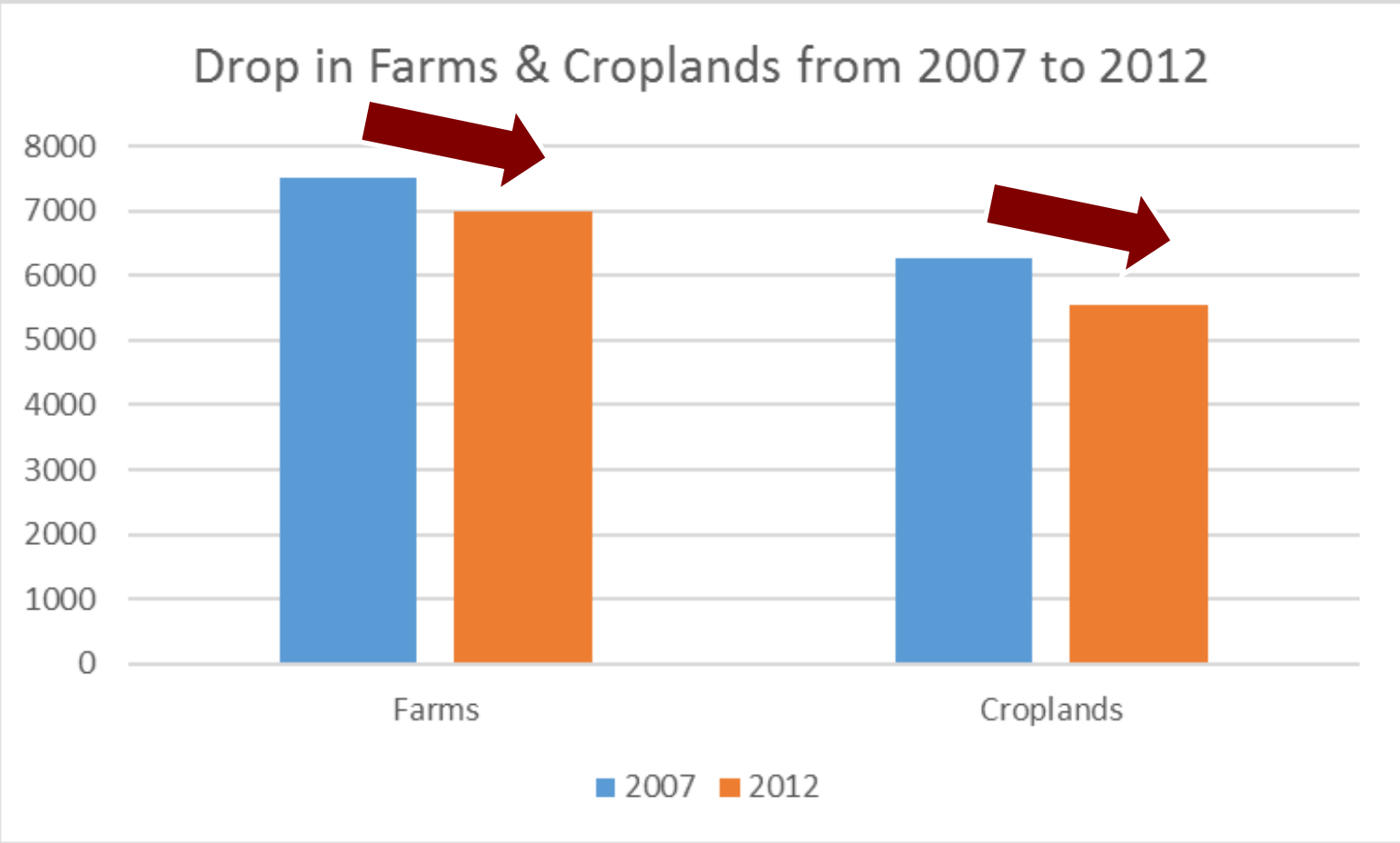
UHM is Hawaii's Land Grant University

- LGU's are located in every state and territory
- CTAHR carries out the LGU's mission by offering the public:
  - Noncredit, non formal instruction
  - Tax-supported educational programs
  - Useful information, based on the results of university research, to invoke change
- CTAHR meets this mandate via it's Cooperative Extension Service

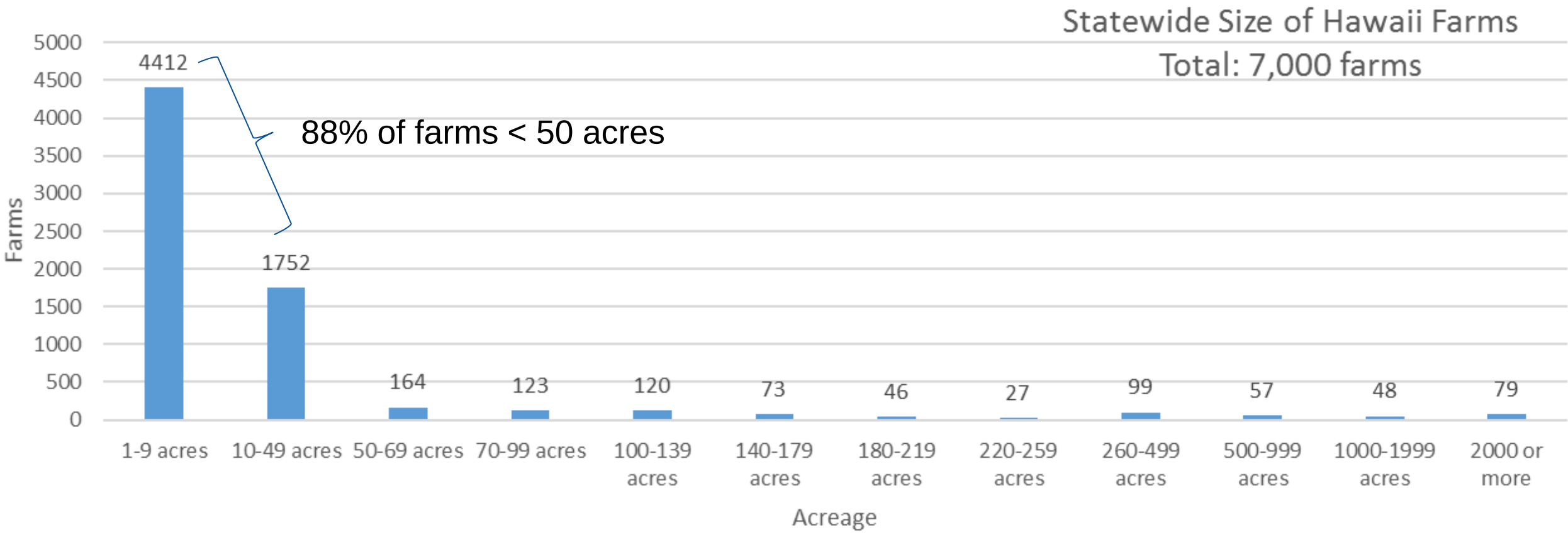
Modified from: NIFA: http://www.csrees.usda.gov/about/partnerships.htm

Governor Ige's Ag Priority:

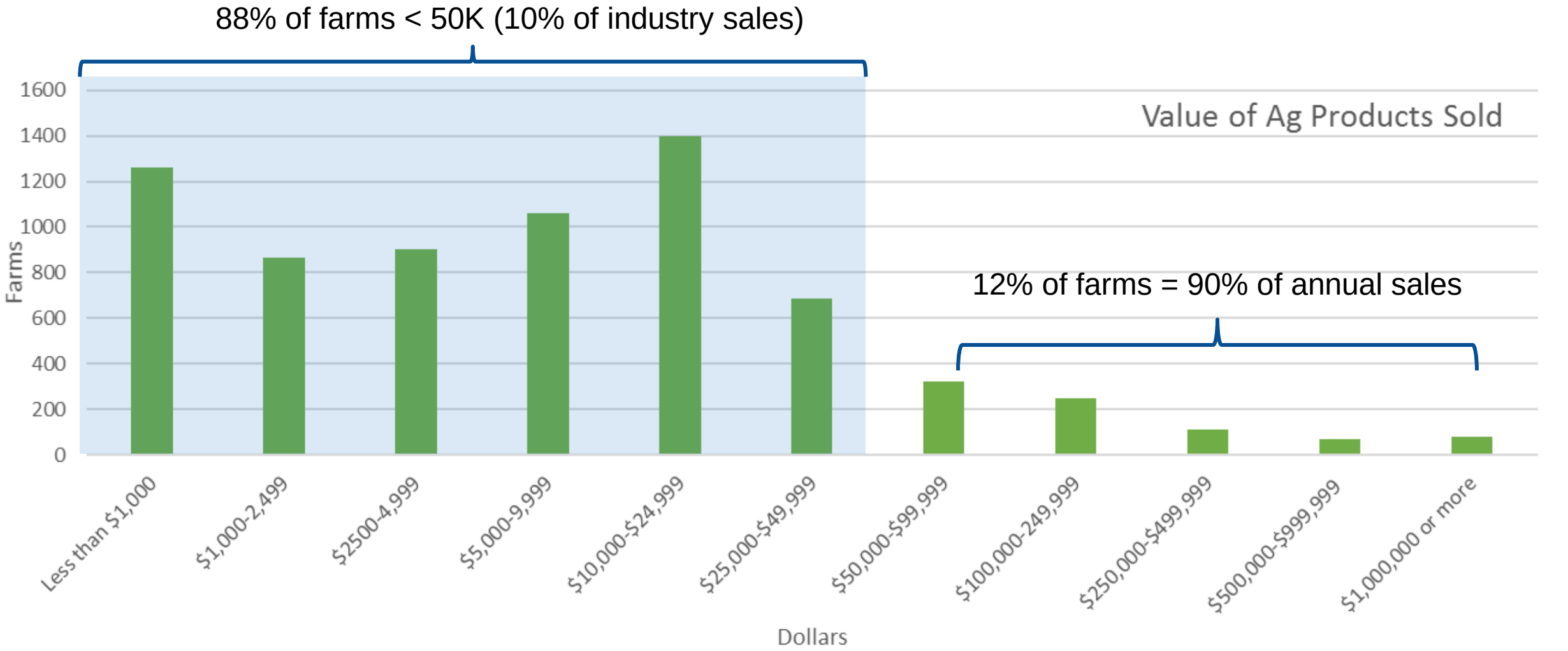
Double food supply by 2020 (2030)



Source: 2012 Census of Agriculture
State Data (all croplands)



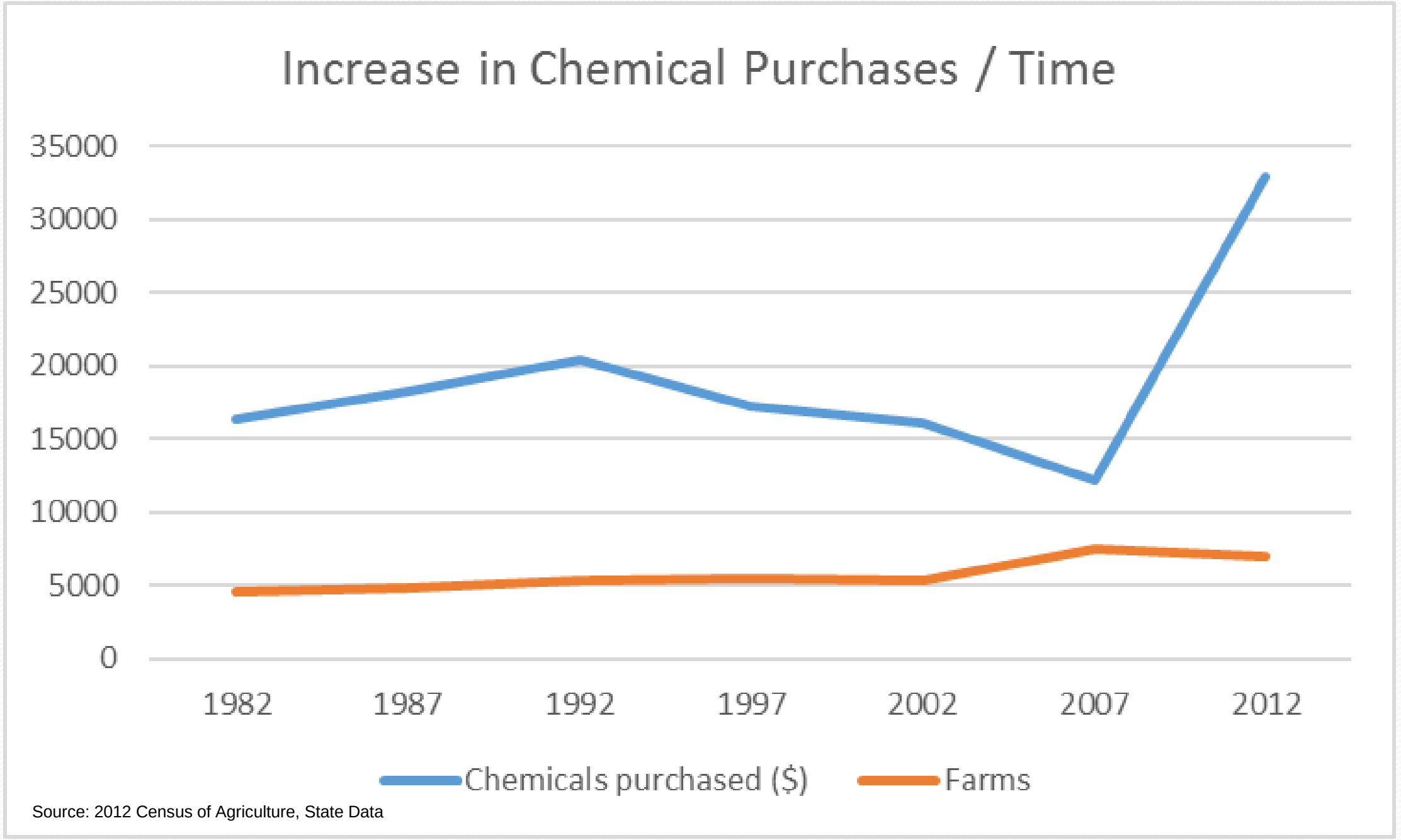
Source: 2012 Census of Agriculture, State Data



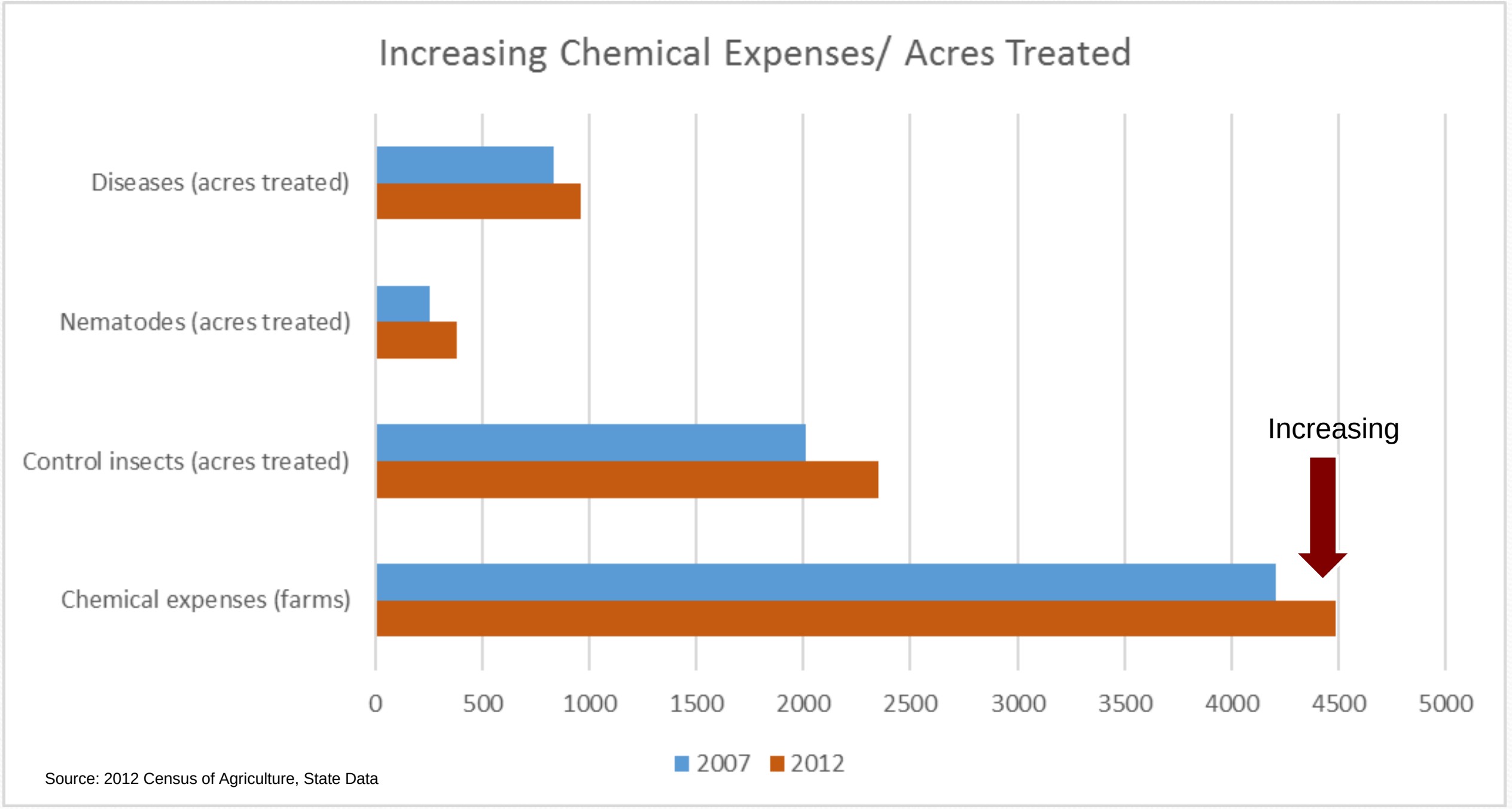
Source: 2012 Census of Agriculture, State Data

Increasing Production of Small Farm Operations

- Challenges
  - Year round pest and disease pressure
  - Growing with little to no chemical inputs
  - Many are part time or socially disadvantaged
    - Time
    - Cost
  - English is a second language
    - Understanding the federal regulations
    - Food safety, worker protection, chemical labels, etc



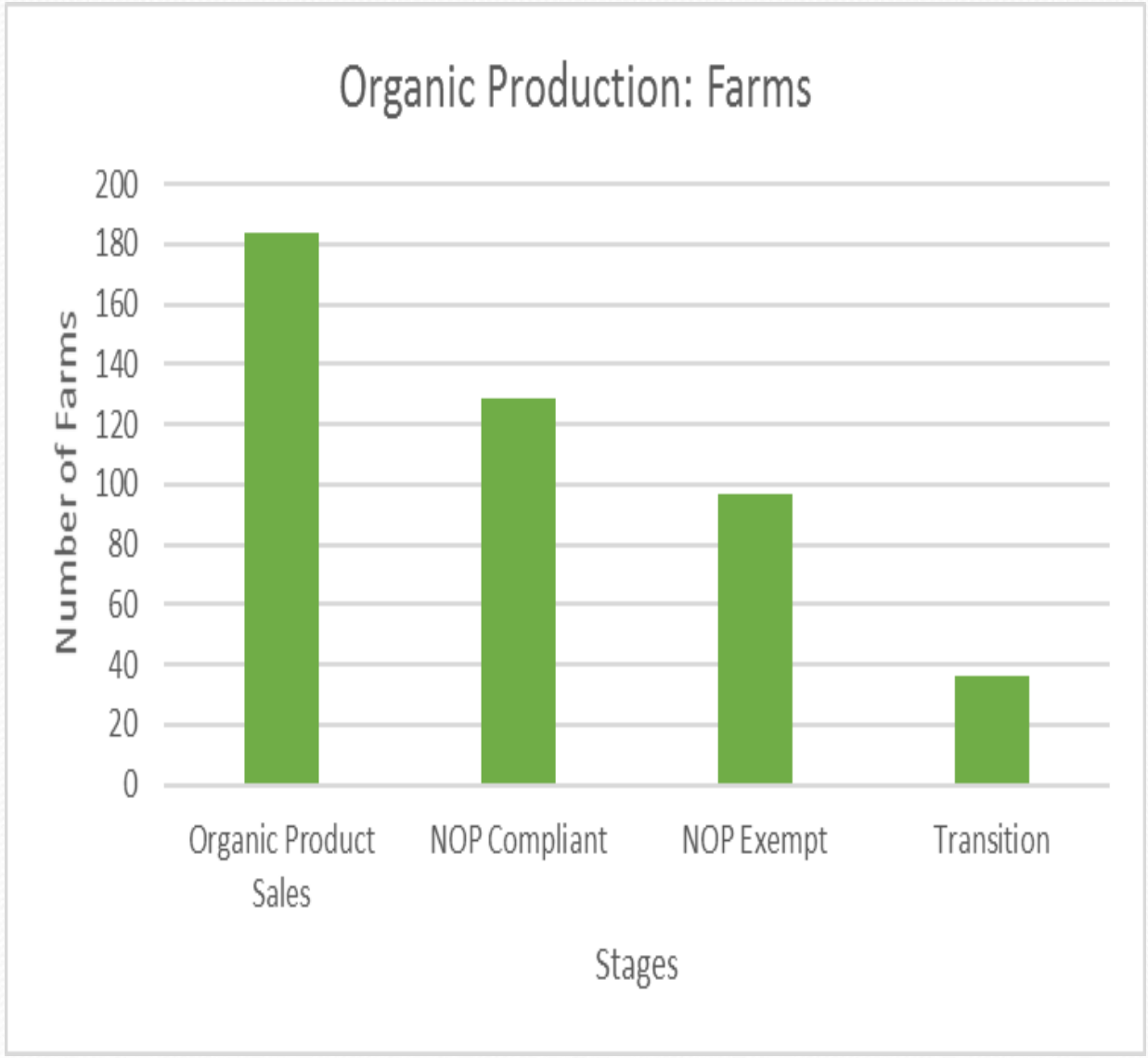
Source: 2012 Census of Agriculture, State Data



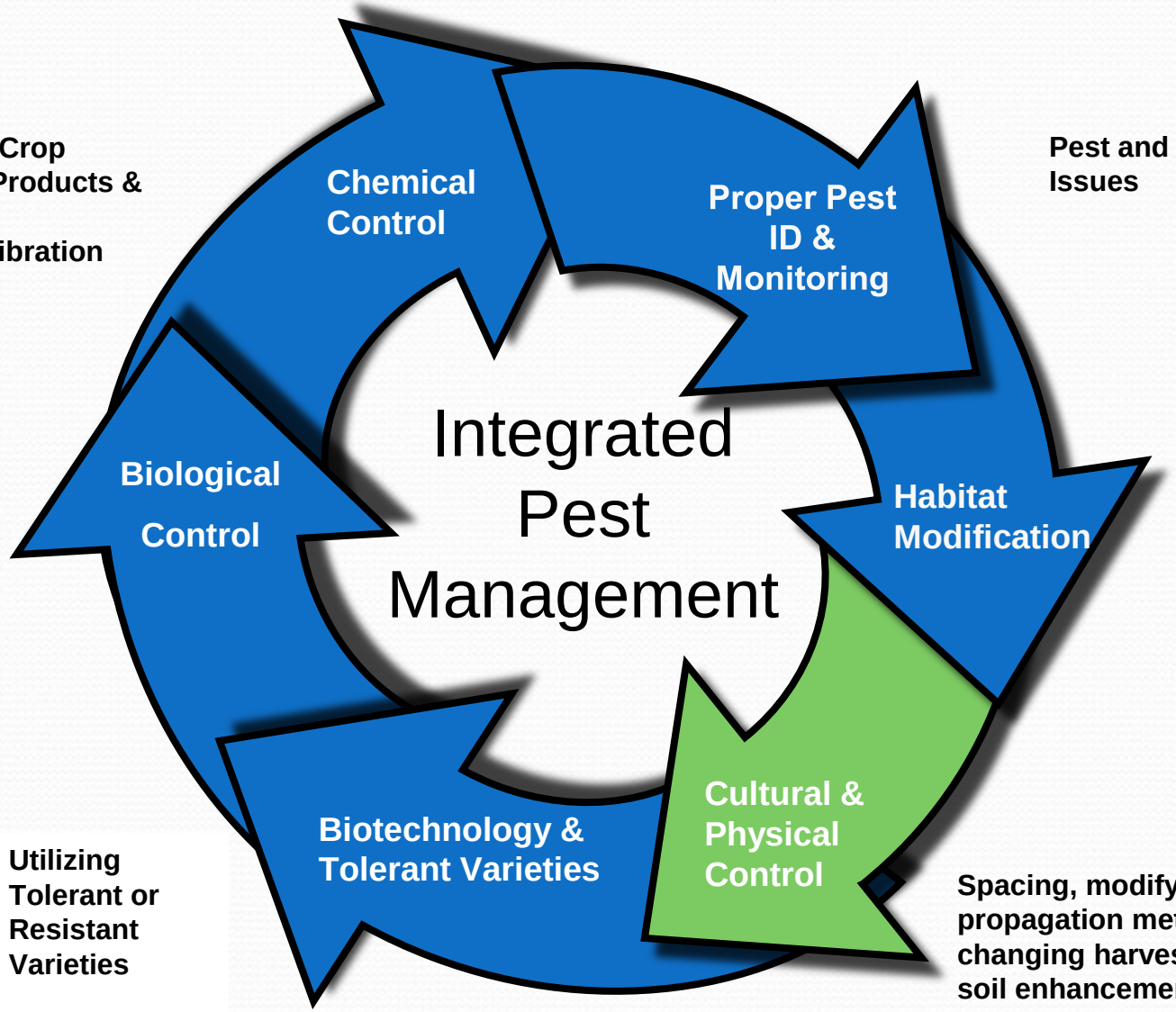
Source: 2012 Census of Agriculture, State Data

Growing trend

- Consumers want organic, natural, less pesticides, etc.
- Willing to pay more for 'healthy' foods
- Growers are looking for reduced risk solutions
  - Organic chemicals are not as effective as conventional
  - Increased interest in 'no spray' agricultural production



2015 Nielsen Global Health & Wellness Survey
Shutz, H. (2013) Survey reveals consumers want to avoid pesticides, but are unsure how to label certifications help them do that.
2012 Census of Agriculture, State Data



Rotation of Crop Protection Products & Surfactants
Sprayer Calibration

Pest and Disease Issues

Biologicals, Organic Crop Protection Products

Environmental conditions:
Wind barriers
Wind direction
Aeration
Drainage, etc

Utilizing Tolerant or Resistant Varieties

Spacing, modifying propagation methods, changing harvest techniques, soil enhancements, etc

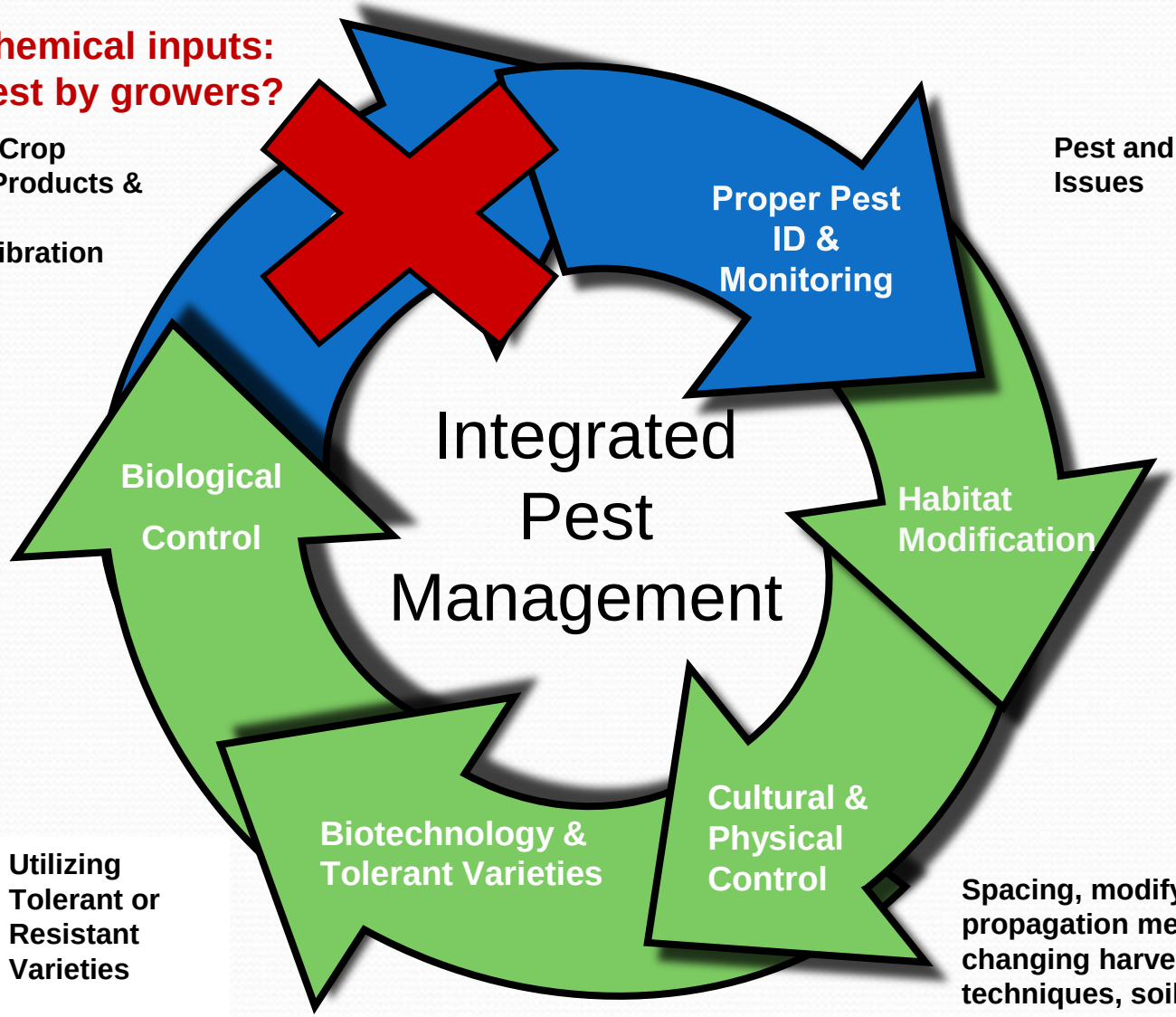
Sugano, 1997


Pesticide Reduction


Started looking at screens in 2009

Still Evaluating New Technology

Reducing or eliminating chemical inputs: How do we meet this request by growers?



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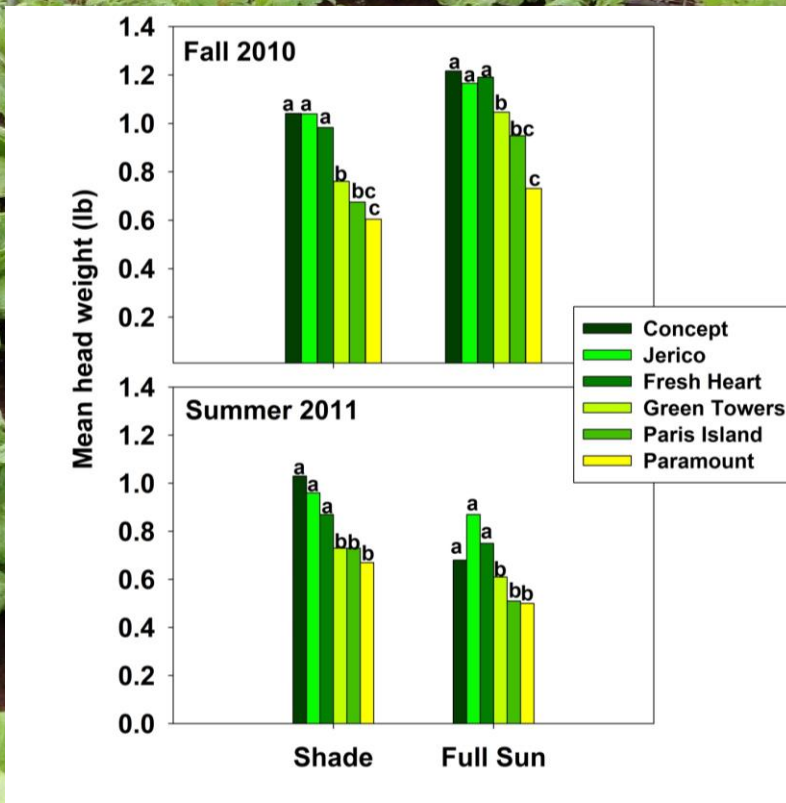
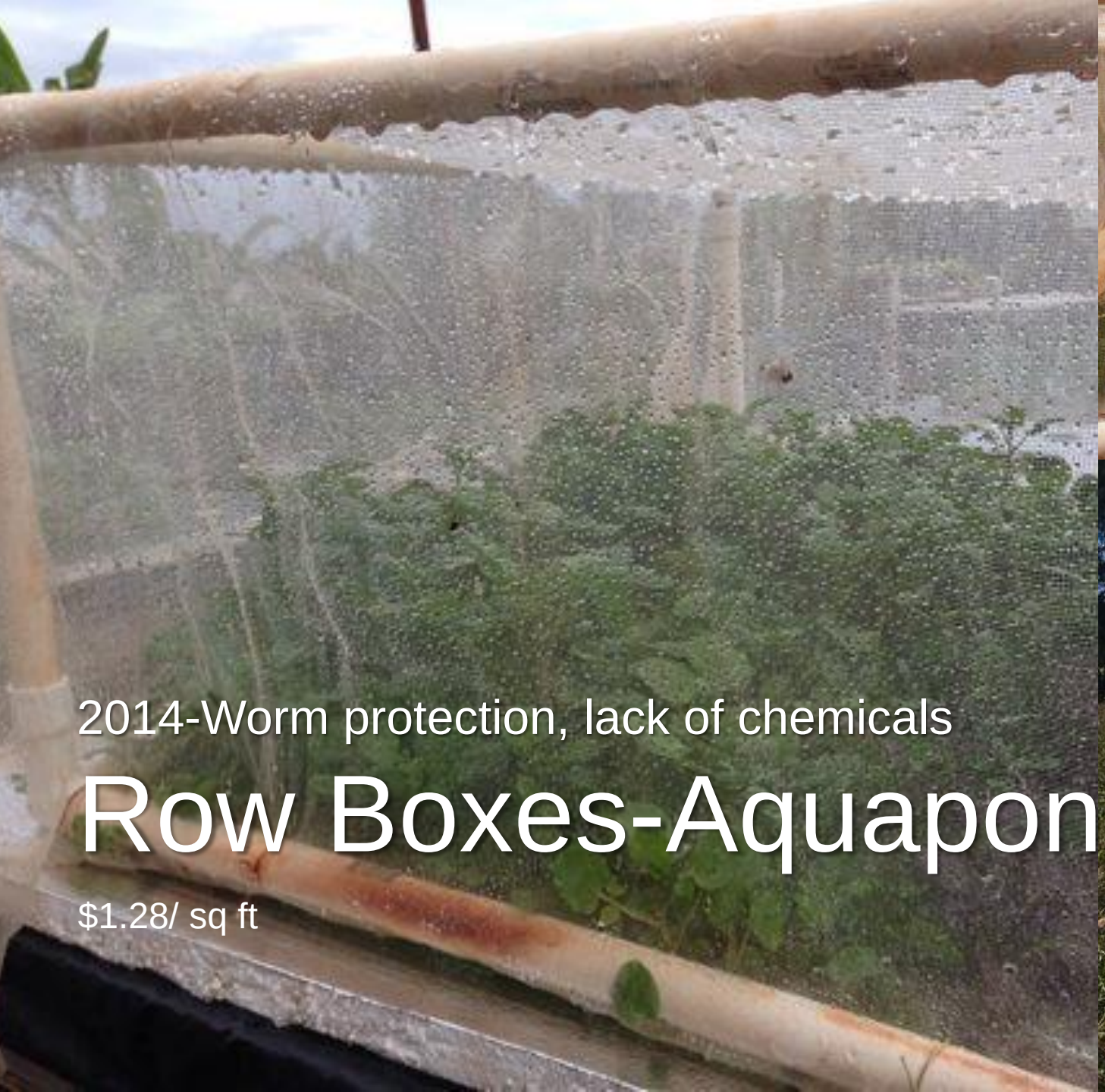
Screen + Pipes / Hoops Shade Trials: 2009-2011





2014-Worm protection, lack of chemicals

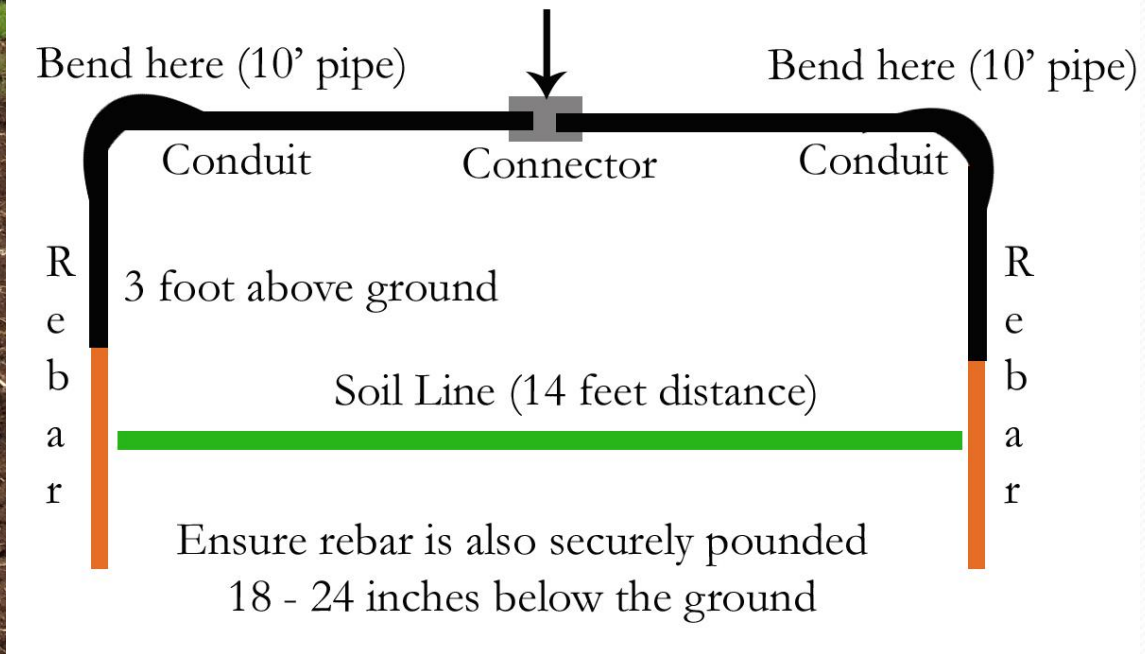
Row Boxes-Aquaponic Industry

$1.28/ sq ft

2015-2016-Protection of bigger areas

Caterpillar Type ($$)

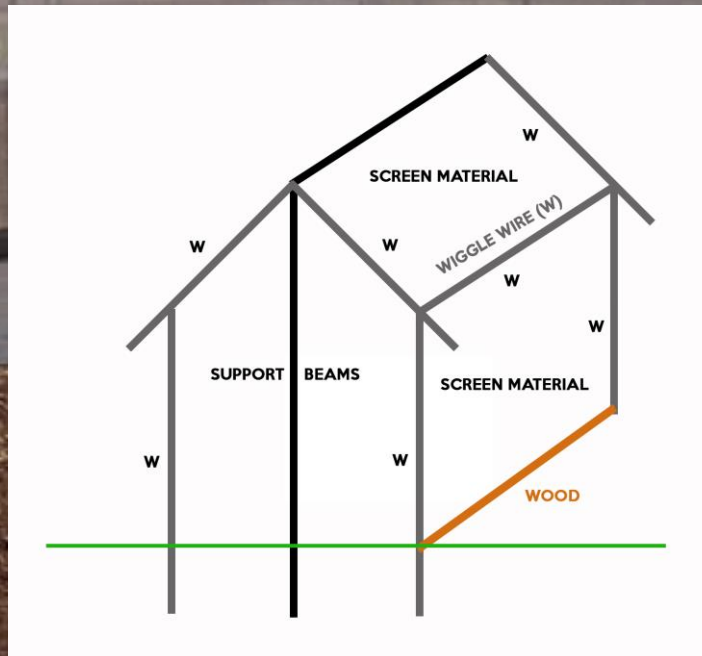
$0.45-0.51/ sq ft



$1.10-1.93 / sq ft

EZ Corner System ($$$)

Easy to install, but not not ideal for high wind areas



Stability Issues

$0.95 / sq ft

$1.08 / sq ft

Increased Stability ($$$)

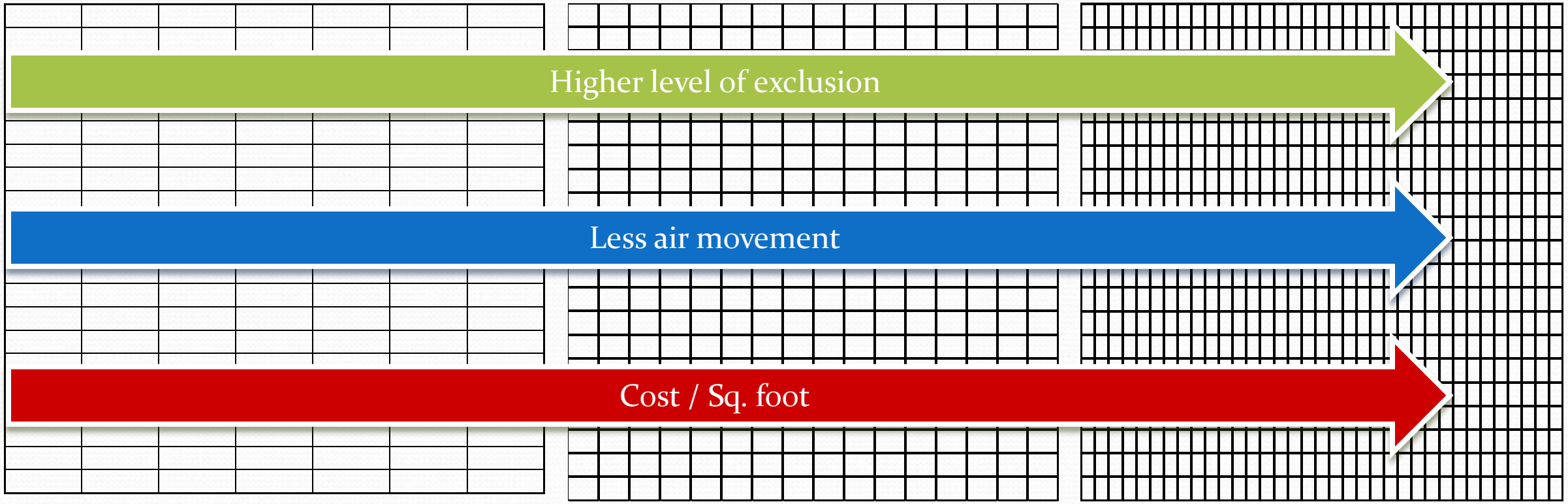
Bending pipes, door, frame, etc

2016- Cost Factor

PVC Hoop Systems

$0.36-0.42 / sq ft

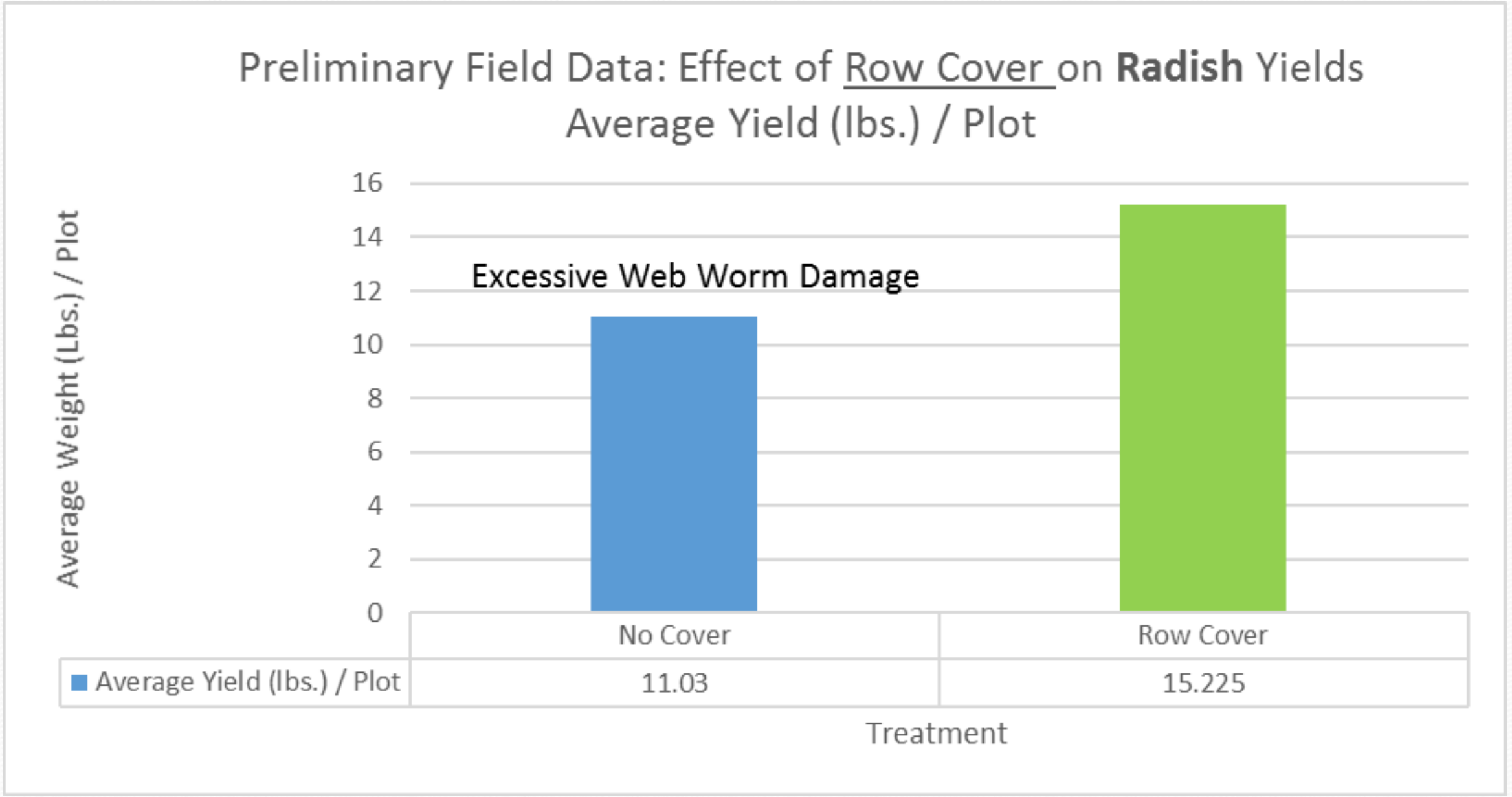
Secret is in the Screen



16 mesh (0.018”-window screen)
Fruit fly, worm type insects (0.125”)

50 mesh (0.0105”)
Aphids, whitefly, leaf miners (0.13-0.25”)

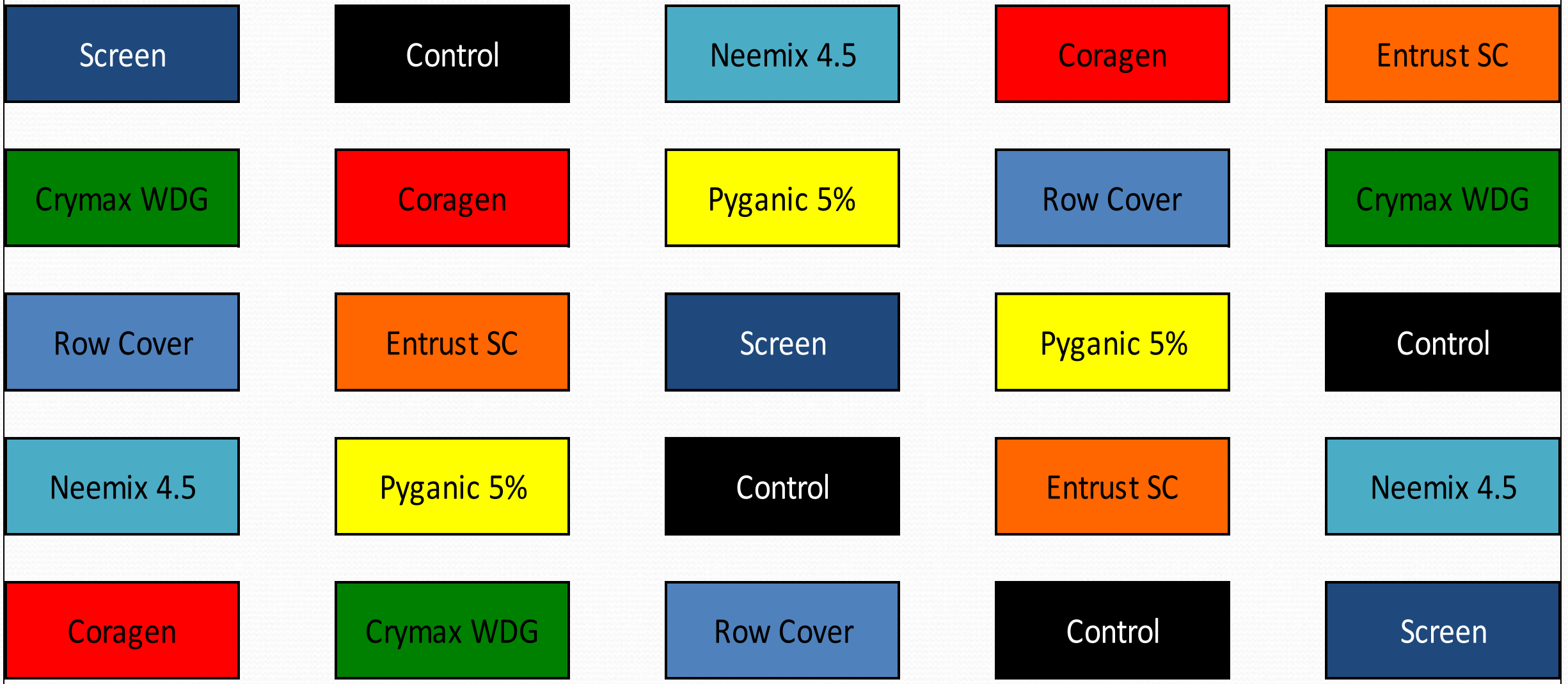
80 mesh (0.0059”)
Thrips (0.0075”)
Mites: (0.003”)



Planted 4/12/16 Waimanalo Research Station. Harvested: 6/8/16 (re-worked field trial due to lack of bird pests)
Thinned rows of direct seeded daikon grown under (and without) row crop for germination period
Preliminary data selected from data rows within 3 plots of 8' x 25'
More work is needed to understand the potential and drawbacks of row covers

Replicated Webworm Trial (2016)

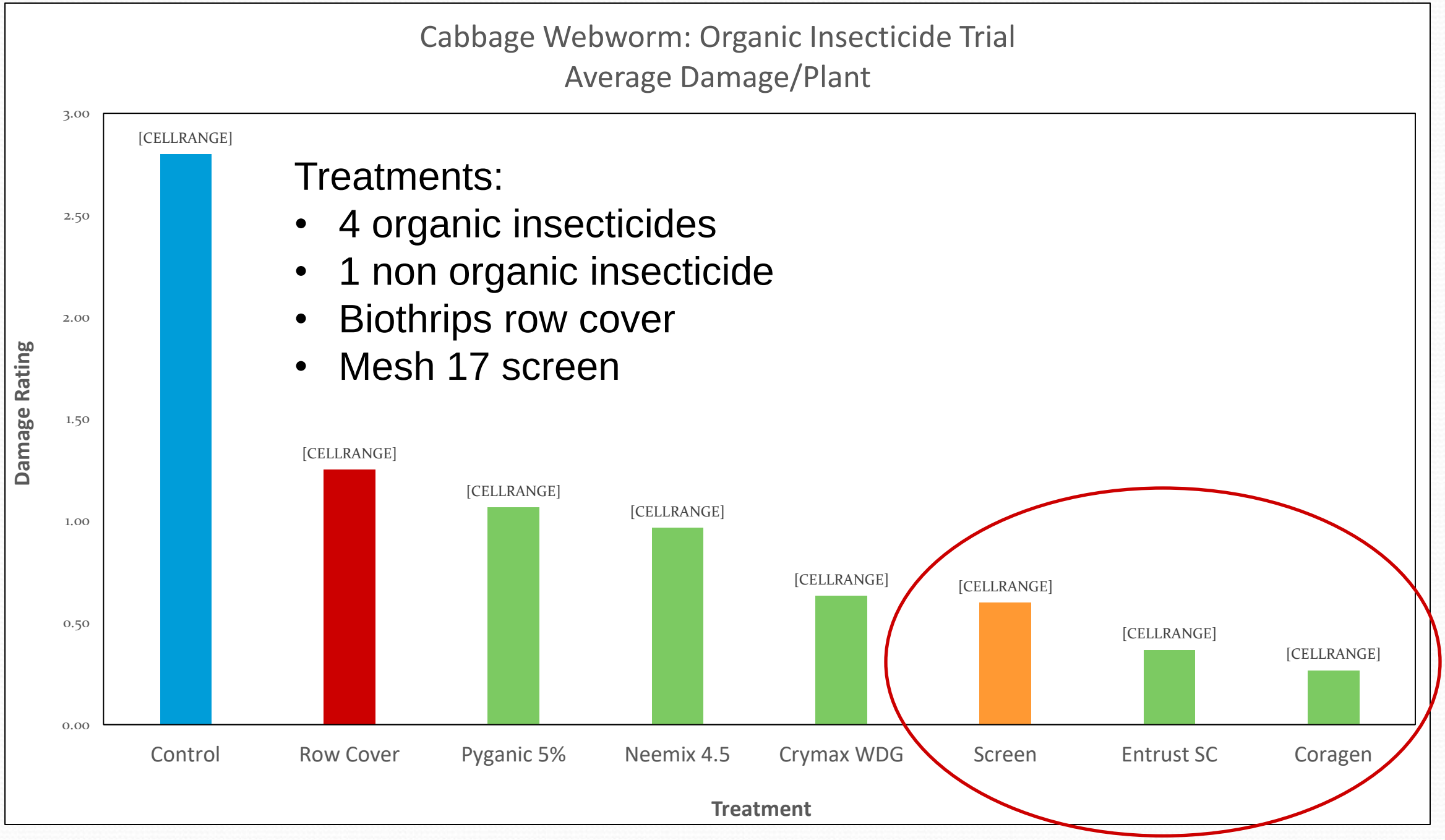
Cabbage Webworm Organic Insecticide Trial
Field Layout




DANGER PELIGRO
KEEP OUT
NO ENTRE


Screen


Row Cover
Smaller screen than Mesh 17


Cabbage Webworm: Organic Insecticide Trial
Average Damage/Plant
Treatments:
• 4 organic insecticides
• 1 non organic insecticide
• Biothrips row cover
• Mesh 17 screen
Damage Rating
3.00
2.50
2.00
1.50
1.00
0.50
0.00
[CELLRANGE]
[CELLRANGE]
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[CELLRANGE]
Control
Row Cover
Pyganic 5%
Neemix 4.5
Crymax WDG
Screen
Entrust SC
Coragen
Treatment

Use Caution:
Screen Installation & Crop Maintenance

2016- Evaluation of screen on virus/ smaller insects

Evaluation of Screens

Mesh 17, 40 and 70, and a shade screen

Field Day Handouts

Reviewed Data from the Observational Trial Using Different Screen Material

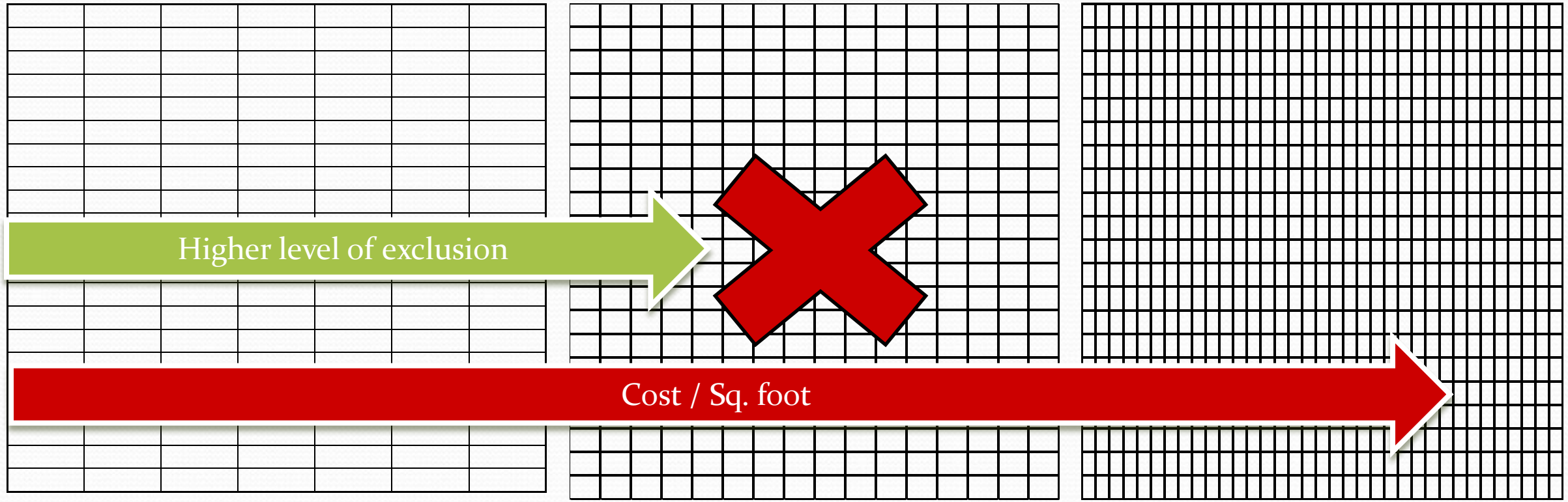
https://gms.ctahr.hawaii.edu/gs/handler/getmedia.ashx?moid=2972&dt=3&g=12&utm_source=Winter+2016-17+Hanai%27Ai&utm_campaign=Winter+2016-2017+HanaiAi&utm_medium=email

http://conta.cc/2kliv3U

Affordable Option ($0.12/ sq ft)

Is this worth it? ($0.35/ sq ft)

Not Practical ($0.85/ sq ft)



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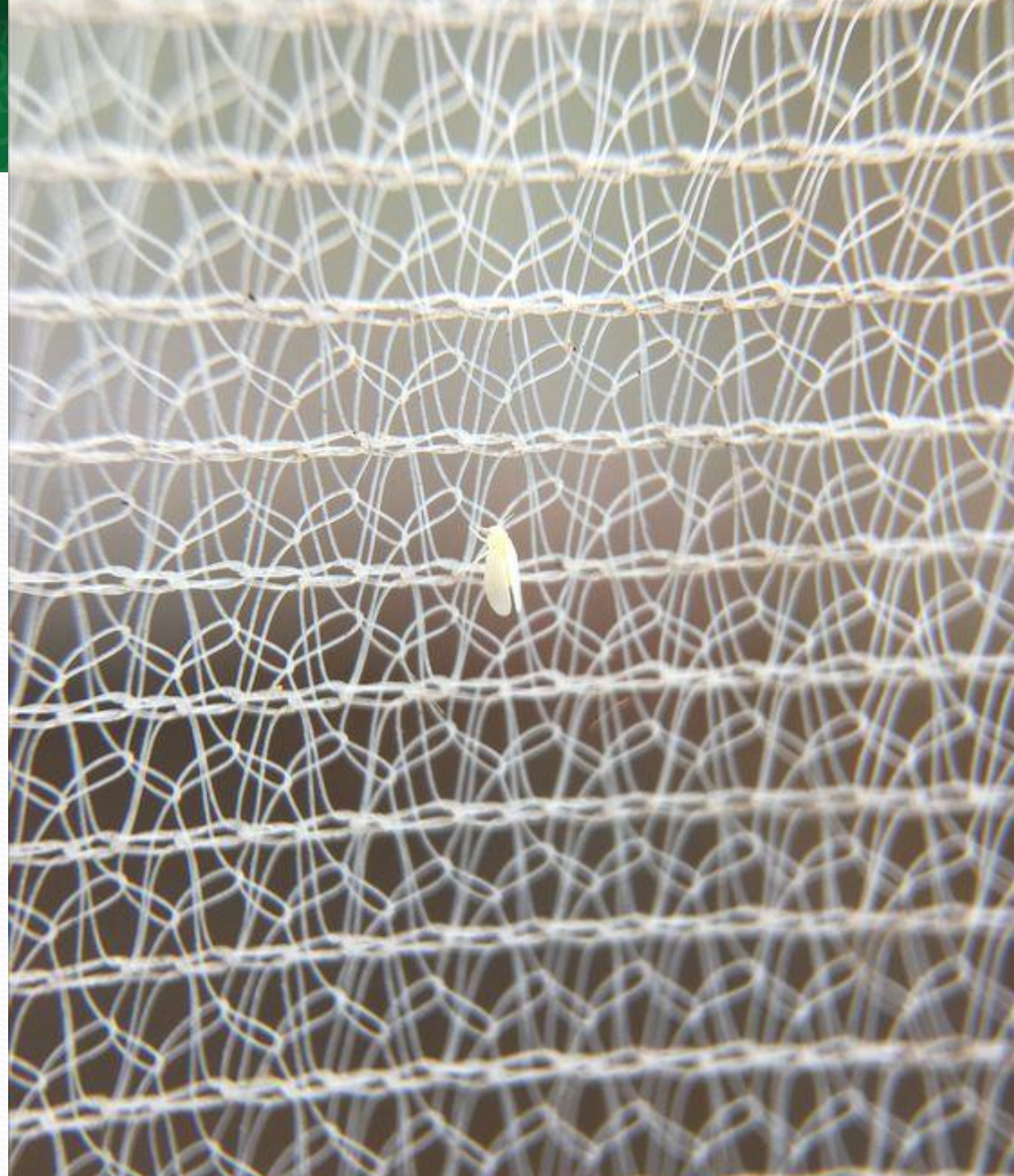
Thrips (0.0075”)
Mites: (0.003”)

Data to be covered in field

Mesh 17, 40 and 70, and a shade screen

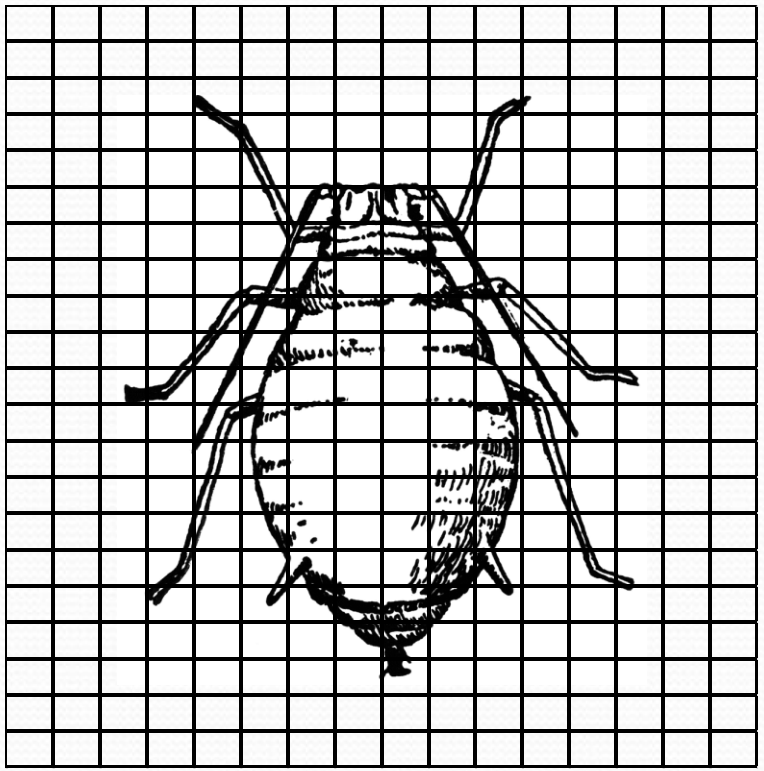
Considerations

- CTAHR research has shown that Mesh 17 can exclude birds, fruit flies and worm type of insects
- Need more time to evaluate mesh 40 & different crop maintenance methods such as direct seeding, weeding, etc.
- Metal contact with screen will rub and tear screen. Cover metal edges with plastic
- Match the screen with the crop and utilize resistant varieties for added virus protection.
- Screen did comparable to organic insecticides Entrust SC, and Crymax WDG.
- Growers should evaluate the crop and pest type and determine whether an organic insecticide maybe a more efficient pest control strategy than installing screen units.



Kale Trial
Mesh 17: Whitefly, aphids & thrips
100% infestation inside and out

Mesh 40: Aphids shouldn't fit, but if they enter the screen they can't escape



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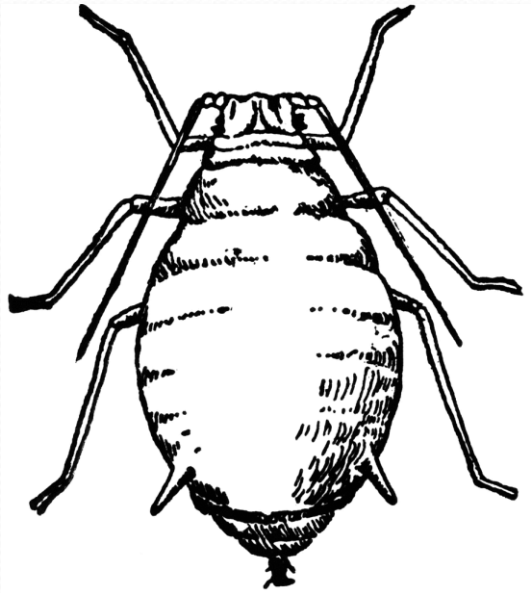


- Aphids are females that:
  - Do not need to reproduce
  - Give birth to live offspring
  - Develop wings and fly

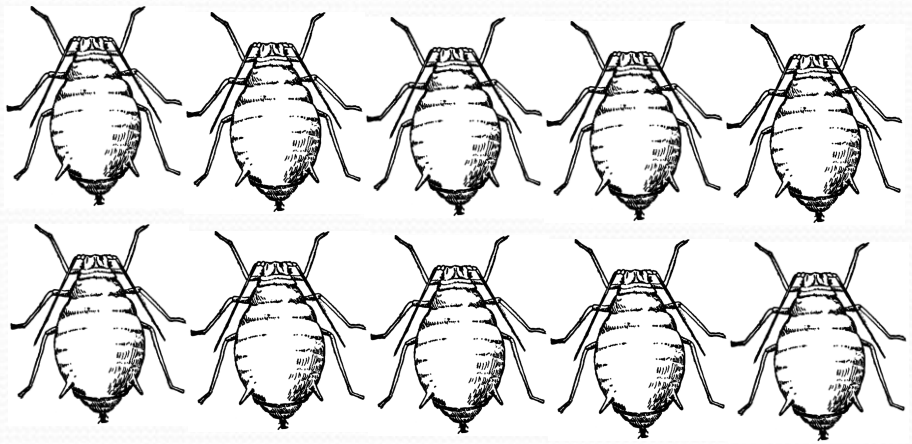


Photo: http://etc.usf.edu

Matching Mesh 17 with Crops

- Matching mesh with crop: Bird, worm and fruit fly protection, but subject to white fly, aphid, thrips and mite issues
  - Brassicas- ideal crop for this mesh system
  - Tomato-Pair with virus resistant variety
  - Cucumber- Pair with virus resistant variety with parthenocarpic capabilities
  - Zucchini- Pair with virus resistant variety with parthenocarpic capabilities
  - Peppers – may need to apply a miticide to protect from mites, but screen provides bird protection


Secure the Bottom…or It’s an Insectary

Next Steps:
Practical, Affordable and Adoptable

Gardening to Farming Systems

Commercial Conley System (USDA NRCS)

Took over a year to arrive in Hawaii
$3.67-$4.22/ sq ft (cement, raised pipes,screen)
Field trials are pending, evaluating managing heat for vegetable crops

2017 USDA NRCS Season Extender System

Cost share can range from $2.77-4.16 for approved kit systems

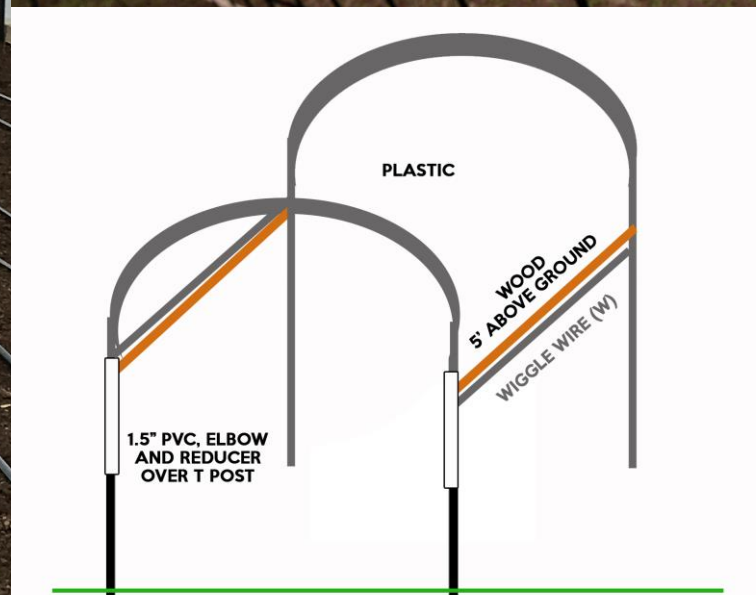
No longer needs to be 6 mil plastic

High Tunnel System	Gothic style high tunnel with shade cloth	sq ft	$2.77
High Tunnel System	HU-Gothic style high tunnel with shade cloth	sq ft	$4.16
High Tunnel System	Quonset style high tunnel with shade cloth	sq ft	$2.20
High Tunnel System	HU-Quonset style high tunnel with shade cloth	sq ft	$3.30


Development of more DIY affordable systems to address heat and ergonomic issues

$1.50-1.58 / sq ft

Utah State High Tunnel Modified for Added Pest Control



Started Evaluating Practical Ways to Screen Fruit Trees

Screening trees for pollination
Seedless Fruit Production
(California, 2016)

For More Information

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