San Juan Basin Research Center
Colorado State University
Agricultural Experiment Station
Hesperus, Colorado
Beth LaShell
SJBRC Staff

- Dr. Doug Zalesky
- Beth LaShell
- Dan Selzer
- Clayton Shonk

Summer FLC Students

- Alyssa Green
- Gus Westerman
- Kimmie Helfinstine
Developing A Hands-on Organic Weed Management Learning Center For Commercial Market Gardens In Local Communities
WSARE Grant

- Western Region
- Sustainable Agriculture Research and Education
- Professional Development Grant
- August 1, 2008 to March 1, 2011
Purpose

• Develop a Learning Center for organic market garden weed management strategies
  – Address the needs of newcomers to the 4-Corners region and long time residents looking for more sustainable alternatives or methods to increase income
Primary Investigators:

• Beth LaShell, San Juan Basin Research Center
• Darrin Parmenter, La Plata County Horticulture Agent
• Dr. Phil Shuler, Fort Lewis College
• Jim Dyer, SW Marketing Network
• Gary Hathorn, Model Farm Dissemination Program; Shiprock, NM
• Tom Hooten, Montezuma County Agent
Training Participants

- Agriculture professionals
- Master Gardeners
- Students
- Progressive producers
- Model Farmers
  - Opinion leaders in culturally diverse communities, and training the next generation of professionals and producers
Outcomes

– Establish Learning Center for training participants in organic weed management strategies
  • Determine knowledge level of Learning Center training participants
  • Provide hands-on organic weed management training to Learning Center participants
– Increase availability of training opportunities and resources on organic weed management
– Create printed document (2011) containing purchase information, appropriate methods, cost, efficacy, and sustainability data
More Outcomes…

– Establish website to document strategies and provide links to current literature
  • www.colostate.edu/dept/sjbrc/owm
– Create BLOG
  • www.organicweedmanagement.blogspot.com
– Provide agriculture professionals with different methods of obtaining the knowledge to help organic producers.
– Assist participants in establishing on-farm demonstration sites in Year 2 to increase local knowledge and implementation.
Workshops for 2010

• Organic Weed Management Symposium
  – Held February 23, 2010 at McGee Park
• Initial Workshop in April
• Summer Workshops (1.5-2 hours)
  – Methodology
  – Soil and sustainability analysis
  – Efficacy and production
  – Hands-on tool usage
  – Managing web-based information
Demonstration Area at SJBRC

- Organic Market Garden Plots
  - 2008: Used 10 different techniques
  - 2009: Used 14 different techniques

- Crops Grown
  - Beans, Beets, Corn, Broccoli, Cabbage, Peas (only 08)
FLC Students created and planted market garden plots

Plots established- May 11, 2009

Plots established- May 22, 2008
OWM Techniques in 2009

**Barrier Methods**
- Black Plastic
- Sunbelt Weed Fabric
- NRCS Weed Barrier
- Garden Bio-Film
- Planters Mulching paper
- Garden Blanket
- Weed Guard Plus
- EcoCover
- Shredded Paper

**Cultural and Biological**
- Horticultural vinegar
- Flaming
- Corn Gluten Meal
- Glaser Wheel Hoe

And a Control
What happens if you do nothing?
Barrier Methods

- Black Plastic
- Sunbelt Weed Fabric
- NRCS Weed Barrier
- Garden Blanket
Black Plastic

- 3’ x 50’ roll - $7.44
  - $.05 per square foot
- 4 mil plastic
- Not biodegradable
- Puncture resistant
- Looks the best!
Sunbelt Weed Fabric

- 3 x 50 ft roll $14.79; 3’ x 300’ roll $69.99
  - $.17 to $.08 per square foot
- 3.2 oz/yard high-grade fabric blocks 99.7% of light
- Resistant tearing, puncturing and weed penetration
- Approved for most government weed control applications
- Typically lasts 8-12 years
  - Manufacturer guarantees product for 5 years against UV breakdown
- Observations
  - Surface gets very hot during peak of summer
  - Can be reused in market gardens
  - 3’ may not be wide enough for market garden rows
NRCS Weed Barrier

• 6’ x 300’ or 4’ x 300’ available
  – $115.50 and $76.75, respectively
    • $.06 per square foot
• Keeps the UV rays out
• Resistant tearing, puncturing and weed penetration
• Long lasting and reusable
  – 2010 will be fourth year for some pieces
• Observations:
  – Surface gets very hot during peak of summer
  – 6’ may be too wide for market garden situations
  – Shifts easily if cut slits for plantings; does better with single holes for transplants
Picture from 2009 where we overlapped fabric to create square plots. Six feet may be too wide.
Garden Blanket

- 2’ x 50’ package $12.99
  - $ .13 per square foot

- Convenient perforated tear offs
- Pre-cut X’s for plant locations
- Micro perforations let in water
- Absorbs sun rays that warm soil
- Includes garden staples

- Observations:
  - Need more staples than provided
  - Slits for continuous rows caused barrier to tear in wind
Biodegradable Barrier Methods

- Bio film
- Planters Paper
- EcoCover
- Shredded Paper
- Weed Guard Plus
Garden Bio-Film

- **50 x 30” roll $16.95**
  - $0.04 per square foot
- **100% biodegradable and compostable mulching film**
  - Made from cornstarch and other renewable resources
  - Begins to decompose in 50-60 days, biodegrading 95% after about 90 days depending on environmental conditions
  - Shelf-stable, its decomposition ability is only activated by UV exposure
  - It can be tilled into the soil at any time during the season
- **Observations**
  - Installation can be difficult
  - Edges must be secured
    - Only 30 inches wide
Planters Mulching Paper

- 2’ x 200’ package $29.99
  - $ .15 per square foot
  - Getting more difficult to find

- Biodegradable, mulching paper
  - When the edges are secured, the crepe in the thin paper allows it to hug the soil and to efficiently pass on the heat it absorbs.
  - Porous to water, it effectively suppresses weeds and keeps vegetables from contact with the soil, reducing spoilage
  - Made from recycled paper containing a resin binder and an anti-microbial to stop decomposition at the paper/soil interface

- Observations:
  - Edges must be secured
  - Installation can be difficult
  - 2’ is too narrow for market garden rows
  - Excessive moisture can accelerate decomposition
EcoCover

- 1m x 100 m package $65.00 plus $60 shipping
  - $ .12 per square foot

- Organically Certified Mulch Mats made from waste paper
- Manufactured in New Zealand; Limited availability in U.S.

- Observations:
  - Very easy to install
  - Edges must be completely covered to prevent tearing from wind
Shredded Paper

- Shredded office paper and obtained bags from local bank
- Created method to lay paper mat
  - Used cardboard sides and created about 6’ at a time alternating paper and water
  - Created 2 inch thick layer

- Observations:
  - Lowest weed percentage
  - Lowest crop production figures
  - Plants were deprived of Nitrogen
Planters Paper (left) vs Shredded Paper (right)
July 30, 2009
Weed Guard Plus

• 23” x 50’ package $12.99  
  – $ .13 per square foot

- 100% Natural Decomposition
- Fertilizer enhanced (5,5,5)
- Helps retain water and reduce soil erosion

• Observations:
  – Edges must be secured; Installation can be difficult; Tears in wind
  – 2’ is too narrow for market garden rows
    • Notice excessive weed growth between rows
  – Excessive moisture can accelerate decomposition
Cultural and Biological Control

- Horticultural Vinegar
- Flaming
- Corn Gluten Meal
- Glaser Wheel Hoe
Horticultural Vinegar

• 1 gallon; $26.00
  – ½ gallon will treat 80 linear feet
• 20% Acetic Acid (household is typically 5%)
  – Diluted to 10% for research project
• Spray directly on dry leaves
• Most effective on warm, sunny days
• Contains Yucca extract to increase effectiveness
• High acidity (over 11%) can cause skin burns and eye damage
Horticultural Vinegar - Apply when weeds are small

2008

2009
Flaming

- Tractor mounted or handheld units available
  - Weed Dragon: $69.99
  - Can produce heat up to 2,000 °F
- Propane fueled
  - Purchase tank separately
- Pass heat quickly over small weeds
- Water in cells boils and bursts the cells
- Generally does not kill grasses
- Certain vegetables will not tolerate heat
Corn Gluten Meal

• By-product of corn milling process
  – Pre-emergent herbicide
    • Effective in stopping or inhibiting root formation
    • Must be applied after seeds have germinated or use transplants
  – 10% Nitrogen
  – Been primarily used on lawns
    • 20 lb/1000 square feet recommended

Trade names:
  – WOW, WeedBan, SafeLawn
  – $.02/square foot plus shipping

• Lawn products are not as effective
  – Pure corn gluten meal not readily available
Glaser Wheel Hoe

- Lightweight with low center of gravity
  - $349 for professional version
    - Wider; heavier duty; 57 inch handle; 12”’ wheel
  - $199 for standard version
    - 52 inch handle; 10”’ wheel

- Several attachments available
  - $59-$99
  - Oscillating knives
  - Furrower
  - Cultivator
## Cost Comparison Review

<table>
<thead>
<tr>
<th>Product</th>
<th>Cost</th>
<th>Square feet</th>
<th>Cost per sf</th>
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<tbody>
<tr>
<td>Black Plastic</td>
<td>$7.44</td>
<td>150</td>
<td>$0.05</td>
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<tr>
<td>Sunbelt Weed Fabric</td>
<td>$24.99</td>
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<td>$69.99</td>
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<tr>
<td>NRCS Weed Barrier</td>
<td>$115.50</td>
<td>1800</td>
<td>$0.06</td>
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<tr>
<td></td>
<td>$76.75</td>
<td>1200</td>
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<td>Garden Biofilm</td>
<td>$16.95</td>
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<td>$0.04</td>
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<td>Planters Mulching Paper</td>
<td>$29.99</td>
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<td>Garden Blanket</td>
<td>$12.99</td>
<td>100</td>
<td>$0.13</td>
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<tr>
<td>WeedGuard Plus</td>
<td>$12.99</td>
<td>100</td>
<td>$0.13</td>
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<tr>
<td>EcoCover</td>
<td>$125.00</td>
<td>1024</td>
<td>$0.12</td>
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<td>WOW: CGM</td>
<td>$49.90</td>
<td>2000</td>
<td>$0.02</td>
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<td>Horticultural Vinegar</td>
<td>$13.00</td>
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## Weed Suppression

<table>
<thead>
<tr>
<th>Treatment</th>
<th>DataPoint</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Glaser Wheel Hoe</td>
<td>Weed</td>
<td>0.83%</td>
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<td>Shredded Paper</td>
<td>Weed</td>
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<td>Biofilm</td>
<td>Weed</td>
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<td>Weed</td>
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<td>Weed</td>
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<td>BI Plastic</td>
<td>Weed</td>
<td>34.17%</td>
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<td>EcoCover</td>
<td>Weed</td>
<td>41.25%</td>
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<tr>
<td>Weed Guard Plus</td>
<td>Weed</td>
<td>52.50%</td>
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<td>Hort Vinegar</td>
<td>Weed</td>
<td>59.58%</td>
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<tr>
<td>CGM</td>
<td>Weed</td>
<td>62.08%</td>
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<tr>
<td>Control</td>
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<td>71.25%</td>
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<tr>
<td>Garden Blanket</td>
<td>Weed</td>
<td>74.58%</td>
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# 2009 Production Data (Beans, Beets, Broccoli)

<table>
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<tr>
<th>Treatment</th>
<th>Total Production (pounds)</th>
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<td>EcoCover</td>
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<td>Planters Paper</td>
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<td>GWH</td>
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<td>Biofilm</td>
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<td>Flaming</td>
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<td>Hort Vinegar</td>
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<tr>
<td>Black Plastic</td>
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<td>Garden Blanket</td>
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<td>NRCS Fabric</td>
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<tr>
<td>Control</td>
<td>2.2</td>
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<tr>
<td>Shredded Paper</td>
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New Barrier Methods for 2010

• Red Mulching Film
• Newspaper/Straw combination

• Removing the following:
  • Shredded Paper
  • WeedGuard Plus
Summer Workshops

• Hands-on Topics
  – Methodology
    • Tour demonstration plots
  – Soil and sustainability analysis
    • Soil sampling, pH meters, water filtration, soil compaction
  – Efficacy and production
    • See which methods are working
  – Hands-on tool usage
    • Glaser Wheel hoe, Flamers, Hand tools

• Schedule
  – Beginning in June
  – 1.5 to 2 hour workshops at SJBRC in Hesperus
  – Usually conduct 2-3 different workshops
Summer 2009 Workshops
Becoming involved in OWM Learning Center

- **Website**
  - [www.colostate.edu/dept/sjbrc/owm](http://www.colostate.edu/dept/sjbrc/owm)
  - Long term storage of information

- **Blog**
  - [www.organicweedmanagement.blogsplot.com](http://www.organicweedmanagement.blogsplot.com)
  - Small articles/pictures that can be easily updated
Demonstration Plots for 2010

- Shiprock, NM
- Norwood, CO
- Bayfield, CO

Will work with producer to set up best organic technique for their crop and climate
How can you be involved?

• Sign up to be a participant!!!
  – Complete form today and you’ll receive email updates on workshops and activities

• Attend workshops

• Contact me at lashell_b@fortlewis.edu

• Stop by anytime to tour the demonstration plots
Questions?

WSARE Hoophouse at Hesperus

Before

After

Demonstration Site Jan ‘10