From Conventional to Organic: Weed Management Principles for the Transition Years

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From Conventional to Organic Cropping: What to Expect During the Transition Years

by Fabien Mendlik, Obin Jones, Dave Buschman, and Perry Miller

Organic agriculture is one of the fastest growing sectors in Montana’s agriculture. This MontGuide reviews the definition of organic agriculture and describes some of the economic, environmental, and biological challenges that a producer could face during the transition period from conventional to organic practices.

What is organic agriculture?

Although the term “organic” may sound ambiguous, the USDA National Organic Standards Board (NOSB) provides useful guidelines. Specifically, the NOSB states that organic agriculture “is based on minimal use of off-farm inputs and on-farm management practices that conserve, maintain, or enhance ecological harmony.” In this context, the primary goal of organic agriculture is to optimize the health and productivity of interdependent communities of soil life, plants, animals, and people and “the principal guidelines for organic production are to use materials and practices that enhance the ecological balance of natural systems and that integrate the parts of the farming system into an ecological whole.”

How can I become a certified organic crop producer?

Organic producers interested in obtaining USDA certification in organic agriculture must comply with the National Organic Program (NOP). This program develops, implements, and administers national production, handling, and labeling standards for organic farming. Specifically, the organic crop production certification standards require that:

- Land must have no prohibited substances (e.g., non-approved pesticides and synthetic fertilizers) applied to it for at least 3 years before the harvest of an organic crop.
- Soil fertility and crop nutrients should be managed through tillage and cultivation practices, crop rotations, and cover crops, supplemented with animal and crop waste materials and allowed synthetic materials.
- Crop pests, weeds, and diseases should be controlled primarily through management practices including physical, mechanical and biological controls. When these practices are not sufficient, an approved biological, botanical, or synthetic substance may be used.
- Preference will be given to the use of organic seeds and other planting stocks, but a farmer may use non-organic seeds and planting stocks under specified conditions.
- The use of genetic engineering, ionizing radiation and sewage sludge is prohibited.

More information on the USDA NOP can be found at www.ams.usda.gov/nop.

Organic Crops in Montana

According to recent data provided by the Montana Department of Agriculture, Montana ranks first among U.S. states in the production of certified organic wheat, and second in organic production of all grains, peas, lentils and flax. As of 2005, there were 1,453 USDA certified organic producers and cropland operations, representing a total of 103,433 and 126,450 acres respectively.

The Montana Department of Agriculture is accredited to certify organic producers and handlers. More information on the Montana Department of Agriculture Organic program, organic growers in the state and the organic certification process can be found at [website].

For More Online MontGuides, Visit www.msextension.org
A Disclaimer

• This is not going to be a “traditional” weed extension presentation
• Your best weed management tool is located between your ears
Today, we’ll talk more about principles than specific practices.
Outline for Today’s Presentation

Transitioning to organic

• What to expect

Some basic concepts

• What is a weed?
• Why do we have weeds?

Integrated Weed Management (IWM) in organic systems
From Conventional to Organic
What to Expect

Yield

Time

Stop Synthetic Herbicide & Fertilizer Inputs

Weeds (& other things)
What’s the Impact of Transitioning from Conventional to Organic on Weed Communities?
Study Site

Bozeman

P. Miller, LRES, MSU
Organic & No-till Rotations After 4 yr, Bozeman (Counted prior to spraying No-till)

Number/m²

- F. pennycress
- Wild oat
- Cheatgrass
- Prkl. lettuce

Organic

No-till

P. Miller, LRES, MSU
Field Pennycress. A smother crop?

July 18 - Organic winter wheat (4 days before severe hail)

P. Miller, LRES, MSU
So...I Shouldn’t be Scared, Right?
... WRONG! The Real Weed Story

Canada Thistle

www.btny.purdue.edu/Extension/Weeds/NoTillID/

Organic lentil plot
May 30, 2007
A healthy alfalfa stand can help you managing Canada thistle
Assessing Weed Communities in Conventional and Organic Systems
Study Sites

Big Sandy

Moore
<table>
<thead>
<tr>
<th>Weed Species - Big Sandy, MT</th>
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<tbody>
<tr>
<td><strong>Shared</strong></td>
</tr>
<tr>
<td>Crazyweed</td>
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<tr>
<td>Kochia</td>
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<tr>
<td>Prickly lettuce</td>
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<tr>
<td>Redroot pigweed</td>
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<td>Russian thistle</td>
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<td>Wild buckwheat</td>
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<td>Wild oat</td>
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<td>Canada thistle</td>
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<tr>
<td><strong>Conventional</strong></td>
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<tr>
<td>Perennial ryegrass</td>
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<td>Alfalfa</td>
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<td>Barley</td>
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<td>Winter vetch</td>
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<td>Common chicory</td>
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<td>Common lambsquarters</td>
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<td>Cowcockle</td>
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<td>Cheatgrass</td>
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<td>False flax</td>
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<td>Field pennycress</td>
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<td><strong>Organic</strong></td>
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<td>Canada goldenrod</td>
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<td>Green foxtail</td>
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<td>Cutleaf nightshade</td>
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<td>Tansy mustard</td>
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<td>Crossflower</td>
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<td>Milkweed</td>
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<td>Rush skeletonplant</td>
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<td>Common sunflower</td>
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<td>Tall tumblemustard</td>
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<td>Wild mustard</td>
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<td>Yellow starthistle</td>
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<td>Field bindweed</td>
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From Conventional to Organic
What to Expect

- Abundance
- Diversity

in reduced input & organic systems
From Conventional to Organic
What to Expect

- Abundance
- Diversity
- Species composition

\rightarrow in reduced input & organic systems

\rightarrow Shift
From Conventional to Organic
What to Expect

- Abundance
- Diversity
- Species composition
- Spatial patterns

Shift in reduced input & organic systems
Why Assessing the Spatial Distribution of Weeds?

- Weeds in conventional systems are distributed as patches
  
  Dieleman et al., 1999; Faechner et al., 2002; Hughes, 1990;
  Mortensen et al., 1995; Rew and Cousens, 2001; Wiles et al., 1992

- Precision agriculture
- Weed distribution in organic systems?
- Site specific agriculture
Spatial Patterns

Percentage cover / spp. Weed species richness, diversity

- Big Sandy, MT
- 3 conventional fields
- 3 organic fields

Stratified sampling

Weed patch
**Conventional**

**Organic**

*No Gaps!*
From Conventional to Organic
What to Expect

- Abundance
- Diversity
- Species composition
- Spatial patterns

Shift in reduced input & organic systems

complexity
The sky is falling! X

Weeds = Yields
This relationship isn't constant

↓ Yields ≠ ↓ Profits

↑ Weeds = ↓ Yields

© Disney
Weed Abundance & Yield

Weed abundance

Yield
Weed Abundance & Yield
Weed Abundance & Yield

Yield

Weed abundance

Weeds
(& other things)
When transitioning, don’t go “the whole enchilada”. Take “baby steps”
Outline for Today’s Presentation

✓ Transitioning to organic
  ✓ What to expect

Some basic concepts
  • What is a weed?
  • Why do we have weeds?

- Integrated Weed Management (IWM) in organic systems
Questions, so far?
What is a Weed?

Photos Source: WSSA web site. Ian Heap
What is a Weed?

A plant that is growing where it is not wanted

Roberts et al. 1982. Weed Control Handbook
Any Problem With this Definition?
Understand the source of your problems

Source: C. Mohler
Why Do We Have Weeds?

Light

Water

Nutrients

Space
Why Do We Have Weeds?

Because we create the environments where weeds thrive!
Weed Management is Achieved Through "large hammer"
Alternative Weed Management

- Replace a “few large hammers” with “many little hammers” (herbicides, tillage, crop rotation, pathogens, insects, cover crops, etc)
- Alone, each factor may have a small effect. Together, these factors may provide sufficient control

Liebman and Gallandt 1997

Integrated Weed Management
Outline for Today’s Presentation

✓ Transitioning to organic
  ✓ What to expect

✓ Some basic concepts
  ✓ What is a weed?
  ✓ Why do we have weeds?

Integrated Weed Management (IWM) in organic systems
Questions, so far?
Weed Management
Weed Management
Weed Management

Cultivation

Prevention
CRP to Organic?
Do Not Spread Weed Seeds!

Standard weed management conducted at the field level

270% expansion over 6 years

Standard weed management + weed shed prevention

24% expansion over 6 years

1997 2002

After H. Beckie, Agri-Food Canada @ Saskatoon
Row Spacing and Seeding Rate

20 site-years in Oklahoma

Wheat yield (Bu/A)

Weed Free

Cheat

Row spacing (inches)

Epplin et al. 1996
Weed Management

Crop variety
Row spacing
Seeding density
Cultivation
Prevention
Crop Variety

Weedy vs. Weed Free

Weed tolerance

Weed suppression

Harrow tolerance

After Jones & Murphy, 2006
Crop Variety

Cultivars vary in their competitive ability:

- Height
- Early season growth
- Tillering capacity
- Leaf area

- Some varieties are better adapted to weed competition than repeated harrowing and vice versa

Mason and Spaner, 2006 & Jones and Murphy, 2006
fallow → wheat → fallow → wheat → fallow → wheat

Grassy Weeds
“Rotation of crops, when accompanied by care in the use of pure seed, is the most effective means yet devised for keeping land free of weeds.”

Leighty (1938)
Crop Rotation and Cheatgrass Density

Downy brome density (no. m^{-2})

<table>
<thead>
<tr>
<th>Year</th>
<th>Wheat-canola, no-till</th>
<th>Wheat-canola, till</th>
<th>Continuous wheat, no-till</th>
<th>Continuous wheat, till</th>
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(After Blackshaw 1994)
Relative Time of Emergence

- Downy brome emergence:
  - 0-14 days after wheat
  - 21-35 days after wheat

Wheat Yield Loss (%)

Downy Brome Populations (plants/sq. yd.)
Weed Management

- Crop rotation
- Crop variety
- Time of emergence
- Time of control
- Row spacing
- Cultivation
- Resource management
- Seeding density
Weed Management

Crop rotation

Crop variety

Time of emergence

Time of control

Resource management

Cultivation

Seeding density

Row spacing
You Are Not Alone....

CLOSE ENCOUNTER
OF THE FIRST KIND
Sighting of a UFO

CLOSE ENCOUNTER
OF THE SECOND KIND
Physical Evidence

CLOSE ENCOUNTER
OF THE THIRD KIND
Contact

CLOSE ENCOUNTERS
OF THE THIRD KIND
Welcome to eOrganic
Fri, 03/07/2008 - 15:08 — alex.stone

eOrganic is a web community (eOrganic.info) where organic agriculture practitioners, researchers, and educators network, exchange objective, research- and experience-based information, learn together, and communicate regionally, nationally, and internationally. As an eOrganic community member, you can create a personal webpage, form/join one or more workgroups, work on personal and group projects, and network and learn from other eOrganic members.

One of eOrganic's missions is to develop organic agriculture content for extension, the new national Extension website (www.extension.org). eOrganic will publicly launch outreach material on eXtension.org in Fall 2008. eXtension is a searchable collection of articles, videos, presentations, interactive materials, news, and ask-the-expert. eOrganic's eXtension content is created by and for farmers, Extension and other educators, agricultural professionals, researchers, students, and the general public.

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Weed Management in Diversified Vegetable Production Systems

Thu, 04/17/2008 - 14:14 — john.mcqueen

Mark Schonbeck, Virginia Association for Biological Farming
updated September 9, 2008

1. Introductory Articles

   1. *An Ecological Understanding of Weeds*
   
   2. *The Organic Grower’s Dilemma: how to manage weeds effectively without compromising soil quality*
   
   3. *Integrated Pest Management Concepts for Weeds in Organic Systems*
   
   4. *Twelve Steps Toward Ecological Weed Management in Organic Vegetables*

II. Planning for Ecological Weed Management in Organic Vegetables

   1. **Step 1 – Know the Weeds**

      i. Ecology of Weed Management in Organic Systems
      
      ii. *Weed Monitoring*
      
      iii. *Weed Identification Tools and Techniques*
      
      iv. *A Virtual Tour of Major Weed Plant Families*

   2. **Step 2 – Design the Cropping System to Minimize Niches for Weed Growth**

   3. **Step 3 – Keep the Weeds Guessing**

   4. **Step 4 – Design the Cropping System and Select Tools for Effective Weed Control**

      i. *An Organic Weed Control Toolbox*
      
      ii. *An Illustrated Listing of Cultivation and Flame Weeding Tools for Vegetable Production*
      
      iii. *Building for Weed Control*
The sky isn't falling!

Principle # 1: Don't hate weeds, manage them
OK, You can Hate These Guys...

Field Bindweed

Canada thistle
Principle #2: Don’t go “the whole enchilada”. Take “baby steps”
Principle # 3: Understand the source of your problems
Principle #4: Use All Your Tools!

- Crop rotation
- Time of emergence
- Time of control
- Herbicides
- Resource management
- Crop variety
- Seeding density
- Row spacing
Principle # 5: ASK!

CLOSE ENCOUNTER
OF THE FIRST KIND
Sighting of a UFO

CLOSE ENCOUNTER
OF THE SECOND KIND
Physical Evidence

CLOSE ENCOUNTER
OF THE THIRD KIND
Contact

CLOSE ENCOUNTERS
OF THE THIRD KIND
Principle # 6:

• Your best weed management tool is located between your ears!
Questions?