



Great Lakes Fruit, Vegetable & Farm Market EXPO Michigan Greenhouse Growers EXPO

December 4-6, 2018

DeVos Place Convention Center, Grand Rapids, MI



50 Organic Production - Where to Start?

Where: Grand Gallery Overlook Room H

MI Recertification Credits: 1 (COMM CORE, PRIV CORE)

CCA Credits: PM (1) CM (1)

Moderator: Vicki Morrone, Michigan State University

- 9:00 AM** **Intro to Helpful Resources for Transitioning to Organic**
- Vicki Morrone, Michigan State University
- 9:15 AM** **Painless Fundamentals of Achieving Organic Certification**
- Harriet Behar, University of Wisconsin-Madison
- 10:00 AM** **Choosing Varieties for Organic Markets and Maybe Even Saving Their Seed**
- Lori Hoagland, Purdue University
 - Liz Maynard, Purdue University
- 10:45 AM** **Equipment Adjustment for Effective Cultivation and Tillage**
- Sam Hitchcock Tilton, K.U.L.T. Kress LLC
- 11:30 AM** **Session Ends**

CHOOSING VARIETIES FOR ORGANIC MARKETS AND CONSIDERATIONS FOR SAVING SEED

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EXPERIENCE
Purdue Agriculture

HORTICULTURE

OUTLINE

- Organic seed certification
- Choosing varieties for organic markets
- Why might you consider saving seed?
- Important considerations for saving seed
- Resources for further information



<https://www.seedsavers.org/saving-seeds-for-beginners>

ORGANIC CERTIFICATION REQUIREMENT

SEEDS AND PLANTING STOCK (§205.204)

- Producers of organic crops are required to source certified organic seed, annual seedlings and planting stock.
- If organic seeds are not commercially available, non-organic untreated seeds may be used.



WHY ARE ORGANIC SEEDS REQUIRED?

- Seed production is part of our agricultural systems
 - often rely of frequent pesticide applications
- Solution to corporate control over the seed industry
 - best varieties for organic systems (or best regionally adapted varieties) can be dropped in favor of more widely adapted varieties
- Seed grown in organic farming systems may be better adapted for organic systems



CHOOSING THE BEST VARIETIES FOR ORGANIC MARKETS

END-USE QUALITY CHARACTERISTICS

- FLAVOR!!!**
- Market trends
 - cocktail tomatoes/lunchbox peppers
 - miniature specialty cucumbers
 - novel colored carrots
- Market specialization
 - 'the purple potato guy'



AGRONOMIC CHARACTERISTICS

- Maturity
- Resistance to pests

Consult with Plant Pest and Diagnostic Labs to Know Your Enemies

- Yield




KEEP CALM AND KNOW YOUR ENEMY



Disease Resistance Codes in Seed Catalogs
 AS - Alternaria Stem Canker N - Nematodes
 F2 - Fusarium Wilt (Races 1 & 2) L - Gray Leaf Spot
 V - Verticillium Wilt
 TMV - Tobacco Mosaic Virus

VARIETIES BRED IN AND FOR ORGANIC FARMING SYSTEMS

- Evidence that varieties bred under organic farming conditions are better adapted to organic farming systems (Murphy et al., 2007; Lammerts van Bueren et al., 2011; Hoagland et al., 2012)
- Why?
 - Nutrient dynamics (*organic vs. inorganic nutrient sources*)
 - Weed competition
 - Tolerance to mechanical weed control
 - Pest resistance
 - Interaction with beneficial soil microbes
- Organic vegetable breeding programs are underway



<http://eorganic.info/tomi>

ORGANIC VARIETY TRIALS

- Promising varieties selected and evaluated for performance in organic farming systems
- <https://varietytrials.eorganic.info/>



Southeast Organic Seed + Variety Trial Report



Check with your local organic extension specialist to learn about local trials

CONDUCTING YOUR OWN ORGANIC VARIETY TRIAL

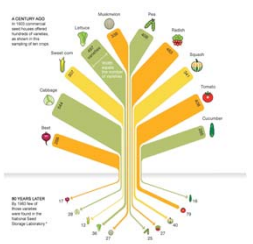
- Identify specific objectives for the trial (ie. disease resistance, flavor, etc.)
- Identify promising varieties from seed catalogs, non-profit groups, germplasm repositories, etc.
- Replicate and randomize plots
- Plan ahead to allow enough time to collect data and analyze results



WHY MIGHT YOU CONSIDER PRODUCING YOUR OWN SEED?

WHY SAVE SEEDS?

- It's part of our cultural history
- We're losing genetic diversity at an alarming rate
- Ensure that your favorite varieties remain available in the face of corporate control over seed systems
- Adapt varieties for your farm



KEY CONSIDERATION BEFORE STARTING

Can or should you save a particular seed lot?

- **Open-pollinated (OP):** stable varieties resulting from pollination between the same or genetically similar parents (**YES**)
- **Hybrids:** varieties resulting from pollination between genetically distinct parents. F1 is the first generation after pollination (**PROBABLY NOT WORTH IT BECAUSE PROGENY WILL NOT BE "TRUE TO TYPE"**)
- **GMO's (genetically modified organisms):** seeds that have had their genetic make-up altered by replacing certain genes (**CANNOT BE SAVED**)

13

PLANT MATING SYSTEMS

Self-pollinated plants (inbreeding):

- Plant species that are pollinated and fertilized by their own pollen
- Natural condition due to flower structure
ex. pea flower petals completely enclose stamens and pistils

Examples of self-pollinated crops

| | |
|--------|---------|
| wheat | rice |
| tomato | oats |
| barley | legumes |

14

PLANT MATING SYSTEMS

Self-pollinated plants (inbreeding):

- Advantages:
 - Helps maintain genetic purity
 - Helps ensure reproductive success under variable conditions
- Population 'Fixed' by selection under consecutive generations
 - Breeds "true to type"
- Offspring can still be different from mother
 - 4% outcrossing
 - Genetic mutation

Tomato

Easier to save seed from these crops

15

PLANT MATING SYSTEMS

Cross-pollinated plants (outbreeding):

- Most common strategy in nature
- Plant is pollinated by a different plant (*flowers are open*)
- High diversity maintained in the population

Examples of self-pollinated crops

| | |
|----------|------------|
| beets | corn |
| spinach | alfalfa |
| broccoli | watermelon |

16

PLANT MATING SYSTEMS

Cross-pollination (outbreeding):

- **Advantage:** provides opportunity for evolutionary adaption to changing environments
- Requires pollination by wind, animals, insects or humans

More difficult to seed from these crops

Pollination of *Euphorbia bupleurifolia*

17

POLLINATION AND FERTILIZATION

- In-breeders require movement (ie. wind or you to encourage pollination)
- Out-breeders require:
 - 1) sufficiently large population of the crop flowering in unison
 - 2) adequate insect/animal population or wind

Method depends on plant species

18

ISOLATION

- Required to maintain genetic purity (varieties that breed "true-to-type")
- Protects your seed from pollen of plants from the same species that you did not intend to for your plants to cross with
- Know the genus and species of the plant you are working with (including related weed species)



Examples of plants that can interbreed

Brassica oleracea

- Cabbage
- European kale
- Broccoli
- Brussel sprouts
- Cauliflower

Daucus carota

- Queen Anne's Lace
- Domestic carrot

19

ISOLATION REQUIREMENTS



- Isolation in space
 - self-pollinated crops (10 ft)
 - cross-pollinated crops
 - insects (1/4th to 1 mile)
 - wind (1/8th to 2 miles)
- Isolation in time (stagger planting dates)
- Isolation with physical barriers

Isolation in space

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Isolation with physical barriers





20

POPULATION SIZE

- Need to retain some genetic variability within the population to avoid inbreeding depression in cross-pollinated crops
- Improves adaption to:
 - environment
 - pathogens
 - etc.
- Number of plants depends on the plant and available space

Number of plants depends on the plant and available space



Onion – 200 plants
Lettuce – 10 to 20 plants
Arugula – 80 plants

21

SEED PRODUCTION


- Use best management practices to optimize crop productivity and avoid pest outbreaks
- Carefully observe plants and only save seed from the best plants and fruits
- Do not save seed from diseased plants/fruits
- Wait to harvest until fruit/seed structures are fully ripe or just past being fully ripe

Use best management practices to optimize crop productivity and avoid pest outbreaks

Carefully observe plants and only save seed from the best plants and fruits

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Beet seed production

22

SEED PROCESSING

Dry seeds

- May want to use a drop cloth to catch seeds
- Cut seed pods when plants are fully dry
- Thresh to separate seeds
- Clean seeds to remove chaff
- Dry seeds for storage

Wet seeds

- Soak for 8-12 hours to loosen pulp - some plants (ie. tomato/cucumber) require fermentation for 2-3days
- Decant to let seeds settle
- Rinse using screens/colanders
- Dry seeds for storage





Fermenting tomato

23

SEED TREATMENT


- Many pathogens can be spread via seed
- Passive (seed surface)
- Active (systemic/inside seed)

Many pathogens can be spread via seed

Passive (seed surface)

Active (systemic/inside seed)


Affects ability to clean or treat seed



- Many viruses
- Some fungi
 - Vascular wilts
 - (*Verticillium dahliae*, *Fusarium oxysporum*)
- Few bacteria
 - *Xanthomonas campestris*

Routes of active seed infection

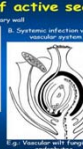
A. Penetration through embryo wall



E.g. *Ascochyta blight* (*Ascochyta blight*), *Ascochyta blight* (*Ascochyta blight*)


From Meeke (1976)

B. Systemic infection via vascular system



E.g. *Vascular wilt* (*Fusarium oxysporum*)

C. Penetration through floral ducts




E.g. *Onion yellow neck* (*Peronospora allii*)

24


HOT WATER TREATMENT

- **Physical treatment of seed with hot water to eliminate pathogens**
- **Advantages**
 - can kill internal as well as external pathogens
 - can fully eradicate heat sensitive pathogens
 - leaves no residue



25

HOT WATER TREATMENT



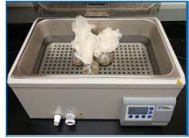
- **Disadvantages**
 - may delay or reduce seed germination, particularly in old and poor quality seed
 - may reduce seed vigor and longevity
 - **too damaging to large-seeded crops**
- **Considerations**
 - treat a small sample 1st and test for viability
 - apply only to new, high-quality seed
 - treat seeds close to the time of planting (within weeks)
 - treat seed only one time in their lifetime

26

HOT WATER TREATMENT METHODS

Requires precise timing & temperature control

- **Method:**
 - Wrap seed in permeable cloth (ie. cheesecloth)
 - Soak & pre-warm @ 100F for 10 min.
 - Transfer seed to bath for prescribed temp. & duration
 - Place seed in cold tap water for 5 min. to end treatment
 - Spread on paper towel or screen to air dry




| Species | Temp. (F) | Duration |
|---------|-----------|----------|
| Cabbage | 122 | 25 |
| Carrot | 122 | 20 |
| Lettuce | 118 | 30 |
| Mustard | 122 | 15 |
| Tomato | 122 | 25 |

27

BLEACH

- Chemical treatment (*calcium/sodium hypochlorite*) of seed
- Only option for large-seeded vegetables
- Disadvantages: only affects pathogens on seed surface
- Advantages:
 - quick, easy, no spec. equip. needed
 - can be combined with harvest of wet seeds
- **Method:**
 - soak seed in 5-10% bleach solution for 20 minutes and rinse thoroughly

Check with certifier to ensure compliance



28

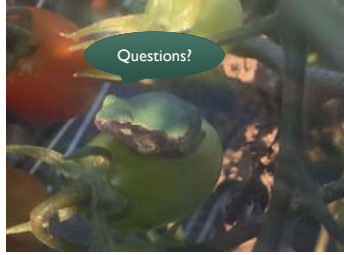
ADDITIONAL SEED SAVING RESOURCES





29

THANK YOU FOR YOUR ATTENTION



30

Painless Fundamentals of Achieving Organic Certification



Based on a law passed by Congress in 1990
 October 2002
 CFR 7 Part 205

www.ams.usda.gov/nop

Harriet Behar
 Outreach Specialist

Organic and Sustainable Cropping Systems Program, U of WI - Madison

Organic is a production claim.

Organic is about how food is produced and handled.

Organic is not a content claim.

It does not represent that a product is "free" of something.

Organic is not a food safety claim.

Organic is not a judgment about the quality and safety of any product.



Any farmer or processor who sells more than \$5000 annually of organic production, must be **Certified** to use the organic label.



with a yearly inspection to continue their certification.

"Exempt" (non-certified) operations cannot sell crops that are further "processed", this includes livestock feed.

There is no "Transition to Organic" label recognized in the marketplace; there is no organic premium for "transitional".



Exempt from certification organic producers can sell their organic products direct to consumer at farmers markets or roadside stands as well as to retailers or restaurants who will not further process their crops or who will not represent their processed product as organic.

Only *CERTIFIED* organic operations may use this seal.



- ✓Farmer chooses certification agency and receives application
- ✓Application received by agency
- ✓Agency reviews application and may ask for more information
- ✓Agency assigns inspector, crops must be seen during growing season
- ✓Inspector writes report and sends to agency
- ✓Agency reviews all documentation, and either approves or denies certification, with comments.



A three to five hour on-site inspection verifies all information provided on the application, including crops, crop production methods, buffer zones, projected harvest yields, storage and sales.



It can be beneficial to have an outsider review and discuss the organic management system.

Organic Certification Cost Share

Funds distributed through each state's Department of Agriculture

\$750 per year or 3/4 the cost of certification (includes certification fee, all inspection fees and user fees) whichever is LOWER. Payment is per scope, crops, livestock, wild harvest and/or handling

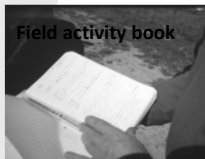
Record keeping is an important aspect of certified organic production. Management decisions are based on historical reference and knowledge



Organic Production and Handling Requirements

Components of the Organic System Plan-written in the organic certification application.

- Practices
- Materials used
- Monitoring
- Recordkeeping
- Planting of organic seed
- Management and buffer zones



Records needed to illustrate activities on the farm that demonstrate operator complies with organic rules.



MOSA Completed the first year
3 YEAR FIELD HISTORY

Use a separate line for each field and list fields in order. Do not group fields on the same line unless the fields are always tilled as one field.

| Office Use Only | Field # | Acres | Seed or Other | Crop | Name | Year: 2015 |
|-----------------|---------|-------|---------------|------|---|--|
| | | | | | Seed variety and Company (List any inoculants or seed treatments) | Input (such as fertilizer, lime, weed or pest control products and manure) |
| | | | | | Amount / Rates of input used | Input application dates |

MOSA Completed subsequent years
CROP SUMMARY / CURRENT YEAR FIELD PLAN

Name: _____ Year: _____

1. Complete the Current Year Field Plan below for all organic, transitional and conventional land under your management.

2. Using the equipment shown, the Field No., and the total number of acres of each crop type, fill in the field plan below. Vegetable producers, for your convenience, will receive a complete list of crop systems including corn/soybeans. If your field does not fit into any category, select A (crop other). In the "Notes" section, list the production plan for each crop.

| CROP SUMMARY | FIELD NO. | NUMBER OF ACRES | CROPPING SYSTEM | CONVENTIONAL | TRANSITIONAL | ORGANIC | PRODUCTION YEAR | FIELD NO. FOR FIELD PLAN |
|--------------|-----------|-----------------|-----------------|--------------|--------------|---------|-----------------|--------------------------|
| | | | | | | | | |

Definitions


➤ **Organic production-** A production system that is managed in accordance with the Act and regulations to respond to site-specific



conditions by integrating cultural, biological and mechanical practices

that foster cycling of resources, promote ecological balance and conserve biodiversity.



Transition period to organic



This includes no use of nonapproved seed treatments for the transitional years.


Land Requirements
 •Fields must have distinct boundaries and buffer zones.
 •No prohibited substances applied to it for a period of 36 months immediately preceding harvest of the crop.
 Previously fallow land can grow an organic crop immediately: no waiting time.
 All crops and livestock managed by farmer are not mandated to be organic.

Organic production mandates a soil building rotation, promoting improved soil fertility, soil structure and increased organic matter.

14

Can continuous row crops that require extensive cultivation each year (such as sweet corn/green beans/sweet corn) be considered a rotation that improves soil organic matter?



15


Farming Systems Trial
Rodale Institute



Crop residues
Crop residues
Crop residues
Animal manure

20 years of similar tillage intensity
Different quantity of Carbon inputs

Soil Fertility and Crop Nutrient Practice Standard



MANURE---MUST be composted UNLESS it is

- Applied for a crop NOT for human consumption
- Soil incorporated not less than 120 days prior to the harvest whose edible portion is in contact with soil particles.
- Soil incorporated not less than 90 days prior to the harvest whose edible portion does not have direct contact with soil particles

17


Organic issues to be tracked with manure

Under the "prevent contamination or application of prohibited substances to organic land"....

- No arsenic fed to poultry or hogs
- No synthetic substances added to manure pits to control odor
- No fly sprays on piles of solid manure
- No use of "factory farm" manure if crop is to be sold into the European Union.
- Documentation from supplier of manure should be present verifying compliance.
- Nonorganic carbon sources such as lawn clippings, hay, straw, and even GMO corn or soybean stalks are allowed under the USDA rule in raw manure or compost.

Compost defined as:
 Processed from plant and animal materials

- Initial Carbon:Nitrogen ratio between 25:1 to 40:1
- Temperature maintained between 131 and 170 degrees F for 15 days using a windrow that has been turned at least 5 times
- Temperature maintained between 131 and 170 degrees F for 3 days using an in-vessel or static aerated pile.



Processed manures that reach 165 degrees or 150 degrees for one hour or can be proven to contain less than 1000 most probable number (MPN) fecal coliform and 3 MPN Salmonella per 4 gram can be used with no restriction, the same as compost.

Materials and the National List


- All naturals approved
- All synthetics prohibited
- If a natural is on list, then prohibited
- If synthetic on list, then approved
- List is broken into crops, livestock and ingredients in processed products.

20

NOT ALLOWED

- Genetically engineered products
- Grown with sewage sludge
- Irradiated

Synthetic substances unless specifically approved.....



Organic Crop Fertilizers


- Fish Emulsion
- Kelp Meal
- Soybean Meal
- Feather Meal
- Blood Meal
- Bone Meal
- Humic Acid
- Compost
- Raw Manure
- Soil Bacteria – AgRestore type products
- Dehydrated pelletized manures/composts

Soil Amendments –mined

Quarry lime okay, hydrated lime not okay for soil amend

Gypsum – calcium sulfate okay

Recycled wall board – not okay



22

Pest, weed and disease control hierarchy

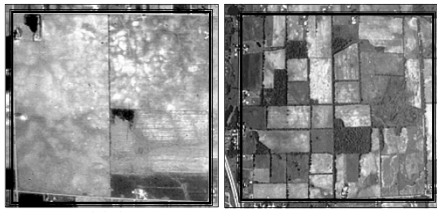
1st: Cultural (crop rotation, sanitation, seed variety)
 Mechanical or physical (exclusion, beneficial insect habitat, lures, traps, repellants, mulches, flame)

2nd: Natural biological, botanical or mineral inputs

3rd: Approved synthetics on the national list-provided the CONDITIONS for use are DOCUMENTED and the previous 2 were ineffective

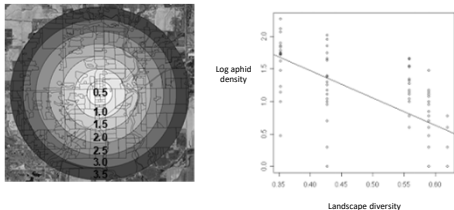
23

Agricultural Landscapes



Simple landscape Complex landscape

Relationship between landscape diversity and aphid outbreaks



SEEDS

**Certified organic seeds must be used, unless producer proves the seed they wish to use is not "commercially available".*

**Proof that the producer tried to obtain organic seed of an equivalent variety to desired type.*

**Phone logs, seed catalogs and letters from seed suppliers illustrating non-availability of organic seed are used.*

Farmers can also trial small amounts of organic seed to show they are researching equivalent varieties.

ORGANIC SEED SEARCH

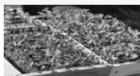
Use this form to document your attempts to seek three sources that carry organic seed or planting stock to ensure organic seed or planting stock and have a backup of your original submission. **Attention:** If you source your seed or planting stock from outside the state, you may need the contact info for three companies that carry organic seed or planting stock available for your request to use.

| Variety & Crop Type | Company | State | Contact | Year | Reason why nonorganic seed or planting stock was purchased. |
|---------------------|---------|-------|---------|------|--|
| | | | | | <input type="checkbox"/> Organic unavailable in the appropriate form, quality, or quality suitable for your operation. |
| | | | | | <input type="checkbox"/> Variety preference (specific varietal characteristics) Exotic. |

High price is not an acceptable reason to not buy organic seed.

Planting stock such as rhizomes, shoots, leaf or stem cuttings, roots, or tubers are treated like seeds for commercial availability (potatoes, sweet potato slips)

Annual transplants must be organic.



No captan, apron or other nonapproved seed treatments for three years.

No GMO nitrogen fixing bacteria allowed, nonGMO inoculants are allowed.

Cover crop seeds MUST be organic as well.

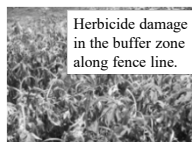
Seed Trialing Worksheet

| Organic seed source | Source | State | Year | Cost | Quantity | Quality | Availability | Planting | Harvest | Yield | Quality | Notes |
|---------------------|--------|-------|------|------|----------|---------|--------------|----------|---------|-------|---------|-------|
| Organic seed source | | | | | | | | | | | | |
| Organic seed source | | | | | | | | | | | | |
| Organic seed source | | | | | | | | | | | | |
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| Organic seed source | | | | | | | | | | | | |
| Organic seed source | | | | | | | | | | | | |

Buffer Zones Required

25 to 30 foot buffer area is typical ---roads, grass, hay or trees where prohibited sprays from the neighbor may present a risk to the organic integrity of their crop.

Size of buffer relates to risk- aerial spray, ground driven equipment, or windbreaks all affect size of buffer required by certifier



Organic weed management

MINDSET: Think management not annihilation. Weeds are not the enemy! They also provide benefits.

STRATEGIES:

Do not let weeds go to seed.

Reduce weed bank.

Delay planting - take a few weed crops first.

Plan ahead - before you plant know how you will manage weeds.



Space for quick canopy or longer access

The goal of early mechanical weed control is to eliminate the bulk of the weed population before it competes with the crop and to create as large a crop-to-weed size differential as early as possible.



Crop pest, weed, and disease management practice standard 205.206

The producer must not use lumber treated with arsenate or other prohibited materials for new installations or replacement purposes in contact with soil or livestock.

205.207 Wild-crop harvesting practice standard.


- No prohibited materials for 3 years prior to harvest.
- Harvesting or gathering will not be destructive to the environment and will sustain the growth and production of the wild crop.

Presentation developed by MOSES

33

Prohibition on....

- **Commingling** – mixing of organic and non-organic products- *must clean all equipment and storage areas before organic use*
- **Contamination** – contact with prohibited substances- *no use of pesticides in or near storage areas or equipment used for organic*



34

Processing defined as

| | | |
|---------------------------------------|----------------------------|--------------|
| Cooking | Baking | Heating |
| Drying | Mixing | Grinding |
| Churning | Separating | Extracting |
| Cutting | Fermenting | Slaughtering |
| Eviscerating | Preserving | Dehydrating |
| Freezing | Or otherwise manufacturing | |
| Packaging | Canning | Jarring |
| Or enclosing in any type of container | | |

Preparation of an agricultural product for market.

Labeling

4 types for retail packaged organic products

- 100% Organic
- Organic
- Made with Organic.....
- Organic only as an adjective in ingredients listing