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Feeding the Crop: Effective Organic Fertility Management Practices & the Need for Technical Advice

Presented By Mallory Krieger & Nate Powell-Palm


"Top Dog 1"
15 Way CC Mix
Sun Hemp (4 Lbs), Clover, Dixie Crimson (3 Lbs),
Clover, Medium Red (2 Lbs) Clover, Yellow Blossom (2 Lbs), Vetch, Cahba or
Peas, Cow, Iron + Clay (8 Lbs) Oats (4 Lbs) Bayou Kale (4 Lbs) Sorghum, sudan
Pearl Millet (1 Lb) Radish, deep Tillage (0.5 Lbs) Turnips, Purple Top (0.3 Lbs)
Sunflower optional (1 Lbs) Buckwheat (5 Lbs) Flax (2 Lbs)

CURRENT STATE OF TECHNICAL SUPPORT

CONVENTIONAL

- Extension
- Seed Sales Rep.
- Fertilizer Rep.
- Chemical Dealer
- Crop Consultants (CCAs)
- Agronomists

ORGANIC

- Almost no Extension
- Some seed sales
- Few input dealers
- Almost no CCAs or Agronomists
- Field days
- Workshops
- Conferences
- Other farmers

TOP 10
Barriers to transition

1. Access to information
2. Low yields during first 3+ years
3. Initial cost increase and learning period
4. Retooling and new equipment/storage
5. Market uncertainty
6. Lender support through transition years
7. Risk management options
8. Certification and recordkeeping
9. Support network
10. Barriers “between the ears”

Key part of the pipeline from curious to certified organic

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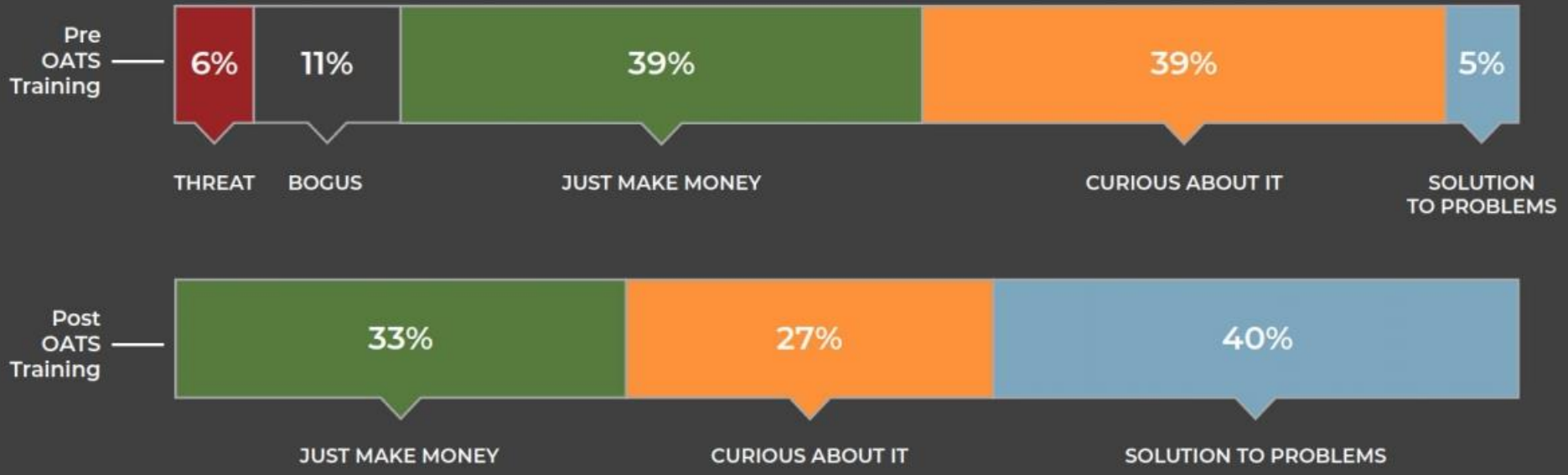
HOLISTIC APPROACH

Promote Organic Literacy

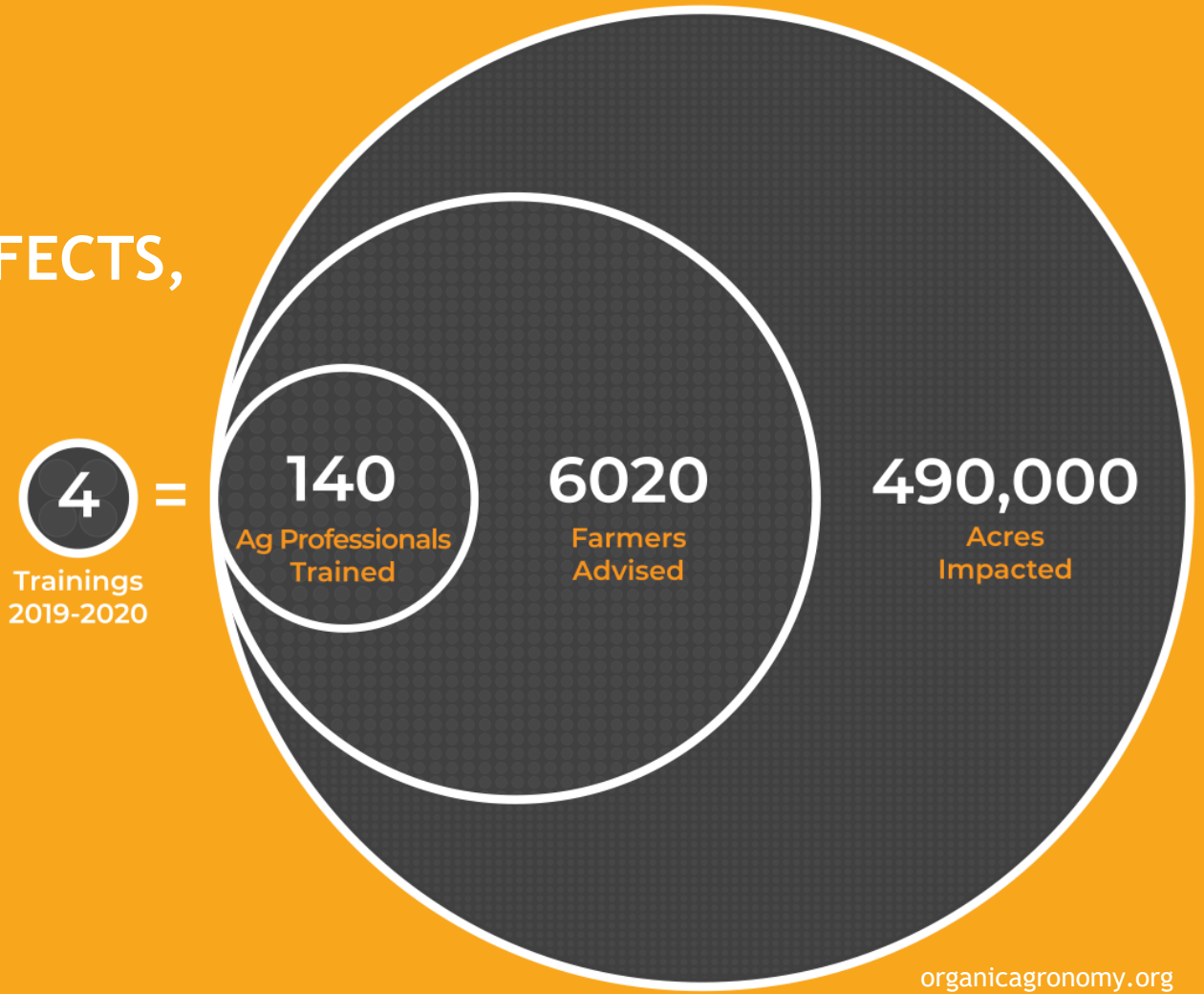
MOVING SKEPTICS TO ADVOCATES

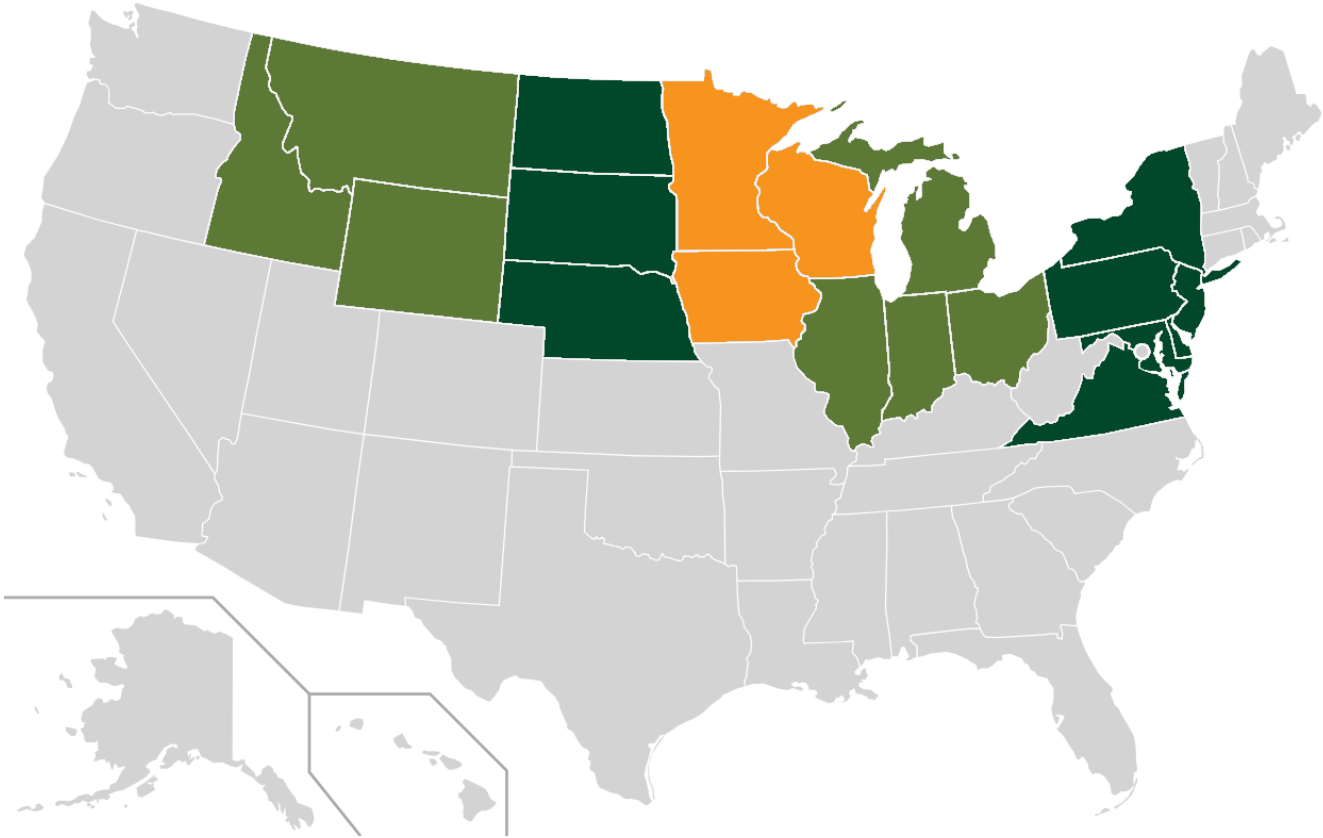
"What most closely describes your opinion of organics."



Evaluation data from March 2020 training with Anheuser-Busch agronomists.

COMPOUNDING EFFECTS, 1:43





5 TRAINING REGIONS

ADVISING & CONSULTING SERVICES

- Moral support
- Certification & Recordkeeping support
- Financial management
- Transition planning
- Marketing support
- Operations support
- Agronomic consulting

- **Crop rotation planning**
- **Fertility management planning**

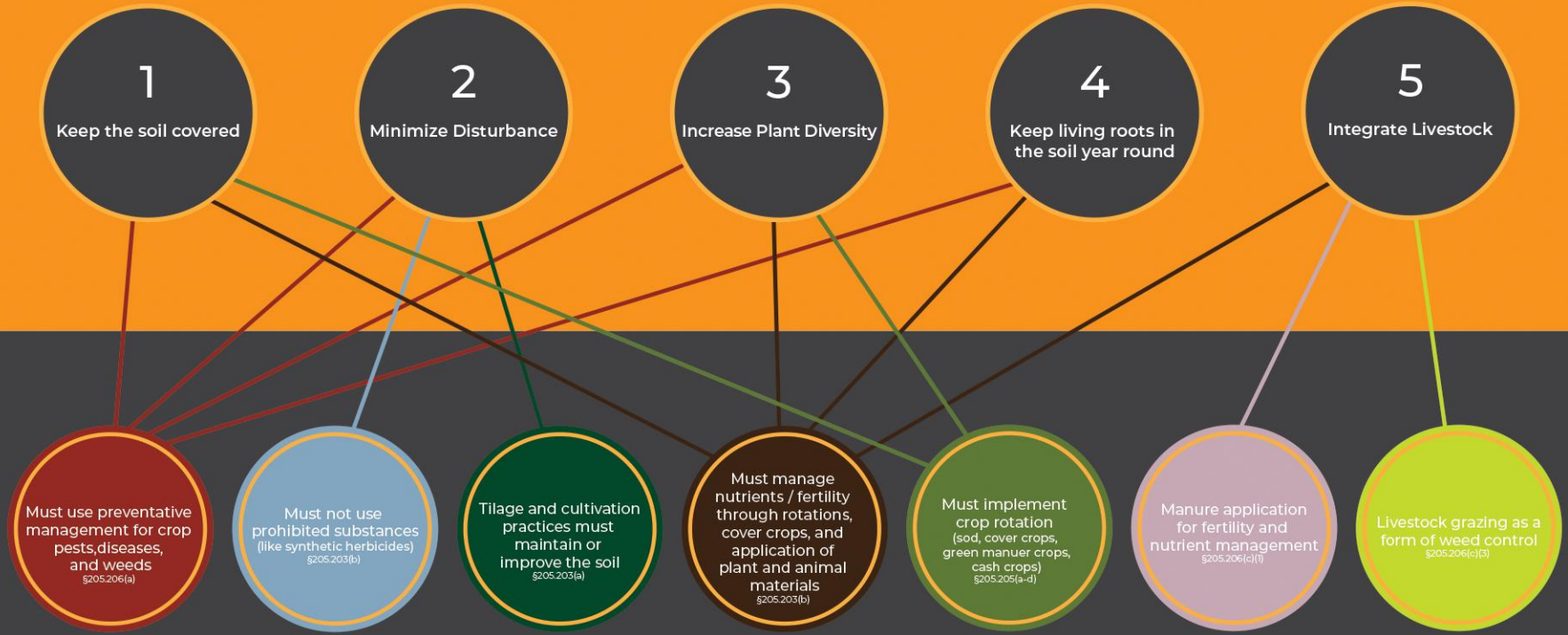
ORGANIC FERTILITY MANAGEMENT

Importance of microbial nutrient cycling

- **Carbon can be a limiting nutrient** – supply PLENTY of organic matter to the soil to charge up activity of the soil biology

- Efficient nutrient cycling comes down to management
    - Start with practices that promote soil health
    - Provide habitat for “livestock” living underground
    - Lean on 5 Principles of Soil Health

Principles of Soil Health and Regenerative Agriculture



National Organic Program Regulations

The definition of organic production requires practices that foster cycling of resources, promote ecological balance,and conserve biodiversity.
§205.2

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ORGANIC FERTILITY TOOLBOX

- Avoid prohibited inputs – synthetic NPK is a no go
  - No ammonia, ammonium nitrate, urea, ammonium citrate, superphosphate, DAP, or MAP

- Two main sources of organic fertility
  - Grown in the field = crop rotation & cover crops
  - Added with off-farm inputs = manure, compost, minerals

YIELD DOES NOT EQUAL PROFIT

How to avoid going broke chasing yield

1. Reduce input costs by growing fertility in place
2. Plan for and calculate profitability over a whole rotation
3. Improve nutrient cycling in the soil

CROP ROTATION

The MOST important fertility tool on organic farms

A well designed crop rotation…

- Produces Nitrogen through legume cash and cover crops
- Balances crop nutrient needs over time – spinning the flywheel
- Balances heavy feeders with light feeders
- Is long and phenotypically diverse!

PLANNING A CROP ROTATION

- Separate crops from the same “family” by at least one growing season – never back to back

- Grow your fertilizer
  - Legumes (forages, pulse crops, cover crops) provide a substantial amount of Nitrogen to the soil
  - Perform a nutrient budget analysis for the entire rotation to track nutrient inflows and outflows
  - Grow as much fertility in place as possible

- Follow the Nitrogen
  - Plant heavy feeders (wheat, corn) in the first year after a legume
  - Plant light feeders (oats) in the second or third year after a legume

MONTANA CROP ROTATIONS

ALFALFA

PULSES

CEREAL GRAINS

OIL SEEDS

GROWING FERTILITY WITH COVER CROPS

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CATEGORIES OF COVER CROPS

Crucifers

- Scavenge and draw up nutrients from deep in the soil profile
    - Turnips and Radishes recover excess nutrients from the top 4-5 feet of the soil profile
- Act as fumigants for soil pathogens
- Can be planted in the summer after an early season crop like winter wheat or in the fall after a later harvest
- Terminated by hard freezes and tillage – very versatile!

CATEGORIES OF COVER CROPS

Grasses

- Good Nitrogen scavengers – they draw up bioavailable N and hold it in their tissues until they are terminated
    - Wheat, barley, oats, other cereal grains

- Maximize fertility benefit by plowing them down while they are still in a vegetative growth stage; keeping C:N ratio as low as possible
    - Mature grasses can cause Nitrogen tie-up if incorporated

- Most commonly planted in the early fall
- Terminate with tillage in the spring – wait several weeks to plant the cash crop to allow nutrients to release

CATEGORIES OF COVER CROPS

Legumes

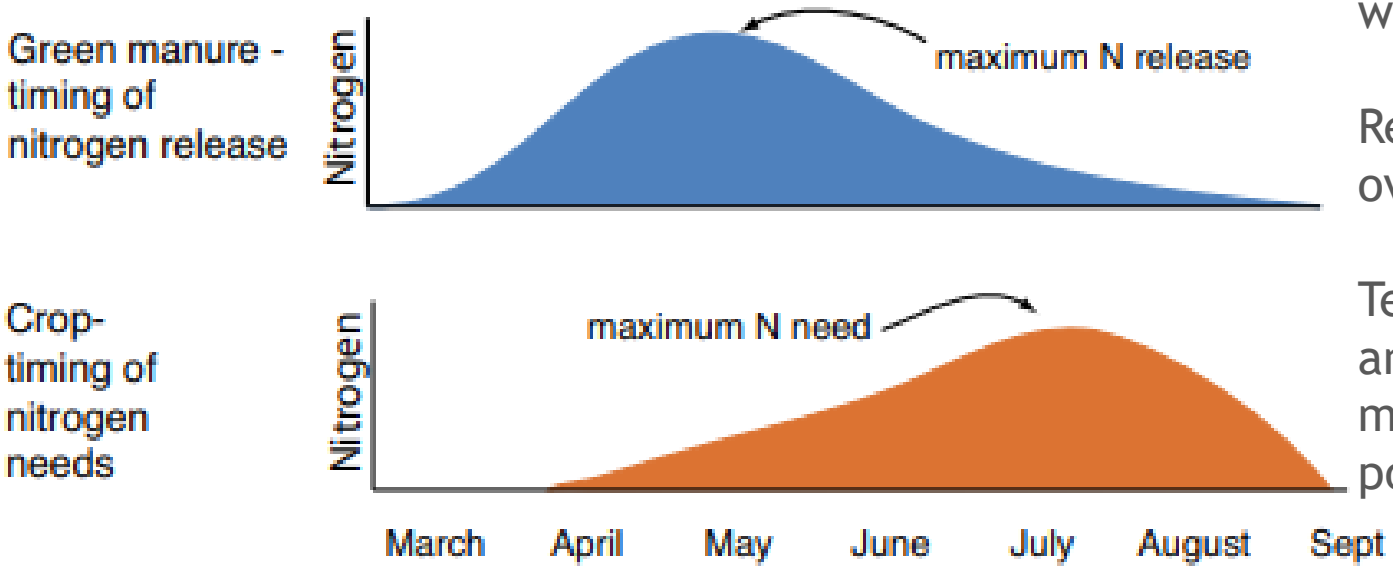
- Sustainable way to provide nitrogen – do not cause phosphorus loading and less prone to nitrogen leaching than manures
    - Red clover, alfalfa, hairy vetch, peas

- Do not make considerable lasting contributions to soil organic matter.

- Timing of planting will vary based on species
- Termination typically done in the spring ahead of the subsequent cash crop
    - Alfalfa terminated in the fall by moldboard plow

MAXIMIZING NITROGEN AVAILABILITY FROM LEGUMES

Highly dependent on TIMING



50% of N released within 1 month

Remaining N released over next 12 months

Terminate in spring and incorporate as much plant matter as possible

Figure 4-8. ***Nitrogen rate of release from green manures relative to crop needs. The majority of nitrogen is released by June, while the crop needs are highest in July.***

GETTING THE MOST FERTILITY FROM COVER CROPS

1. Match Nitrogen output from covers to the needs of the cash crop
    1. Watch timing to avoid N tie-up
    2. Follow legumes with heavy feeders; leave light feeders for later after a legume

2. Experiment with multi-species cover crop mixes
    1. Boost diversity; get multiple benefits like weed control

3. Consider including a perennial crop in your rotation
    1. Incredible for soil health!
    2. Reduce soil disturbance; break pest, weed, and disease cycles
    3. Examples: alfalfa, clover, hay mixes

GROWING PROFITABILITY with Cover crops

- Covers as a cash crop?
  - Yellow peas
- Forage & Grazing
  - Perennial legumes
  - Grazing annual covers
- CAUTION – selling hay off-farm is selling nutrients!

ADDING FERTILITY WITH ALLOWABLE INPUTS

- Use natural substances first
  - Natural = derived from mined, plant, or animal matter and does not go through a synthetic process
  - Examples: fish emulsions, pelleted poultry manure, mined lime
- Short list of synthetic substances are allowed
  - See 205.601(j)
  - Permitted only in specific circumstances
  - Examples: aquatic plant extracts, elemental sulfur, humic acids, magnesium sulfate
  - Nearly all micronutrients are derived from synthetic processes and are allowed with a tissue test
- Adjusting pH – only mined sources such as calcitic and dolomitic lime

BE WARY OF SNAKE OIL

Skepticism is your friend

- Look for 3rd party data on the efficacy of the product.
- Look closely at the quality of the data
  - Best data – replicated and randomized trials
  - Side-by side and one-off comparisons don't count!
- Consider conducting a field trial yourself to validate data and understand product performance in your area with your crops.

ADDING FERTILITY WITH ANIMAL MANURE

ANIMAL MANURE

NOP regulation 205.203(c)(1)

(c) The producer must manage plant and animal materials to maintain or improve soil organic matter content in a manner that **does not contribute to contamination of crops, soil, or water** by plant nutrients, pathogenic organisms, heavy metals, or residues of prohibited substances. Animal and plant materials include:

(1) Raw animal manure, which must be composted unless it is:
(i) Applied to land used for a crop not intended for human consumption;

(ii) Incorporated into the soil not less than 120 days prior to the harvest of a product whose edible portion has direct contact with the soil surface or soil particles; or

(iii) Incorporated into the soil not less than 90 days prior to the harvest of a product whose edible portion does not have direct contact with the soil surface or soil particles

ANIMAL MANURE
Best practices

- Avoid water contamination
  - Do not apply to frozen ground
  - Incorporate into bare soil ASAP
  - Inject liquid manure
  - Plant grass buffer strips on downslope side
- Apply on living crops to maximize uptake (hay fields and cover crops)
- Be careful of prohibited substances in manure – think stabilizers for slurry
- Watch out for phosphorus and salt loading
- Best source of manure is from livestock on the farm – incorporate grazing into the rotation

GETTING THE MOST FERTILITY FROM ANIMAL MANURE

1. Test manure for NPK prior to application and use to set rates

2. Nutrients from manure become plant available over three years
    1. 40% in year 1
    2. 15% in year 2
    3. 7% in year 3

3. Apply manure on living crops to maximize uptake – best on hay fields and cover crops

ADDING FERTILITY WITH COMPOST

- Excellent for adding humic compounds and organic matter – feeds the soil “livestock”
- Extracts and teas make great foliar spray – enhances plant vigor
- Research data supports plant health benefits of compost
- Low risk for water contamination as compared to raw manure
- Not all compost is equal! Poorly made compost can harm plant development and/or contribute to heavy metal contamination
- EXPENSIVE and difficult to source high quality compost
- EXPENSIVE to transport
- On-farm production is time consuming but can be a more economical source

Q & A

The Organic Field Crop Course from OATS

The best of in-person and distance learning

Online, video-based lessons to learn at your own pace. Meet virtually with your regional cohort and course instructor periodically to discuss current issues and lesson materials.

During the growing season, the cohort will meet on working organic farms to gain hands-on, in-person experience. After completion, participants will be prepared to provide one-on-one technical assistance to transitional and certified organic farmers.

On-line course launching in early 2022

In-person events in summer 2022

OATS materials and curriculum are science-based, research-supported, and expert-vetted

- Basics of organic production - weed control, nutrient management, crop rotation, pest management
- Systems thinking & long-term strategies for success in organic production
- Managing risk during transition
- Certification and record-keeping
- National Organic Program (NOP) rules and regulations
- Marketing and Profitability
- On-farm & hands-on experiential learning on organic operations

OATS Podcast

Honest and fair answers to six common criticisms of organic agriculture

- Episode 1 - Moldboards and Dust Clouds: Organic Has a Tillage Problem
- Episode 2 - Unsightly Fields: Organic is a Weedy Mess
- Episode 3 - Farming Like It's 1921: Organic is Anti-Science
- Episode 4 - Double the Acres Half the Yield: Organic Can't Feed the World
- Episode 5 - Soft Markets: Organic Doesn't Scale
- Episode 6 - No Tools, No Premiums: Organic Transition is a Trap

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OATS is supported with funding from the Organic Trade Association's industry-invested GRO Organic research, promotion, and education program. Top GRO Technical Assistance Donors are General Mills, Clif Bar, Stonyfield, King Arthur Baking Co., and Organic Valley.

Thank you.

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