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Paul Mugge
Sutherland, Ia.
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Paul Mugge

- Farming since 1976
- Progression from conventional to organic
- Jump to organic in 1998
- 300 acres all certified
- No livestock
- Karen, 3 children, 7 grandchildren



Zach Knutson
Meservey, IA

Zach Knutson

- Farming part-time since 2007
- Certified organic in 2007
- Added some conventional no-till acres in 2010
- Made the jump to full-time farming in 2012
- Happily married to Kari
- 4 kids – Daniel, Kaylee, Josie, and Avery

We Need More Organic Farmers

- In 2015, US organic Industry = \$43.3 billion
- 20,300 organic farmers, up 12.8 %
- We can't meet demand currently
- We need you
- IOA

Industrial vs. Organic

- Single species
- Open cycles
- Purchased inputs
- More externalities
- High energy use
- Low labor use
- Unstable
- Diversity & complexity
- Close cycles
- Ecosystem services
- Fewer externalities
- Lower energy use
- Higher labor use
- Stable

Weed Control

- No longer have the herb. crutch to lean on
- “Many little hammers”, Matt Liebman
- Objectives
 1. limit damage by competition, allelopathy, etc.
 2. Reduce survival of weed seeds and propagules
 3. Prevent introduction of new weeds

3 Main Methods of Organic Weed Control

- Biblical Method – Hope and Pray
- Secular Method – Cross your fingers
- New Age/Hippie Method – smoke some of your organic weed and it will all be OK!

Crop Rotation is the 1st Consideration in Weed Control

- 3 yr. rotation or longer has many benefits (weeds, disease, and insects)

- Row crops – late plant, late harvest

- Small Grains – early plant, early harvest

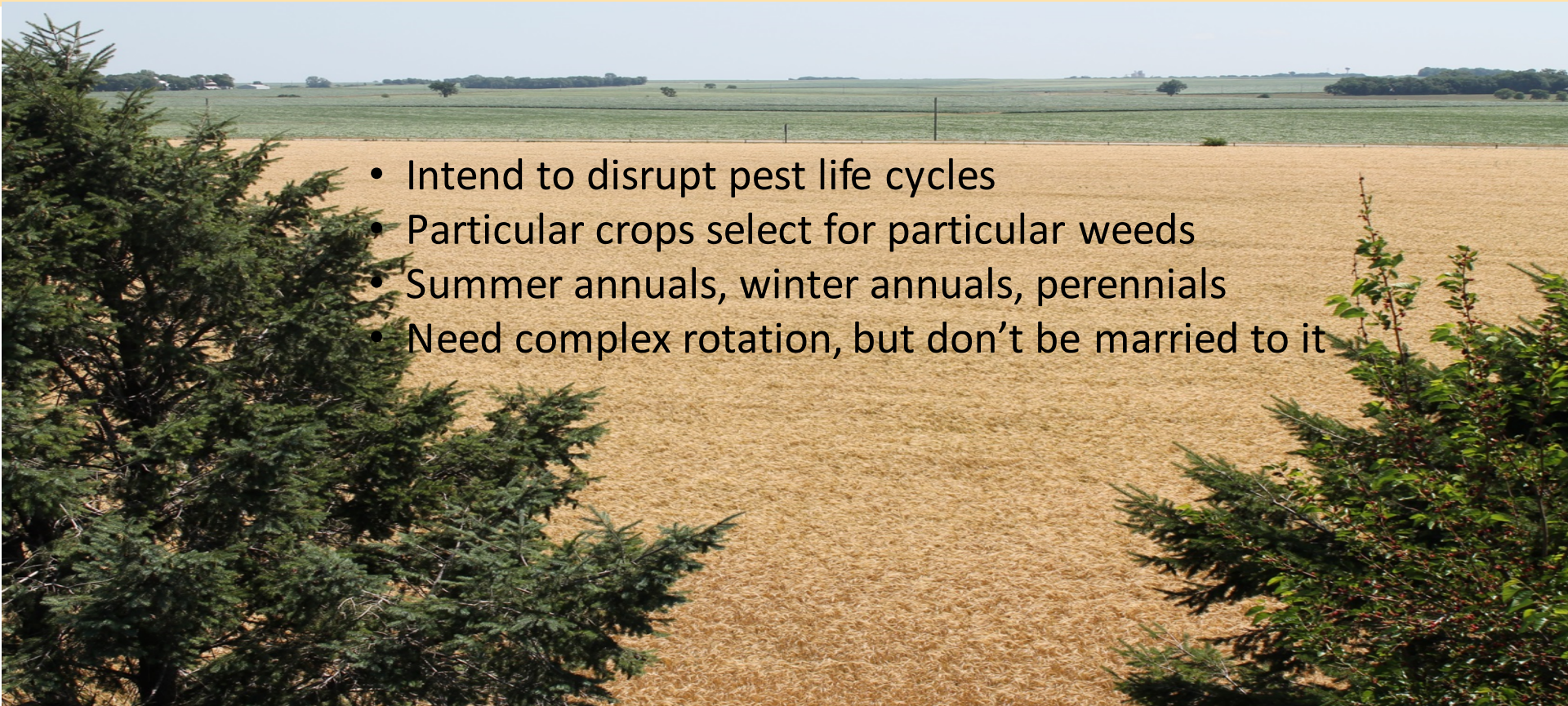
Fall seeded vs. Spring seeded

- Grasses and legumes, annual & perennial

- Cash crops and cover crops

Crop Rotations

- Intend to disrupt pest life cycles
- Particular crops select for particular weeds
- Summer annuals, winter annuals, perennials
- Need complex rotation, but don't be married to it



Current Rotations

- Corn
- Soybeans
- Small Grain - winter triticale/red clover (Paul's standby), oats/alfalfa (Zach's rotation), barley, flax, canola, wheat



Planting and seed considerations

- Population – depends on soil, fertility, row spacing, and variety
- Planting date – early as possible for small grains, delay for corn and beans
- Seed selection
 - germination
 - strong emergence
 - early canopy
 - yield in the presence of weeds
- Don't hesitate to replant, you must have a stand
- Legume Cover + 10 bu. ?

Corn – tillage & weed control

Paul's corn management

- Disk clover in fall and incorporate fertilizer
- Field cultivate 2x in spring
- 35K plant pop., 30" rows
- Harrowed or rotary hoed 3x
- Cultivate 3x
- RTK guidance

Zach's corn management

- Rip alfalfa and incorporate fertilize
- Soil finish 2-3x in spring, spaced out
- 28-36K plant pop., 30" rows
- Blind harrow 1-2x
- Cultivate 3x
 - Early with Front Mount
 - Later with rear mount
- Possibly walk corn too

Zach's fall ripped alfalfa on April 20th 2016



Soybean – tillage & weed control

Paul's soybean management

- Ridge plant
- Plant before corn
- Rotary hoe 3x
- Cultivate 3x
- Clod buster
- Walk

Zach's soybean management

- Chop corn stalks, rip in fall
- Soil finish 2-3x in spring, spaced out
- 170K plant pop., 30" rows
- Blind harrow 1x
- Rotary hoe 2x
- Cultivate 3x
 - Early with Front Mount
 - Later with rear mount
- walk 1-2x

After Ridge Planting



Hoe three times



Cultivate three times - walk



Small Grains – tillage and weed control

Paul's winter triticale/red clover Zach's oats/alfalfa

- **No-till drilled behind combine**
 - **Overseed red clover in spring**
 - **Walk for thistles**
 - **Harvest grain and straw**
 - **Mow clover and disk late fall**
- **Soil finish 1x**
 - **Drill oats and alfalfa together ASAP in spring**
 - **Drill in 7.5 rows, spread alfalfa on top, drag to smooth & incorporate alfalfa**
 - **Walk oats if necessary**
 - **Harvest grain and straw**
 - **Harvest alfalfa (keeps weeds from going to seed too)**

Great Plains No-till Drill





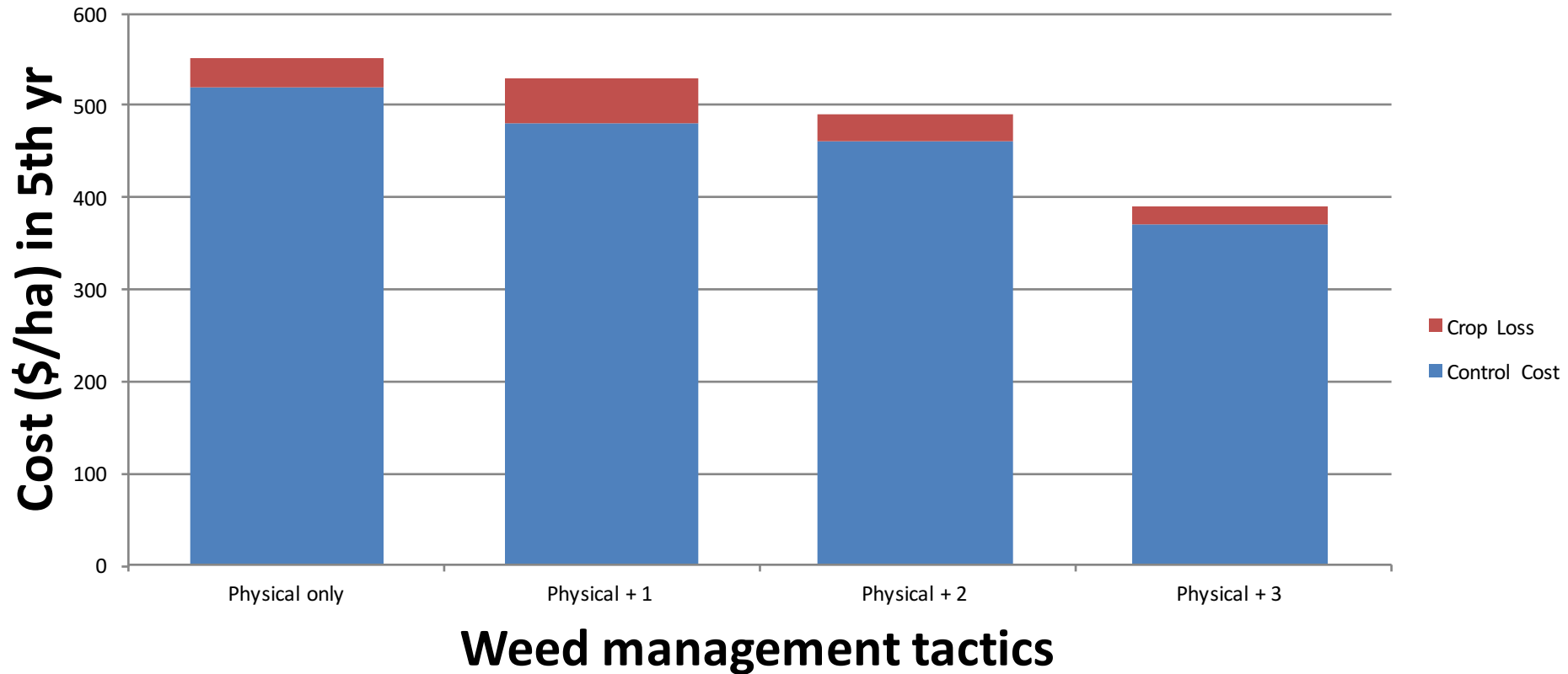


Cultural Methods

- Plant population
- Planting date
- Narrow rows? – mixed bag
- Cultivar selection - strong germination
 - strong emergence
 - early canopy
 - yield in presence of weeds

Synergism with Cultural Tactics

After Liebman and Davis, 2009



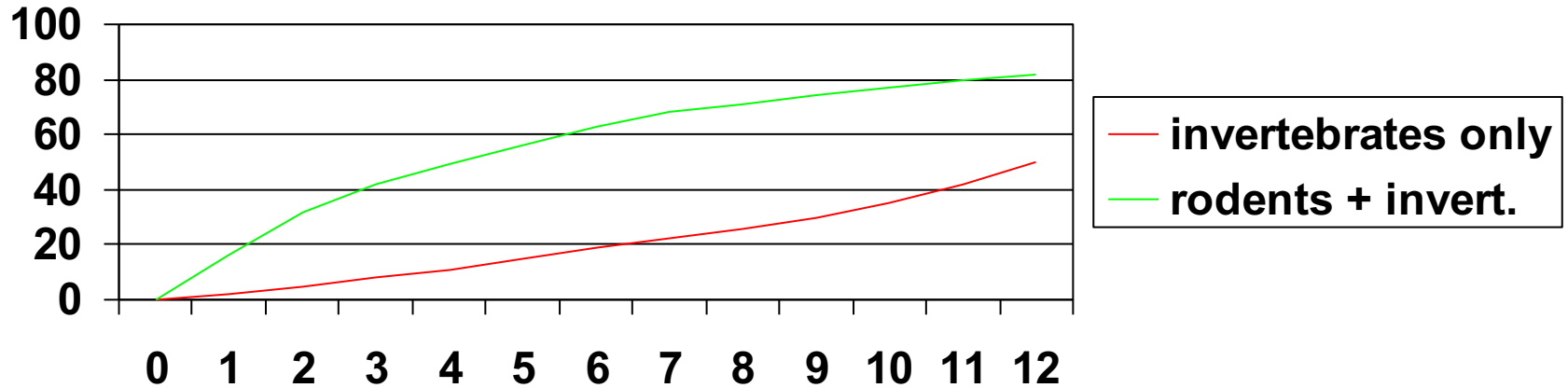
Allelopathy?



Seed Predation

- 1 female cricket ate 223 pig weed seeds in one day
- 90% destroyed at end of one year
- Must not disturb predators with tillage
- Must provide habitat - cover

Predation of Giant Ragweed Seeds



Cumulative seed predation (%)

vs.

Time after seed dispersal (months)

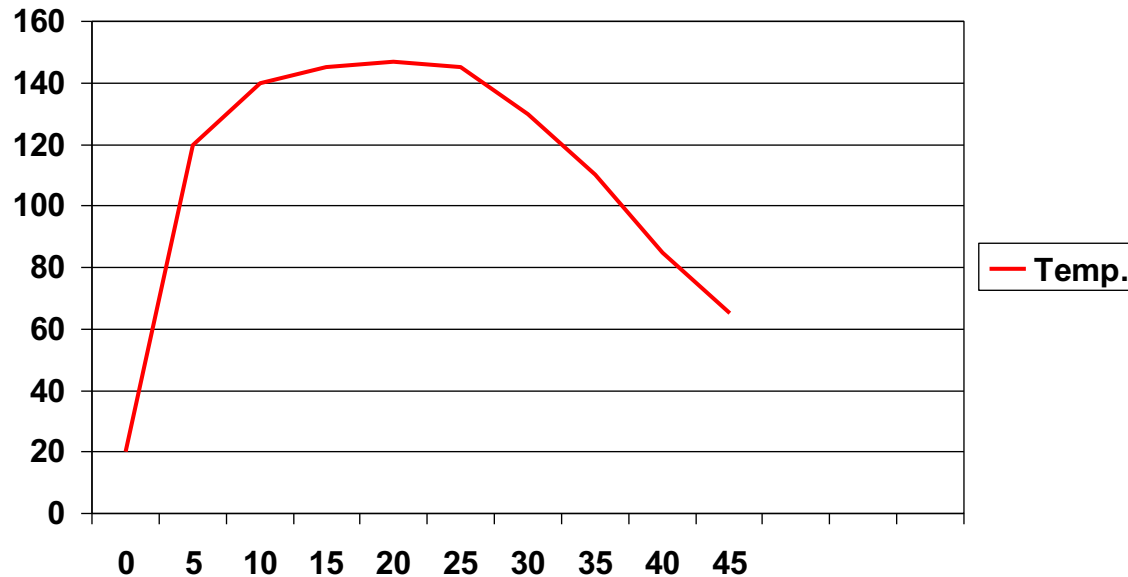
Management Tips

- Leave seed on soil surface
- Habitat on field borders, etc.
- Small fields (diversity helps)
- Need cover & overwinter habitat





Composting?



Temperature of compost vs. days after piling

- 20 days at 113 deg. F kills all weed seeds
- 3 days at 130 deg. F kills all weed seeds
- Stabilize nutrients
- Reduce volume

Composting?

Weed	Before Feeding	After Digestion	After 3 mo. storage
Redroot Pigweed	98	36	12
Lambsquarters	70	58	22
Green Foxtail	21	20	0

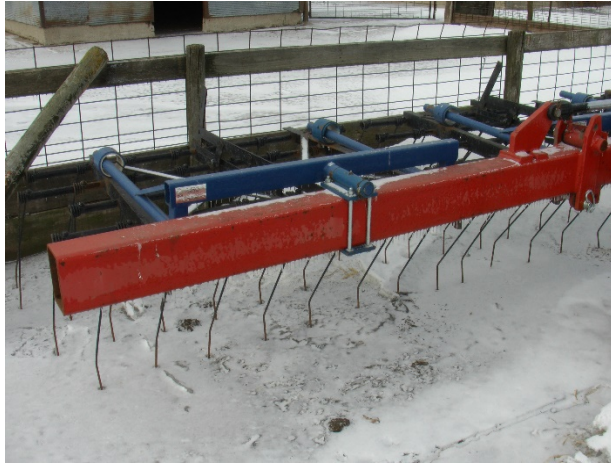
Percent weed seed germination before and after feeding cows and after storing the manure for 3 months

Tool Talk

- Seedbed tillage
 - Must kill all living weeds completely
 - Must create a uniform and level seedbed
 - Warm, sunny days will help improve weed kill
- Planter
 - Must plant at a consistent depth with consistent spacing
 - Attachments
 - Row cleaners
 - Seed firmers with spiked closing wheels
 - Chain or harrow on the back of the row unit

Blind and Early Cultivation

Tiny weeds are much easier to kill than big ones



Blind and Early Cultivation (con't)



Buffalo Rolling Chopper



Rolling Chopper - again



Row crop cultivators



Visual Aids



- Cultivision Mirror
 - Look outside tire
 - Use both sides
 - Mount securely
- Mounted video cameras

Automatic Guidance

tractor guidance via RTK or cultivator guidance via visual sensing



K.U.L.T. Kress Fingerweeders

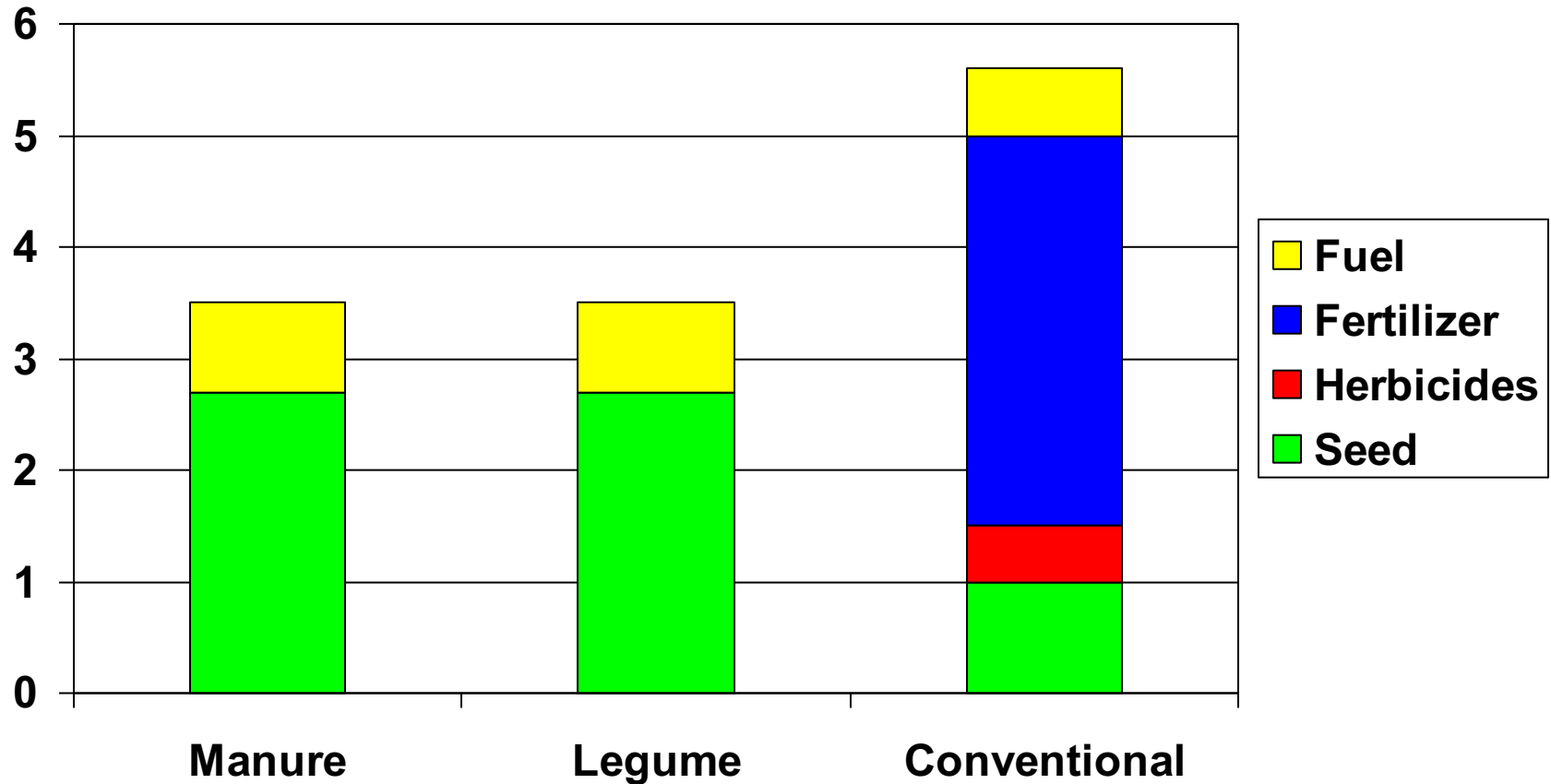


Energy Considerations

- 2X rot. Hoe + 2X cult. = 585 MJ/ha
- 1X Roundup = 763 MJ/ha
- 1.7 tons coal per ton N
- 500 M tons/yr N = 1% of world's energy and 3-5% of world's natural gas

Fossil Fuel Energy Use

David Pimmental (Bioscience 55(7):573-582)







Sometimes it's Ugly



More Ugly



Oct. 16, 2014 = 55 bu/a





Problem weeds

- Giant Ragweed
- Canada thistle
- Palmer Amaranth
- Nightshade (in soybeans)

Giant Ragweed



Giant Ragweed

- Early germinating annual
- Fast growing
- Large canopy and can grow taller than corn
- Major yield robber
- Makes harvesting small grains tough

Canada Thistle



Canada Thistle (A.K.A the Hydra)

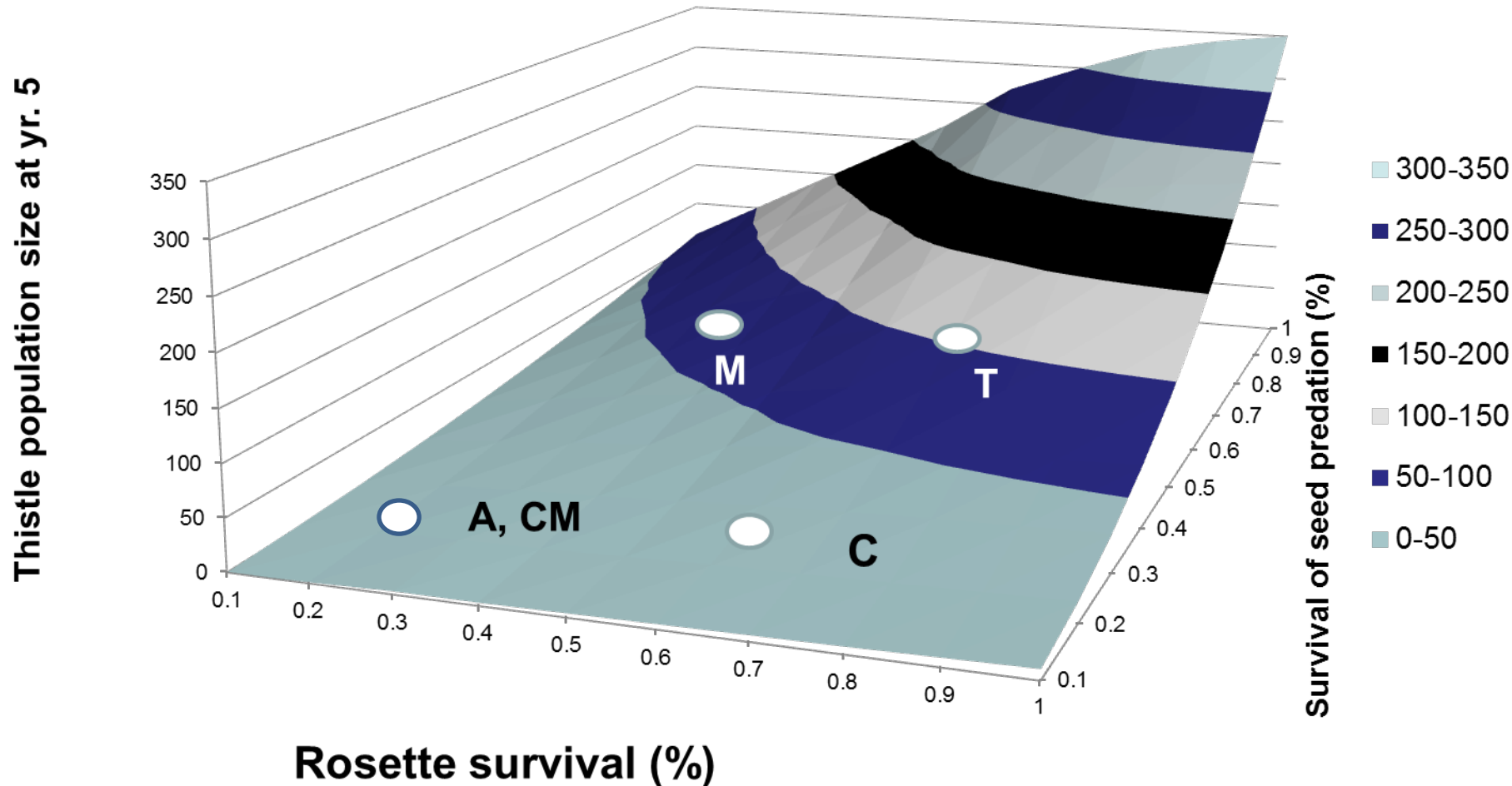
- Early emerging perennial
- Massive root web that stores energy and from which the plant mainly spreads
- Major yield robber in places where it is very concentrated
- Does not compete well in crops with a good canopy
- Best times to kill
 - As late in the spring as possible (root reserves are drained)
 - In fall to prevent root reserves from refilling

Alfalfa – for Canada thistle mgmt.



Response of Thistles to Management Options

from Liebman & Davis, 2009



Palmer Amaranth



- New to the scene in Iowa
- Fast growing annual closely related to waterhemp
- Major yield robber

Other Considerations

- You must follow the rules
- You must like to cultivate
- You must be committed
- You must keep good records
- You must learn to market beyond the local elevator and develop relationships
- CRP, CSP, EQIP

Eight misperceptions about organic

- Organic = neglect or omission
- Organic = input substitution
- Plants don't know the difference
- Organic systems require pre-plant tillage
- Precision Ag. incompatible with organics
- Balanced farming = cation balancing
- Organic systems use more energy
- Organic systems use too much tillage

Weak Links in Organic Systems

- Success w. conv. → success w. organic
- Assuming adequate equipment
- Lack of timeliness
- Planting issues – timing, depth
- Not enough nutrients, especially N
- Failure to manage residue
- Poor marketing

Weak Links in Organic Systems

- Failure to plant well adapted genetics
- Failure to take advantage of new tech.
- Improperly manage cover crops
- Not having a good support system

Joel Gruver

Resources

- Mosesorganic.org
- Moses Organic Farming Conference
- Iowa Organic Farming Conference
- OFRF (organic farming research found.)
- ISU Extension
- Iowa Organic Association
- Practical Farmers of Iowa
- Other farmers