



OHIO STATE UNIVERSITY EXTENSION

Sustainable Crop Rotations with Grass Cover Crops

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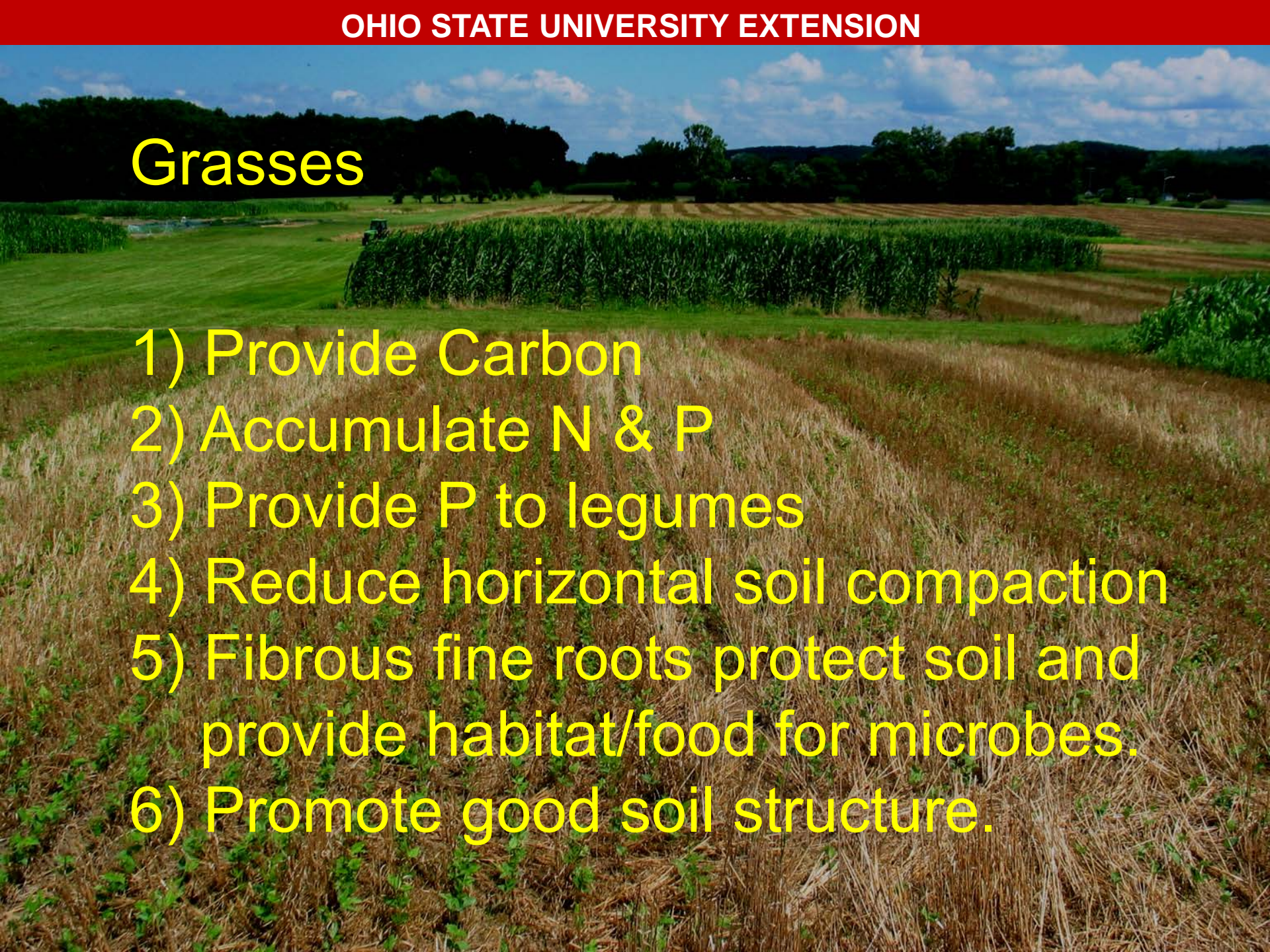
Type of Cover Crops

Legumes: Make Nitrogen, low C:N ratio
cowpeas, Austrian winter pea, hairy vetch,
red clover, soybeans

Grasses: Accumulate nutrients (fine roots), C:N
ratio depends on killing date: oats, cereal rye,
annual ryegrass, barley, wheat, Sorghum-Sudan

Brassicas: Good for surface compaction and weed
control: Daikon radish, turnips, kale, rape

Grasses

- 
- 1) Provide Carbon
 - 2) Accumulate N & P
 - 3) Provide P to legumes
 - 4) Reduce horizontal soil compaction
 - 5) Fibrous fine roots protect soil and provide habitat/food for microbes.
 - 6) Promote good soil structure.



Cereal rye

Annual Ryegrass



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Pearl Millet after Wheat



Sorghum-Sudan grass



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Cowpea & Sudan Grass



Winter Rye (Cereal Rye)

Disadvantages

- May have allelopathic characteristics
- May “get away from you” in the spring and become difficult to kill



Advantages

- Can be planted later than any cover crops with greatest opportunity to succeed
- Works well with aerial application
- Good rooting depth
- Excellent winterhardiness
- Scavenges N & P

Winter Rye (Cereal Rye)

Advantages

- Excellent for winter/spring grazing
- Excellent for spring haylage (4-6 ton/A)
- May have allelopathic characteristics (improved weed control)



Suggested Planting Rates for Cereal Rye

- Air = 1.5 bushels/Acre
- Dry Spread w/ Fertilizer = 1.1 bushels/Acre
- Grain Drill = 1 bushel/Acre



Strategically...

Do Soybeans
need N ?
...Sure, but
they
capture
their own!



Oats

Disadvantages

- Bin run oats will have weed seed in them
- Winterkills

Advantages

- Scavenges N
- Deep and fibrous root mass
- Works well with aerial application
- Excellent for forage
- Winterkills



Oats- planted August 3 photo taken October 10



Oats

- Provides erosion control
- Scavenges nitrogen
- Grows a deep and fibrous root mass
- Promotes mycorrhiza growth
- Quick to establish
- Relatively inexpensive
- Can be broadcast and lightly tilled in
- Can be added to other cover crops to add additional value
- Can spray with broadleaf herbicides if necessary to control weeds



Oats applied with highboy July 2012 on August 28, 2012.



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Other cover crop options – **Winter Barley**

- Makes excellent feed or haylage
- Up to 2 weeks earlier harvest than wheat
- Less N needed for top crop
- Excellent scavenger of N
- More tolerant of low fertility
- Less winter hardy than rye



Why Annual Ryegrass (ARG)?

- 1) Great Scavenger of N & P
- 2) Extensive Root System
- 3) ARG does not go dormant in Winter
- 4) Grows Well on Heavy Clay soils
- 5) Tolerates Flooding
- 6) Prevents Soil Erosion
- 7) Weed and Pest Suppression



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Characteristics of ARG

- 1) Extensive Root System
in top 18-24" of soil.
- 2) Roots can penetrate down
6 feet deep.
- 3) Fast Emergence, Little top
growth.
- 4) Scavenges for N & P
(300-700# N).
- 5) Elevates Nutrients from subsoil
into the topsoil.
- 6) 80-90% of root growth by
April 1st.



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Annual Ryegrass

Disadvantages

- May be difficult to kill
- Many varieties rarely live through the winter



Advantages

- New Winterhardy varieties are available
- Deep and fibrous root mass
- Excellent scavenger of N
- Works well with aerial application
- Excellent for forage
- Plant early Aug – early Sept.

Planting ARG

- 1) Plant after wheat, corn
silage, or soybeans.
- 2) Planting Date: 8/1-9/20
- 3) Seeding Rate: 15-25#/A.
- 4) Seeding depth: .25 to .75 inch
- 5) Needs 60 days of growth
Or 6-9 inches before frozen soil.
- 6) Seeding Method: light tillage,
drill.
- 7) Fertilizer: 25-50# Nitrogen



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Annual Ryegrass 45 Days 6,000 Gallons Swine Manure



Nitrogen Uptake

ARG had 5-5.3% N in the tissue with maximum manure. With 4-4.5 tons of biomass (above and below ground), equals 400-450# of N being recycled.

Cereal ryegrass has 4-4.5% N in tissue or 350 to 400# of N.

Daikon radish-Highest uptake 5.3-5.5%N
Also fastest release.

Harvest/Kill Annual Ryegrass early



- Kill before jointing
- Be ready for 2nd spray
- Harvest before heads appear for best forage



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Root Density of Grass Cover Crops

Winter Rye-less dense
1,500-2,600 #/A



- Annual Ryegrass
- greater root density
 - 2,600-4,500 #/A

Very little top growth does not mean very little root growth.

- Four inch tall Annual Ryegrass with 21" deep roots
- 15" deep radish roots that had 2" tall tops and a "pencil" sized tuber
- 12" deep crimson clover roots under 2" tall top growth (with many nodules)



What fits after Corn and Soybeans?

- The tool box is not quite as full
- Aerial application works very well on most species
- Timing and moisture are critical for success
- Drilling provides best and most even stand...but efficiency problems



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What Species work best after Corn and Soybeans?

- Cereal Rye
- Oats
- Annual Ryegrass
- Crimson Clover
- Brassicas
(Radish/Turnips
/Kale/Rape)
- Mixes of the
above



What fits after WHEAT?

- The “tool box” is wide open!
 - For forage production
 - For nutrient sequestration
 - For nitrogen production
 - For building soil organic matter
 - Etc...etc...etc...
- **CAUTION**...DO NOT plant some of these too early
 - Early August works best (except with summer annuals)

Drill in after wheat...

Early Aug - Early Sept



What about inter-seeding into Corn and Soybeans





Airplane

Helicopter



Detassler for broadcasting seed into standing corn



Highboy applicators





Van Tilburg Applicator Applied in August with growth by October, 2011



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Need 50% Light Penetration in Corn



09-17-2010

Yellowing Soybeans 25% Yellow Leaves



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Cereal Rye Overseeded

Residue from leaves hold moisture



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Other popular combinations

- Oats and Radish
 - 1bu Oats + 2# Radish
 - Dies over winter
 - Very good cover
 - Great for controlling winter annuals
 - Great for holding/scavenging nutrients in the fall



Planting Soybeans into Cereal Rye

- Need a thick, vigorous growth of cereal rye
- When to plant soybeans – maximize rye growth for SOM, water retention, weed control.
- How to kill rye – herbicide vs mechanical
- Managing soil moisture for soybean growth is a key to success. If dry conditions, kill early, if wet conditions, use cereal rye to dry out soil.

SUMMARY

- Grasses (cereal rye, annual ryegrass) combined with Brassicas hold soil/nutrients.
- Grasses (oats, Sorghum Sudan) die with frost but loosen soil and may provide forage.
- Planting early maturing crops helps cover crops establish themselves early.
- All cover crops require 60-90 days of growth in fall to survive winter. Plant early maturing crops or plant early to maximize cover crop growth.



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