Fitting Cover Crops in Corn Silage Systems

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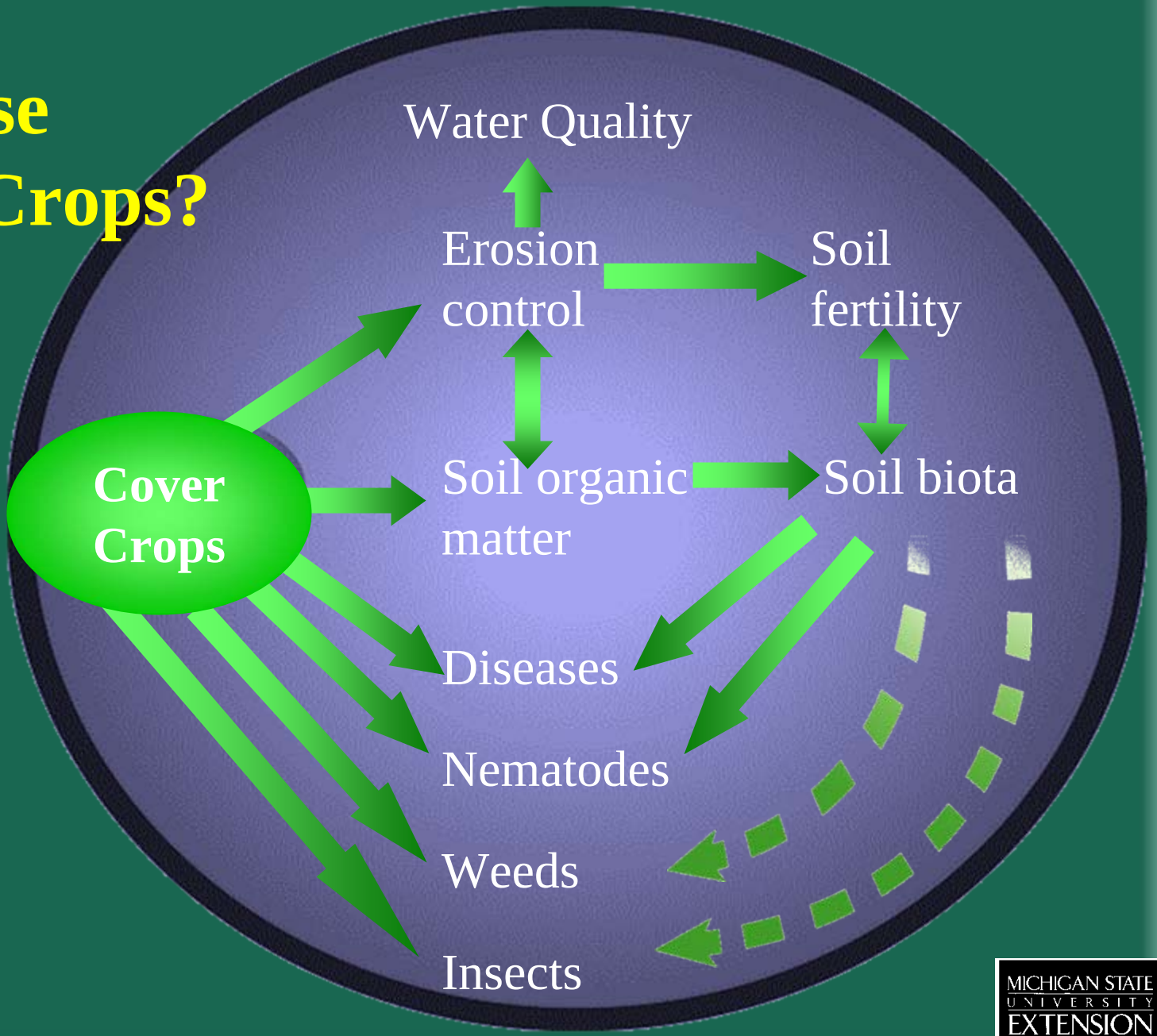
Why Use Cover Crops?



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Cover Crop Seeding

- Frost seeding
- Over seeding
- Broadcast
- Drill
- Aerial seeding
- Manure Slurry Seeding
- Brillon Seeder

Frost seeding

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Over seeding

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Broadcast

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Drill (no-till)

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Aerial Seeding

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Manure slurry seeding

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Brillon seeding

Legumes

Crimson Clover

Mammoth Red Clover

Medium Red Clover

Sweet Clover

White Clover

Hairy Vetch

Alfalfa

Cowpea

Austrian Winter Pea

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Grasses

Annual Ryegrass
Barley
Oats
Cereal Rye
Triticale
Winter Wheat
Sorghum/Sudan grass

Broadleaf (non-legumes)

- Buckwheat
- Oilseed Radish
- Rape/Turnip
- Oriental Mustard

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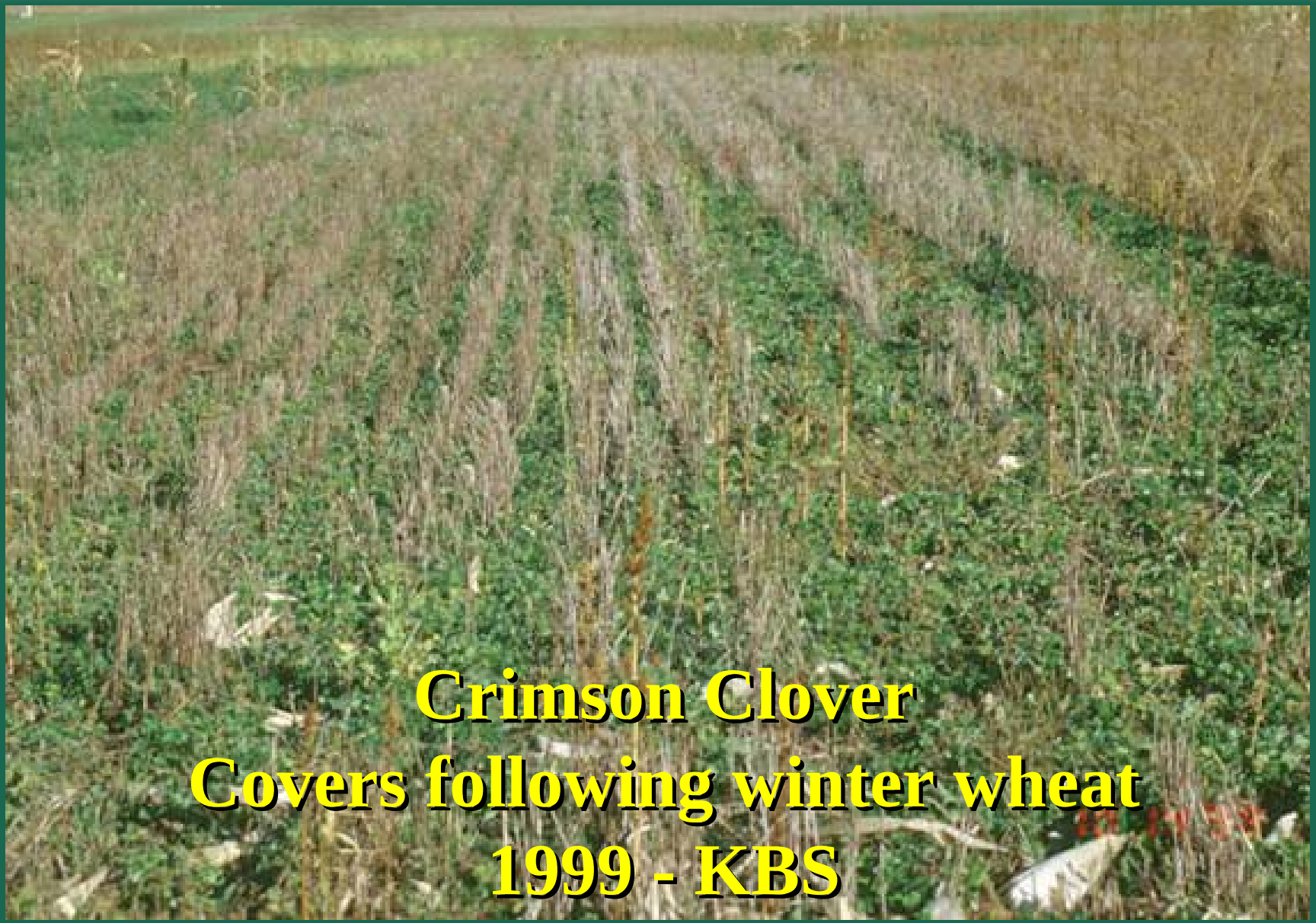
Cover Crop Research at KBS
Covers Following Winter Wheat

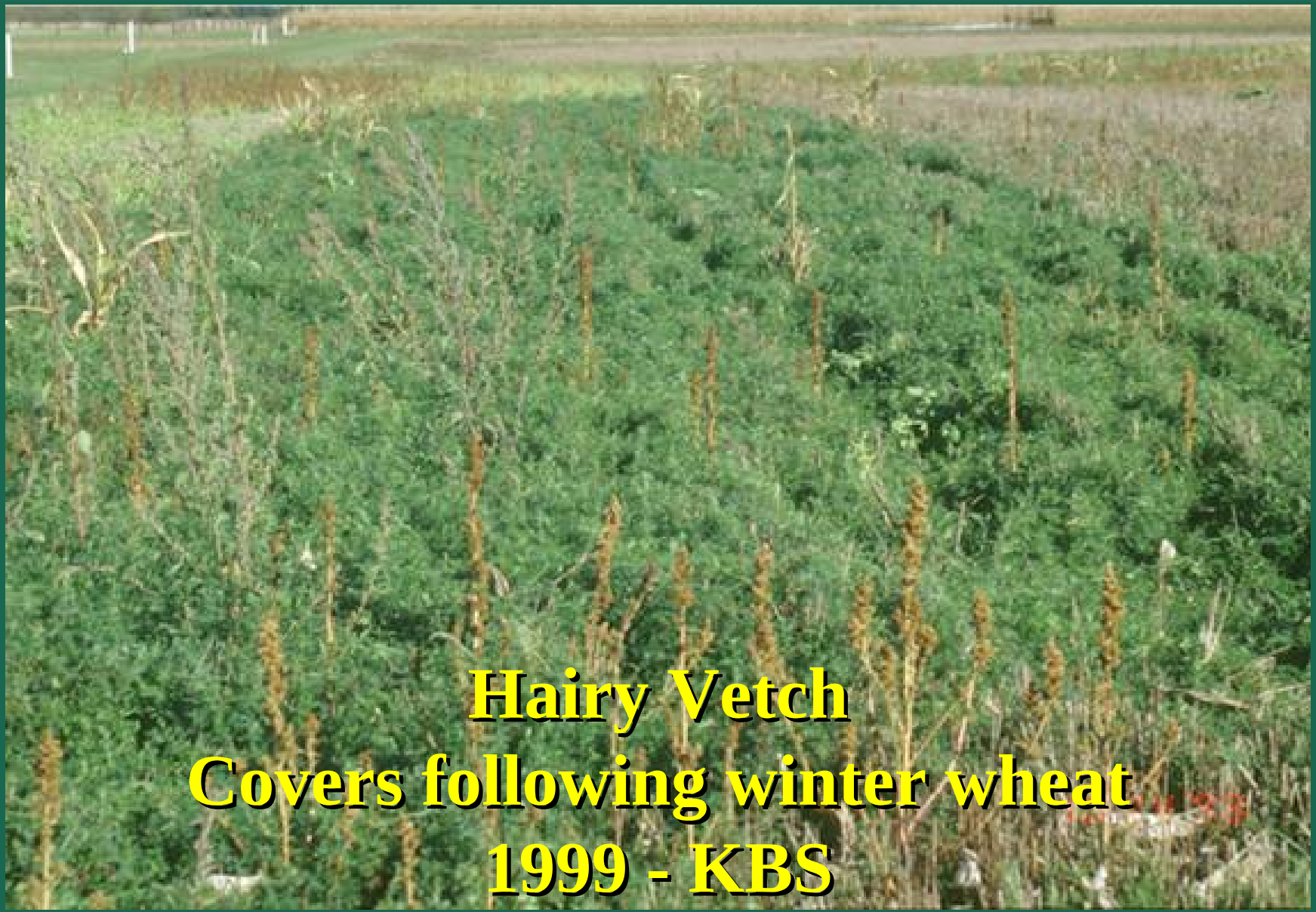
- Wheat harvested
- No-till covers
- Plot size: 20 feet X 125 feet
- Biomass late fall before frost

Cover Crop Research at KBS

Covers Following Winter Wheat

- Crimson Clover – 15 lbs/A
- Hairy Vetch – 30 lbs/A
- Oilseed Radish – 15 lbs/A
- Soybeans – 1 bu/A
- Control


Crimson Clover
Covers following winter wheat
1999 - KBS


Hairy Vetch
Covers following winter wheat
1999 - KBS


Oilseed Radish
Covers following winter wheat
1999 - KBS


Soybeans
Covers following winter wheat
1999-KBS


Control
Covers following winter wheat
1999 - KBS

Cover Crop Research at KBS

1999 Fall Biomass

	Cover		Weeds	
Treatment	**lbs/A**	**LSD**	**lbs/A**	**LSD**
Oilseed radish	2943	A	44	B
Hairy vetch	2644	A	157	B
Crimson clover	1917	B	349	B
Soybeans	808	C	442	B
Control	0	D	2483	A
LSD@0.05	657		575	

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Cover Crop Research at KBS

2000 Spring Biomass

	Cover		Weeds	
Treatment	**lbs/A**	**LSD**	**lbs/A**	**LSD**
Oilseed radish	0	C	113	C
Hairy vetch	5199	A	0	C
Crimson clover	2963	B	38	C
Soybeans	0	C	322	B
Control	0	C	728	A
LSD@0.05	657		575	

Cover Crop Research at KBS

2000 PSNT N Credits

Treatment	lbs/A	LSD
Hairy vetch	101	A
Crimson clover	67	B
Oilseed radish	37	C
Control	20	C
Soybeans	20	C
LSD@0.05	25	

Cover Crop Research at KBS

2000 Corn Yield

Cover	lbs N	bu/A	LSD
Oilseed Radish	120	185	A
Hairy Vetch	120	182	AB
Hairy Vetch	0	174	ABC
Hairy Vetch	60	173	ABC
control	120	169	ABCD
Crimson Clover	60	165	ABCDE
Oilseed Radish	60	165	ABCDE
Crimson Clover	0	164	ABCDE
Crimson Clover	120	162	BCDE
Soybeans	120	155	CDE
Soybeans	60	150	DE
control	60	149	DE
Oilseed Radish	0	148	E
control	0	118	F
Soybeans	0	117	F
LSD@0.05		21	

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Cover Crop Research at KBS

2000 Stalk Nitrate

Cover	lbs/A N	ppm N	LSD
Hairy Vetch	60	7354	A
Hairy Vetch	120	6238	AB
Crimson Clov	120	4923	BC
Hairy Vetch	0	3572	CD
Oilseed Rad	120	2503	DE
Crimson Clov	60	2501	DE
Oilseed Rad	60	786	EF
control	120	725	F
Soybeans	120	449	F

Stalk N too high

Stalk N optimum

Stalk N too low

Question: This is optimum for grain, is there a desirable stalk nitrate level for silage?

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Cover Crops Seeded into Several Michigan Cropping Systems

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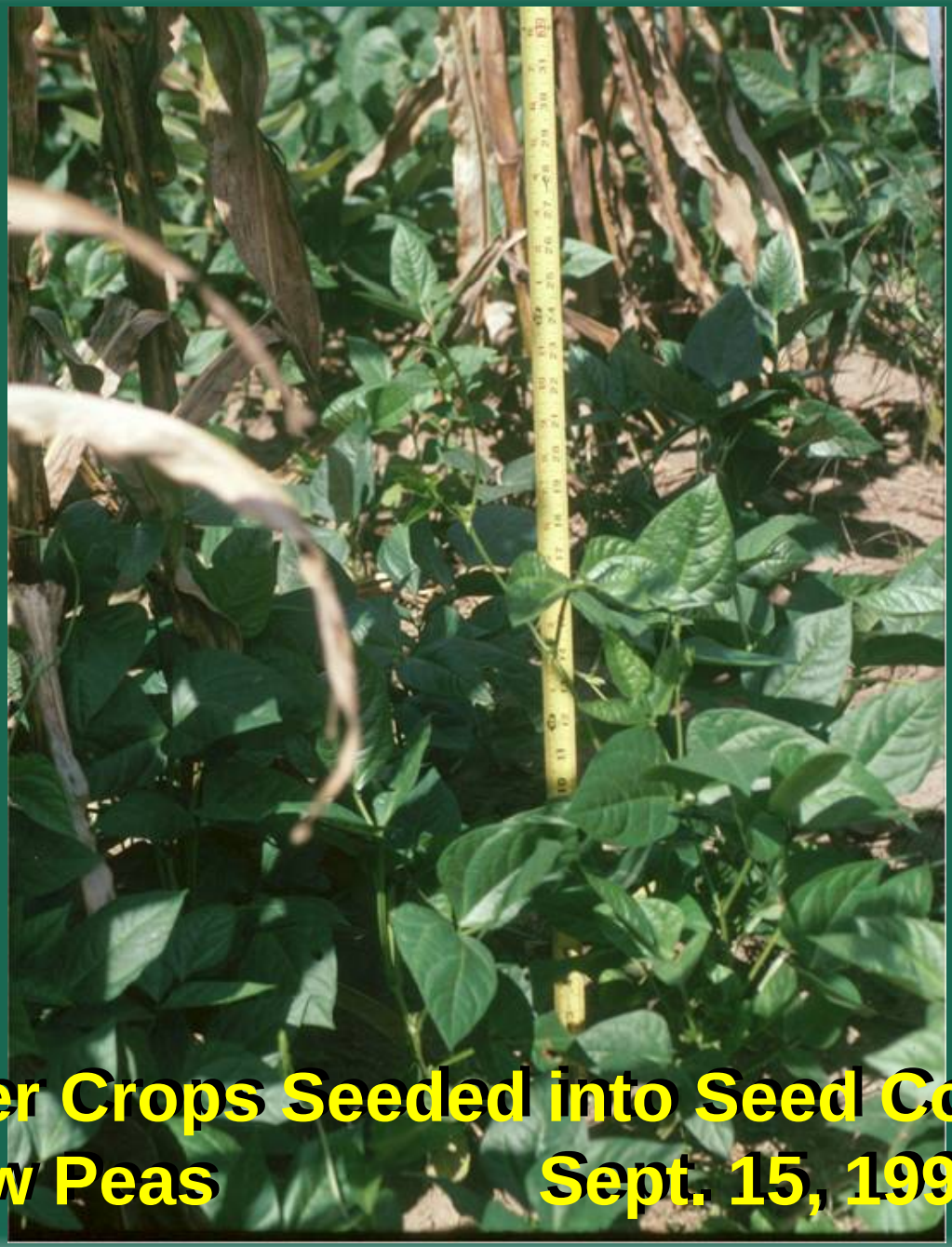

Cover Crops Seeded into Seed Corn
Cow Peas Sept. 15, 1999

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Cover Crops Seeded into Seed Corn
Austrian Winter Peas

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Cover Crops Seeded Following Snap Beans
Oilseed Radish Nov. 19, 1999

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Cover Crops Seeded Following Snap Beans
Oats Sept. 24, 1998

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Crimson Clover Seeded Following Winter Wheat

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Fall Seeded Hairy Vetch

Oriental Mustard Seeded Following Winter Wheat

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Annual Ryegrass Seeded Following
Winter Wheat

Seeding Cover Crops with Manure Slurries

Tim Harrigan

Biosystems and Agricultural Engineering

Dale Mutch and Sieglinde Snapp

Kellogg Biological Station

Michigan State University

Enhance soil biology with organic inputs--manure and cover crops

- Increase
  - organic matter
  - water holding capacity
- Improve
  - aggregate stability
  - water infiltration
- Decrease
  - evaporation
  - soil bulk density

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Manure with a cover crop

- Greater yield response to manure applied with a winter cover crop than manure on bare soil.

Goal

- Develop an integrated process that incorporates
  - » low-disturbance tillage
  - » manure application
  - » and seeding of cover crops
- in one efficient operation

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Manure slurry-enriched seeding of cover crops

Seed placement and emergence

- Aeration tillage creates cracks and fissures that are filled with seed-laden slurry.
  - » Emergence from near surface to 3 inches.

Treatments

Cover Crop	Rate
Annual Ryegrass	35 lbs
Cereal rye	2 bu
Crimson clover	15 lbs
Oilseed radish	15 lbs
Oriental mustard	10 lbs
Control	--

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Oriental Mustard
Manure - 10 plants

Oriental Mustard
No-till - 35 plants

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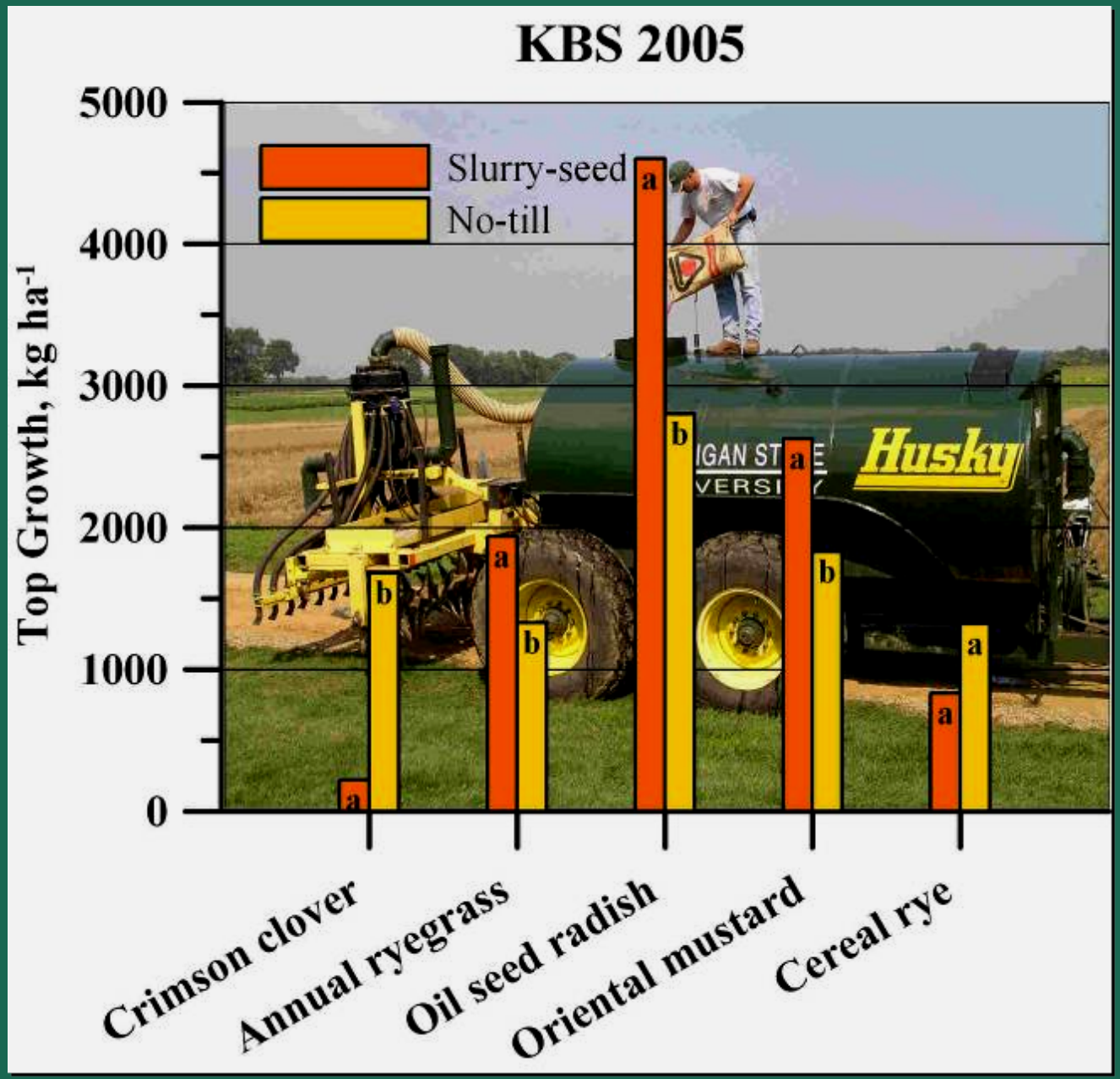
KBS 2005
Top Growth, kg ha-1
5000
4000
3000
2000
1000
0
Slurry-seed
No-till
a
b
a
b
a
b
a
b
a
b
Husky
Crimson clover
Annual ryegrass
Oil seed radish
Oriental mustard
Cereal rye

Corn Yields

trt	Manure/cover crop	PSNT credit (lb/a)	yield	LSD
1	Manure/Crimson Clover	50	159	AB
2	Manure/Annual Ryegrass	55	157	AB
3	**Manure/Oilseed Radish**	**70**	**167**	**A**
4	Manure/Oriental Mustard/Cereal	55	155	ABC
5	**Manure/Cereal Rye**	**40**	**162**	**AB**
6	Manure	55	155	ABC
7	No Manure	40	157	AB
8	**No Manure/Crimson Clover**	**105**	**137**	**D**
9	No Manure/Annual Ryegrass	40	149	BCD
10	No Manure/Oilseed Radish	60	147	BCD
11	No Manure/Oriental Mustard/Cereal	60	139	CD
12	No Manure/Cereal Rye	55	147	BCD
			LSD @ 0.05 = 17	

(All plots fertilized to 120 lb-N/a)

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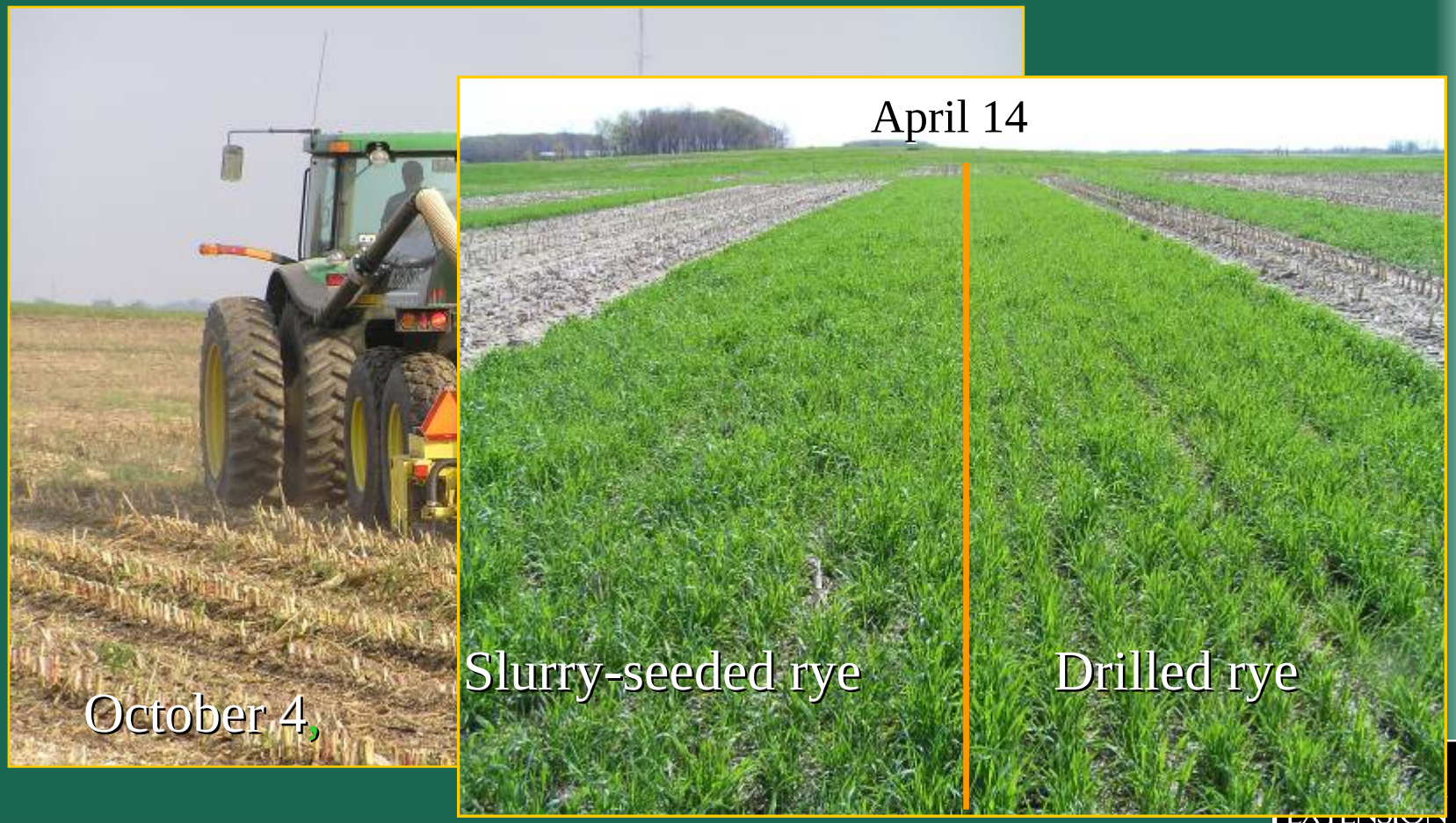
Small grain cover after corn silage



Suitable for several crops

Oil seed radish

Annual rye grass

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Pasture improvement

Pasture im

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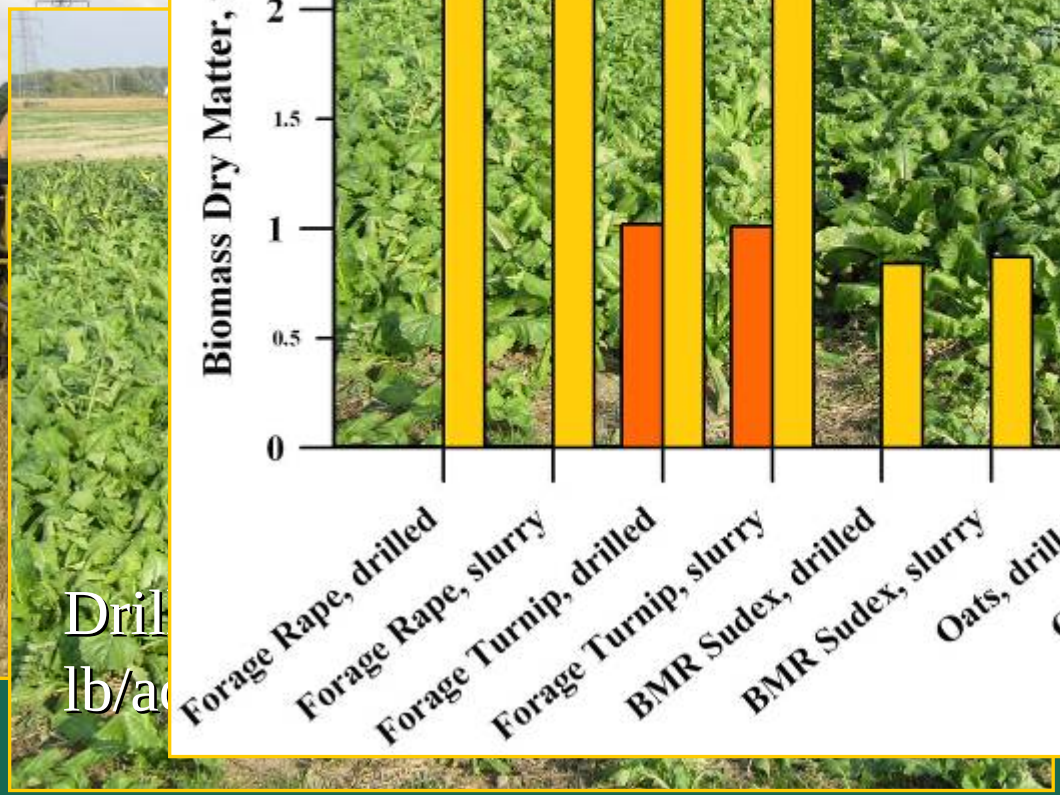
Late season/stockpile grazing



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Slurry-enriched seeding is environmentally sensitive

- Environmental benefits
  - Conserves crop residue and improves infiltration, reduces over land flow.
  - Stabilize soil and contaminants, recycles nutrients.
- Crop protection
  - Natural pest suppression, reduction in pesticides.
- Soil quality benefits
  - Reduce tillage and traffic, organic inputs, sequester carbon, increase soil organic matter.
- Resource efficiency
  - Aeration tillage, manure application and cover crop seeding in one pass. Saves 2 gal/acre fuel, 0.35 h/acre labor.

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