



OHIO STATE UNIVERSITY EXTENSION

Homegrown Nitrogen

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Type of Cover Crops

Legumes: Make Nitrogen, low C:N ratio, tap root, cowpeas, Austrian winter pea, hairy vetch, red & sweet clover, Sunn hemp, lupins, soybeans

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

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

Legumes & Clovers

- 1) Make N with the help of Bacteria
- 2) Provide N to grasses
- 3) Longer deeper tap roots, help with deep vertical compaction
- 4) Recycle P and K
- 5) Acidify the soil, less root mass



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Crimson clover



Red clover



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White Clover



Yellow Clover



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Legume hemp (Crotalaria)



Sunn Hemp



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Photo - Graeme Wilson ©

Sunn Hemp



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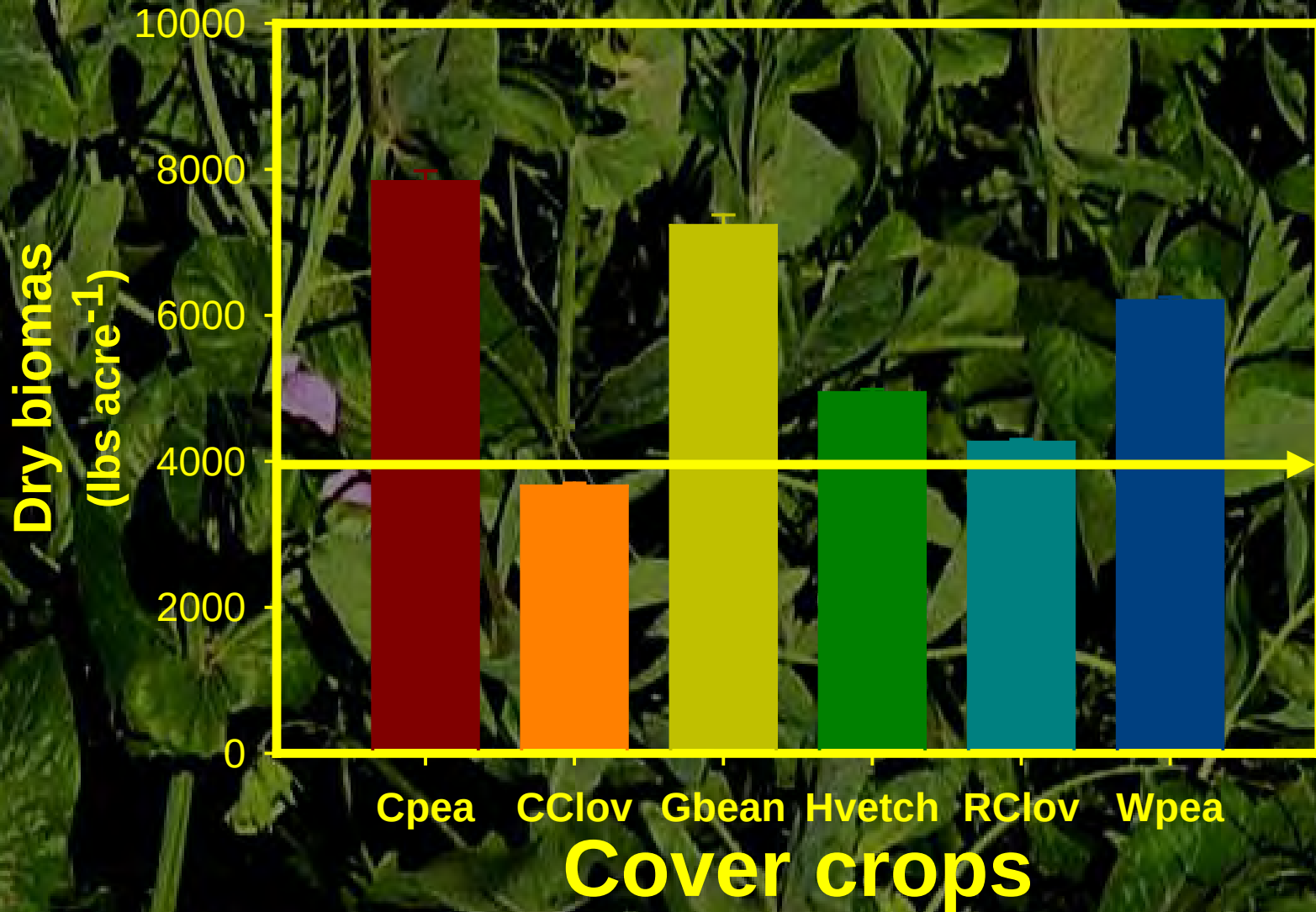
Cowpea



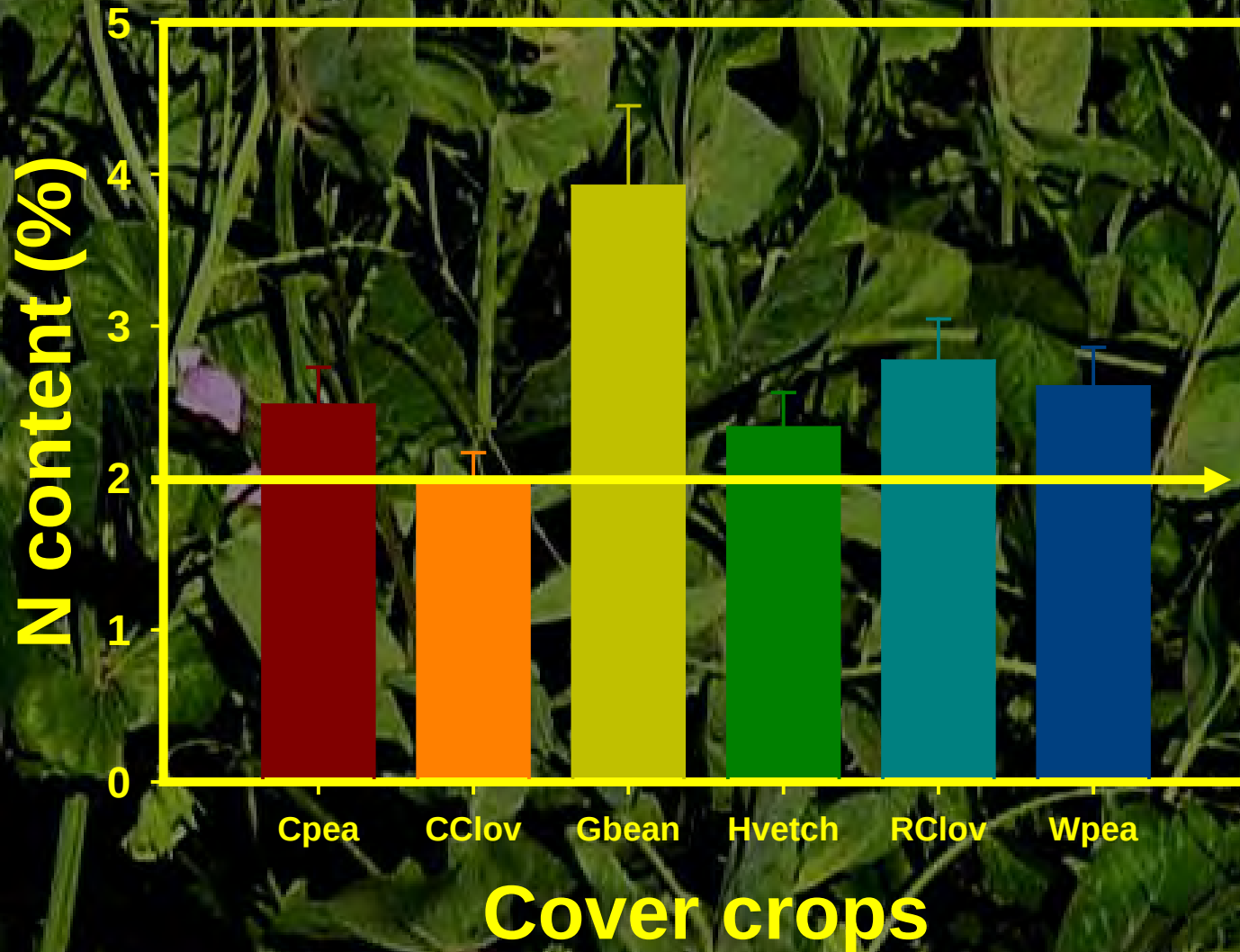
Black-eyed
pea



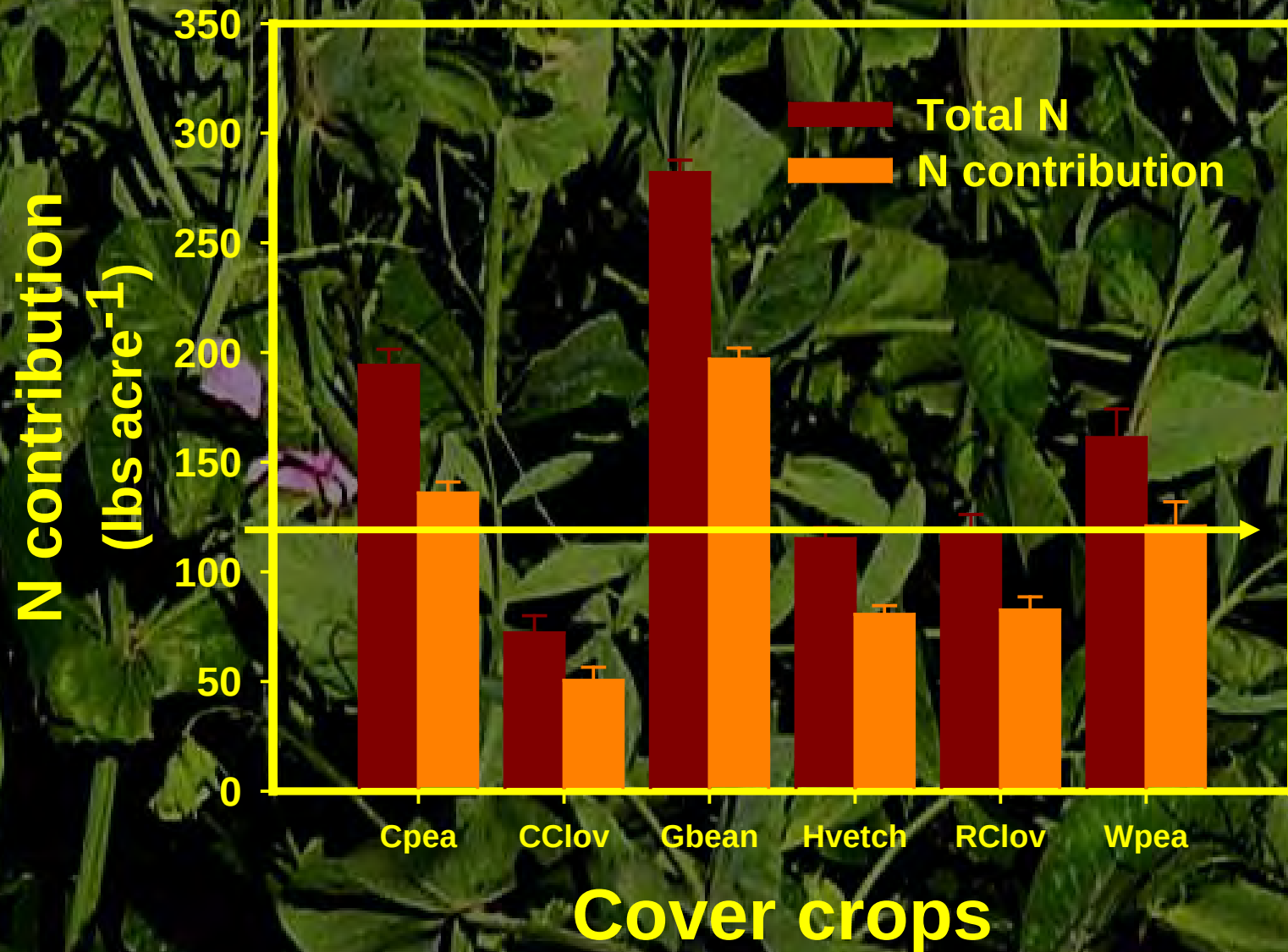
Cover crops biomass production



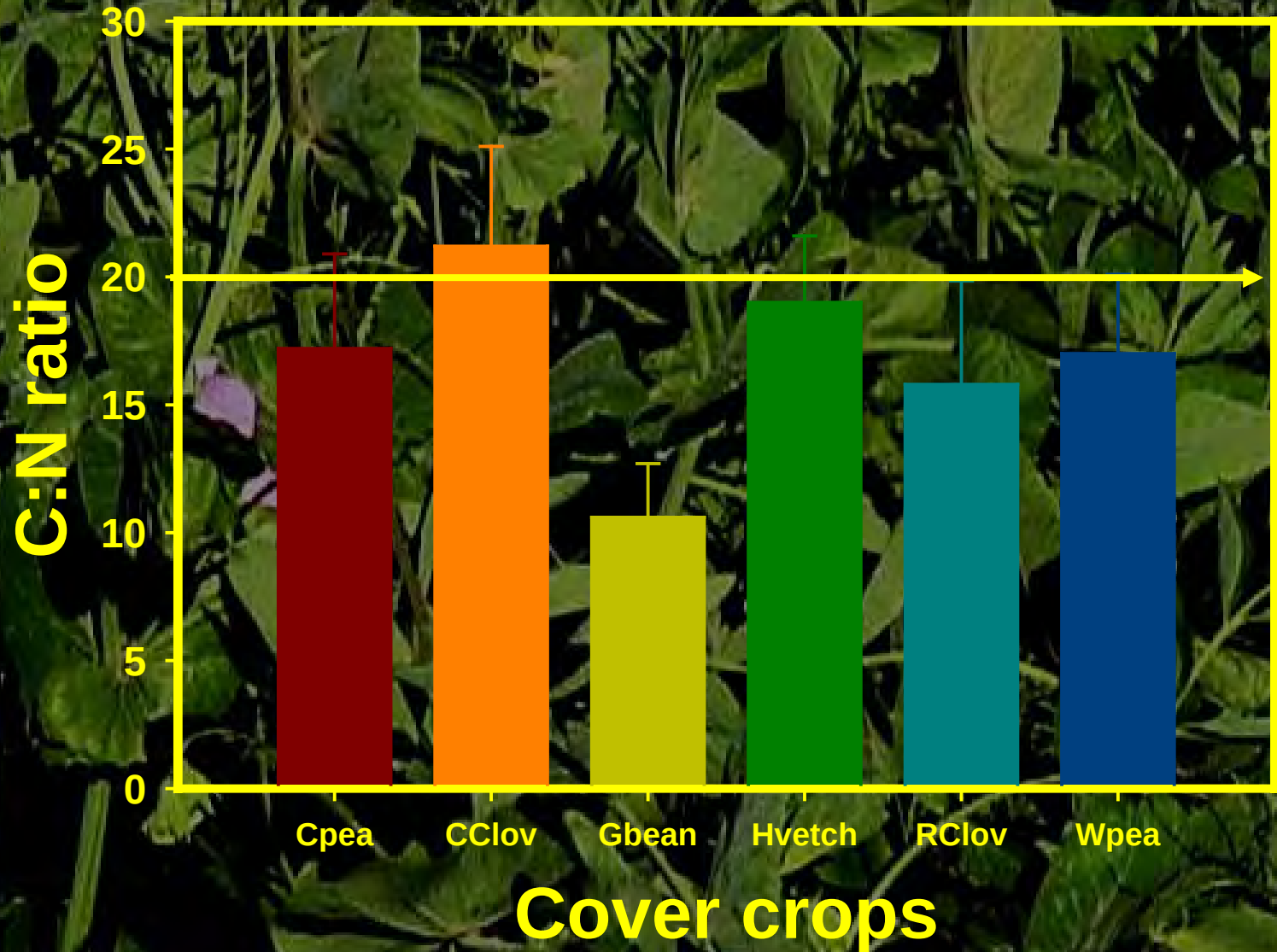
Biomass N content of cover crops



Biomass N contribution



Cover Crops C:N ratio



Crimson Clover



Crimson Clover

Disadvantages

- VNS will possibly winterkill

Advantages

- Can produce up to 140 units of N/acre within 90 days following wheat
- Earthworm “Heaven”
- Easy to kill
- Excellent new (early and more winterhardy) varieties are available: Daisy



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Crimson Clover -2



Advantages

- Works very well as a companion to Radishes, Annual Ryegrass, etc...
- Deep and fibrous root system (21" deep)



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Crimson Clover roots...found 34"
deep spring 2011 (in sandy loam soil)



Austrian Winter Peas

Disadvantages

- Best to be incorporated
- Generally Winterkills
- Needs at least 5-6 weeks growth for best results
- Only one grazing/harvest can be expected

Advantages

- Produces 60-150#/acre N
- Generally Winterkills
- Easy to kill with herbicides



Austrian winter pea (winter pea)



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Ohio NT farmers association president David Brandt standing in his NT winter pea field

NT Crop Rotation with Minimum N Input

Wheat/Cow peas



Corn



Rye



Soybean



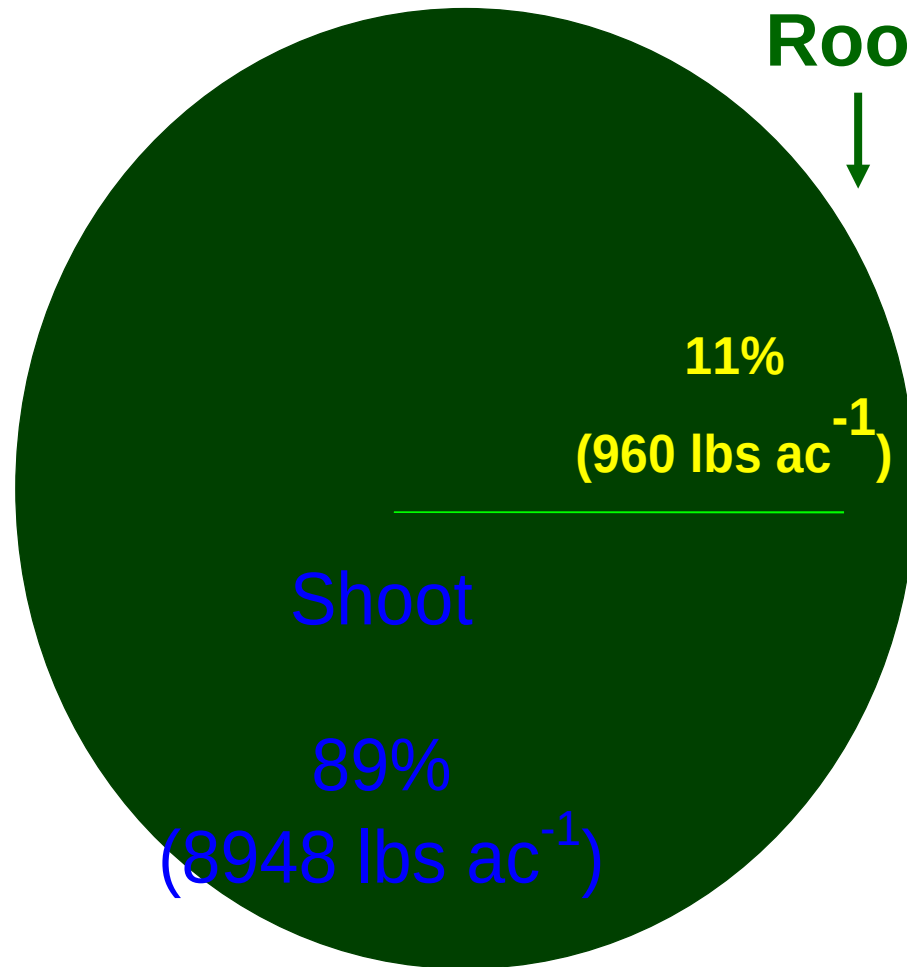
Wheat



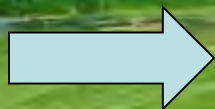
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Winter pea dry biomass partition



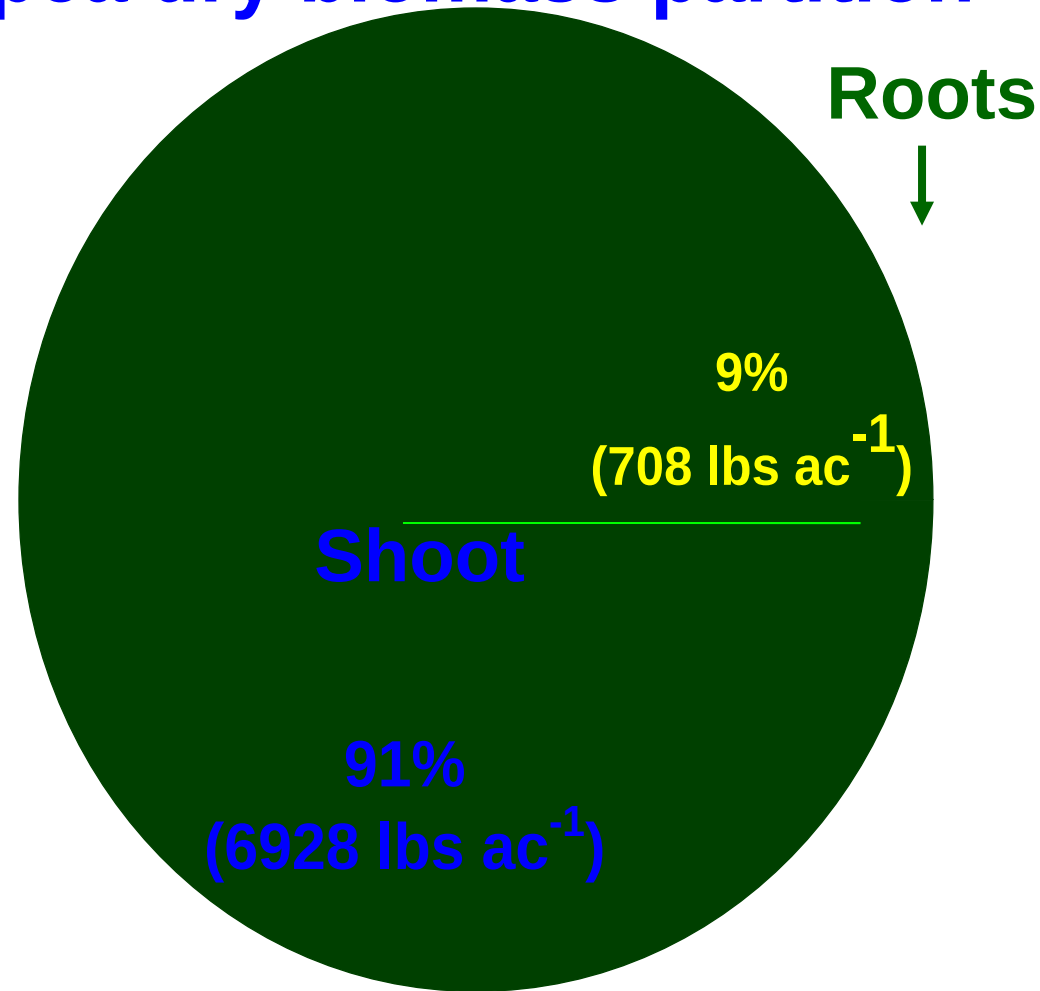
130-150 lbs N contribution per acre



Corn, no nitrogen added

Cowpea

Cowpea dry biomass partition



138-152 lbs N contribution per acre



**No-Till corn in winter-killed
cowpea without N fertilization**

**Conv. tilled corn with N
fertilization**



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**NT corn in
winter killed
cow pea
residues**



**NT corn with N
fertilization**





Plowed field

No-till w/cover crops

July 2008

Bill Richards' Farm, Circleville, Ohio

Corn no-tilled into Austrian Winter Pea

Photos: July 6, 2009



Remains of Austrian Winter Pea cover crop, July 6



Medium Red Clover

Disadvantages

- May get too tall in wheat and affect harvest/Harder to kill.



Advantages

- Produces 75-100# N
- Good root system-soil builder
- Easy to frost seed into wheat
- Often least cost cover crop
- Excellent for forage

2009 NW Ag Research Station Red Clover, N Rate, No-till

Cover Crop	Sidedress N Rate	Corn Yield
No clover	0	39.9 A
Clover	0	47.6 B
No clover	80	93.3 C
Clover	80	103.2 D
No clover	160	129.5 E
Clover	160	135.4 E
LSD (0.10)		6.3



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2010 NW Ag Research Station, Wood County, OH

Red Clover: No-Till

Treatment	Corn Yield
No-Till	130 A
No-Till & Clover	139 B

LSD _{p=0.10}	5.8
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2010 NW Ag Research Station

Red Clover - Tillage

<u>Treatment</u>	<u>Corn Yield</u>		
NoTill	129.8	A	
NoTill & Clover	138.6	B	
Conserv. Tillage	139.3	B	C
Conserv. Tillage & Clover	144.8		C

LSD (.10)

5.8



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When/How much N Fertilizer needed if using Legume before Corn?

When do you need fertilizer? Early spring and summer when temperatures are cool.

How much N fertilizer? Depends on PSNT.
Suggest 40-60# of N fertilizer as starter.
Watch salt content.

When is Legume N released? Depends on moisture and temperature. Most is released in 30 to 90 days or later in growing season.



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Planting Legume Cover Crops

Crop rotation

Time of planting

Inoculation

Broadcast vs. Drilling





Broadcasting/drilling



**Example: Austrian
winter peas**



Summary of Legumes

- 1) Legume Cover Crops may be a significant source of Soil Nitrogen.
- 2) Biomass N equals Biomass Production * N content
- 3) Crimson Clover after Wheat
Up to 140# NA
- 4) Cowpeas after Winter Wheat
138-152 #N/Acre.
- 5) Austrain Winter peas after Winter Wheat
130-150 #N/Acre. Canadian Field Pea 50-100#N/A
- 6) Red Clover after Wheat
75-90 #N