The Big Laboski Hour

Starring Carrie Laboski as
The Big Laboski

Acts

1. N availability of treated dairy manure
2. A first look at Instinct®
3. Tips for managing nutrients to survive the economic crisis
4. Soil test summary website

N availability of treated dairy manure

Why do we want to look at N availability from treated manure?

- Treated manures are becoming more popular
- Treated manure characteristics can be different than raw manure
- Very little research has been conducted on digested manures

Objectives

1. To determine how much potentially available nitrogen (PAN) differs between raw and treated manures

2. To construct a model to predict PAN with various manure characteristics

Materials and Methods

- Lab incubation study
  - 112 days, ~ 1 growing season of GDDs
  - Measured NH_4 and NO_3 concentrations

- Incorporated at rate of 300 lb/a total N
  - ~120 lb/a 1st year available N if incorporated

Soil

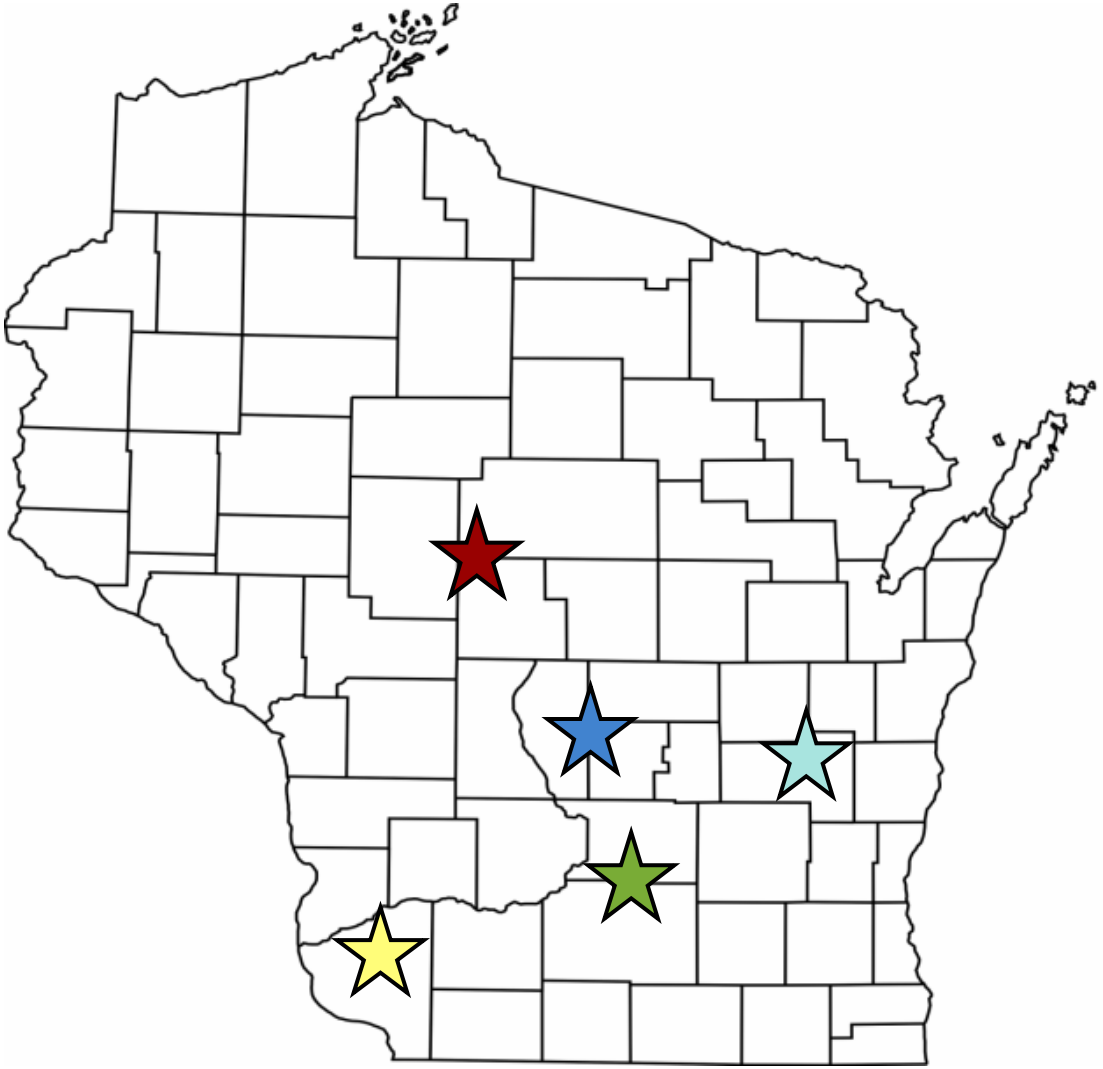
Richford
pH: 6.7
OM: 1.9 %

Withee
pH: 6.7
OM: 2.7 %

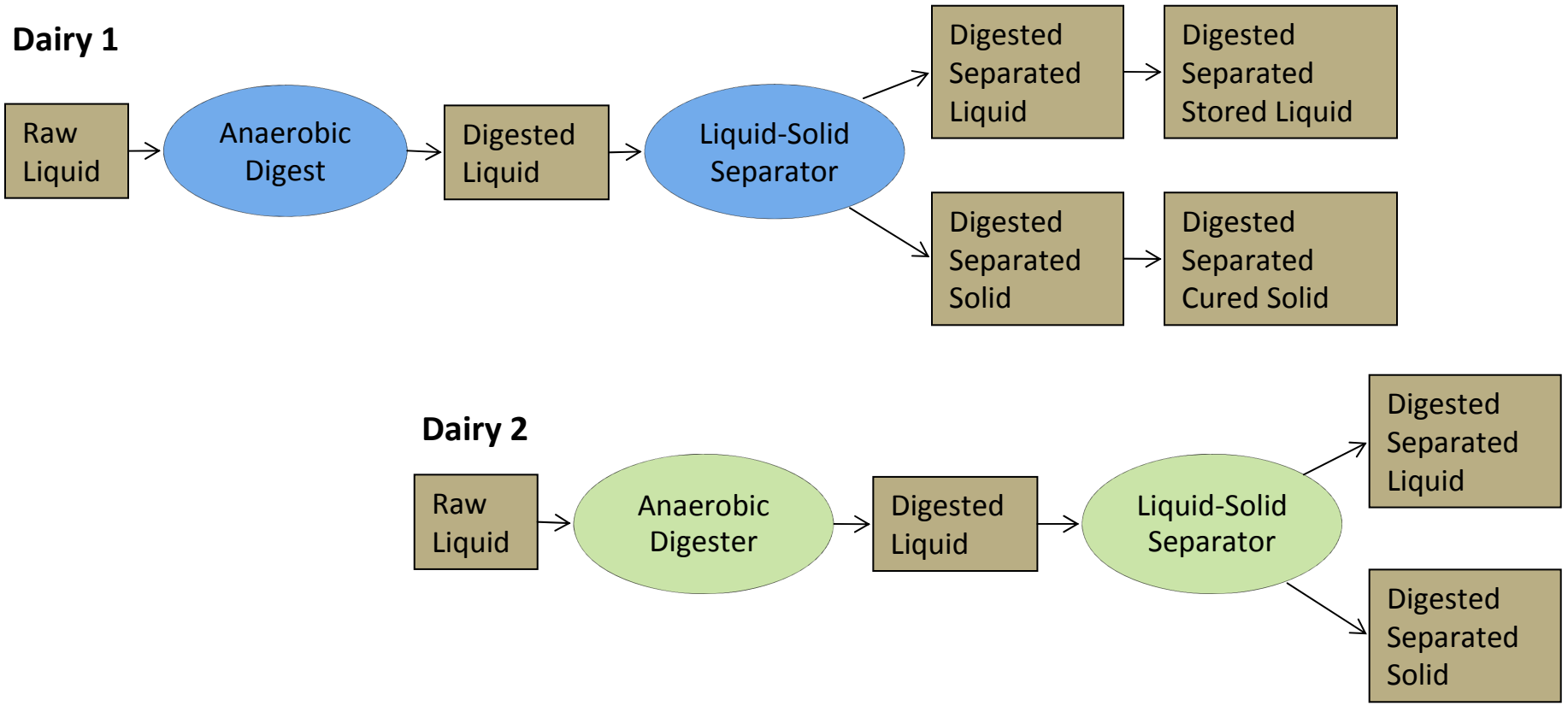
Fayette
pH: 7.1
OM: 2.7 %

Kewaunee
pH: 7.7
OM: 3.2 %

Plano
pH: 5.7
OM: 4.2 %



Manure Treatment Systems



Manure Treatment Systems/Locations

Dairy 4

Composted Bedded Pack 0-1’

Composted Bedded Pack 1-2’

Composted Bedded Pack 2-3’

Concrete Floor

Dairy 5

Center of Barn

Feed Area

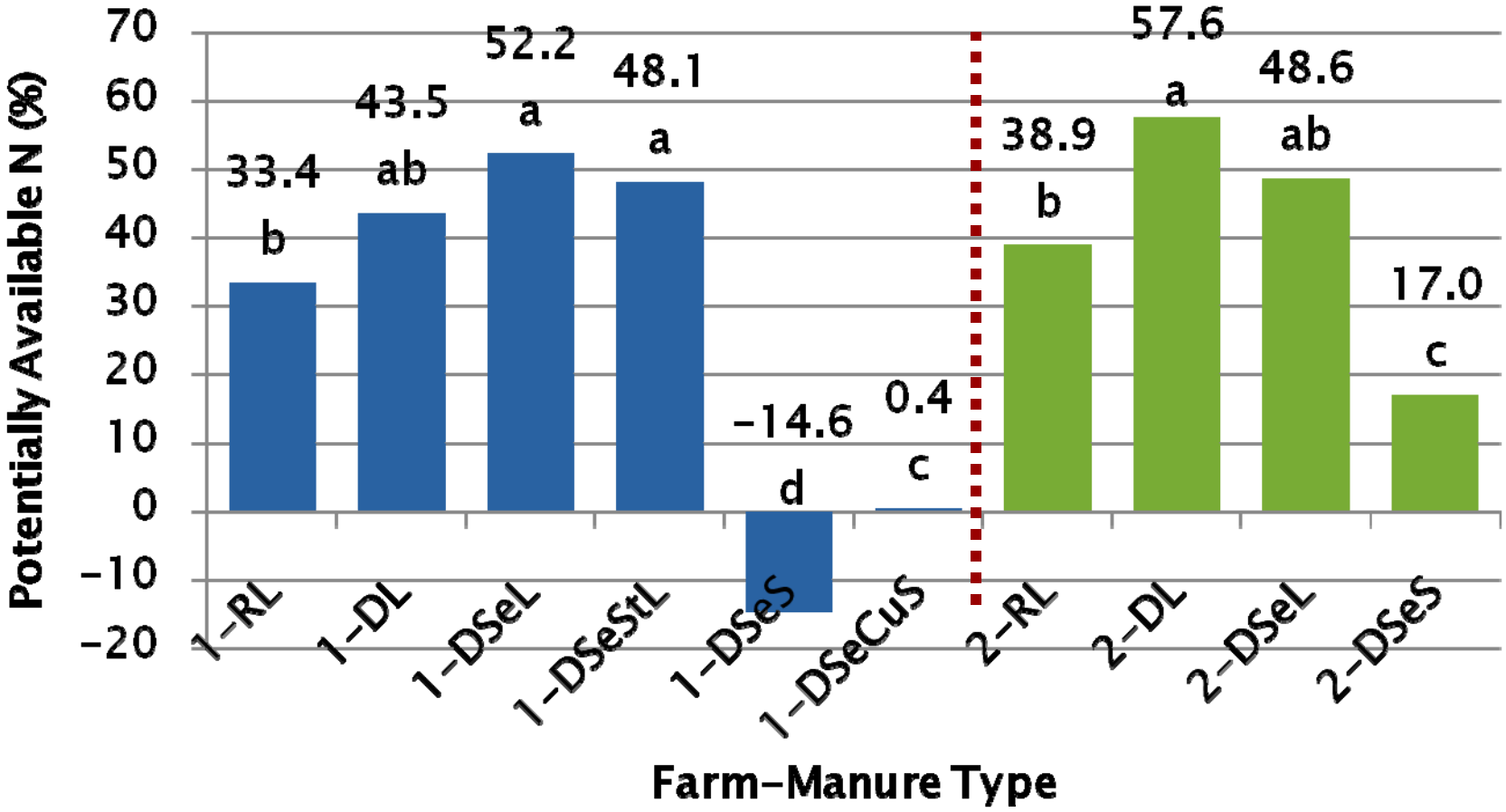
Manure Scrape Alley

Approachment

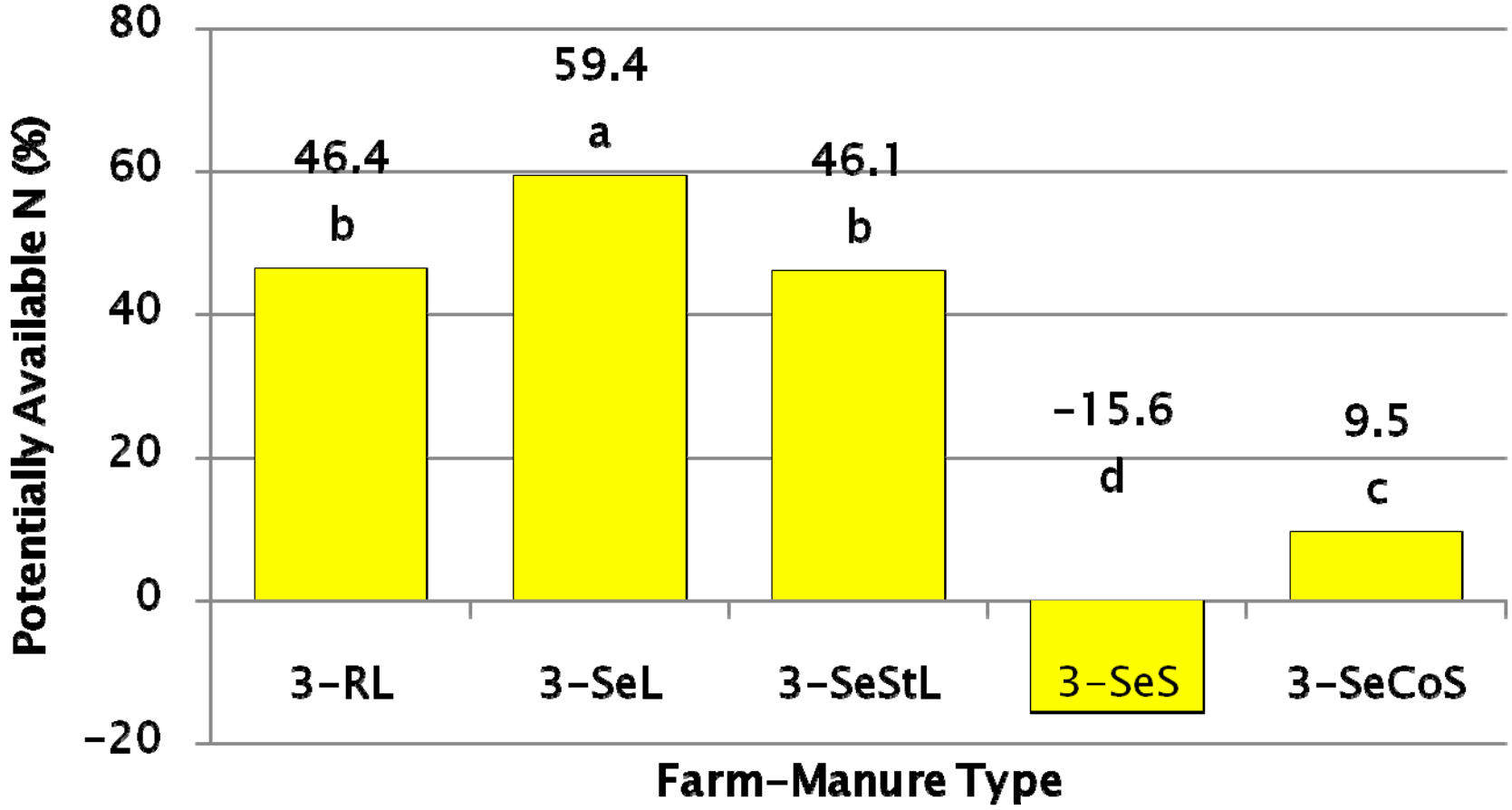
Elevated Bedded Pack

Results

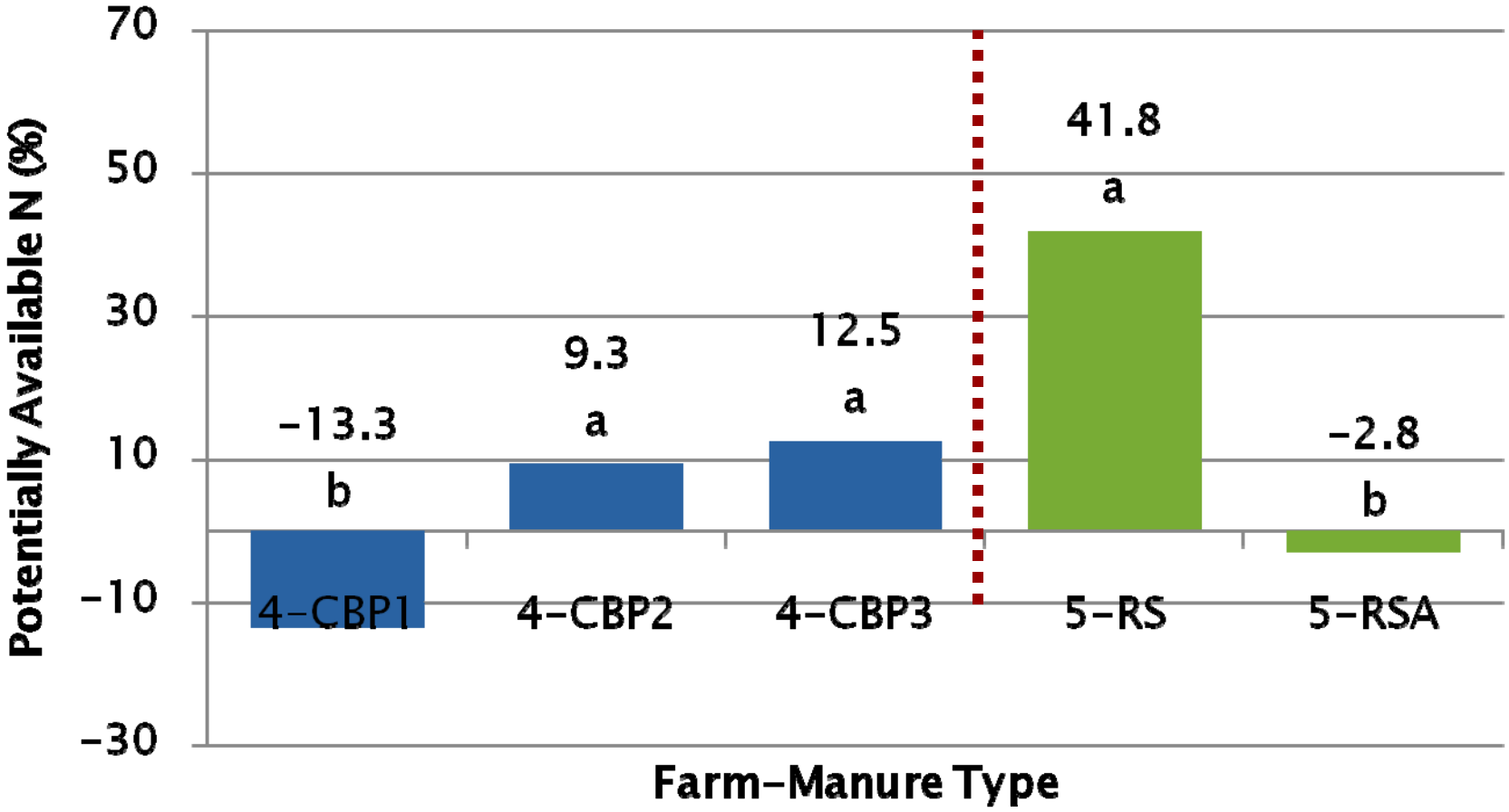
Percent of total N applied that is potentially available N, averaged over all soils – Farms with digesters



Percent of total N applied that is potentially available N, averaged over all soils – Farm with liquid/solid separator



Percent of total N applied that is potentially available N, averaged over all soils – Compost bedded pack and traditional raw solids



Results

- PAN is well correlated with several manure parameters, for example:
  - ADF, ADF:TN
  - NDF, NDF:TN
  - NH_4, NH_4:TN
  - ON, ON:TN

- A predictive equation is being developed
  - Current best equations include:
    - NDF:TN + TC:ON
    - ON + ON:TN

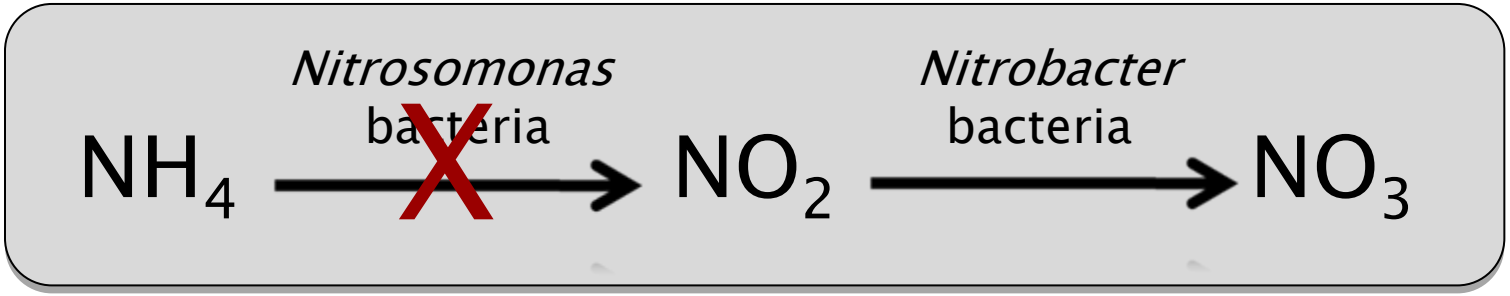
What's next?

- Need to evaluate in the field
  - Verify current results for estimates of 1st year availability
  - Determine 2nd year availability

A first look at Instinct®

What is Instinct?

- A nitrification inhibitor from Dow



- Nitrapyrin
  - Encapsulated
- For use in UAN or manure
  - UAN – 75% is or will be NH_4 with in several days

How is Instinct different than N-Serve?

- Is stable on the soil surface for 10 days
  - Must be incorporated with tillage or 0.5" water
- Is only labeled for corn
- Can only be applied in fall or spring prior to emergence
  - Do not apply after corn has emerged
  - Replant restriction – crops other than corn are not to be rotated in less than 1 year from application
- 1.85 lb/gal active ingredient
  - N-Serve has 2 lb/gal

For how long is Instinct effective?

- Soil microbes break down Instinct
  - Breaks down faster in warmer soils
  - Minimal bacterial activity at 40°F
- Estimated days of efficacy at a certain temperature – ????
  - Info. not provided by Dow
- Assumption for fall manure applications
  - If Instinct is not completely broken down in fall, it will have some efficacy in spring

Label application rates

- UAN – 35 oz/a
- Spring manure – 35 oz/a
- Fall manure –
  - 35 oz/a if 4” soil temperature <50°F
  - 70 oz/a if 4” soil temperature >50°F

2008 and 2009 research results

Effect of Instinct and N-Serve on corn yield for corn following soybean at Arlington, WI in 2008

N timing	N rate (UAN)	Instinct preplant	N-Serve sidedress	Grain Yield	Silage Yield
	lb N/a			bu/a	T DM/a
Preplant	80	no		168	8.30
	80	yes		174	8.87
AONR =	120	no		178	8.76
174 lb/a	120	yes		181	8.88
	mean	no		173	8.53 b
	mean	yes		178	8.88 a
Sidedress	80		no	170	8.49
	80		yes	176	8.52
AONR =	120		no	184	8.84
130 lb/a	120		yes	189	9.03
	mean		no	177 b	8.67
	mean		yes	183 a	8.78

- An additional 9 lb N/a was applied in starter fertilizer

Effect of Instinct and N-Serve on corn yield for corn following soybean at Arlington, WI in 2009

N timing	N rate (UAN)	Instinct preplant	N-Serve sidedress	Grain Yield	Silage Yield
	lb N/a			bu/a	T DM/a
Preplant	40	no		190	9.17
	40	yes		194	9.11
AONR =	80	no		201	9.60
69 lb N/a	80	yes		198	9.39
	mean	no		196	9.38
	mean	yes		196	9.25
Sidedress	40		no	191	9.46
	40		yes	192	9.08
AONR =	80		no	195	9.19
59 lb N/a	80		yes	195	9.15
	mean		no	193	9.32
	mean		yes	194	9.11

- An additional 9 lb N/a was applied in starter fertilizer

Considerations on the use of Instinct

- Costs about $10.92/a at the 35 oz/a rate
  - Need to increase yield by 2.8 bu/a (@$3.90/bu) to pay for the cost, assuming no additional application fee
- Past research with nitrapyrin (N-Serve) shows an economic benefit at current prices if situations for N loss are likely
  - Poorly drained soils – denitrification
  - Excessively drained soils – leaching

Pesticide Applicator License

- Is required in most (but not all) cases to use Instinct, including manure

- For more info contact DATAP:
  - Robby Personette: 608-224-4551
  - Charlene Khazae: 608-224-4541

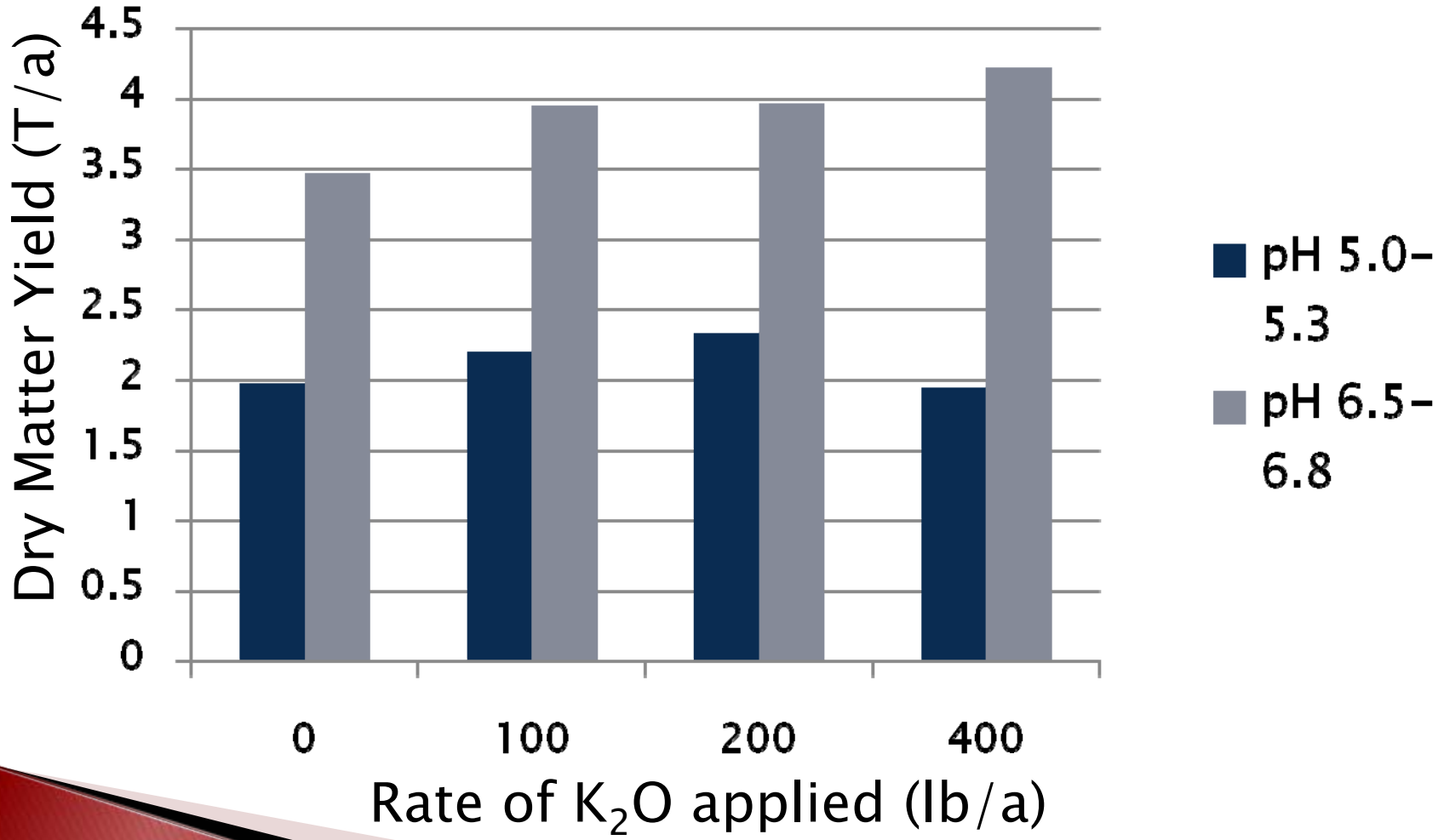
Tips for managing nutrients to survive the economic crisis

Nutrient use efficiency – Rule #1

- Lime is the cornerstone of a good soil fertility program

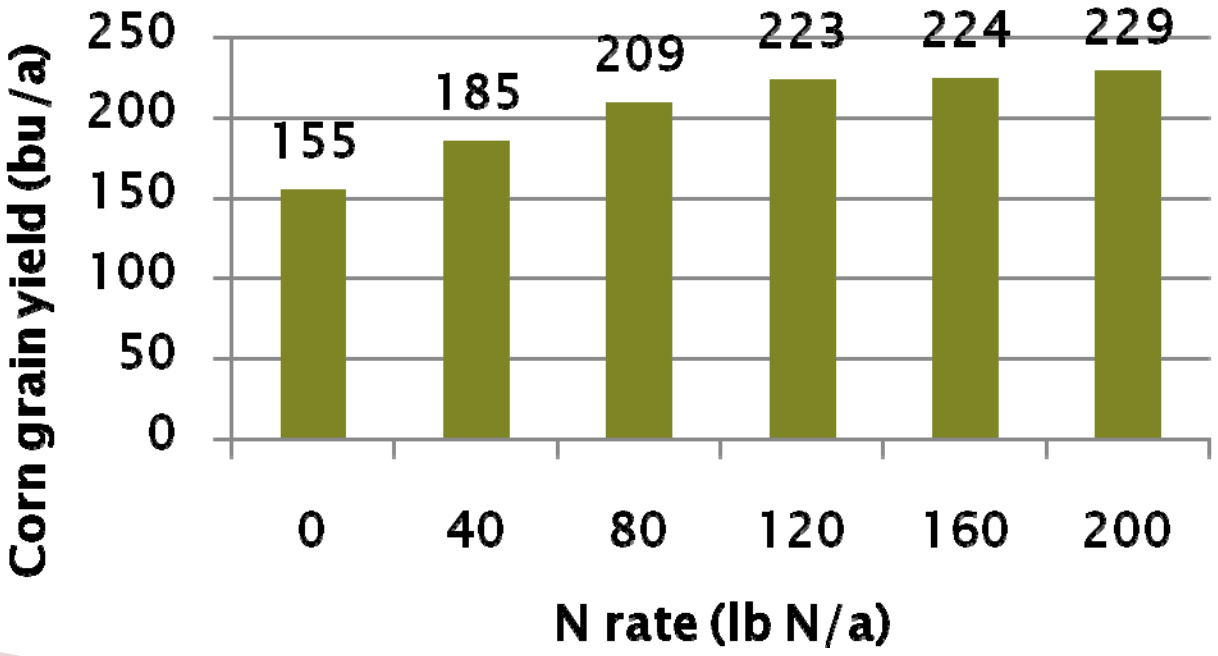
Crop	Target pH
Alfalfa	6.8
Clover	6.6
Soybean	6.3
Corn	6.0
Wheat	6.0

Effect of soil pH and annual topdressed potash on alfalfa yield from 1998–2001 Marshfield, WI



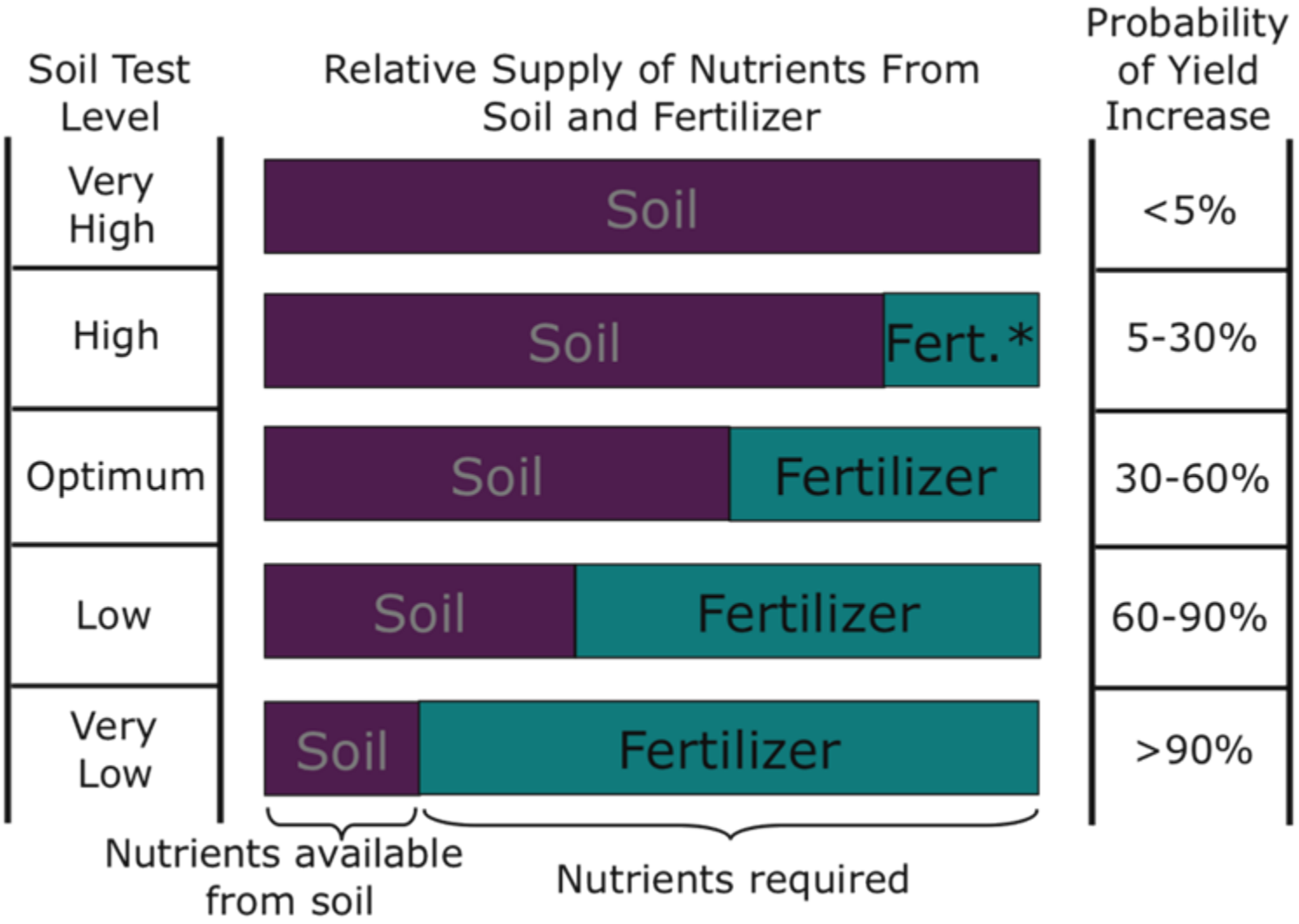
Nutrient use efficiency – Rule # 2

- The first increment of nutrients applied has the greatest efficiency and potential for economic return



Select the right rate of all nutrients

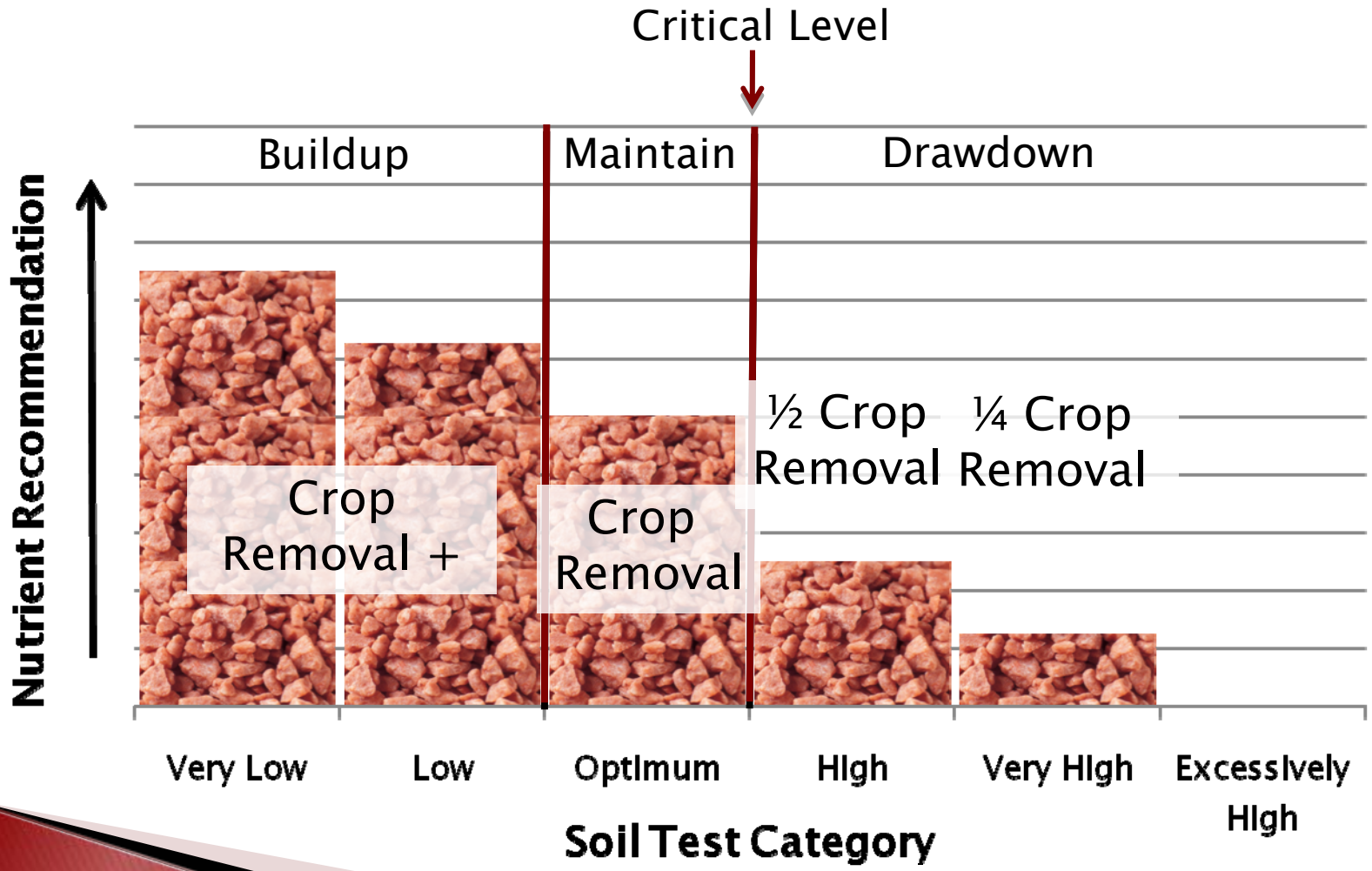
Soil Test Interpretation Categories



* Fertilizers used at high soil test levels are for starter or maintenance purposes

Modified from Tisdale et al., 2005

Relationship between soil test P & K and nutrient recommendations



Fertilizer prices have dropped

- Compared to last fall
  - But still high compared to 5-8 years ago
- For some, following the recommendations is appropriate
  - Owned land
  - Have adequate cash flow
  - Want to build/maintain soil test levels
- For others, need to reduce rates
  - Rented land
  - Poor cash flow
  - Do not want to build soil test levels

Tips for adjusting P & K fertilizer rates downward

Soil Test Category	Options for P	Options for K
Ex. High	No fertilizer recommended; Maybe starter?	
High or V. High	Maybe starter?	Defer or reduce K applications; Maybe starter?
Optimum	Apply near recommended rates (crop removal)	
Low or V. Low	Reduce recommended rate by 10%; Apply no less than crop removal rate	

What effect does delaying potash application have on soil test levels?

Marshfield ARS 1998-2001
4 years of alfalfa

Annual K rate	Soil test K
lb K_2O/a	ppm
	136 initial
0	69
100	84
200	123
400	266

No additional K applied
After initial application in 2006.

Soil	6wk after K applied spring 2006	Fall 2006 silage	Fall 2007 soybean	Fall 2008 silage
	Soil test K, ppm			
Fayette	79	65	67	67
	118	95	97	87
Plano	141	99	104	91
	185	177	167	116
Kewaunee	109	103	102	105
	127	117	116	107
Withee	115	95	98	96
	185	186	177	138
Plainfield	81	22	31	36
	92	34	33	44

Allocating P & K fertilizer on a limited budget

1. Use manure first
2. Apply fertilizer to all responsive fields (Very Low, Low, Optimum)
3. Apply fertilizer to High testing fields
4. If still have money, use starter fertilizer on Ex. High testing fields

Re-evaluating 2x2 starter fertilizer on high testing soils

- 100 Wisconsin sites 1995-1997
  - Average starter rate of 15-26-32
  - Range of soil test P and K levels, most had EH P & K
- Assumptions:
  - 9-23-30 costs $461/T, 100 lb/a of 9-23-30 applied 2x2
    - Starter fertilizer is $23/a
  - Corn is $4.00/bu
  - Need 5.75 bu/a increase to pay for cost of starter
- Probability of a profitable response to starter fertilizer is better in 2010 than 2009, but still less than 50%

Yield increase of at least	Probability of yield increase
bu/a	%
4	49
6	34
8	18
10	10
12	6
16	5
20	3

Manure tradeoffs

- What if…….

  a farmer says he can't/won't buy any fertilizer and plans to use all of his manure on corn to maximize yield

- Is this a good tactic or should another decision be made?

Assumptions

- This is a dairy farm with liquid manure
- There are no P limitations on any field but soil test P is optimum or greater
- Both corn (grain or silage) and alfalfa are grown
- Soils are medium yield potential – Wasepi

Value of Manure

Manure rate	1st yr N	Value 1st yr N	1st yr K_2O	Value 1st yr K_2O	1st yr S	Value 1st yr S
gal/a	lb N/a	$/a	lb K_2O/a	$/a	lb S/a	$/a
4,500	43	17	72	31	10	5
10,000	96	38	160	70	23	13
14,500	139	55	232	102	33	19

- Manure applied at MRTN rate is 14,500 gal/a
  - K and S are over supplied for corn grain
- If manure rate reduced to 10,000 gal/a, yield is reduced by 3 bu/a
  - Adequate K and S will be supplied for corn.

- If 4,500 gal/a of manure is applied 1x to alfalfa with an optimum soil test K level, yield will increase by about 0.2 T/a.
- If S is needed alfalfa, yield increase from the manure application may be 1-1.5 T/a.

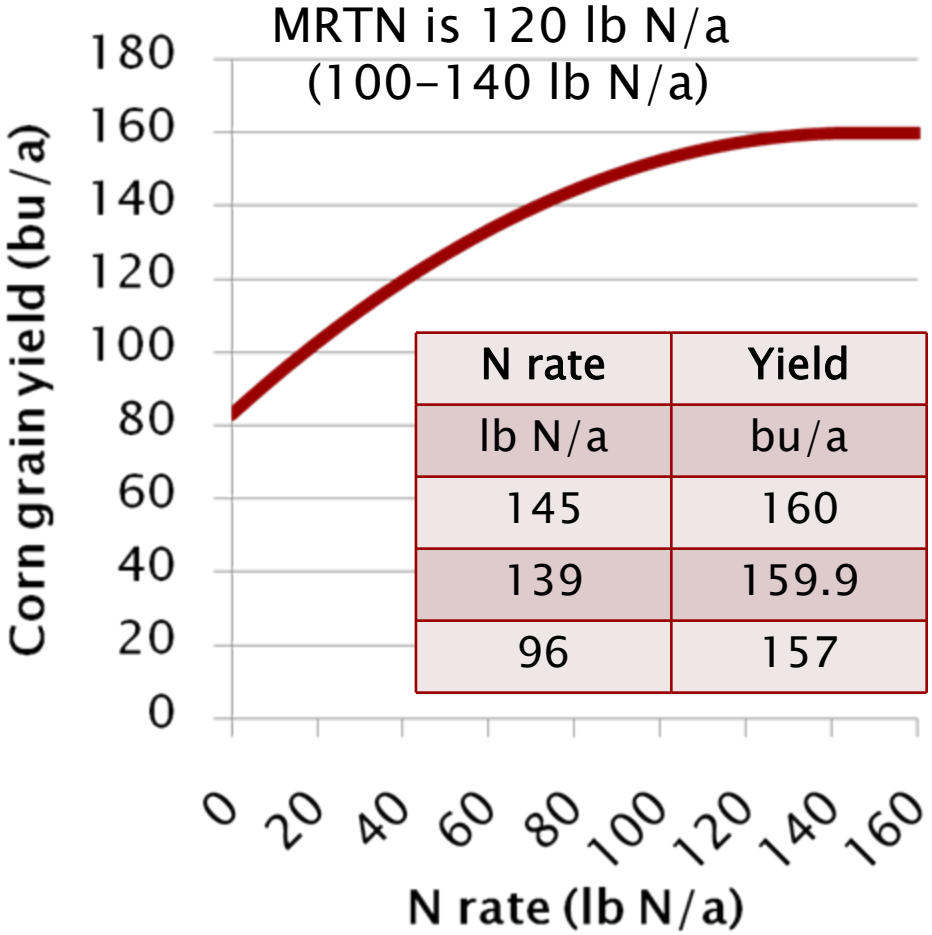
Depending on what is needed for feed; using some manure on alfalfa instead of corn may be most profitable in a cash limited situation

Assumptions:
24 lb tot. N/1,000 gal (40% avail.); [illegible] tot. K_2O/1,000 gal (80% avail); 4.2 lb tot. S/1,000 gal; (55% avail)

Alfalfa K response on a Withee soil (1998–2001)

Annual K_2O rate	Average annual yield
lb K_2O/a	T/a DM
0	3.47
100	3.95
200	3.96
400	4.22

N response on a Wasepi soil (med. yield potential) for corn following corn in 2006



N rate	Yield
lb N/a	bu/a
145	160
139	159.9
96	157

Alfalfa Dry Matter Response to S Rate, 2006

Sulfur rate[1]	Site					
	Wadena	Waucoma[2]	Nashua	Waukon	West Union	Lawler
lb S/acre	ton/acre					
0	1.32	1.85	6.73	1.39	0.78	2.14
15	2.59	3.06	6.98	2.97	1.05	2.11
30	2.76	3.14	6.85	3.33	1.07	2.11
45	2.92	3.24	7.14	3.58	1.07	2.07
Significant (90%)	*	*	NS	*	*	NS
Max rate, lb S/ac	25	22	0	29	12	0
Cut harvested	2+3	2+3	1+2+3+4	2+3	3	2+4

[1] Sulfur applied as calcium sulfate in April at Nashua and May at other sites.
[2] Waucoma site had 10 lb/ac elemental S applied in spring across the entire field.

Data courtesy of John Sawyer

Select an appropriate N rate for corn?

N:Corn Price Ratio

Price of N ($/lb N)	Price of corn ($/bu)								
	2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00	6.50
0.30	0.12	0.10	0.09	0.08	0.07	0.06	0.05	0.05	0.05
0.35	0.14	0.12	0.10	0.09	0.08	0.07	0.06	0.06	0.05
0.40	0.16	0.13	0.11	0.10	0.09	0.08	0.07	0.07	0.06
0.45	0.18	0.15	0.13	0.11	0.10	0.09	0.08	0.08	0.07
0.50	0.20	0.17	0.14	0.13	0.11	0.10	0.09	0.08	0.08
0.55	0.22	0.18	0.16	0.14	0.12	0.11	0.10	0.09	0.08
0.60	0.24	0.20	0.17	0.15	0.13	0.12	0.11	0.10	0.09
0.65	0.26	0.22	0.19	0.16	0.14	0.13	0.12	0.11	0.10
0.70	0.28	0.23	0.20	0.18	0.16	0.14	0.13	0.12	0.11
0.75	0.30	0.25	0.21	0.19	0.17	0.15	0.14	0.13	0.12
0.80	0.32	0.27	0.23	0.20	0.18	0.16	0.15	0.13	0.12

Nitrogen Guidelines for Corn in Wisconsin

SOIL	PREVIOUS CROP	N:Corn Price Ratio (see other side) 0.05	0.10	0.15	0.20
		LBS N/ACRE (total to apply)[3]			
high/very high yield potential soils	**Corn**, Forage legumes, Legume vegetables, Green manures[4]	**165**[1] 135-----■----190[2]	**135** 120--■---155	**120** 100---■--135	**105** 90--■--120
	Soybean, Small grains[5]	**140** 110-----■---160	**115** 100--■--130	**100** 85--■--115	**90** 70---■-100
medium/low yield potential soils	**Corn**, Forage legumes, Legume vegetables, Green manures[4]	**120** 100---■---140	**105** 90--■--120	**95** 85-■--110	**90** 80-■-100
	Soybean, Small grains[5]	**90** 75--■---110	**60** 45--■-70	**50** 40-■-60	**45** 35-■-55
sands/ loamy sands	Irrigated—**All crops**[4]	**215** 200--■--230	**205** 190--■--220	**195** 180--■--210	**190** 175--■-200
	Non-irrigated—**All crops**[4]	**120** 100---■---140	**105** 90--■--120	**95** 85-■--110	**90** 80-■-100

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[1] Maximum return to N (MRTN) rate. [2] Range within $1/acre of MRTN rate. [3] Includes N in starter. [4] Subtract N credits for forage legumes, legume vegetables, animal manures, green manures. [5] Subtract N credits for animal manures and second year forage legumes.

Soil test summary website

http://uwlab.soils.wisc.edu/soilsummary/

- Annual data by county from 1995-2004
  - Older data not electronically available at this time
- Historical 5-yr summary from 1974-2004