

Fertilizer guidelines for increased efficiency and environmental stewardship.

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Winter grower meetings

January 23 and 30, 2012

Covered topics

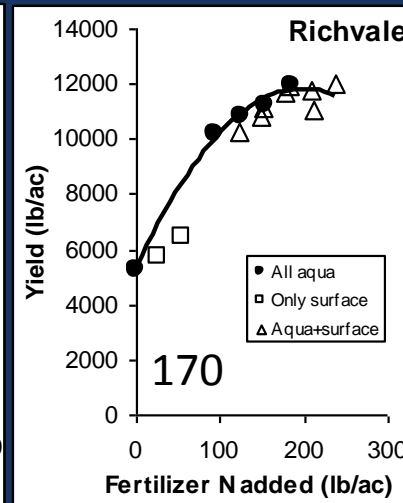
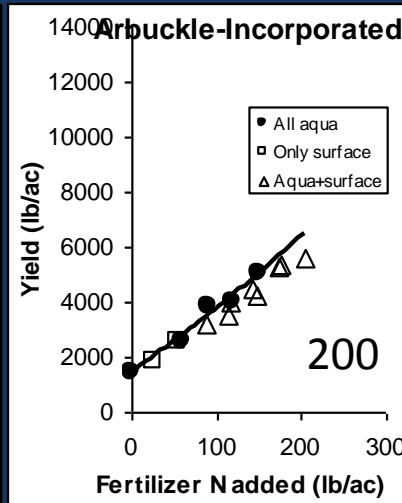
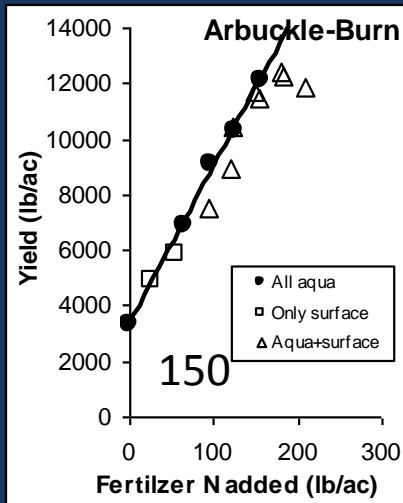
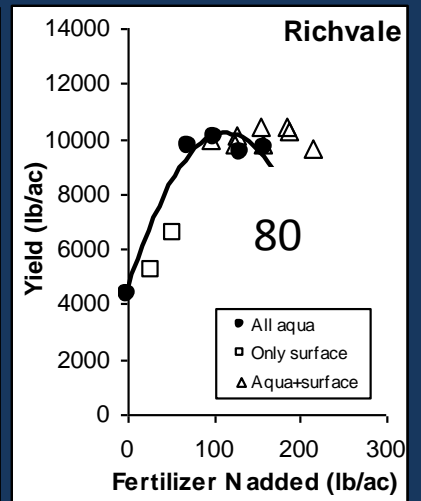
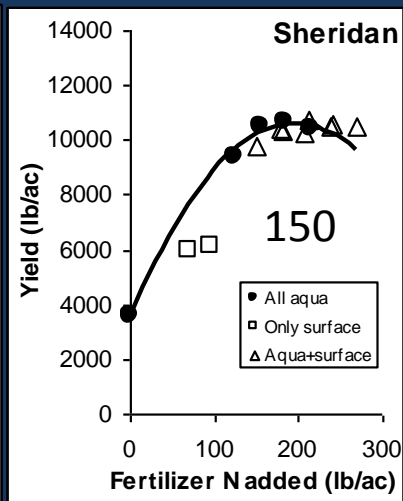
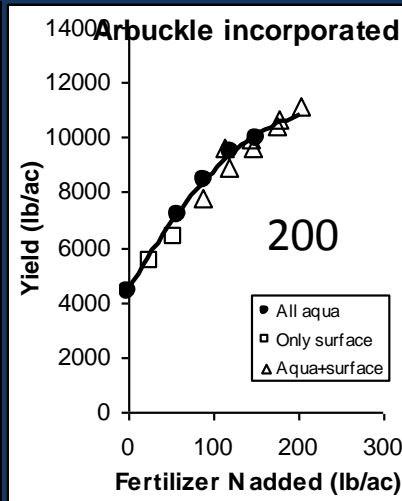
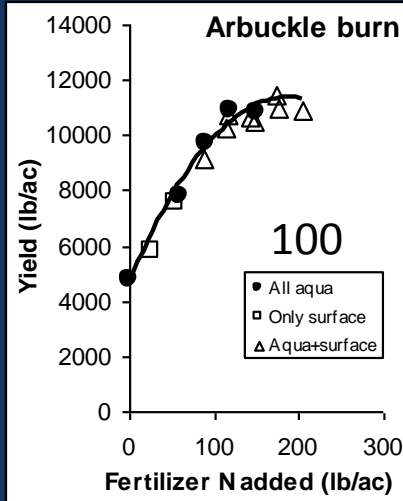
- Overview of
 - rates and
 - application practices for N, P and K
- Management of residues

N management

Nitrogen management: rate

- Why important?
 - economics
 - too little you have low yields and
 - too much delay harvest, increased cost, off-site pollution
- Factors affecting N rate
 - Variety
 - Soil
 - Climate
 - Residue management
 - Incorporating straw allows for a 25 lb/ac reduction in N input
- BUT how do you know how much?

Grain yield versus N rate



Determining correct N rate

1	1	1	1	1	1	1	1	1	1
5	7	2	5	5	5	5	5	5	5
0	5	5	0	0	0	0	0	0	0
	+	-							
	2	2							
	5	5							

- Select representative check
- Go at least one pass in
- One pass with +25 and another pass with -25
 - 2 passes each if aqua rig is narrower than combine.
 - Flag each pass
- Visually monitor over season
 - Color
 - Development rate
- At harvest determine yield with yield monitor for each pass.
 - Correct for moisture
- Compare -25 and +25 with standard practice
 - If -25 has same yield as standard practice you may have over applied N
 - If +25 has higher yield than standard practice then you may have under applied N
- Do over years and fields
- Keep records

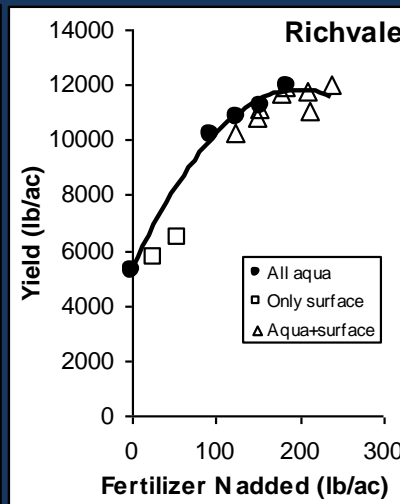
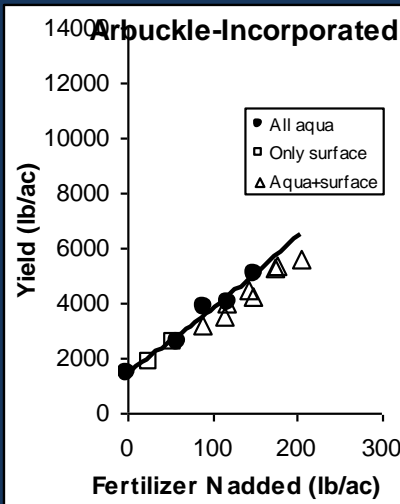
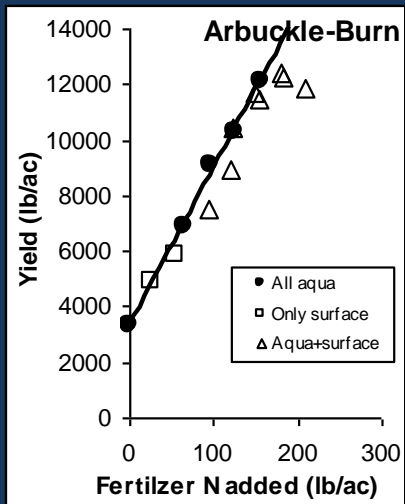
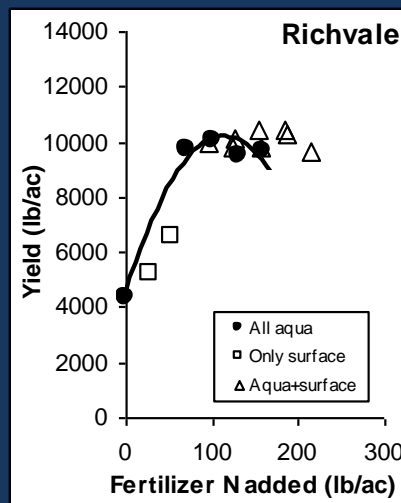
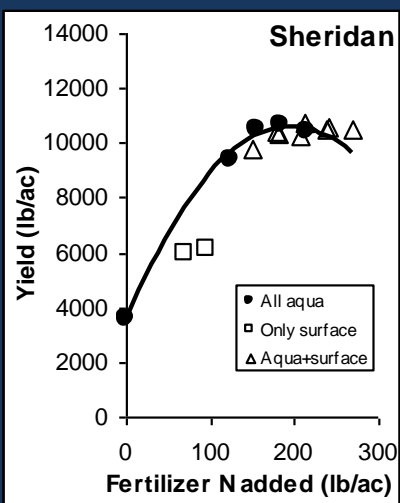
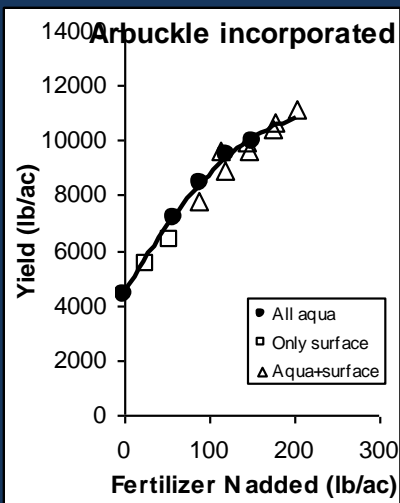
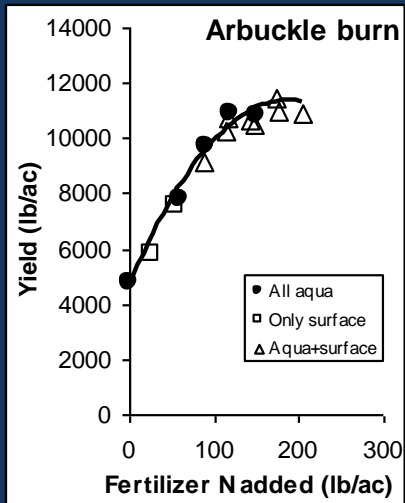


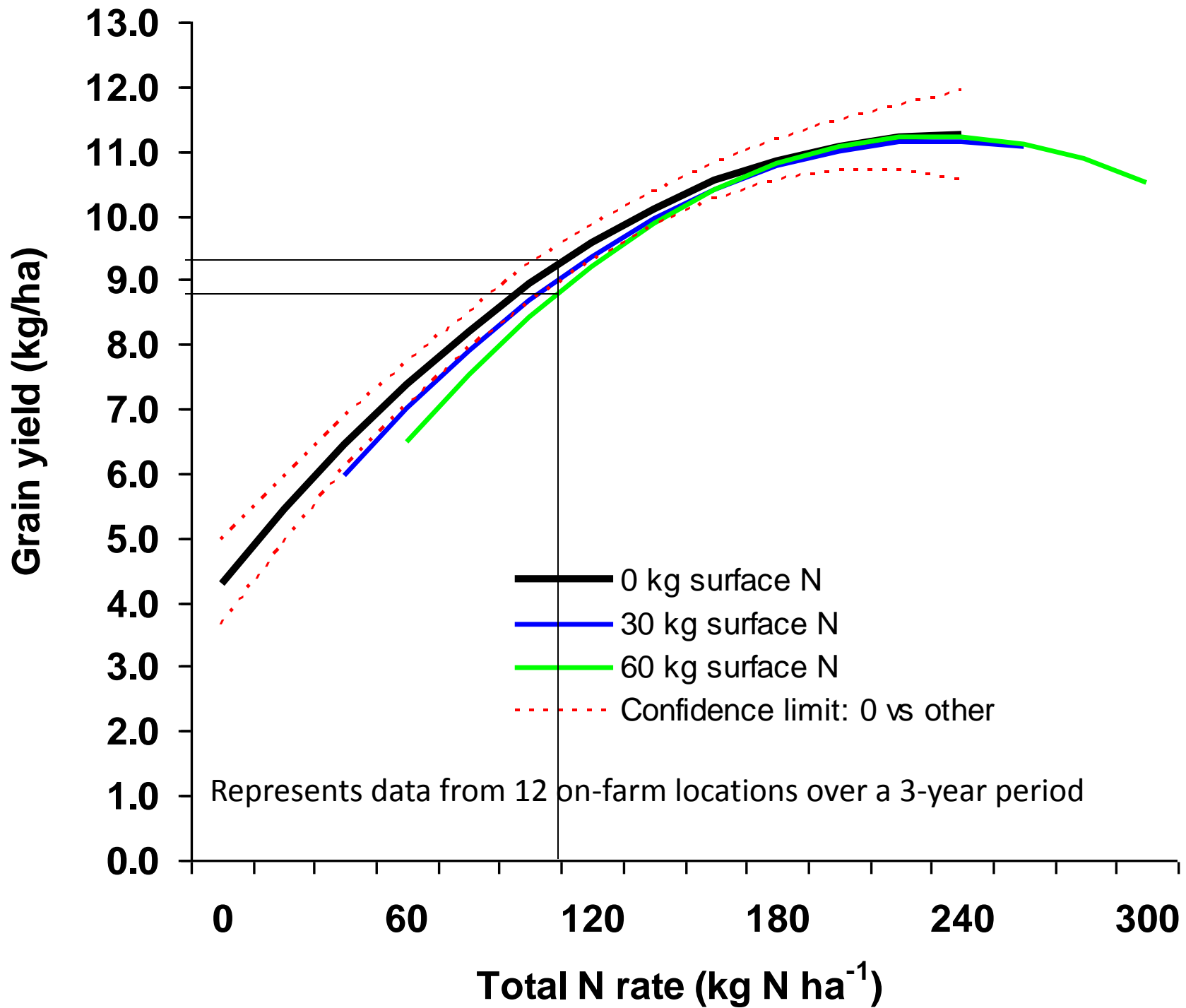
Nitrogen management: application

- How to apply
 - Source
 - Depth
 - Timing

Grain yield:

N applied all as aqua or split with starter





Grower test - field scale

Grain yields (lb/ac)

Aqua + starter		All N as aqua		Difference
2007	9,531	2007	10,001	+470
Field 1	9,710	Field 1	10,040	+330
Field 2	8,529	Field 2	9,419	+890
Field 3	10,275	Field 3	10,570	+295



Take home message: N management

- Begin program to determine N rate for your unique conditions
- Apply as much of the N rate as aqua as possible
 - Higher yields for the same amount of N fertilizer
 - Aqua is a cheaper N source
- Starter N
 - blended with P and K
 - can be applied before planting or up to 30 days after.
 - Delayed P is recommended for fields with algae problems
- No benefit of split N applications
 - Continuously flooded systems
 - Top-dress if needed
 - Color charts



Phosphorus management

- Deciding the correct rate
- How to apply

Phosphorus management: rate

- Should you apply?
- Frequency of P deficiencies
 - Less than 10% of CA rice soils respond significantly to added P fertilizer.
- Determining the P status of your soil.
 - Soil test
 - Plant tissue test
 - Input-output P budget
- How much do should you apply?

Determining the P status of your soil

- Soil test
 - Olsen P test (sodium-bicarbonate)
 - above 6-9 ppm
 - Bray test not good for CA rice soils
- Plant tissue test
 - Y-leaf tissue test.
 - 35 DAS
 - 0.2% P
- Input-output P budget

Input-output P budget: Think of soil as a phosphorus bank

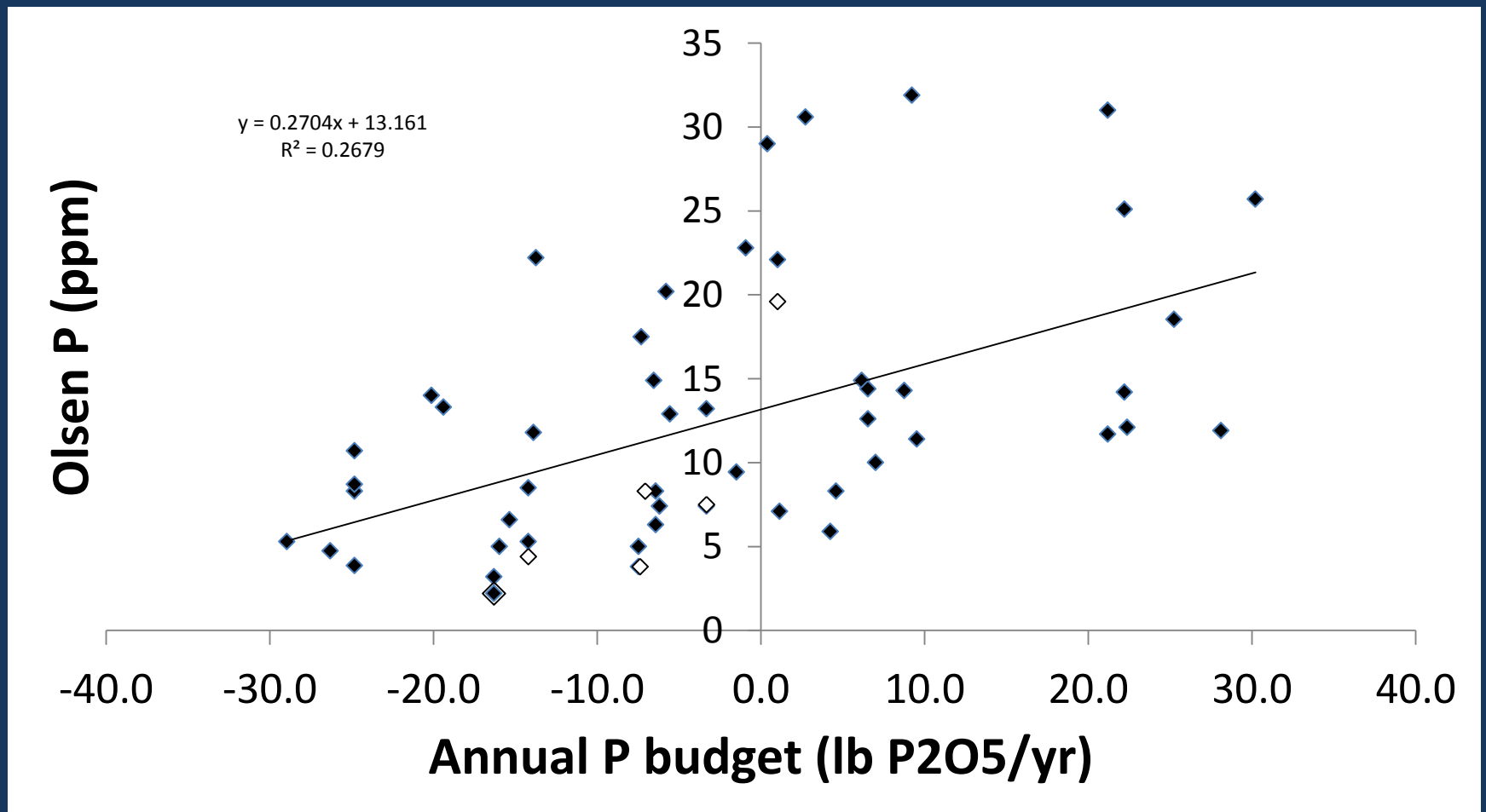
- When managed correctly P fertilizer is relatively immobile in soils.
 - No gas losses
 - Little is lost through water
 - Little lost by leaching
- Inputs
 - Fertilizer
- Outputs
 - Grain removal (0.23% P / 0.52% P_2O_5)
 - Straw removal (0.08% P / 0.18% P_2O_5)



Input-output P budget

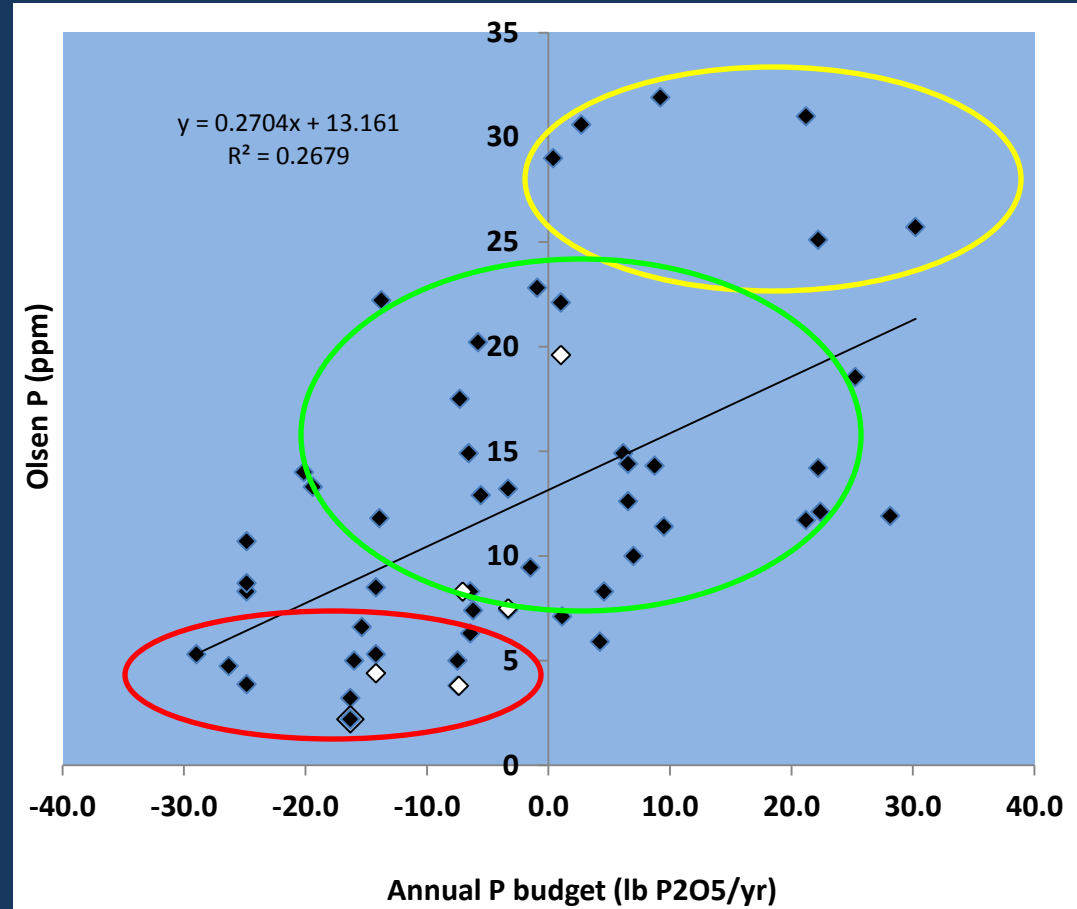
- Develop a budget
 - **Inputs** (lb/ac of P₂O₅ as fertilizer) – **Outputs** (lb/ac removed in grain and straw)
 - Develop such a budget over at least a 5 yr period – take average
- In our study the only sites with significant yield responses had negative P budgets

P budget effects on soil P and yield response



Should you apply?

- Soils have very high P levels based on soil test (i.e. above 20 ppm) and positive P budget
 - Apply no P
- Soils have very low P (less than 6) and a negative P budget
 - Build up soil P
- In most cases where P is not limiting use a maintenance strategy
 - Apply what is removed by the crop
 - **How much is removed?**



Amount of P removed: Only grain removed

Grain yield (cwt@14%)	P fertilizer added (lb P ₂ O ₅ /ac)															
	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	
	P balance (lb P ₂ O ₅ /ac)															
50	-26	-21	-16	-11	-6	-1	4	9	14	19	24	29	34	39		
55	-29	-24	-19	-14	-9	-4	1	6	11	Maintenance line						
60	-31	-26	-21	-16	-11	-6	-1	4	9	14	19	24	29	34	39	
65	-34	-29	-24	-19	-14	-9	-4	1	6	11	16	21	26	31	36	
70	-37	-32	-27	-22	-17	-12	-7	-2	3	8	13	18	23	28	33	
75	-39	-34	-29	-24	-19	-14	-9	-4	1	6	11	16	21	26	31	
80	-42	-37	-32	-27	-22	-17	-12	-7	-2	3	8	13	18	23	28	
85	-44	-39	-34	-29	-24	-19	-14	-9	-4	1	6	11	16	21	26	
90	-47	-42	-37	-32	-27	-22	-17	-12	-7	-2	3	8	13	18	23	
95	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20	
100	-52	-47	-42	-37	-32	-27	-22	-17	-12	-7	-2	3	8	13	18	
105	-55	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	
110	-57	-52	-47	-42	-37	-32	-27	-22	-17	-12	-7	-2	3	8	13	

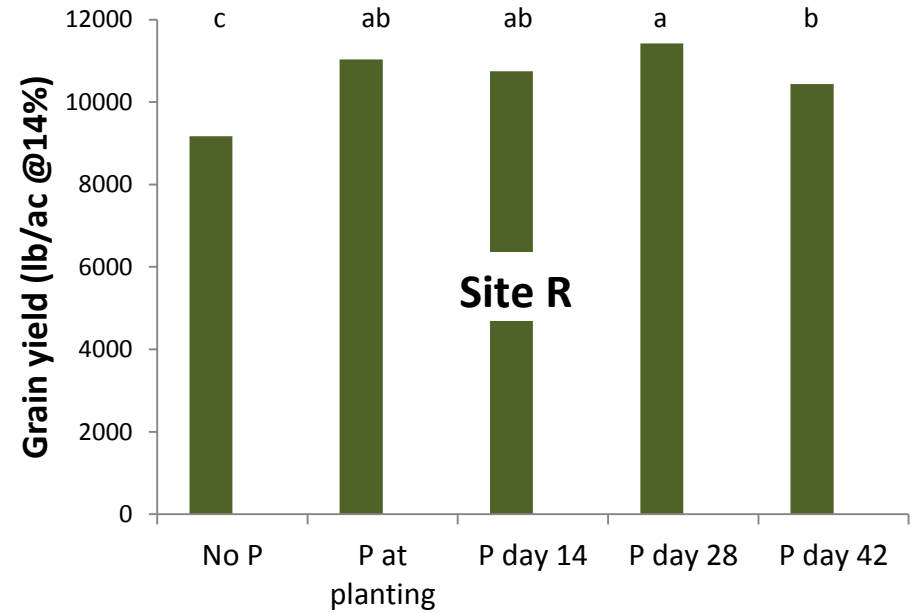
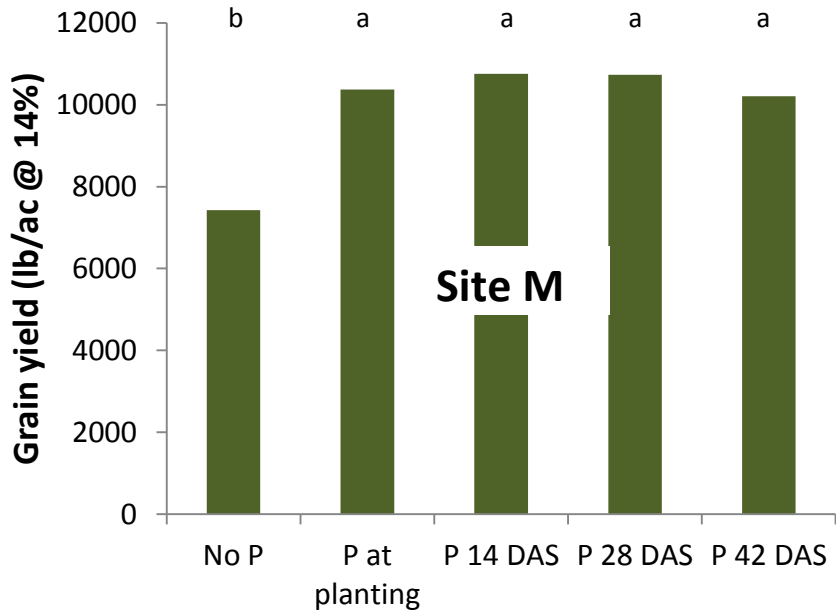
How much to apply: Remove grain and ½ of straw

Grain yield (cwt@14%)	P fertilizer added (lb P ₂ O ₅ /ac)															
	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	
	P balance (lb P ₂ O ₅ /ac)															
50	-31	-26	-21	-16	-11	-6	-1	4	9	14	19	24	29	34	39	
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65	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25	30	
70	-43	-38	-33	-28	-23	-18	-13	-8	-3	2	7	12	17	22	27	
75	-46	-41	-36	-31	-26	-21	-16	-11	-6	-1	4	9	14	19	24	
80	-49	-44	-39	-34	-29	-24	-19	-14	-9	-4	1	6	11	16	21	
85	-52	-47	-42	-37	-32	-27	-22	-17	-12	-7	-2	3	8	13	18	
90	-55	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	
95	-58	-53	-48	-43	-38	-33	-28	-23	-18	-13	-8	-3	2	7	12	
100	-61	-56	-51	-46	-41	-36	-31	-26	-21	-16	-11	-6	-1	4	9	
105	-64	-59	-54	-49	-44	-39	-34	-29	-24	-19	-14	-9	-4	1	6	
110	-67	-62	-57	-52	-47	-42	-37	-32	-27	-22	-17	-12	-7	-2	3	

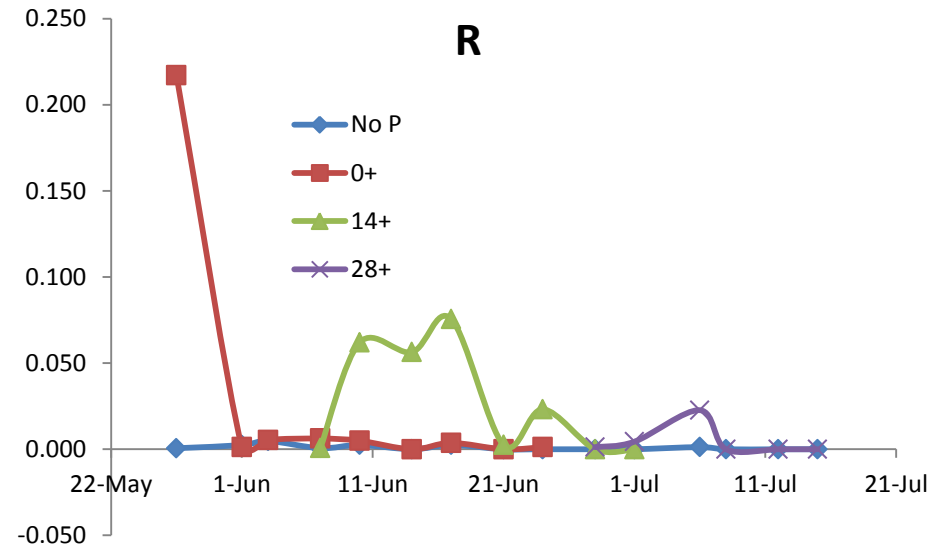
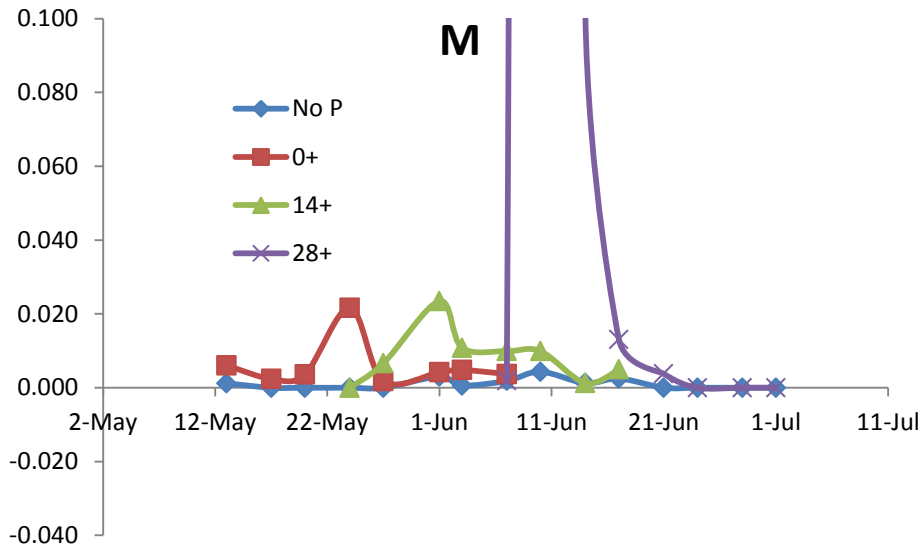
When to apply:

- At planting
 - use P source with lowest N content
 - Incorporate
- Can be applied at other times of the year
 - To avoid algae problems
 - Fit in with field operations
- If you are applying maintenance amounts timing is less of an issue
 - Do not apply when you have water moving through the field
 - If apply to flooded system wait for two weeks after application for water P levels to decline
- If applying when you have a P deficient soil need to be more careful about timing.

When to apply: Grain yield response to delayed P applications



Delayed P application effects on water quality



Summary of P management

- Determine the P status of your fields
- In P limited fields
 - Spring applications and applications up to 28 DAS give similar yields
 - If Fall applications are made, a higher P rate may be needed
- For P sufficient fields (maintenance P application)-90-95% of fields
 - P applications can be made in the Fall, early spring or after planting.
- Delaying P applications reduces algae growth.
- P applications should be made at least 2 weeks before the onset maintenance flow to avoid potential water quality problems.
- Use a P source with lowest amount of N possible (i.e. 11-52-0).
 - If this P is applied during the growing season reduce the amount of N being applied from the total N rate.

Potassium management

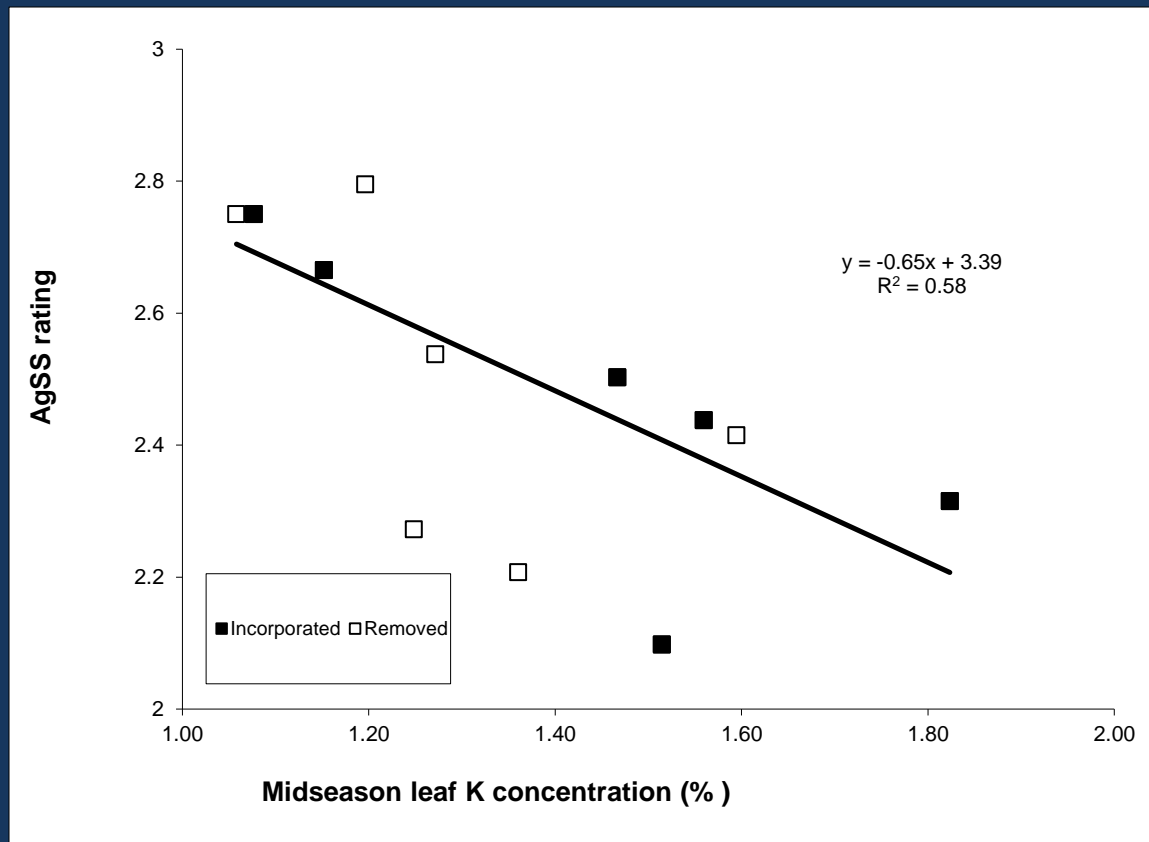
Potassium deficiency

Deficiency symptoms

- Dark green plants with yellowish brown leaf margins
- Dark brown spots first appear on older leaves

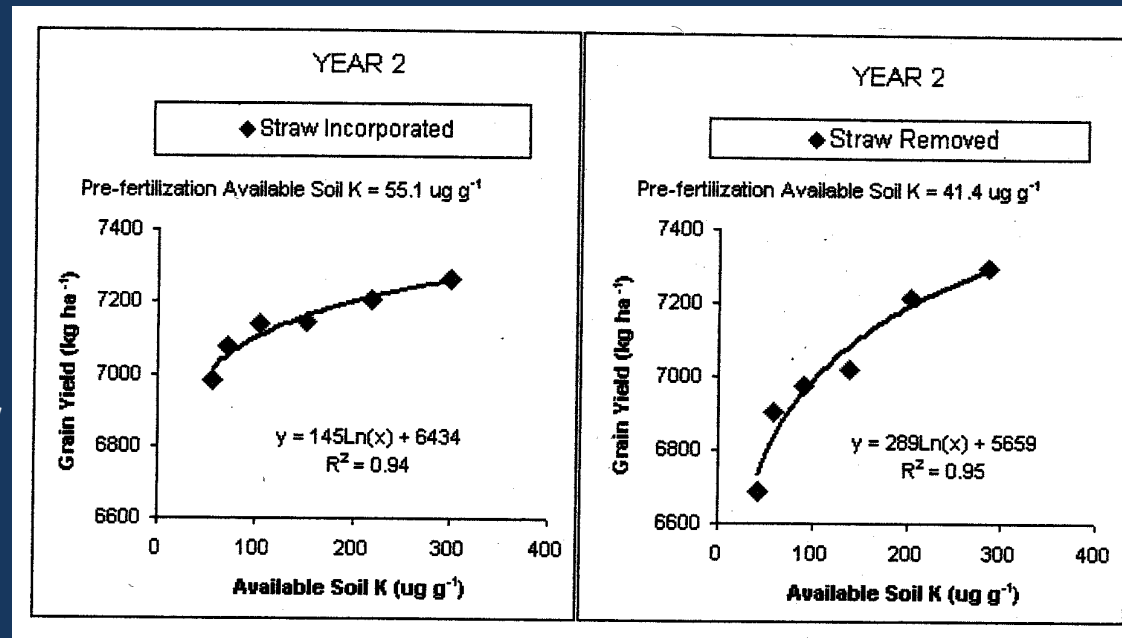


Aggregate Sheath Spot and K



Occurrence of K deficiency in CA

- In the red soils in the eastern part of the valley
 - These soils receive irrigation water that has lower K concentrations.
 - Sacramento and Feather rivers 1.30 ppm K
 - Yuba river 0.50 ppm K
- Where straw has been routinely removed.
 - 80% of the K is in the straw at harvest.
 - Winter flooding with high flow rates removes K.



This years research on K

- We have been receiving more reports about K deficiencies recently
- Field survey to determine extent of K deficiencies and where they are occurring
 - Soil sample
 - Cropping history
 - Leaf K concentration
- Interested growers-sign up in back
 - I will need
 - Field and check location
 - soil sample before fertilizer application
 - planting date
 - You will get a free soil analysis for the field

Residue management

What is this material?



Nutrients (lb) in 1 ton (2000 lb) of rice straw

- N 14 lb
- P 6 lb
- K 31 lb

RICE STRAW
FOR SALE

Thank you



Painting by
Dolores Mitchell