California Rice Research Board

Issue #28, Summer 2012

Phosphorus Management

During the Winter Rice meetings, Bruce Linquist gave a talk on the application of Phosphorus to rice fields. He had three primary points during the talk as follows:

- Should you apply P?
- How much P to apply
- When to apply

Hopefully, the following information will give you a useful tool to determine the "Goldilocks" amount of P to apply – not to much, not to little, but just right.

Managing Your Phosphorus Bank

What does it mean to maintain your phosphorus level? Linquist likens your soil to a bank. At the bank we use fertilizer to make deposits and withdraw P through the grain you produce or the straw you remove. When you manage your P fertilizer correctly it remains relatively immobile in soil. Unlike nitrogen under certain conditions, P does not turn into a gas that is lost. Little is lost through leaching due to the type of soils we farm, and little is lost through the water if it is held at the proper times. Because of this stability, it is possible to chart how much is needed to maintain your current levels based on your level of deposits and withdrawals.

In studies done for the RRB, the only sites that had a significant yield response were those that had negative P budgets. Makes sense that if you take more out of the bank than you put in, you are going to run short over time. So the point of these charts is to help you maintain a healthy P bank balance.

Should you apply P?

Your first decision is which chart to use. That is simple, do you incorporate your straw? If you do, use chart 1. If you remove straw, use chart 2.

Both charts are similar, so let's go through chart 1. Find your grain yield down the left side. Ideally, this would be the five-year average yield for that field. Let's say it is 80 sacks. You will notice that if no P deposit is made that you will make a 42 lb/ac withdrawal in the grain alone (zero P added). Following the 80 cwt line across until we hit the "Maintenance line", you can read on the top how much P is needed to stay even – about 40 lbs. So the question becomes, "are you adding as much P as you are removing?"

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RES Field Day
August 29, 8:00 am

RES - 100 Years

A great celebration of the Rice Experiment Station centenial anniversary will occur on August 29. In keeping with the uniqueness of the occasion, there will be a unique program. Tours start at 8:00 am. Make plans to attend.

History of the RRB/RES

The outlook was grim in the late 1960's. Since 1912 rice research had been limping along with little funding and limited progress. The research had kept rice as one of the prominent crops in California; however, times were changing and expectations were rising.

No new varieties had been released since 1948, lodging was prevalent, propanil drift was showing up, and open field burning was gaining public attention. Various growers and marketers had been visiting research programs worldwide and were surprised at what they found. The Southern states had research budgets from two to over five times greater than the California effort. These states had high-yielding, short-statured, stiff-straw varieties along with superior new cultural practices. As a result of these observations, growers returned with an urgency to accelerate the California research effort to remain competitive.

Late in 1968 committees were formed to

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In This Issue

Olsen P Test

The P budget only gives part of the story. Another part of the story is told by the Olsen P test and reminds me of Goldilocks. The Olsen P test determines your present level of soil P, much like your current bank balance. If the Olsen P test shows greater than 20 ppm of P, you are currently well supplied (not really too hot). If your value comes out less than 6 ppm, levels are deficient (too cold) and you will need to add more than the maintenance amount. If the results are 6-20 ppm, then things are currently just right and you can maintain current levels with the maintenance amount shown on the appropriate chart.

Using both of these tests we can answer our first question – should you apply P? If you have been adding as much P as you remove and your P levels are >20 ppm, you need not apply P, but you should keep an eye on it since you will continue to make withdrawals and decrease the level over time. If your level is <20 ppm then you will need to apply P.

How Much P is Needed

If your P levels are between 6 and 20 ppm, then you can add the amount identified by the maintenance line on the chart for your yield. Ideally, you should use a five year average of yield and Olsen P test results. If your P levels are too little (<6 ppm), then you can select a higher level and see how much additional P you are adding to the bank. There is no firm data on how much more is needed, but a single season application of double the maintenance amount could be appropriate. Subsequent years would then return to a regular maintenance amount. If you choose to add your P in the Fall, it will also take a larger P addition to have the same effect in the next planting season.

When to Apply

Finally, we come to the question of timing. As past studies have explained, if you apply your phosphorus at planting, you can avoid algae problems by incorporating it about one inch into the soil. Use the P product with the lowest N content. Account for the N in your overall application of nitrogen if it is being applied during the growing season.

You can apply P at other times of the year. One timing is 30 days after planting to avoid algae problems. It will still produce algae, but the rice should already be well out of the water and will not be impacted. Up to 30 days after seeding produces the same yield as applying at planting. Applying in the Fall in conjunction with other field operations would also be a good timing if algae is not a problem.

Do not apply your P to a field where water is moving through the field. If you apply to a flooded system, wait two weeks for the P levels to decline before establishing a maintenance flow of water.

Following this procedure should keep your P bank balance healthy and in the black.

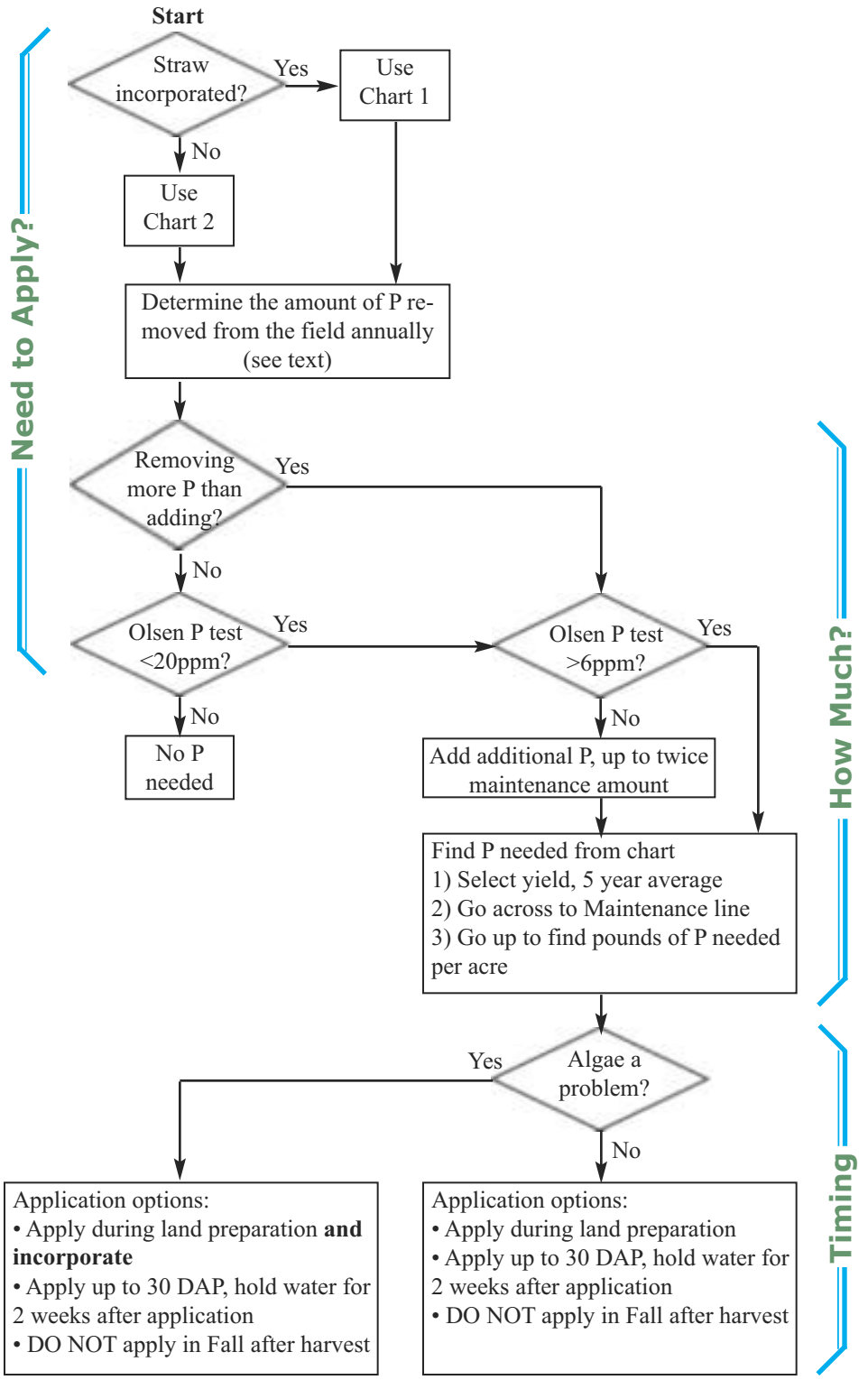


Chart 1: Amount of P removed - Only grain removed

Grain yield (cwt@14%)	P fertilizer added (pounds P_2O_5/ac)														
	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70
	P balance (pounds P_2O_5/ac)														
50	-26	-21	-16	-11	-6	-1	4	9	14	19	24	29	34	39	44
55	-29	-24	-19	-14	-9	-4	1	6	11	16	21	26	31	36	41
60	-30	-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	-24	-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

Maintenance line

Chart 2: Amount of P removed - Grain + 1/2 straw removed

Grain yield (cwt@14%)	P fertilizer added (pounds P_2O_5/ac)														
	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70
	P balance (pounds P_2O_5/ac)														
50	-31	-26	-21	-16	-11	-6	-1	4	9	14	19	24	29	34	39
55	-34	-29	-24	-19	-14	-9	-4	1	6	11	16	21	26	31	36
60	-37	-32	-27	-22	-17	-12	-7	-2	3	8	13	18	23	28	33
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	-3	-4	1	6
110	-67	-62	-57	-52	-47	-42	-37	-32	-27	-22	-17	-12	-7	-2	3

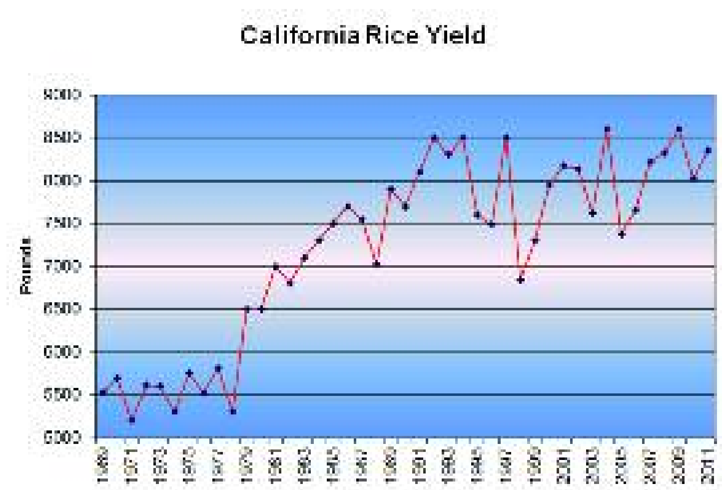
Maintenance line

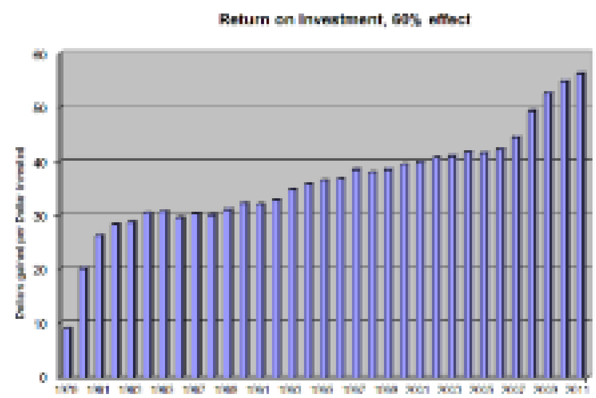
coordinate an effort to establish a Rice Research Board to fund the research efforts for California rice. In June of 1969 growers received the Proposed Rice Referendum to vote on a research program with a maximum assessment rate of 2 ½ cents/cwt. In August votes were tallied and 79% of the industry approved. By September the RRB was up and running.

The objectives in those early years look rather familiar. 1) Better varieties with desirable qualities, 2) Economical residue management, 3) Control of weeds, disease and pests, 4) Better agronomic systems, and 5) Better facilities and efficient, economical research.

What has occurred during those years since 1969 with the Rice Research Board? Several things can be observed. The rice industry has poured money into research, $68 million since the RRB was formed, with nearly $40 million of that into the RES. Has it been worth it? Let's start by looking at yields. During the 1970's the average yield was about 5500 lbs/ac. Breeders had been busy improving varieties and the first ones came into use in 1979. Yield went up to 6500 lbs/ac that year. Improvement continued till the early 1990's when yields reached 8500 lbs/ac. The loss of Londax, restrictions to burning and weather made the 90's a rough decade for yield. In the last five seasons average yield has stabilized between 80-85 sacks/ac even with some very challenging spring weather. Quality is also hitting values that were not seen as possible only a short time ago.

Clearly, yield only helps if you are making money with that yield. What has been the result of your $40 million dollar investment to your bottom line. For every dollar you invest each year, you presently get $50 in return each year through greater yield and thus profits. This is only part of the picture! Even greater gains have been realized through the efforts of the researchers at UC Davis and the USDA.





Rice Research Board
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