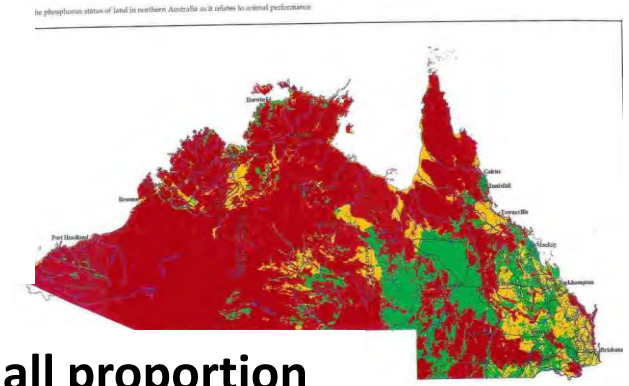
Kidman Springs Phosphorus Supplementation Project

NT DPIR – Tim Schatz

Northern Territory Government

We know from sales figures that adoption of P supplementation in northern Australia is much lower than expected for the amount of P deficient country (red on map).

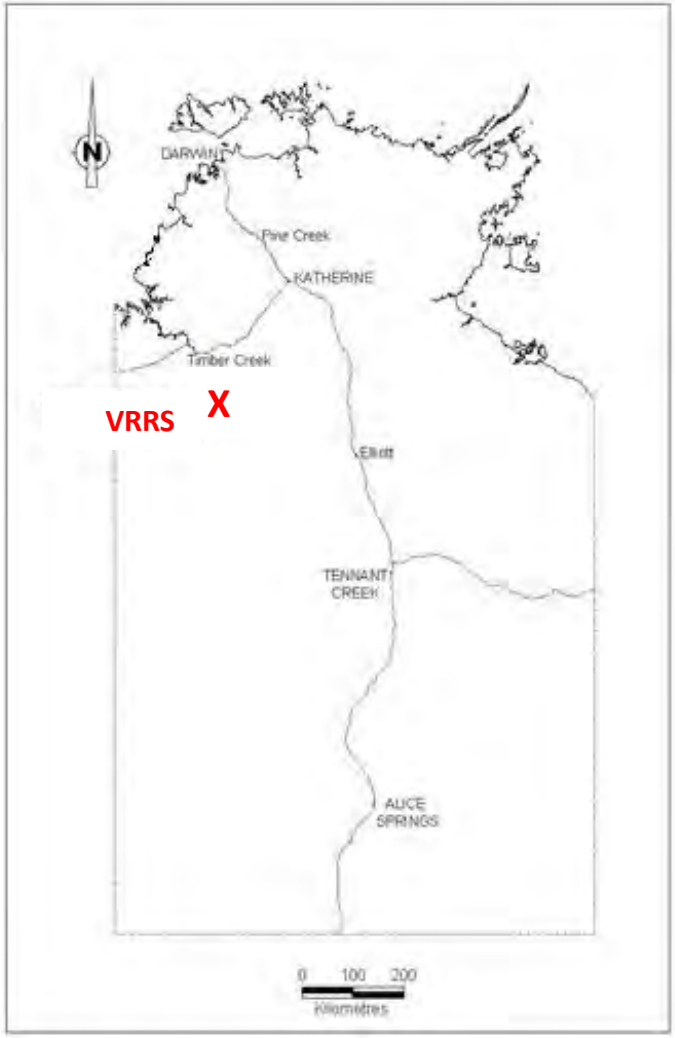


Dixon *et al.* (2011) state that "it appears that only a small proportion of cattle grazing phosphorus deficient pastures are supplemented or otherwise managed to alleviate phosphorus deficiency"

While numerous studies have found that P supplementation increases growth….. There have been no published scientific studies showing that dry lick P supplementation increases pregnancy rates in northern Australia (Winks 1990, Dixon *et al.* 2012)…… This could be a reason for the low adoption.

Beef advisors have had to rely on estimates and assumptions when predicting returns from P supplementation…….. it seems that this has not been convincing enough for many producers to spend money on P supplementation.

The Kidman P trial aimed to quantify the benefits of P supplementation for producers.



Kidman Springs (VRRS)

- 250 km SW Katherine
- Native pastures
- 750 mm rainfall (Nov-Apr)

Method

- In June 2014, 179 Brahman weaner heifers were randomly allocated (stratified for weight) to either a +P or -P treatment.

- Treatments were managed in exactly the same way except that their supplement (mineral loose lick) either contained P (+P) or did not (-P).

- The treatments grazed in neighbouring paddocks that were acutely P deficient (Avg. Colwell soil P of 2.5 and 3.1 mg P/kg). The treatments swapped paddocks each year.

- Heifers were first mated at 2 y.o for 4 months from early January 2016 and then each year for about 4.5 months from early Jan.
- Mustered twice a year (usually in May and Sept./Oct.) for data and blood sample collection (PiP testing).

- Calves were weaned, weighed and mothered up at the May musters.
- There was no culling for non-performance throughout the trial.

Supplement content

	Dry season		Wet season	
	P+	P-	P+	P-
Ridley Biofos MCP	25%		42.5%	
Salt	40%	65%	50%	73.5%
Ammonium sulphate (Gran Am)	10%	10%	7.5%	7.5%
Urea	25%	25%		
Limestone				17.5%
	(5.25% P)		(9% P)	

Basically the licks were similar except that salt was substituted for P in the P- licks (and a bit of limestone in the wet season – to make the Ca:P ratio the same in both licks).

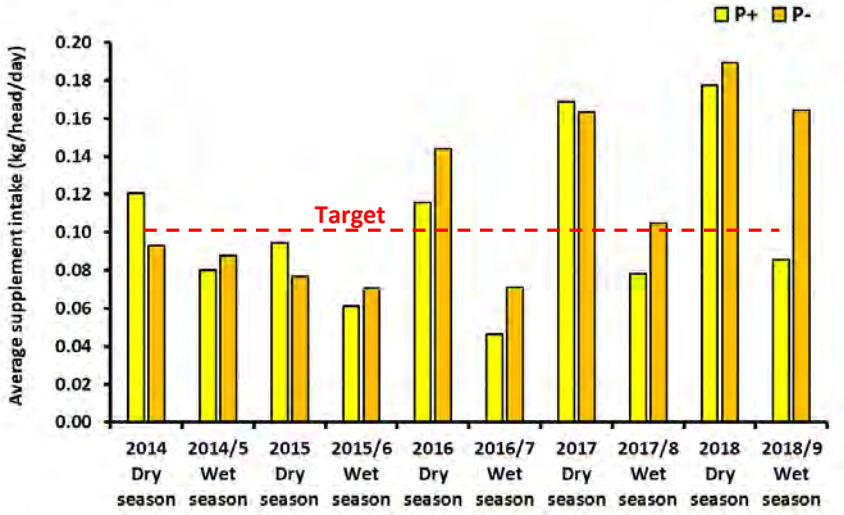
**Biofos is a feed grade monocalcium phosphate (MCP) typically containing 21.1% P and 15.7% Ca*

Average <u>cost per head per year</u> of P+ lick

Wet: 69 g/day for 165 days @ $960/t = $10.82

Dry: 138 g/day for 200 days @ $930/t = $<u>24.36</u>

$35.18



RIDLEY - Supplement sponsorship

1st Calf crop : Large differences in 1st lactation heifer performance

	P+	P-	Difference
Average weight (kg)	382	262	120 kg *
Average P8 fat depth (mm)	3.9	0.1	3.8 mm *
Calf loss (%)	20.6	20.4	0.2% NS
Re-conception rate (%)	30	5	25% *
Average weaner weight (kg)	173	139	34 kg *
Total weight of weaners (kg)	8,616	5,544	3,072 kg *
Overall mortality rate to 3.5 y.o	1%	8%	7% *

P- mortality = 28% if include animals removed for welfare

P+

P-

2nd calf crop – 2018 : Cows 4.5 y.o

	P+	P-	*Difference*
Calf loss (%)	16%	21%	*-5%*
Number of calves weaned	43	30	*13*
Avg weaner weight (kg)	185	172	*13.4 kg*
Total weight of calves weaned (kg)	7,951	5,145	*2,806 kg*
Wet cow Re-conception rate (%)	60%	20%	*40%*
Average weight of all cows (kg)	426	327	*96*

2.8 tonnes more calves weaned from P+ in 2018 @ $3/kg = $8,417

3rd calf crop – 2019 : Cows ~ 5.5 y.o

At the weaning muster P- wet cows (most on their 2nd lactation) were in a bad way – had to remove 29 (33%) for supplementary feeding…… and draw the trial to a close for animal welfare reasons.

P+

Avg Wt = 430 kg
75% pregnant

P-

Avg Wt = 322 kg
9% pregnant

Mortality rate

Over the 2018/19 wet season 5 P- cows that were due to calve went missing/presumed dead. Over the whole trial the mortality rate was 11% higher in P- (+P=2%, -P=13%).

The mortality rate in -P is likely to have been even higher if the trial had not been stopped in May 2019 and supplementary feeding commenced for an additional 27 (30%) of P- wet cows that were weak and in poor condition.

P supplementation literally is a matter of life and death for some cows!

P+

P-

Summary of results

		Avg Wt Wet cows	Wet cow Preg %	Dry cow Preg %	Calf loss %	Avg Wt Weaners	Cumulative mortality rate	ROI
2017	P+	382 kg	30%	86%	20.6%	173 kg	1%	
	P-	262 kg	5%	90%	20.4%	139 kg	8%	
	Diff.	120 kg	25%	4%	0.2%	34 kg	7%	280%
2018	P+	426 kg	60%	96%	16%	185 kg	2%	
	P-	357 kg	20%	92%	21%	172 kg	9%	
	Diff.	69 kg	40%	4%	-5%	13 kg	7%	347%
2019	P+	430 kg	75%	93%	9.9%	202 kg	2%	
	P-	322 kg	9%	85%	18.5%	157 kg	13%	
	Diff.	108 kg	66%	8%	-8.6%	45 kg	11%	483%

Over the first 3 calf crops, on average +P females produced 34% greater weight of calves per female mated than P-.
So you could wean the same weight of calves from 66 P+ females as from 100 P- females.

Assessment of profit to WR1 2019

Year	Total weight of extra calves kg)	Price ($/kg)	Extra value of calves	Cumulative extra value of calves	Cumulative cost of extra supplement	Cumulative return on investment
2017	3072	$3.50	$10,752	$10,752	$3,839	280%
2018	2804	$3.00	$8,412	$19,164	$5,529	347%
2019	6023	$2.90	$17,467	$36,631	$7,089	490%*

When adjusted for the unequal numbers in the treatments at the start the ROI is 483%

The ROI is even greater if the salvage value of cows is included!

In May 2019 the Avg. Wt of +P cows was 91 kg heavier and 11% less had died than P- (~$20K more weight of cows).

$$\frac{\text{Extra value of weaners (\$33,606*) + salvage value of cows (\$19,654)}}{\text{Extra cost of P+ treatment (\$6,951)}} = 766\%*$$

ie. For every $1 spent on P supp. you produce $7.66 worth of extra beef.

*Using figures adjusted for equal starting numbers

Follow on work…….. Develop an “Easy P” supplementation strategy

Another reason why adoption of P supplementation is low is that it can be very difficult to implement in some places during the wet season when access to distribute supplement becomes difficult or impossible.

“Easy P” = Include P in dry season supplement and put out bulk P before the start of the wet season. (No need to try to put out supplement during the wet season).

Find out if an “Easy P“ strategy will give most of the benefits of wet season P supplementation but be easy to implement.
Initially we will compare the 2 strategies on the research station and then roll it out onto Producer Demonstration Sites.

We know that cows can store P in their bones and tissues when it is in excess in their diet and then mobilise it when it is deficient. So cows may be able to replenish/build up their P stores during the dry season.
We saw massive difference between treatments despite wet season P supplement intakes not being achieved……. some benefit from dry season supplement.

Acknowledgements

NT DPIR – funding

Ridley – supplement sponsorship

Kieren McCosker (NT DPIR) – statistical analysis

Kidman Springs staff