



Overview of the 2012 MFS soil test results

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Why are we soil testing?

Control

-P

-Ca

-K

-Mg

-N

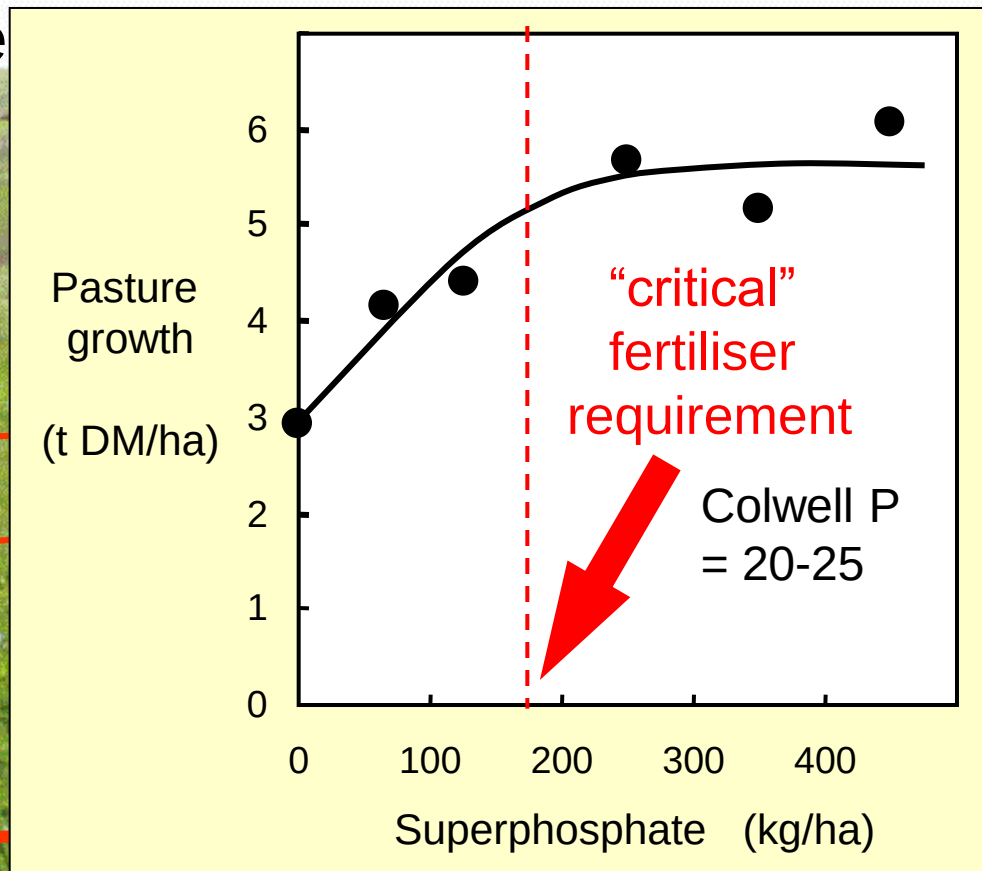
(all nutrients)



Growth of annual ryegrass in topsoil from “Kia-Ora”, Bookham NSW (1 Sep. 03)

Response to superphosphate

(Ginninderra Experiment Station, Canberra)



125

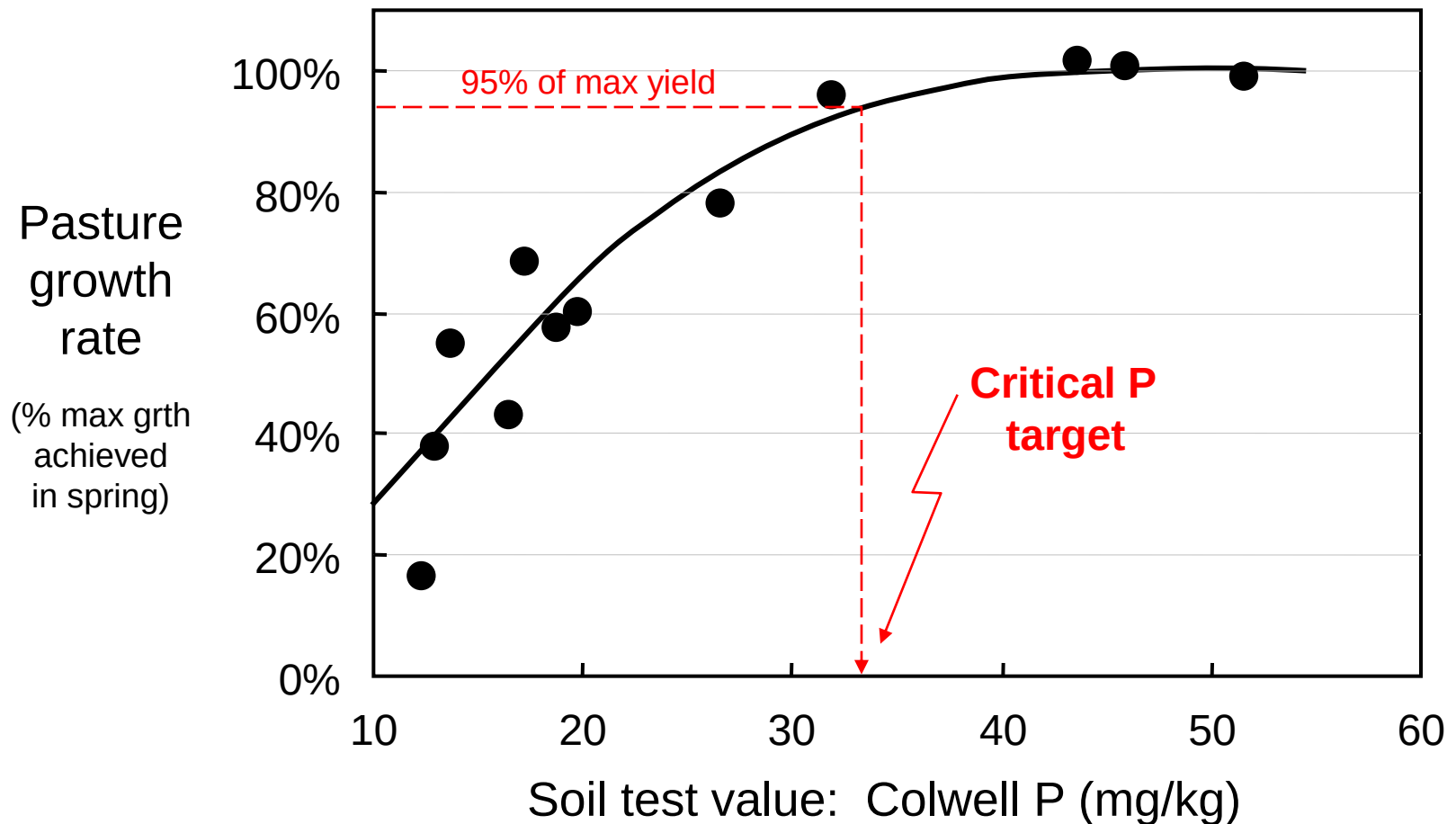
0

63

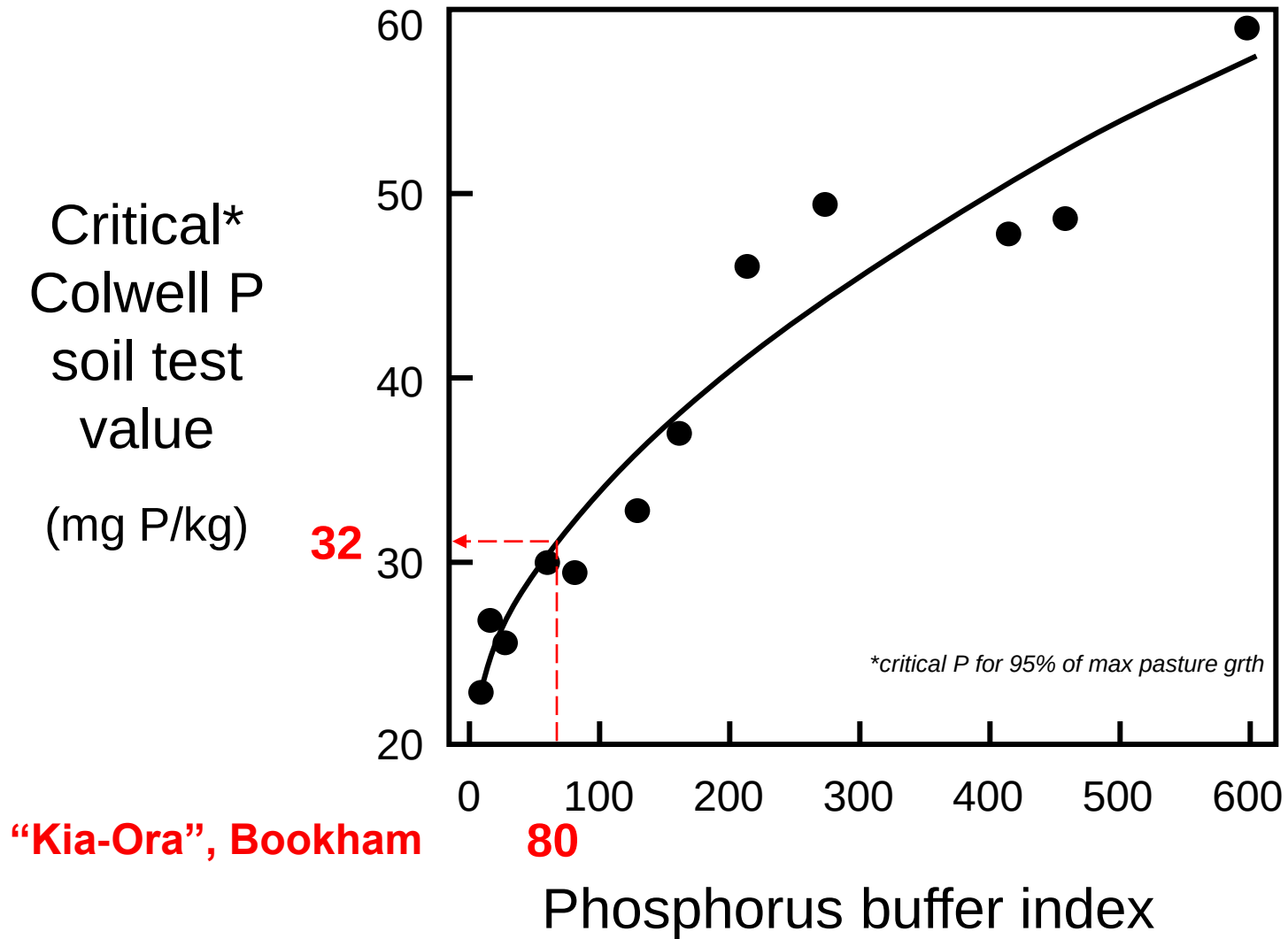
250 kg superphosphate/ha

Three reasons why there is no point exceeding the critical P value of your soil

- (i) no more pasture will be grown
- (ii) it takes more P-fertiliser to maintain high soil P concentrations
- (iii) high P concentrations in soil mean greater losses to the environment

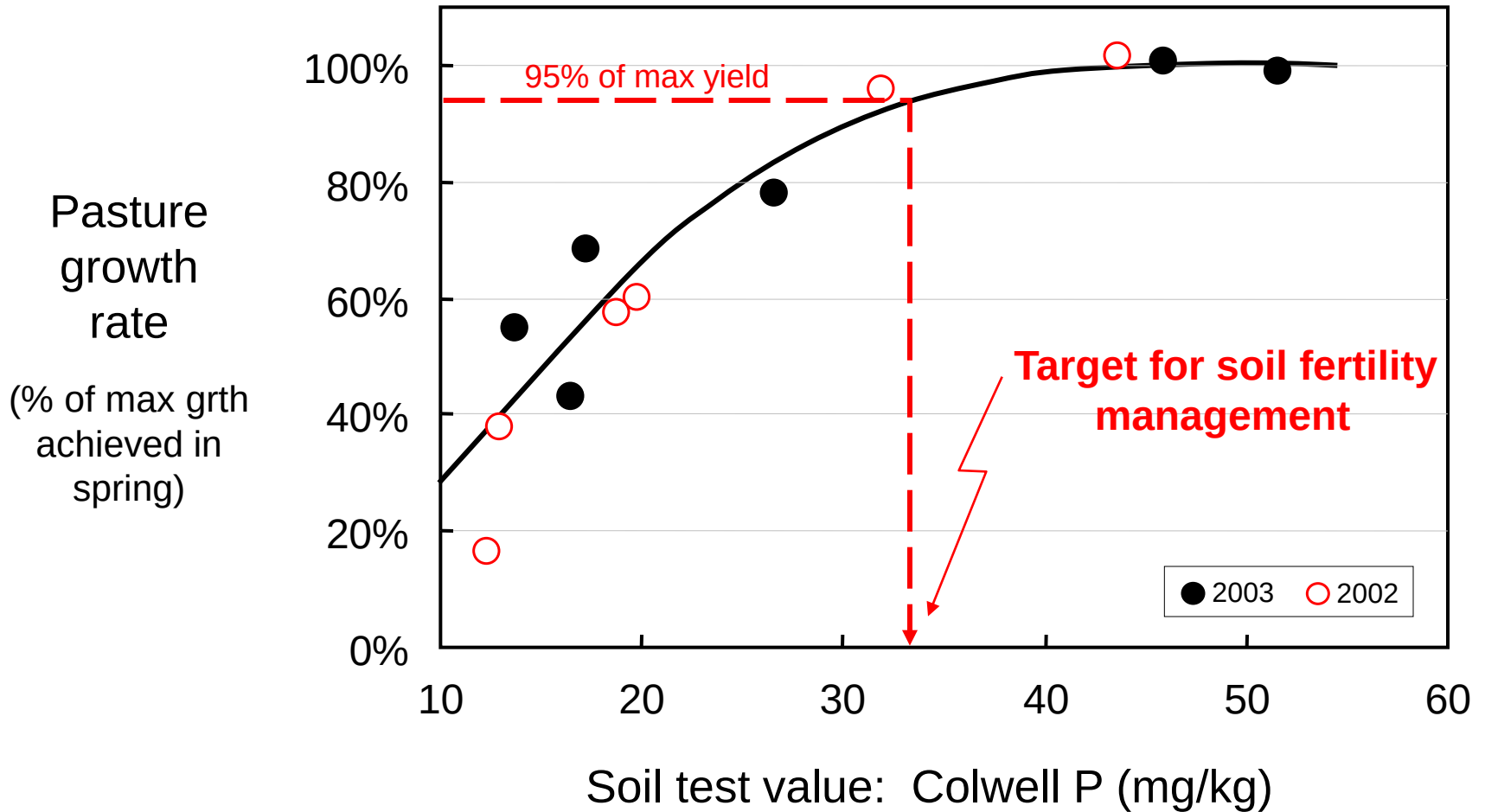


PBI is used to predict the Colwell soil test value for near-max pasture growth



Clover-based pasture (“Kia-Ora”, Bookham)

Phosphorus Buffering Index = 80; *predicted critical Colwell P = 32*



Critical soil test values for clover-based pastures

REFS: *Five easy steps.....* booklet and/or

Making Better Fertiliser Decisions for Grazed Pastures in Australia booklet

Phosphorus - Colwell P test:

PBI test result	Critical Colwell P (mg P/kg soil)
Less than or equal to 20	25
60	30
120	35
200	40
300	45
420	50

(NOTE: Phosphorus - Olsen P test: Critical P = **15** mg P/kg soil (*for all soil types*))

Sulphur - KCl₄₀ sulphate-S test: **Critical S = 8 mg S/kg soil** (*all soil types*)
(an ideal range to target is 8-12 mg/kg)

Potassium – Colwell K test & estimated* “Available K test” equivalent (*for use with 2010-12 MFS soil test results*):

Soil texture	Critical Colwell K (mg K /kg soil)	Est. critical Available K (mg K/kg soil)
Sand	126	112
Sandy loam	139	123
Sandy clay loam	143	127
Clay loam	161	142

* estimated from: $Colwell-K = 1.13 \times Avail-K$
based on information from Incitec-Pivot

- unfertilised native grass pasture
- Colwell P ~10 mg/kg
- 6 wethers/ha

Gross income:	\$185/ha
Variable costs:	51
Fixed costs:	88

- Net farm income: \$46/ha



- fertilised native grass pasture

- Colwell P ~20 mg/kg
- ~~12-15~~ 6 wethers/ha

Gross income:	~~\$274/ha~~	\$187/ha
Variable costs:	~~157~~	78
Fixed costs:	88	88

- Net farm income: ~~\$129/ha~~ \$21/ha

What to look at first in your soil test(s)

Which lab did you use

Visit: www.aspac-australasia.com/index.php?option=com_labproficiency&Itemid=126,
to view the list of ASPAC-certified soil testing labs in Australia

What is your soil type?

Soil acidity: pH too low? = Aluminium (Al) too high?

Type of P test used

PBI: use it to predict critical soil test P
P test values relative to targets

Sulphur (S) test results

Potassium (K) test results

FOR MORE INFORMATION

Look at the [Five Easy Steps booklet](#) or the [Better Fertiliser Decisions brochure](#) available at:
<http://www.asris.csiro.au/downloads/BFD/Making%20Better%20Fertiliser%20Decisions%20for%20Grazed%20Pastures%20in%20Australia.pdf>

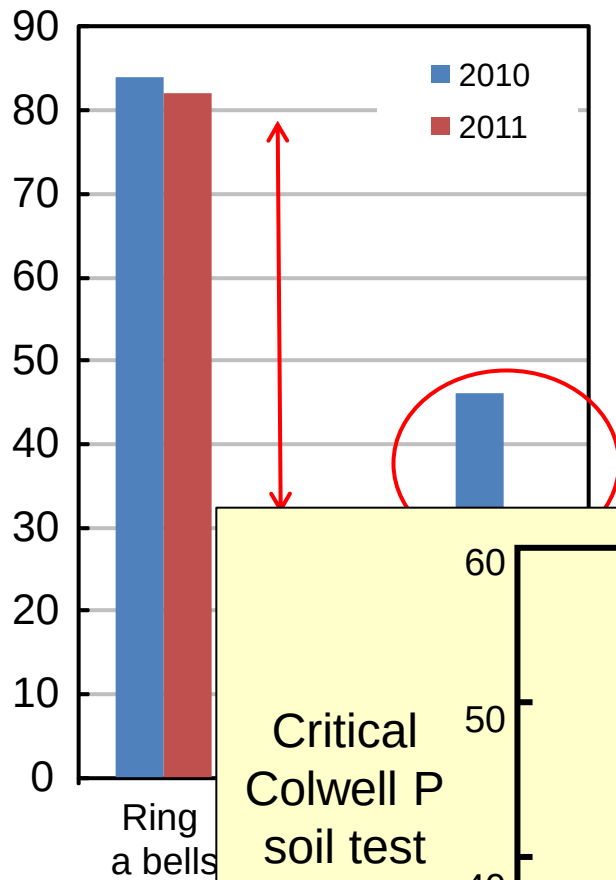


MFS soil test results 2012

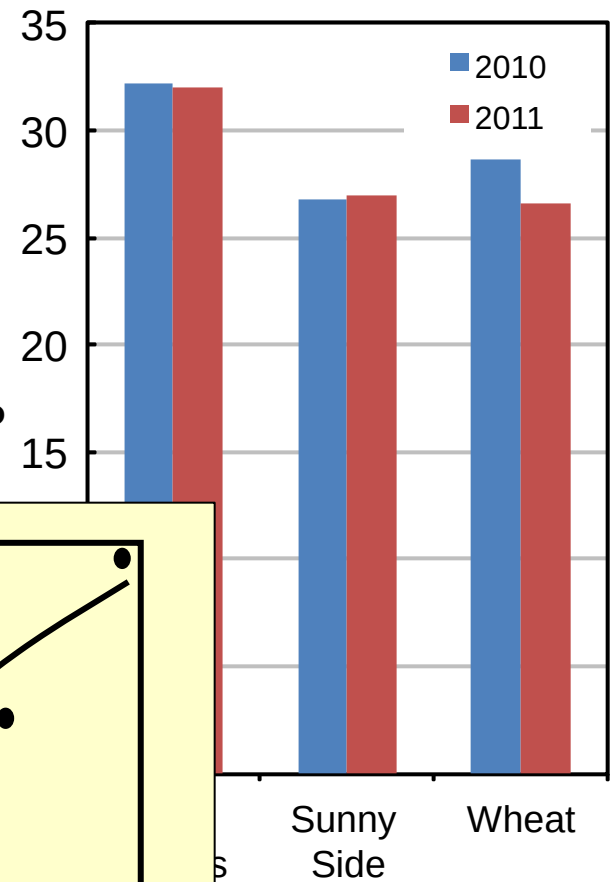
MFS used 2 “standard soil” samples to check the “lab” results

Soil Test	“basalt soil”			“granite soil”		
	2010	2011	2012	2010	2011	2012
pH (CaCl ₂)	7.4	7.3		4.7	4.7	
Phosphorus buffering index	130	160		58	59	
<i>Predicted critical Colwell P (mg/kg)</i>	36	38		30	30	
Colwell P (mg/kg)	37	39		31	27	

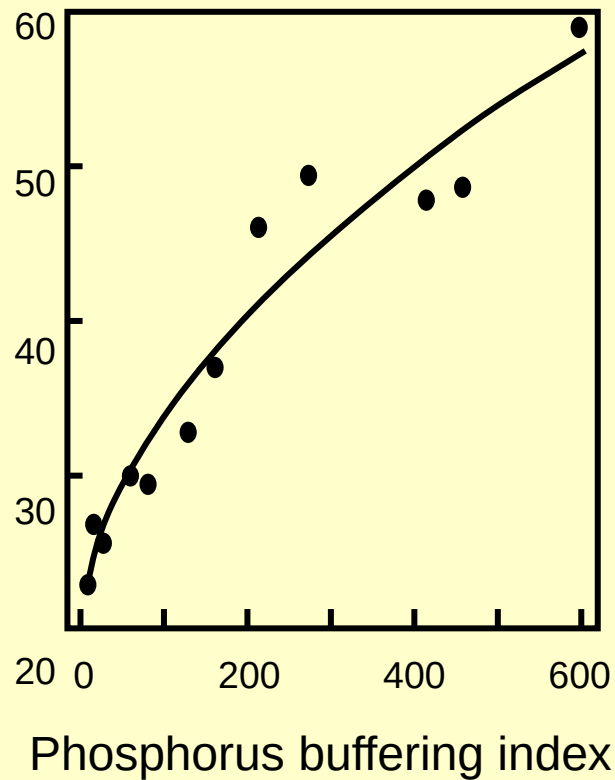
Phosphorus
Buffering
Index



Critical
Colwell P
(mg/kg)



Critical
Colwell P
soil test
value
(mg P/kg)



MFS: internal standards

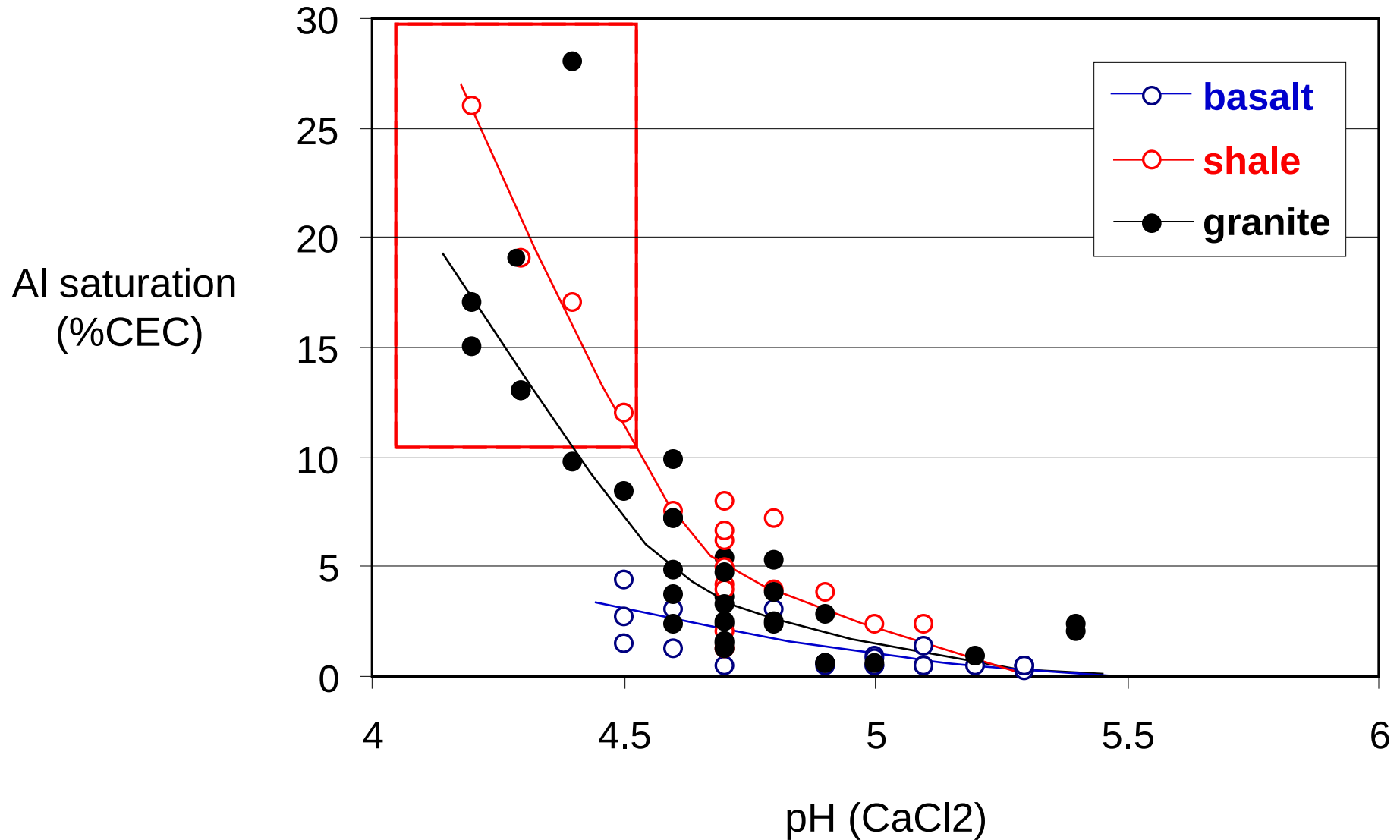
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<i>Predicted critical Colwell P (mg/kg)</i>	<i>36</i>	<i>38</i>		<i>30</i>	<i>30</i>	
Colwell P (mg/kg)	37	39		31	27	
Available K (mg/kg)	450	560		500	460	
KCl ₄₀ Sulphur (mg/kg)	7.5	6.7		6.7	7.0	

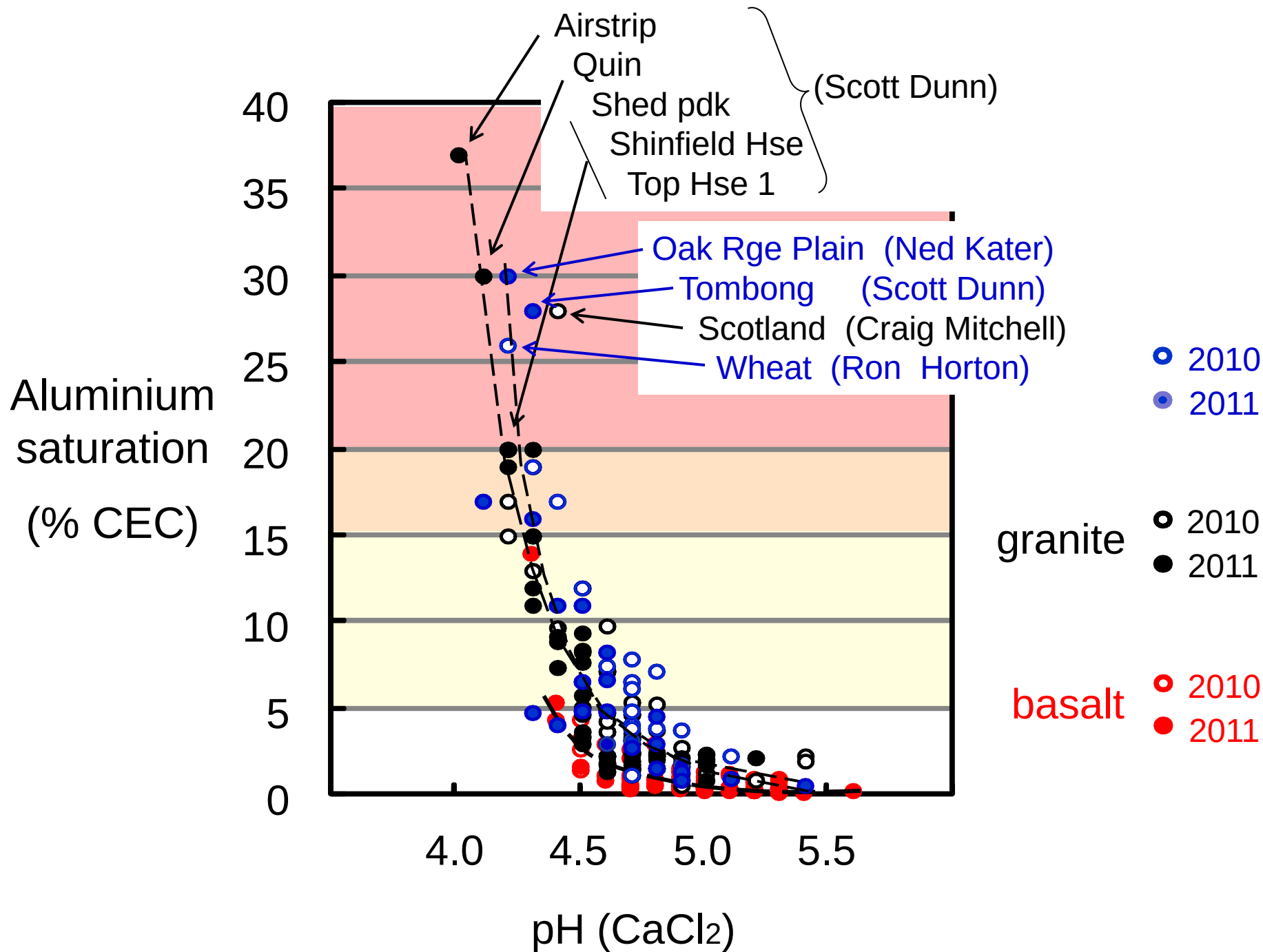
Handling soil samples

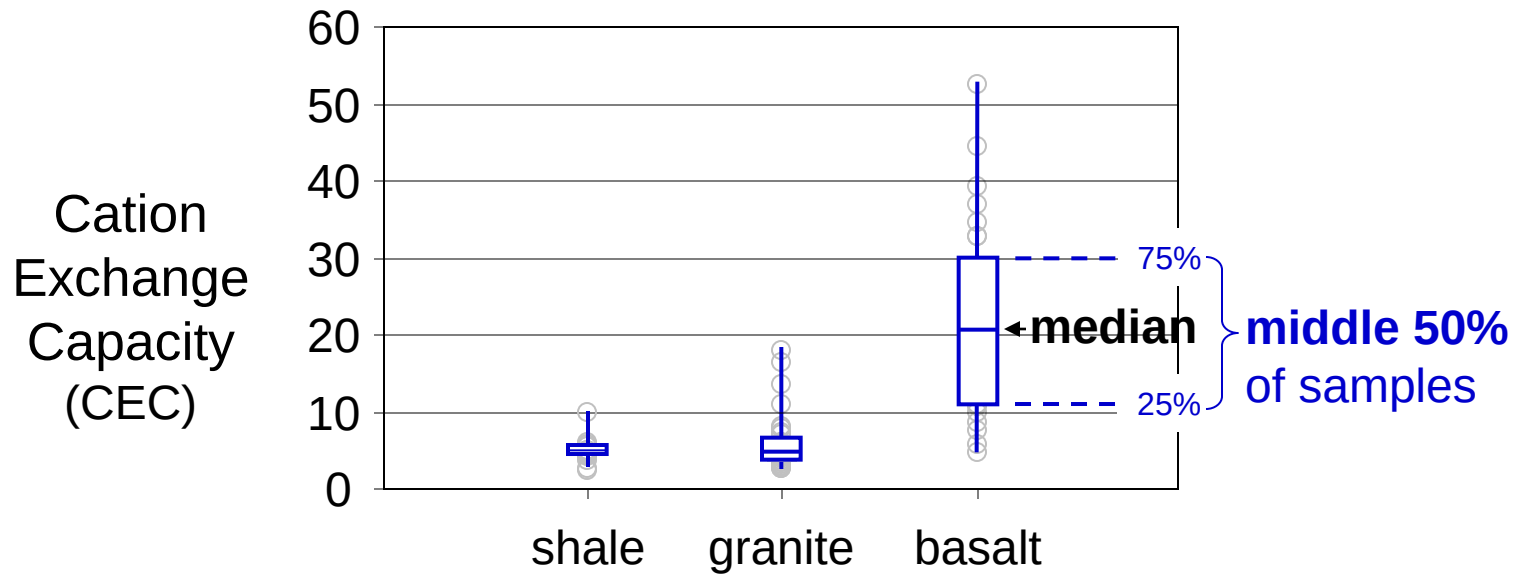
- If soil samples cannot be analysed immediately, they are often dried at 40°C to stabilise them for later analysis
- MFS samples are collected over about a 2-week period.
Samples are held at 4°C in a frig until dispatched to the IPL lab for analysis
 - **does this affect the results ?**

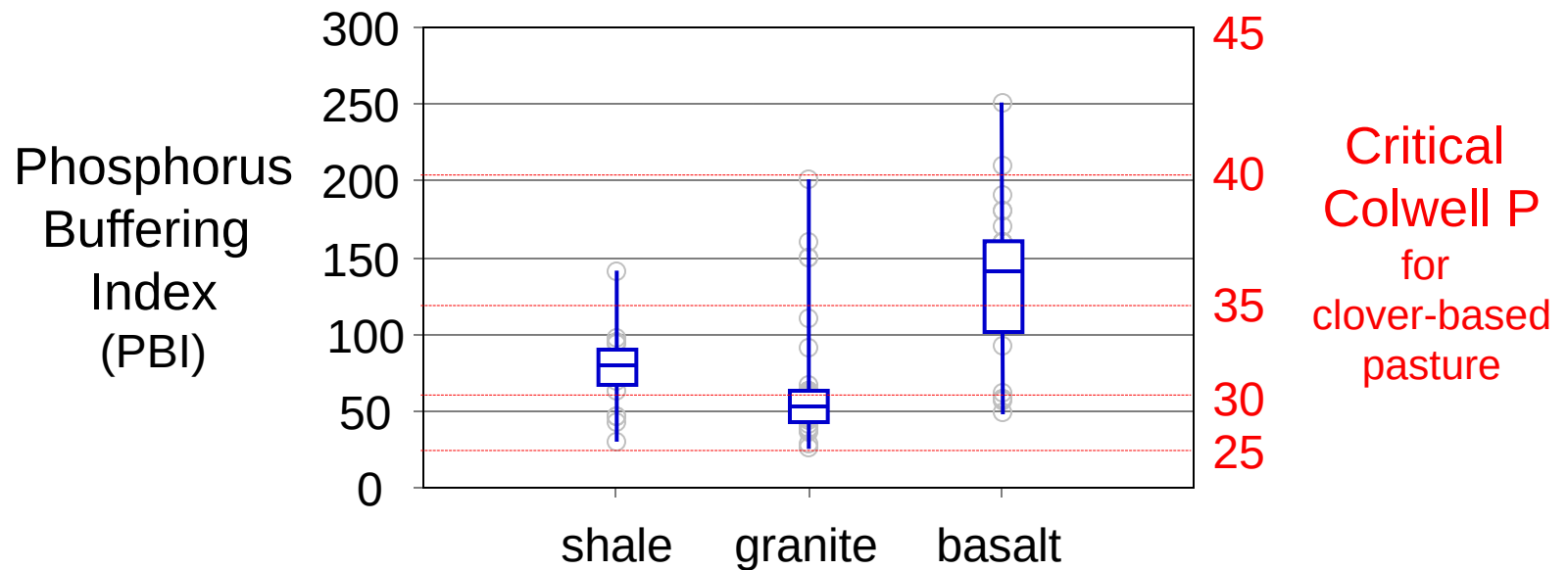
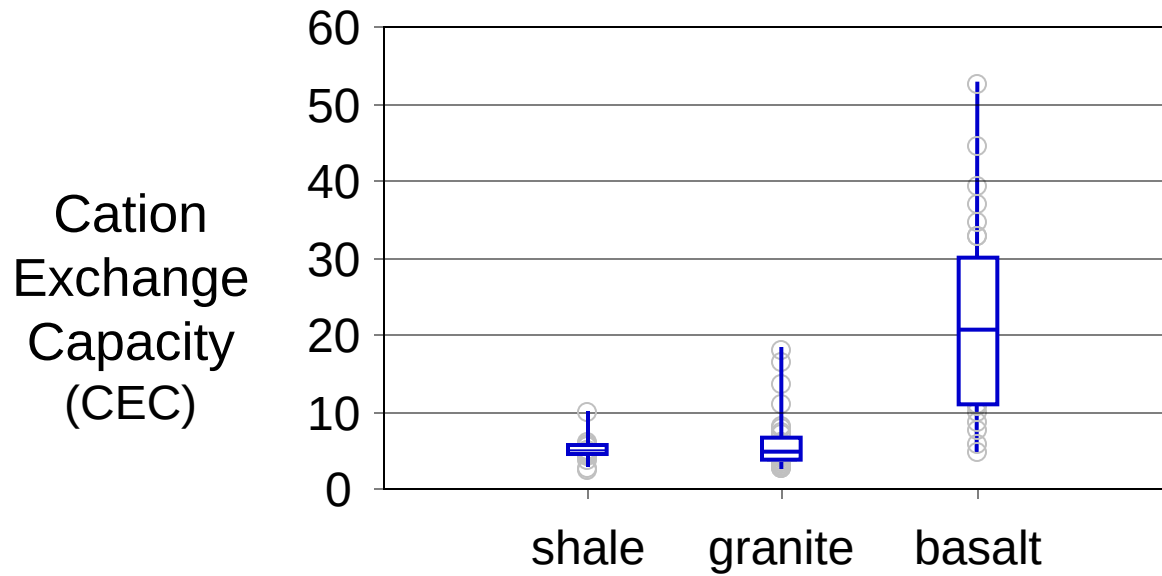
Soil Test	Paddock: Swan	Swan#2
	Jim Litchfield (collected early; held in frig)	Stuart Burge (collected before dispatch)
pH (water)	5.4	5.7
pH (CaCl ₂)	4.7	4.7
Phosphorus buffering index	120	100
<i>Predicted critical Colwell P (mg/kg)</i>	35	33
Colwell P (mg/kg)	29	32
Available K (mg/kg)	310	290
KCl ₄₀ Sulphur (mg/kg)	6.3	3.8

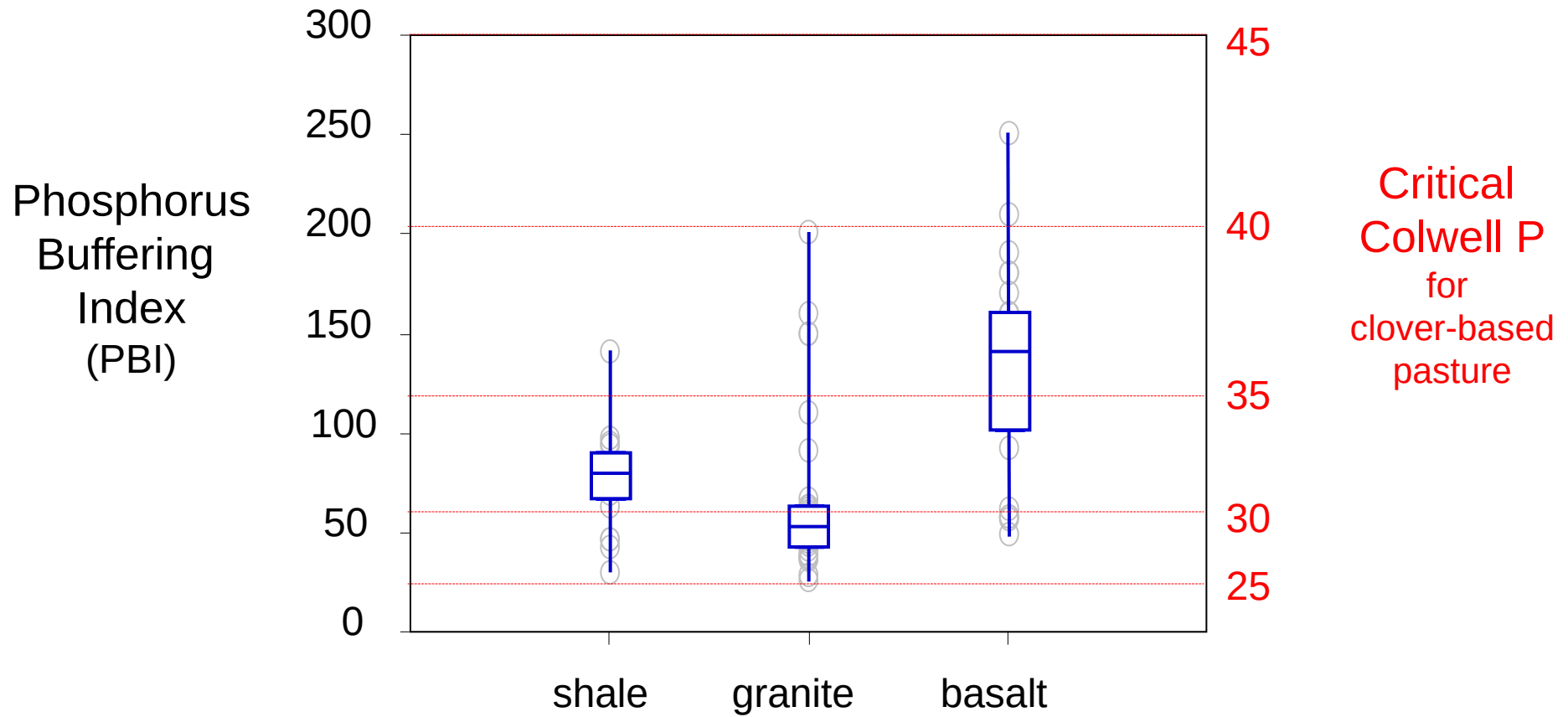
General features of the Monaro soils



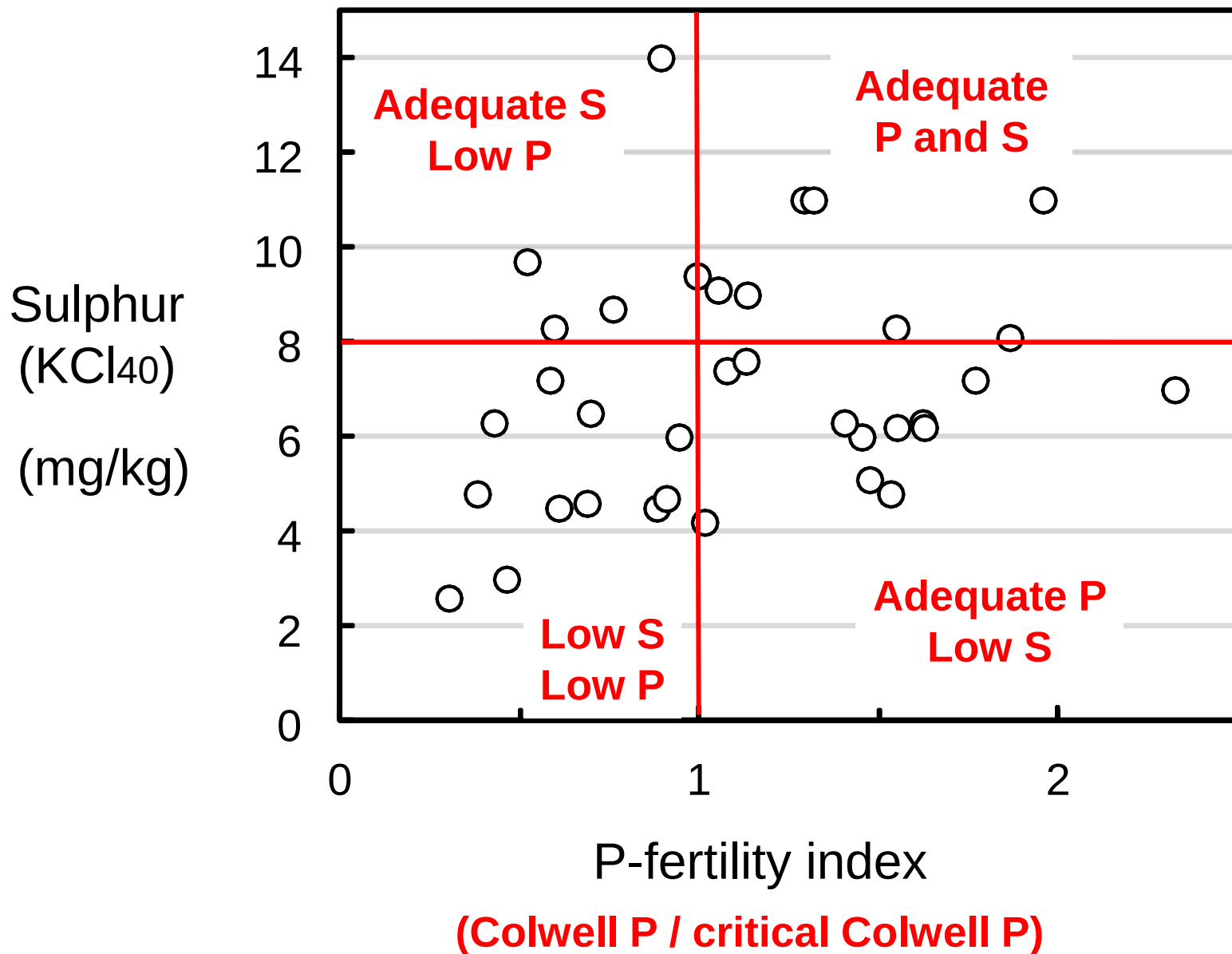








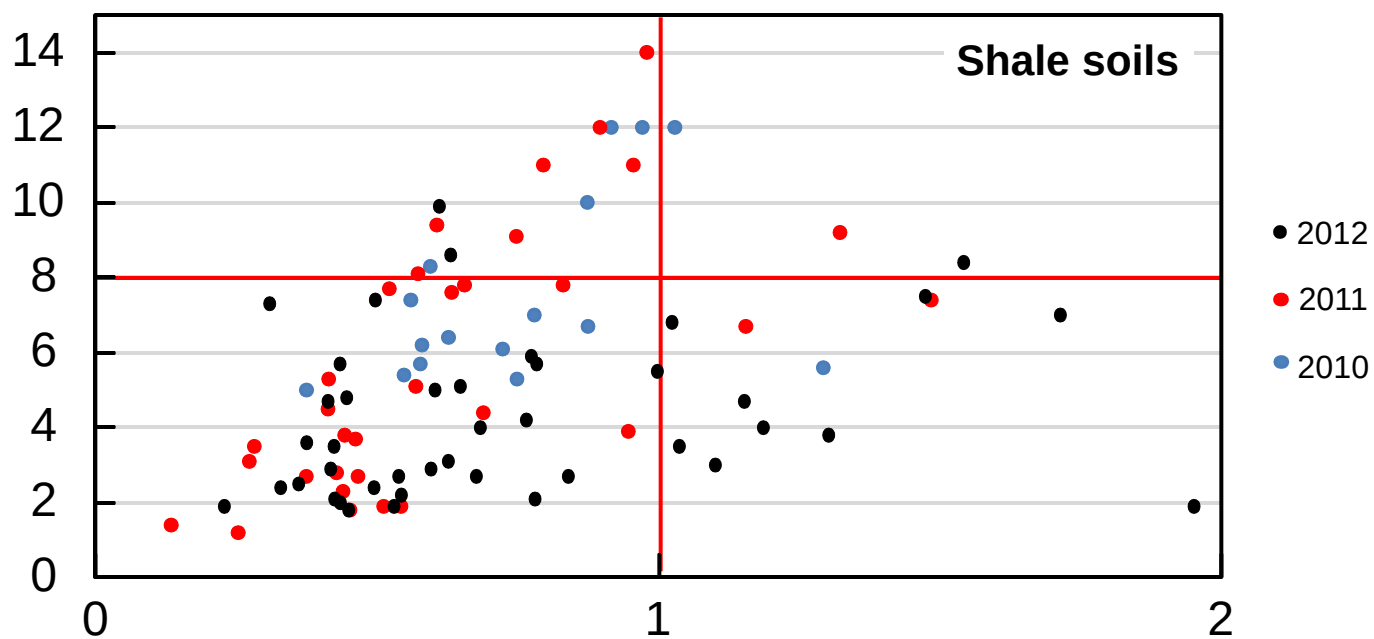
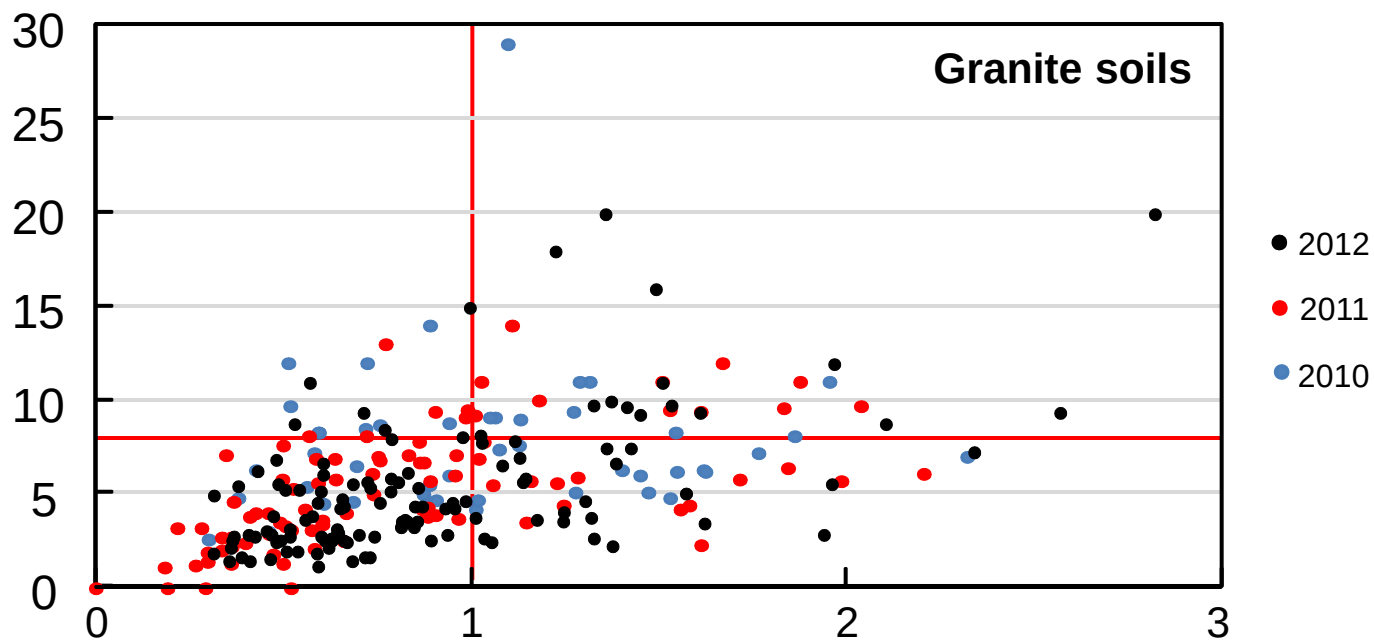
Granite soils 2010



MFS soils club - soil testing history

Year	2010	2011	2012	2013
Total No. of paddocks on main soil types tested	96	247	479	
BASALT SOILS	31	94	198	
GRANITE SOILS	48	121	206	
SHALE/SLATE SOILS	17	32	75	
<i>plus: "OTHER" SOILS</i>			42	

Sulphur
(KCl₄₀ test)
(mg/kg)



P-fertility index

(current Colwell P / critical Colwell P)

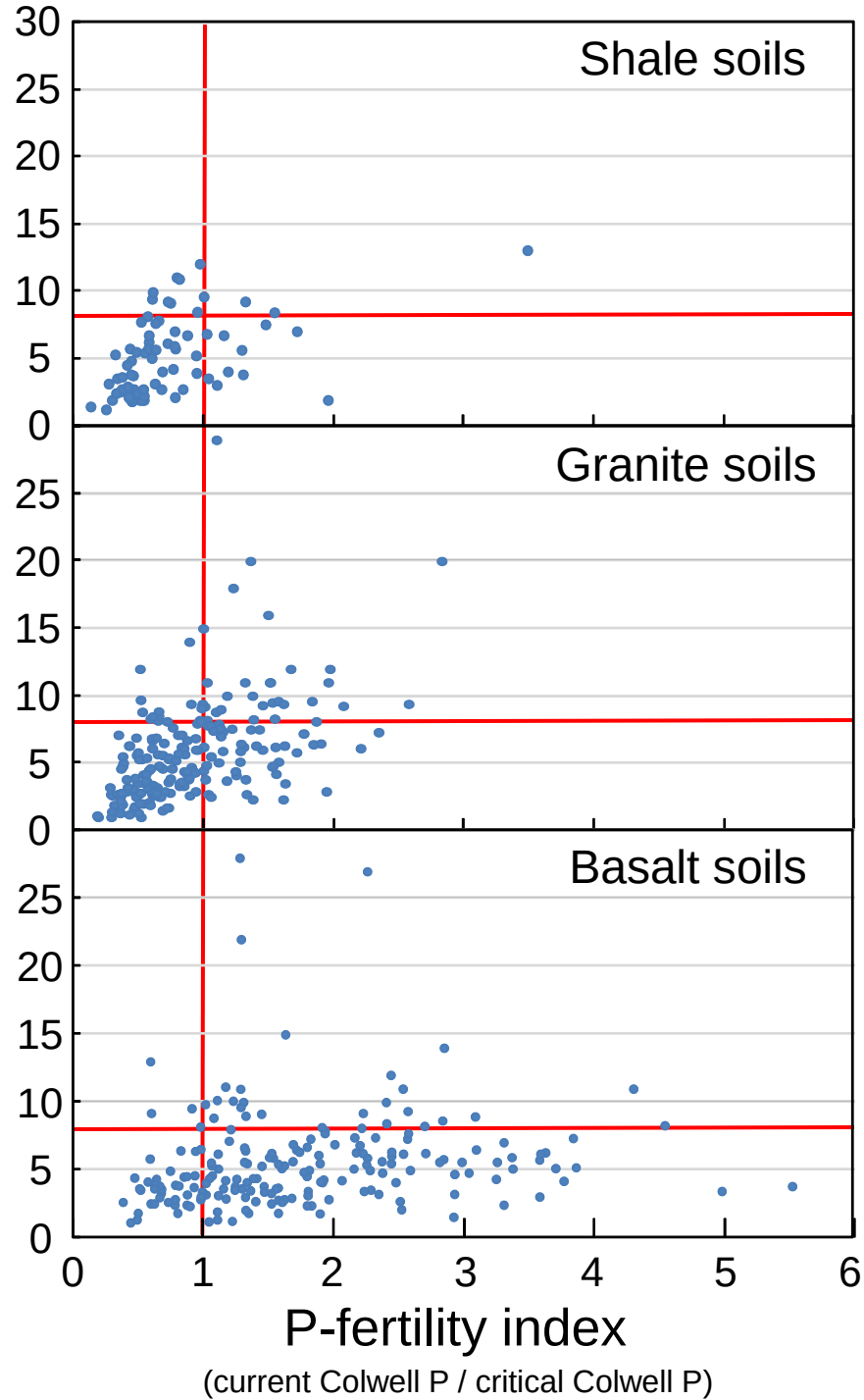
MFS soils club - soil testing history

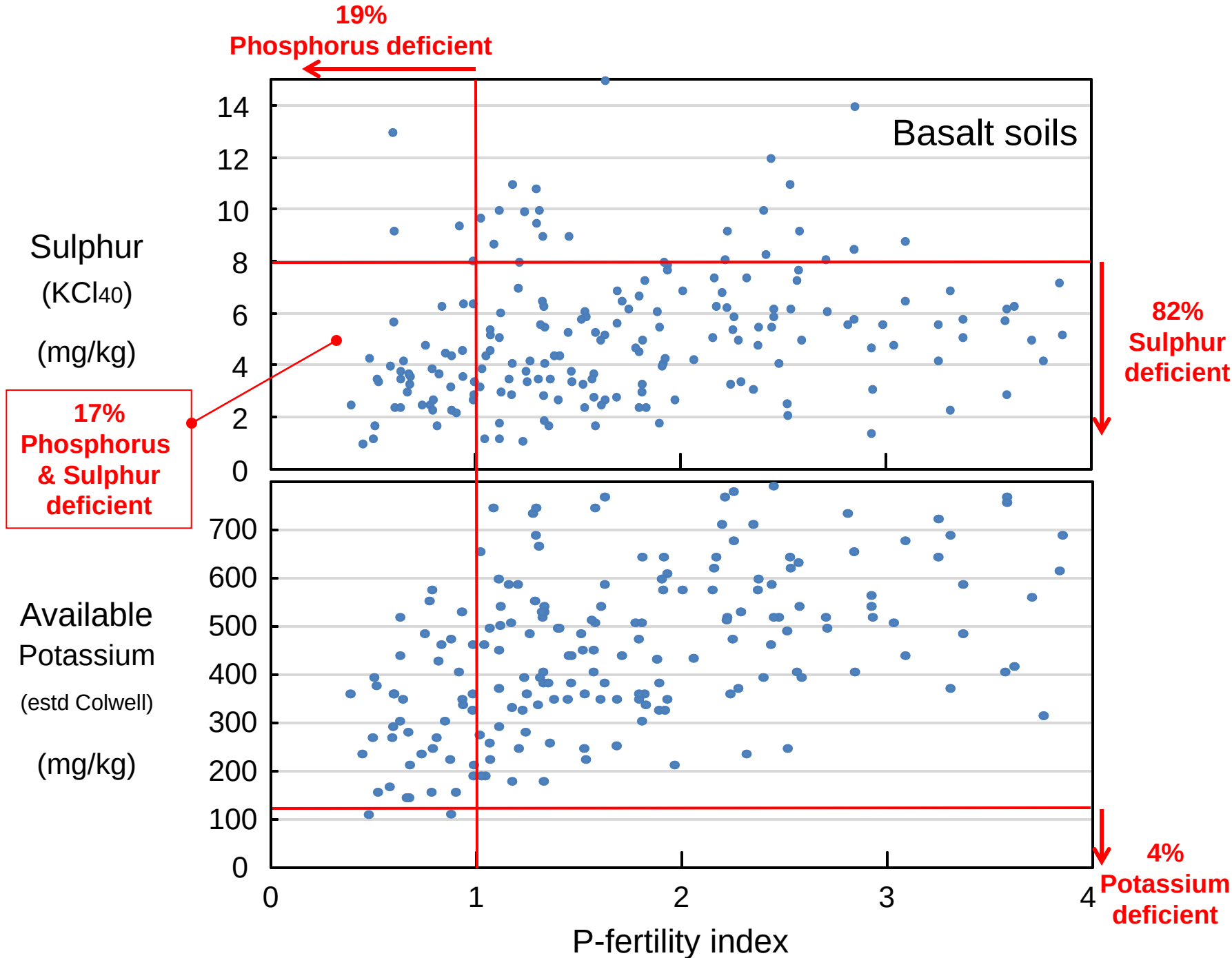
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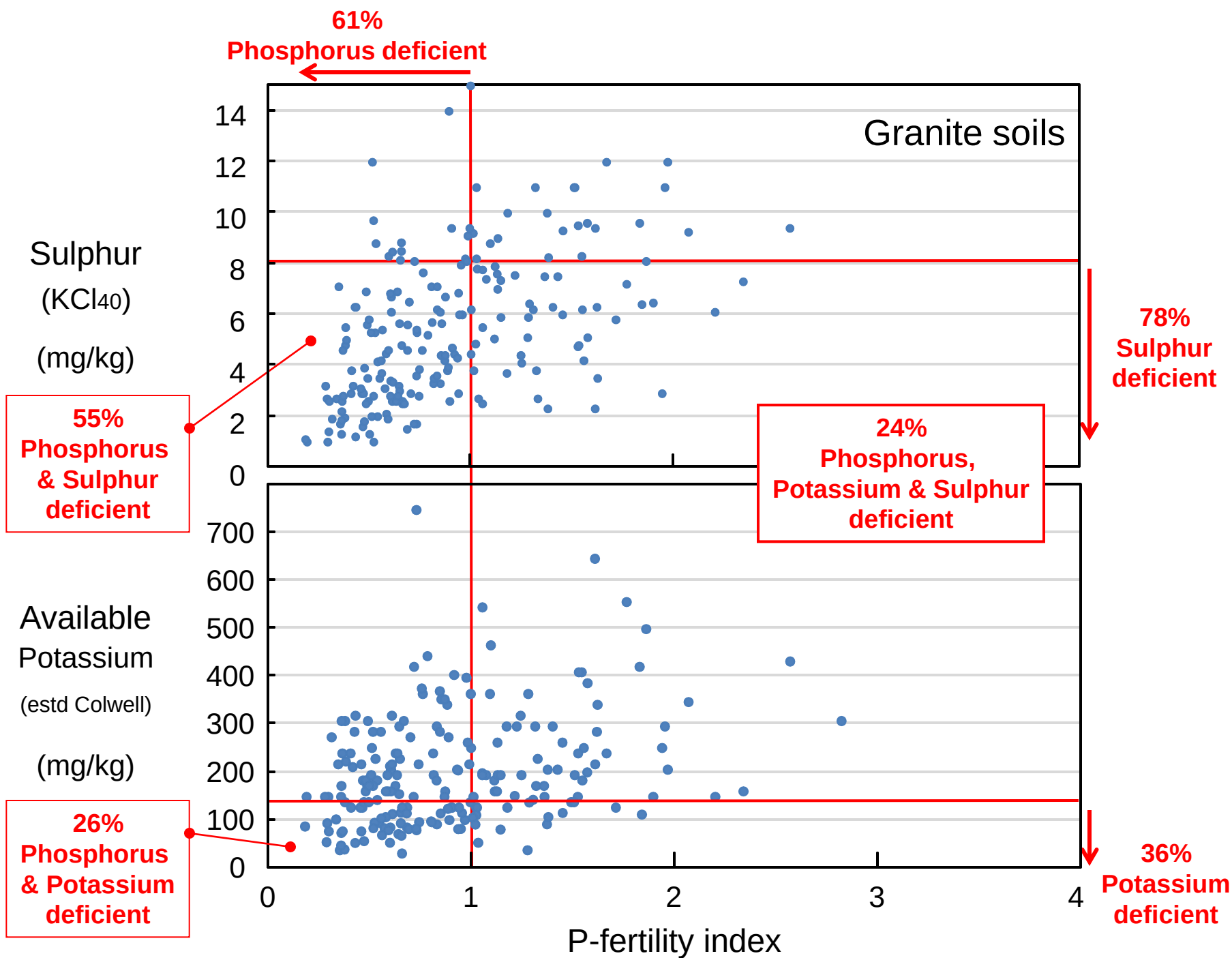
Area analysed: ~500 x ~50ha = 25,000 ha

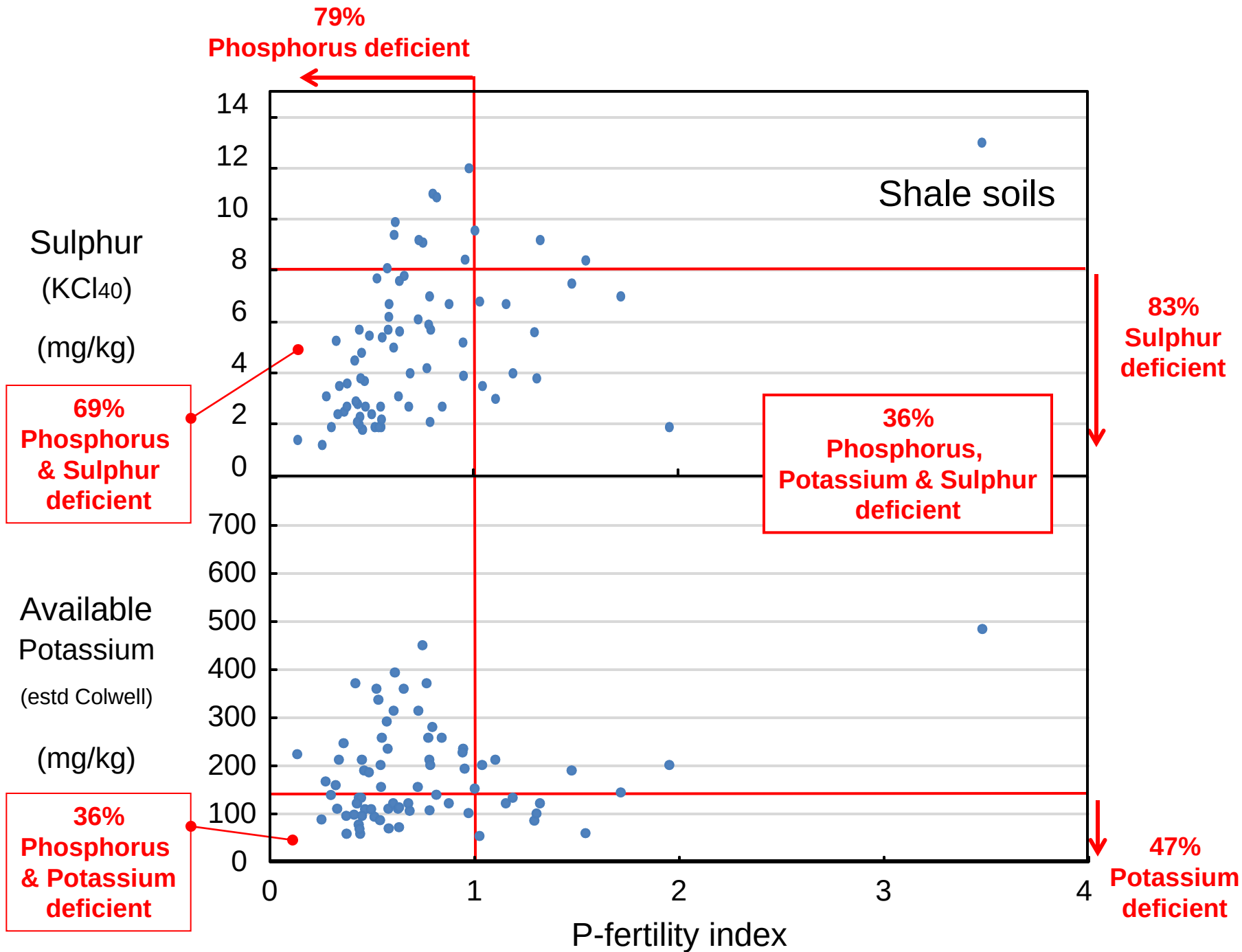
Total value of the data set: ~500 x \$60 = \$30K

Sulphur
(KCl₄₀ test)
(mg/kg)









Conclusions from 2010-2012 data:

Basalt soils

19% below optimum for P
82% below optimum for S
Adequate to high K levels

} **17%** P & S deficient

Granite soils

61% below optimum for P
78% below optimum for S
26% below optimum for K

} **55%** P & S deficient
} **24%** P, K & S deficient

Some soils may benefit from lime

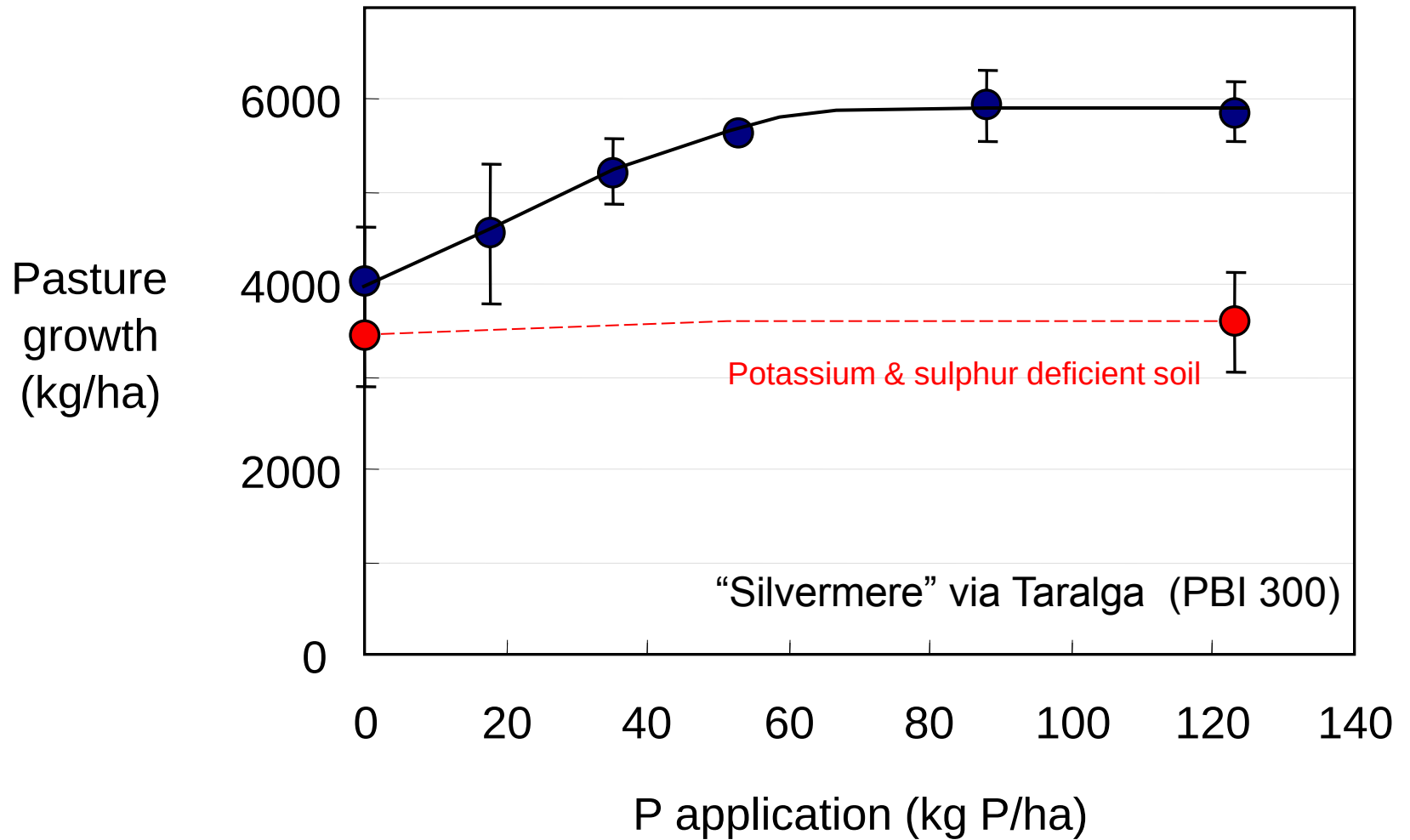
Shale soils

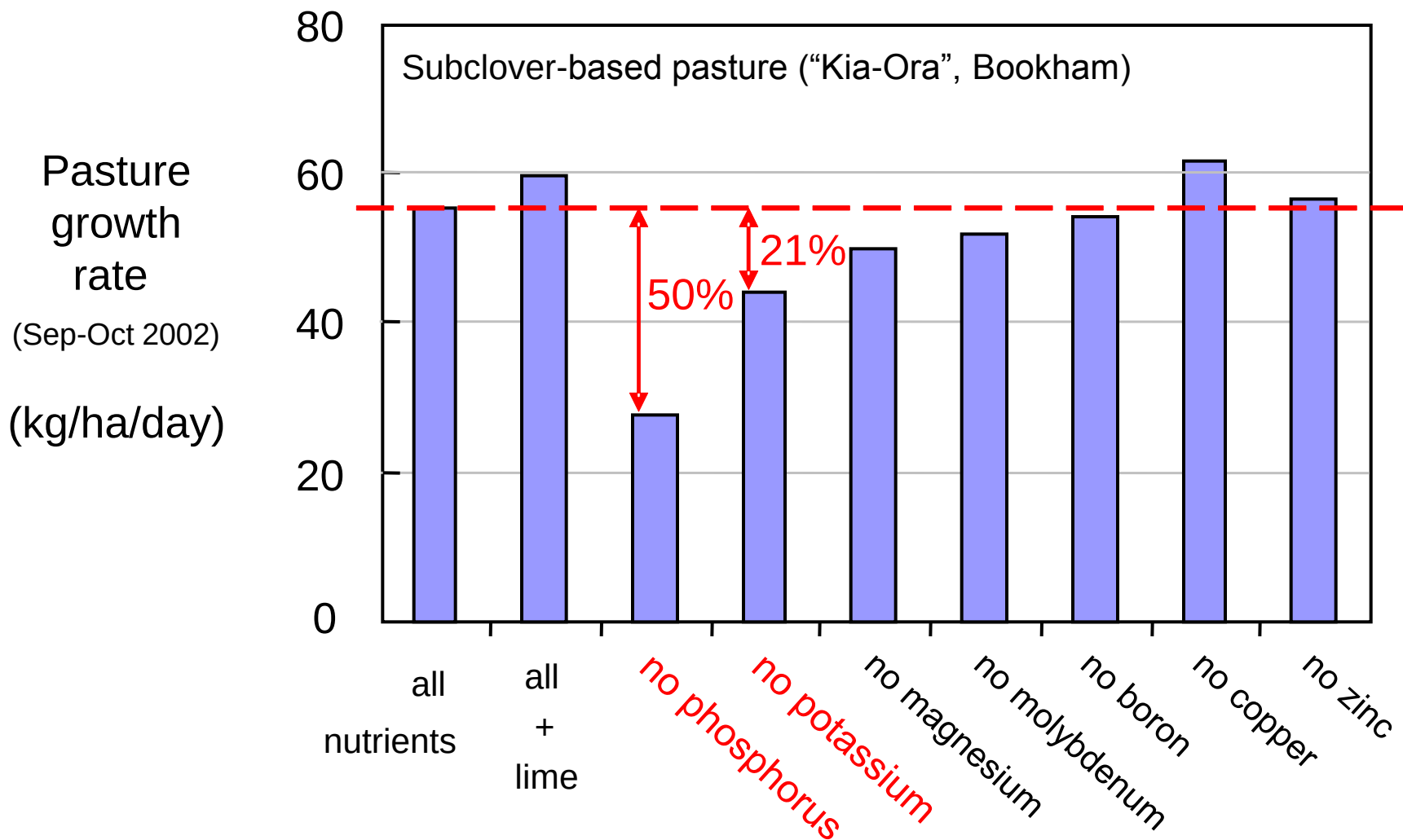
79% below optimum for P
83% below optimum for S
47% below optimum for K

} **69%** P & S deficient
} **36%** P, K & S deficient

Some soils may benefit from lime

Dealing with multiple nutrient limitations





Control
(all nutrients)

-P

-Ca

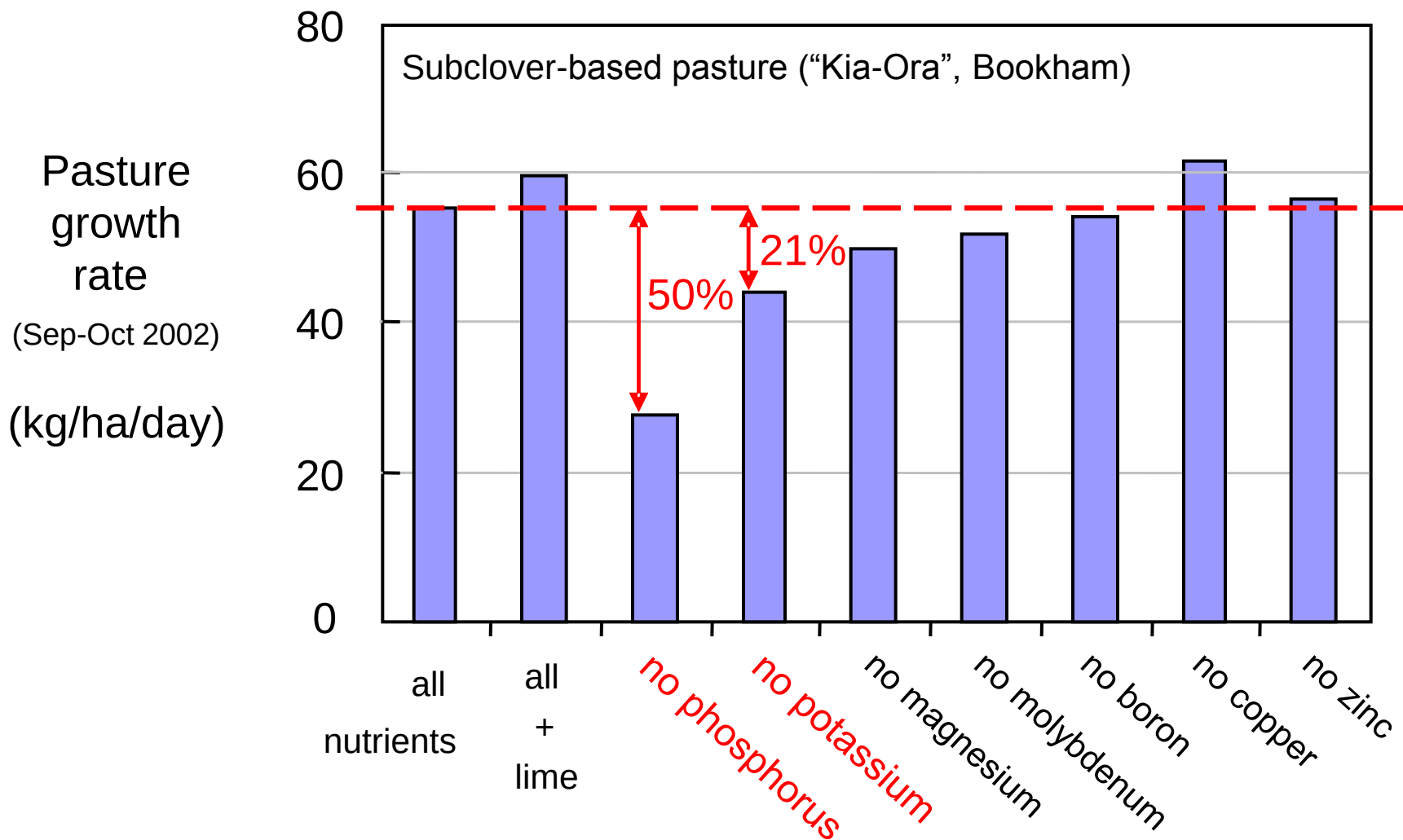
-K

-Mg

-N



Growth of annual ryegrass in topsoil from "Kia-Ora", Bookham NSW (1 Sep. 03)



Multiple nutrient limitations - *difficult decisions ?*

	Paddock name	Soil type	pH (1:5 CaCl2)	Aluminium Saturation	PBI	Colwell P	critical Colwell P	P-fert index	Potassium (estd Colwell K)	critical Colwell K	K-fert index	Available Potassium	Sulfate Sulfur (KCl40)	critical S	S-fert index
				% CEC		mg/kg			mg/kg	mg/kg		mg/kg	mg/kg		
Craig Mitchell	Cherry Tree	granite	4.4	9	58	23	30	0.8	328	140	2.3	290	8.5	8	1.1
Craig Mitchell	Darceys Flat	granite	4.7	3	53	36	29	1.2	294	140	2.1	260	18	8	2.3
Dave Mitchell	Top Currawong Crk	granite	4.5	8	58	34	30	1.1	249	140	1.8	220	5.7	8	0.7
John Jefferys	Mck 2 Poor	granite	4.3	15	42	16	28	0.6	68	140	0.5	60	5.1	8	0.6
Max Stewart	TOWN	grante	4.9	5	25	27	26	1.0	51	140	0.4	45	2.7	8	0.3
Ian Sellars	Bullock Paddock	shale	4.4	11	38	7	28	0.3	90	140	0.6	80	1.2	8	0.2
Ian Sellars	Tombong	shale	4.3	28	71	14	31	0.5	98	140	0.7	87	1.8	8	0.2
John Auer	Gutta Hut - E Fence Ridg	shale	4.7	3	53	8	29	0.3	170	140	1.2	150	3.1	8	0.4
John Jefferys	THN	shale	5.1	2	73	32	31	1.0	57	140	0.4	50	6.8	8	0.9

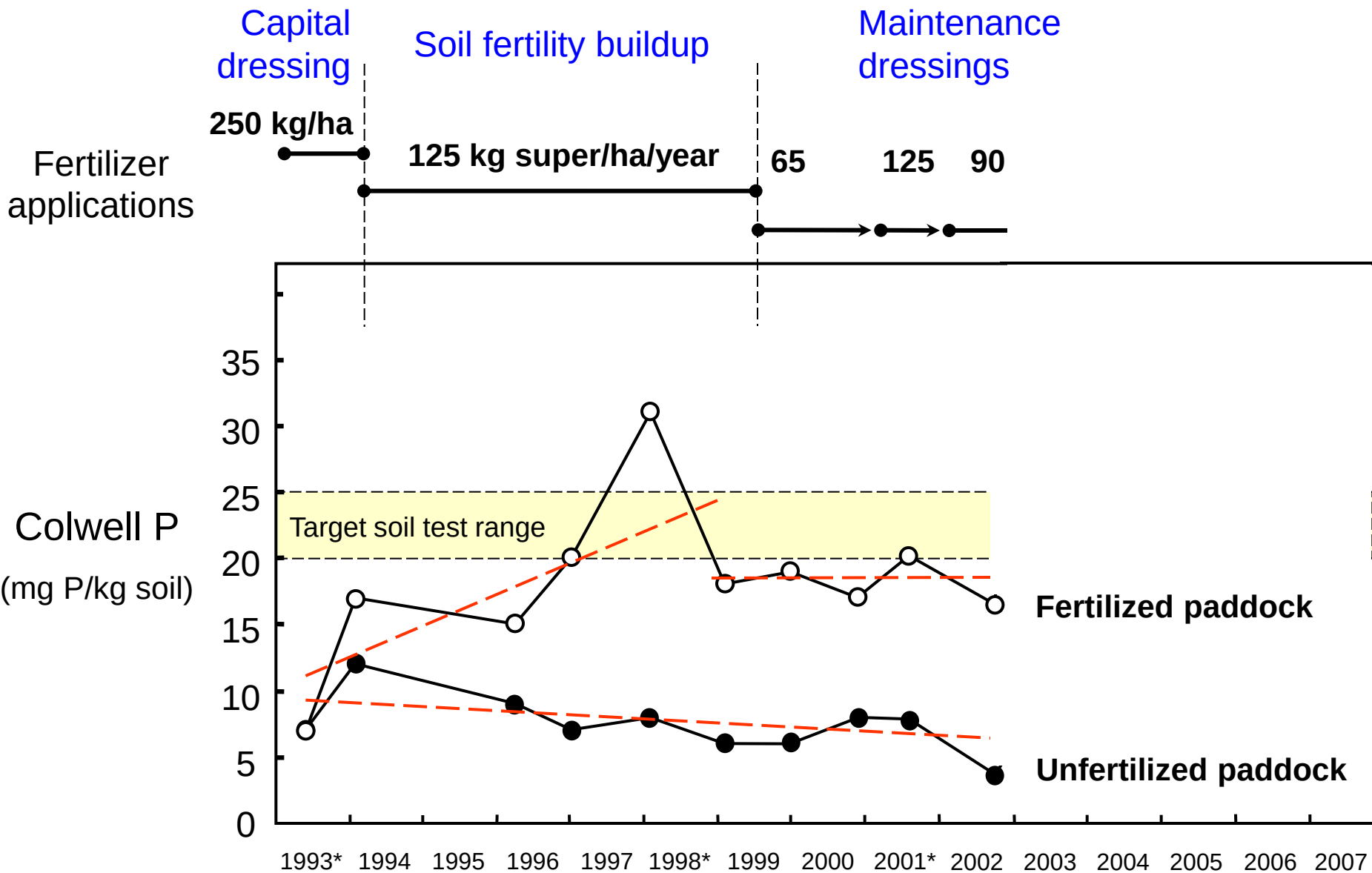
P-fert index = current Colwell P / critical Colwell P

K-fert index = current Colwell K / critical Colwell K

S-fert index = current KCl40-S / critical KCl40-S

Paddock soil fertility trends





* Mo-super applied in these years

Soil fertility build-up

Maintenance phase

Fertiliser applications (kg superphosphate/ha/year)

250

125

65

125

90

0

85

Colwell P
(mg/kg)

30

25

20

15

10

5

0

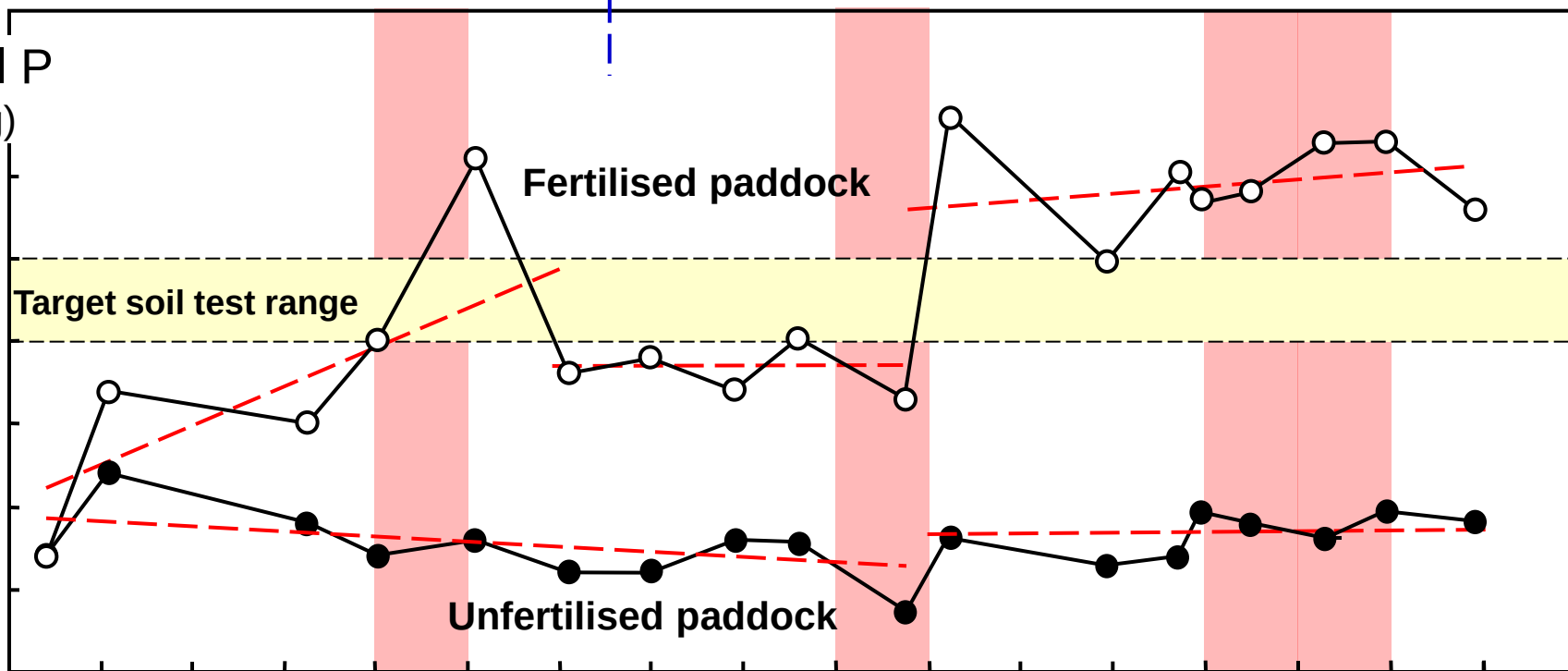
Fertilised paddock

Target soil test range

Unfertilised paddock

1993* 1994 1995 1996 1997 1998* 1999 2000 2001* 2002 2003 2004 2005 2006 2007 2008 2009

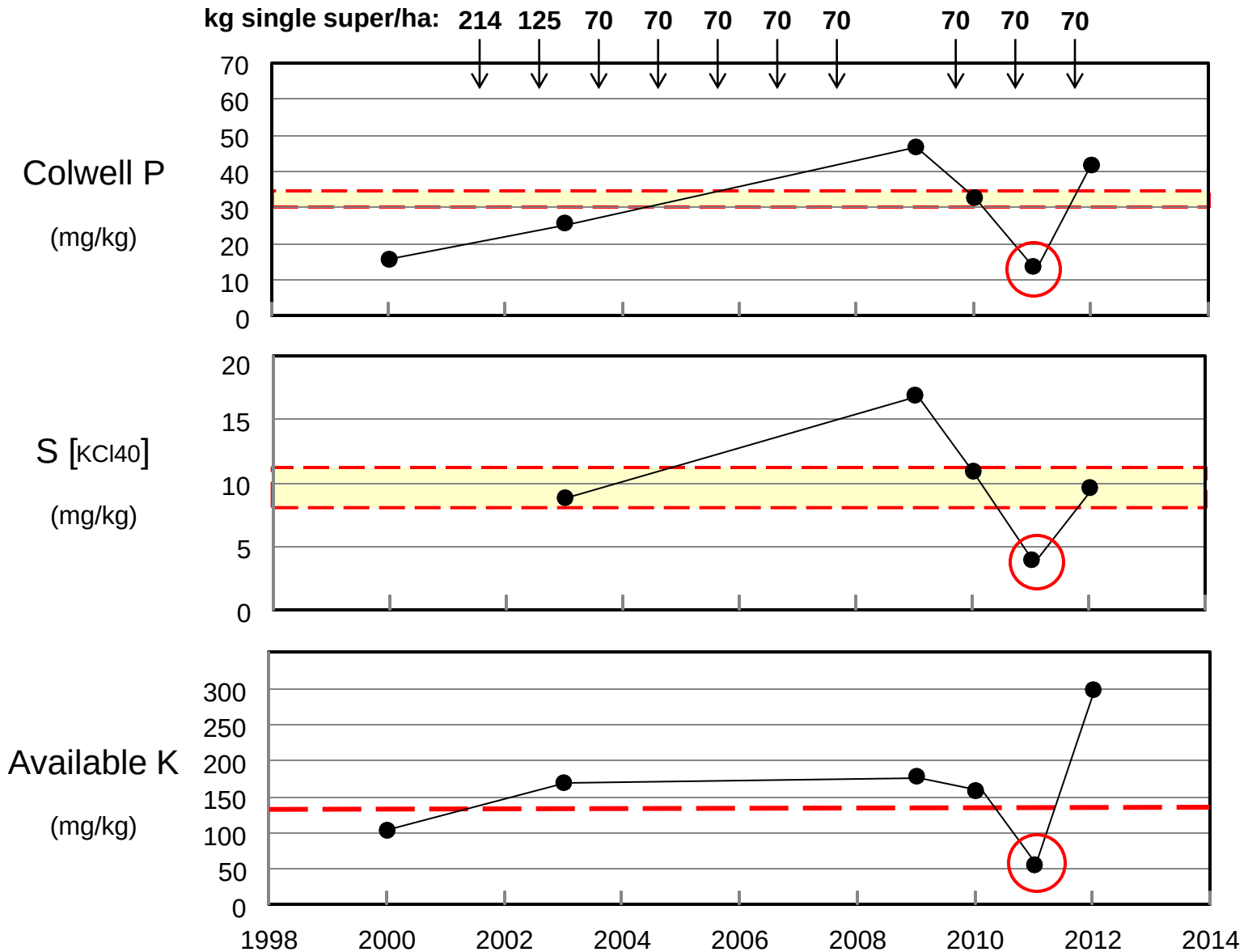
* Mo-super applied in these years



Paddock soil fertility trends

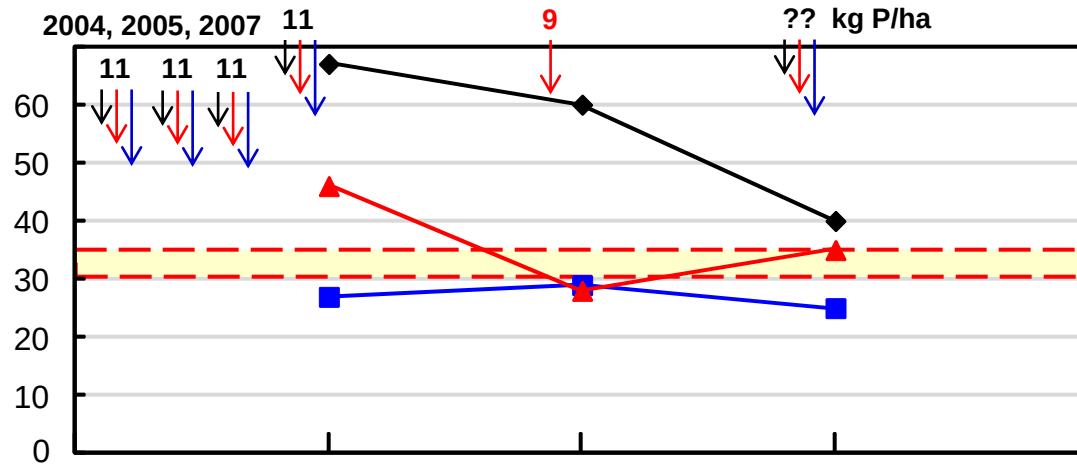
Dave Mitchell

Gambola paddock (granite soil)

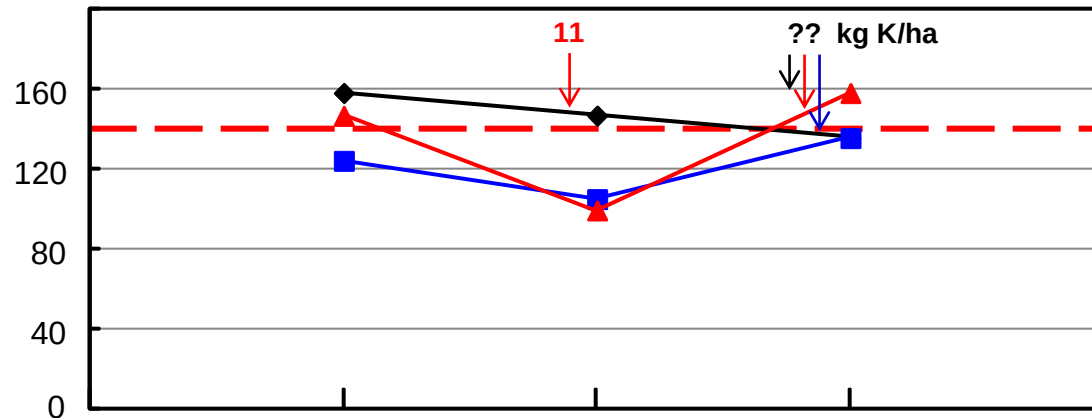


Lisa Phillips
(granite soils)

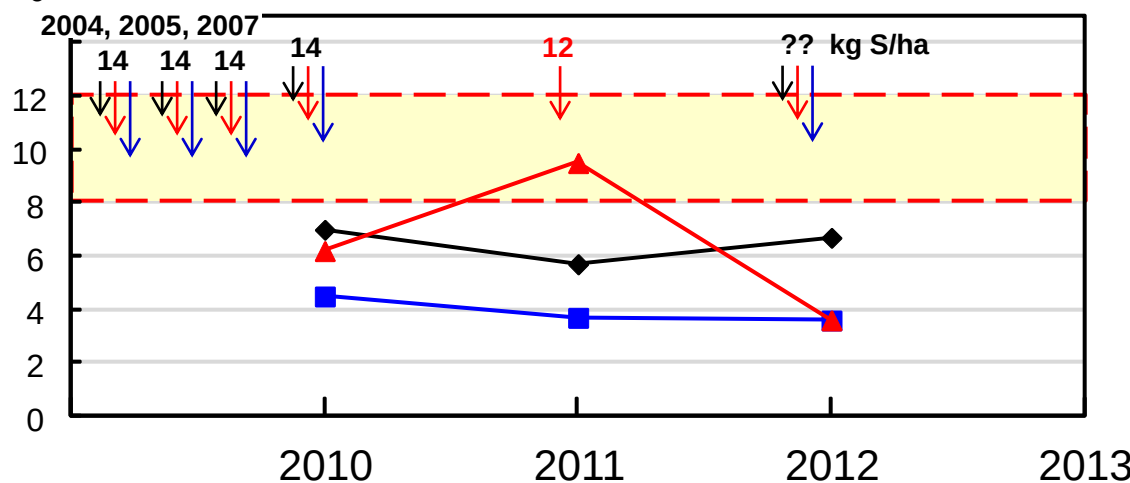
Colwell P
(mg/kg)



estimated
Colwell K
(mg/kg)



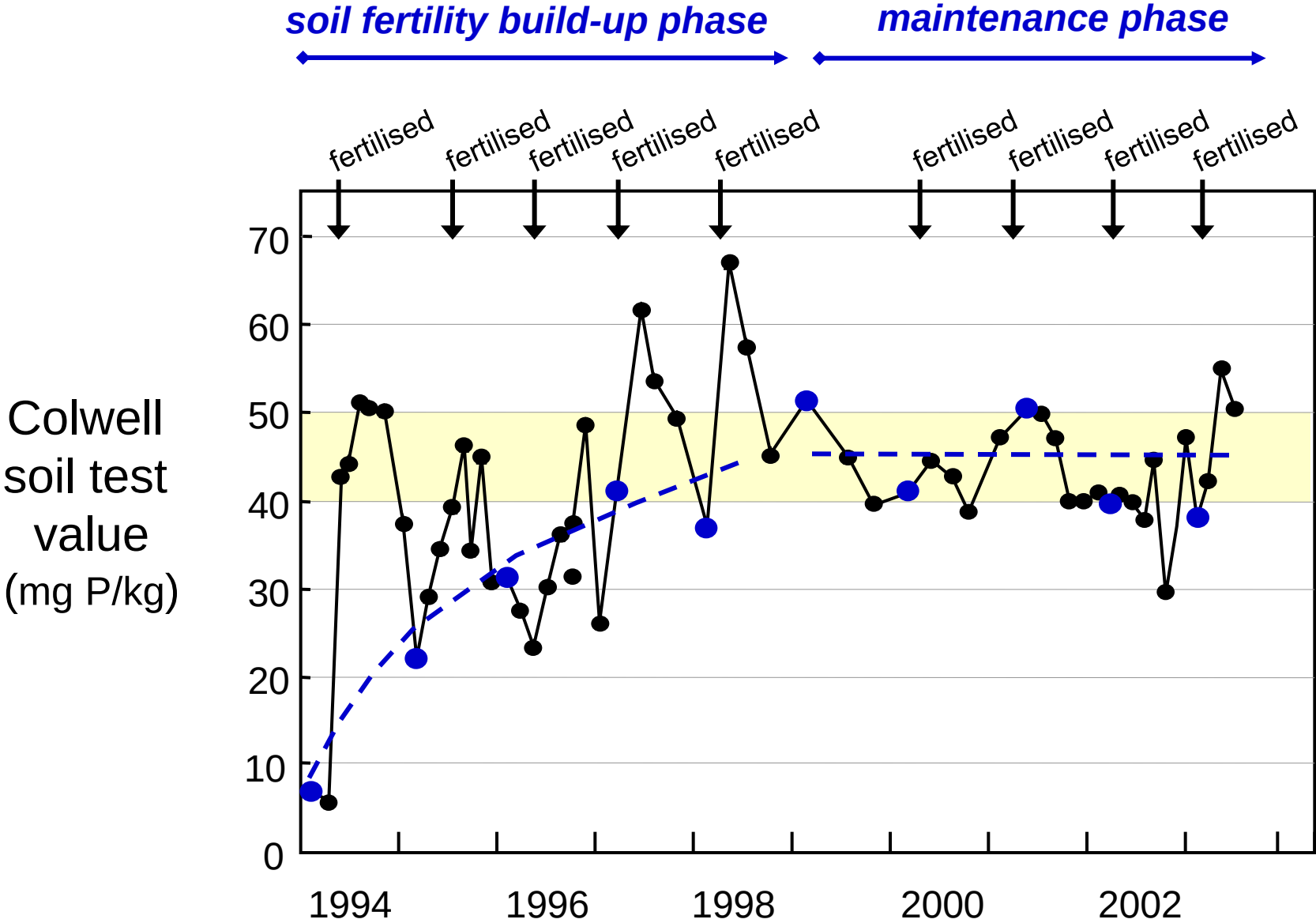
KCl40-S
(mg/kg)



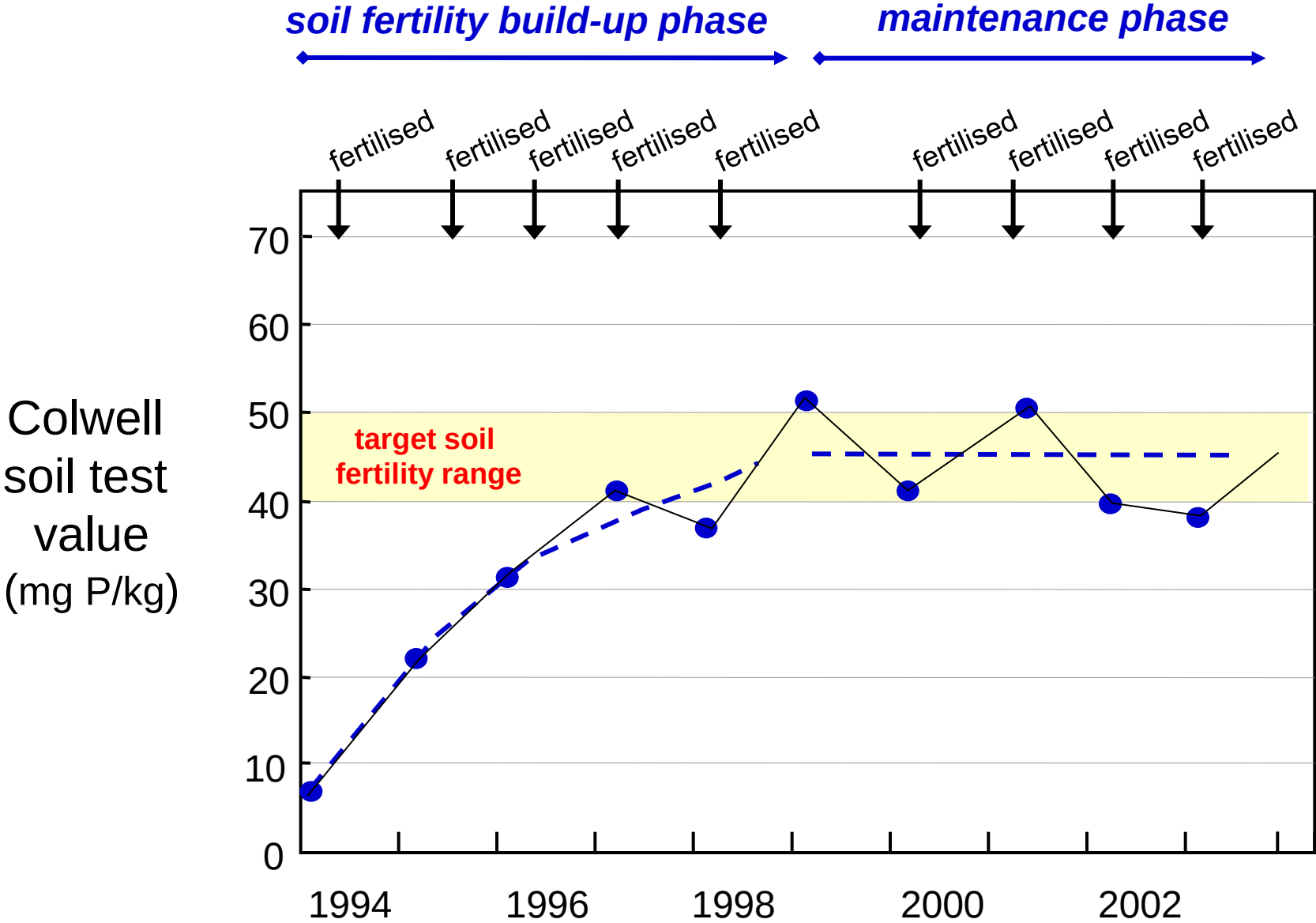
Paddocks

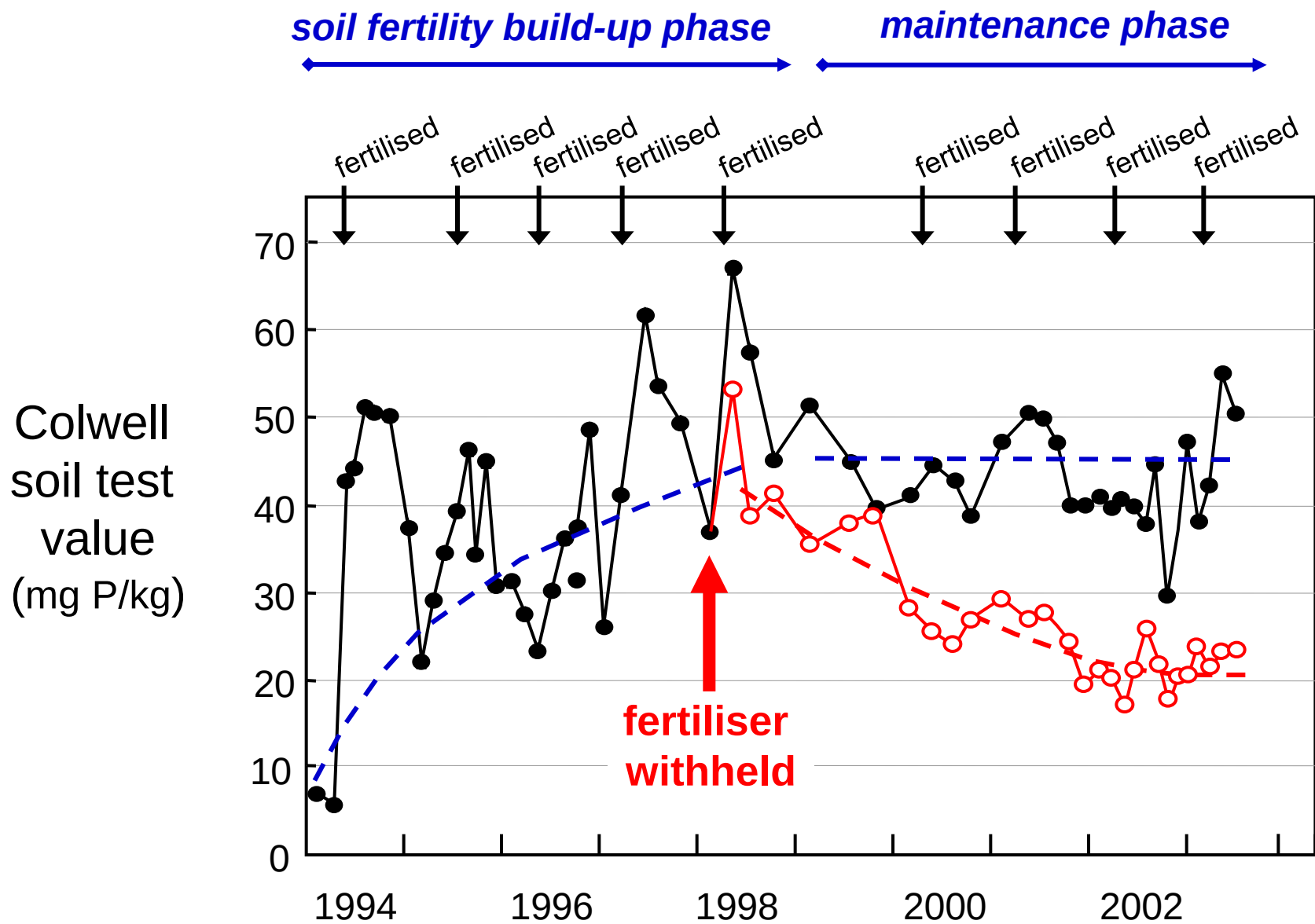
- ◆ Beesnest
- Swimming Hole
- ▲ To Teds

Analysing soil fertility trends



The equivalent data if soil testing occurred annually





How to take soil tests properly

It is important to collect soil samples correctly to ensure a meaningful test result:

i. **Representative samples** – Establish monitor areas or transects that represent each of the major classes of land (land management units) across the farm. The objective is to adequately represent the differing areas of the farm that are to be fertilised whilst ensuring a reasonable soil testing load and expense. Using a soil corer, sample in the monitor area or along the transect in a systematic way and record the sampling interval and pattern used so that the sampling pattern can be replicated at later times. To ensure samples reflect the paddock as a whole, avoid stock camps, fence lines, water troughs, fertiliser dumps, burnt timber rows, wet gullies, gateways, tracks or dung patches and sample from different soil types separately.

ii. **Mark the site** – Keep a record of the monitor area or transect for future testing. You may do this by noting where you started and finished and the route taken, by taking a series of GPS readings, etc.

iii. **Depth** – Extractable P is measured in topsoil samples using a soil sample depth of 10cm. P is typically more concentrated in the top few centimetres of soil so it is very important to obtain the full volume of soil to 10 cm depth to avoid biasing the concentration of P in the soil sample.

iv. **Sample number and handling** – Take a minimum of 30 soil cores along the transect or monitor area and combine to give a sample that is representative of the paddock. Send the sample to the testing laboratory promptly. Use an ASPAC-accredited laboratory to take advantage of the quality control that this accreditation represents.

v. **Timing** – Always sample at the same time every year. It is potentially feasible to take annual samples at any time of the year, but soil samples are most commonly taken in late spring. At this time soil is usually moist, but not wet, allowing soil cores to be taken quickly

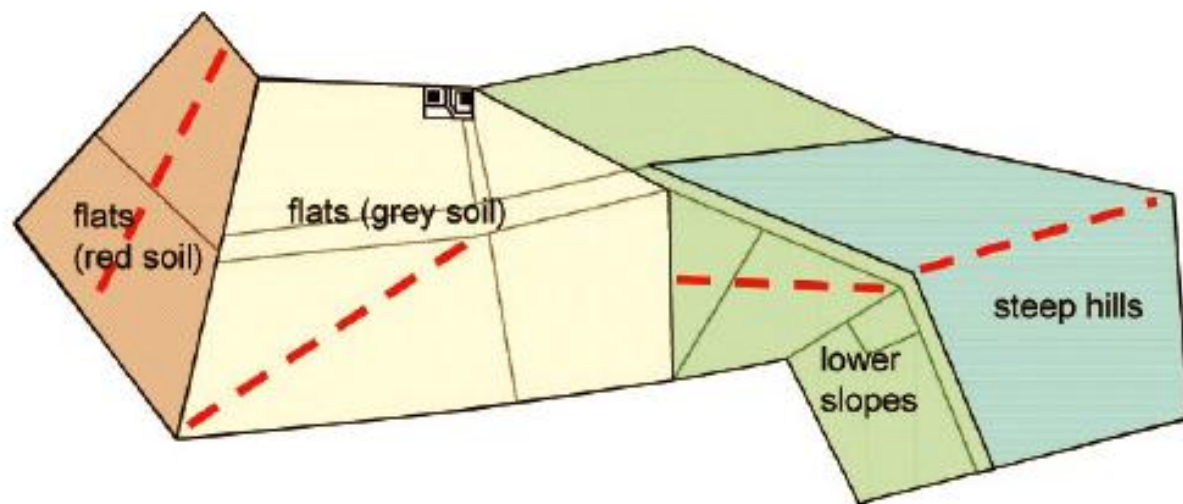
and easily. Moist soil holds together in the corer and this helps to ensure the sample is the full 10 cm depth. Never sample within the first few months after fertiliser application.



Soil tests that are not taken correctly will not give you an accurate result.

See page 6 of the “Five easy Steps..” booklet

Soil testing: establish monitor paddocks or transects (■■■■) that represent the major classes of land, or land management units of the farm. The objective is to adequately represent the differing areas of the farm that are to be fertilised whilst ensuring a reasonable soil testing load. Retest the monitor areas annually. Over time you will be able to make decisions on the basis of the soil fertility trends that the data will reveal.



“Five Easy Steps” booklet and tool available for download from:
www.mla.com.au/nutrients

