



Overview of the 2011 MFS soil test results

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Why are we soil testing?

Control

(all nutrients)

-P

-Ca

-K

-Mg

-N



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

- 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



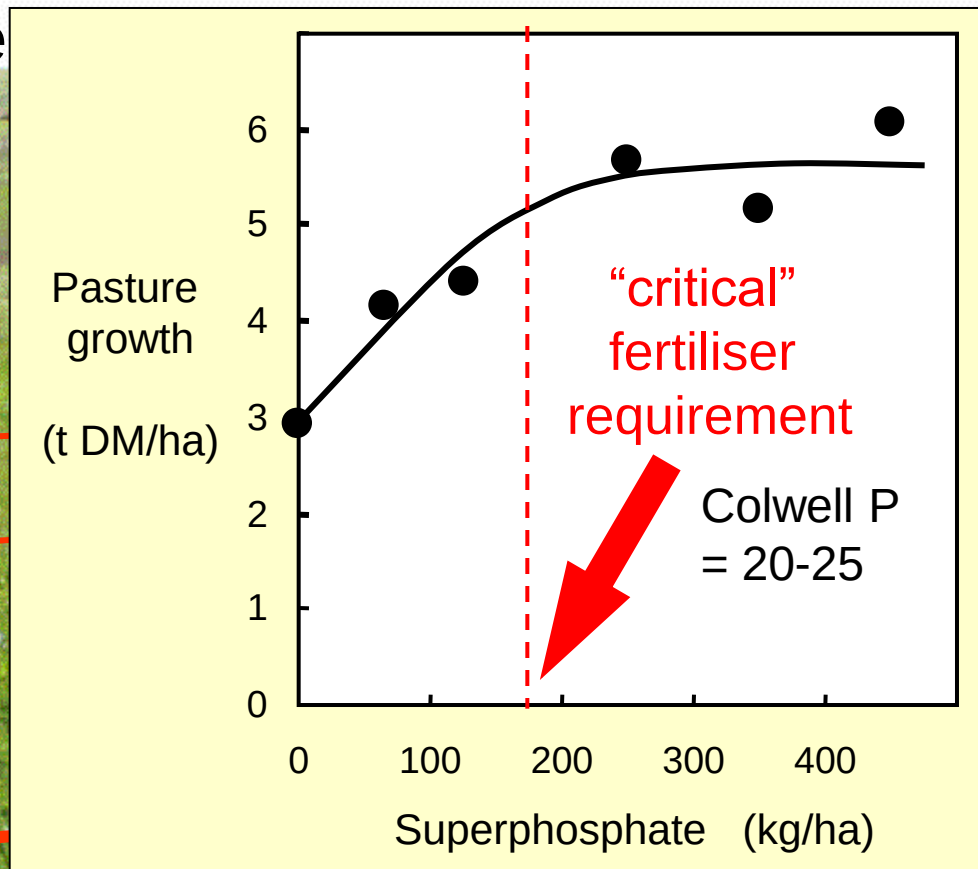
- fertilised native grass pasture
- Colwell P ~20 mg/kg
- 12–15 wethers/ha

Gross income:	\$374/ha
Variable costs:	157
Fixed costs:	88

- Net farm income: \$129/ha

Response to superphosphate

(Ginninderra Experiment Station, Canberra)



125

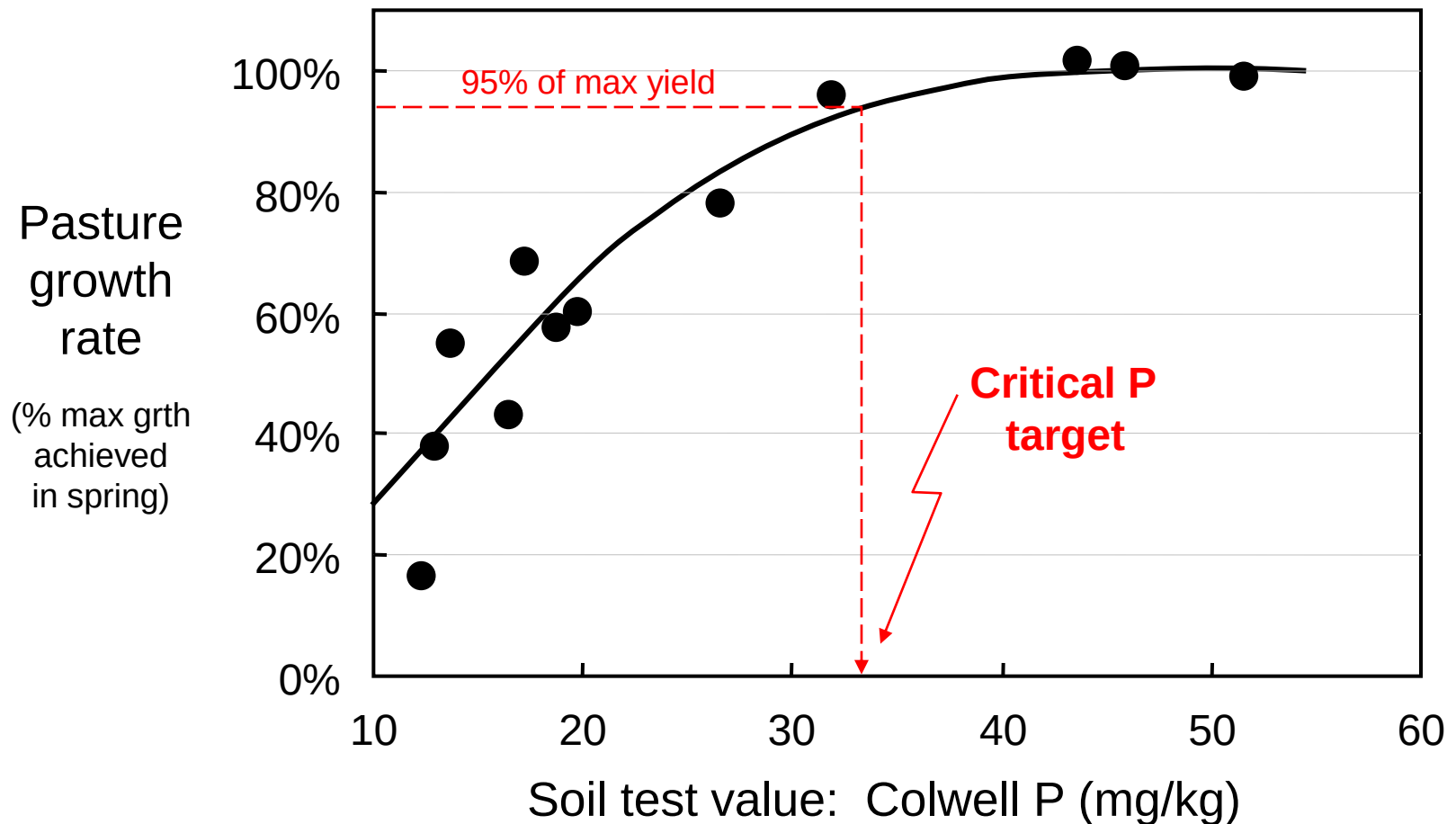
0

63

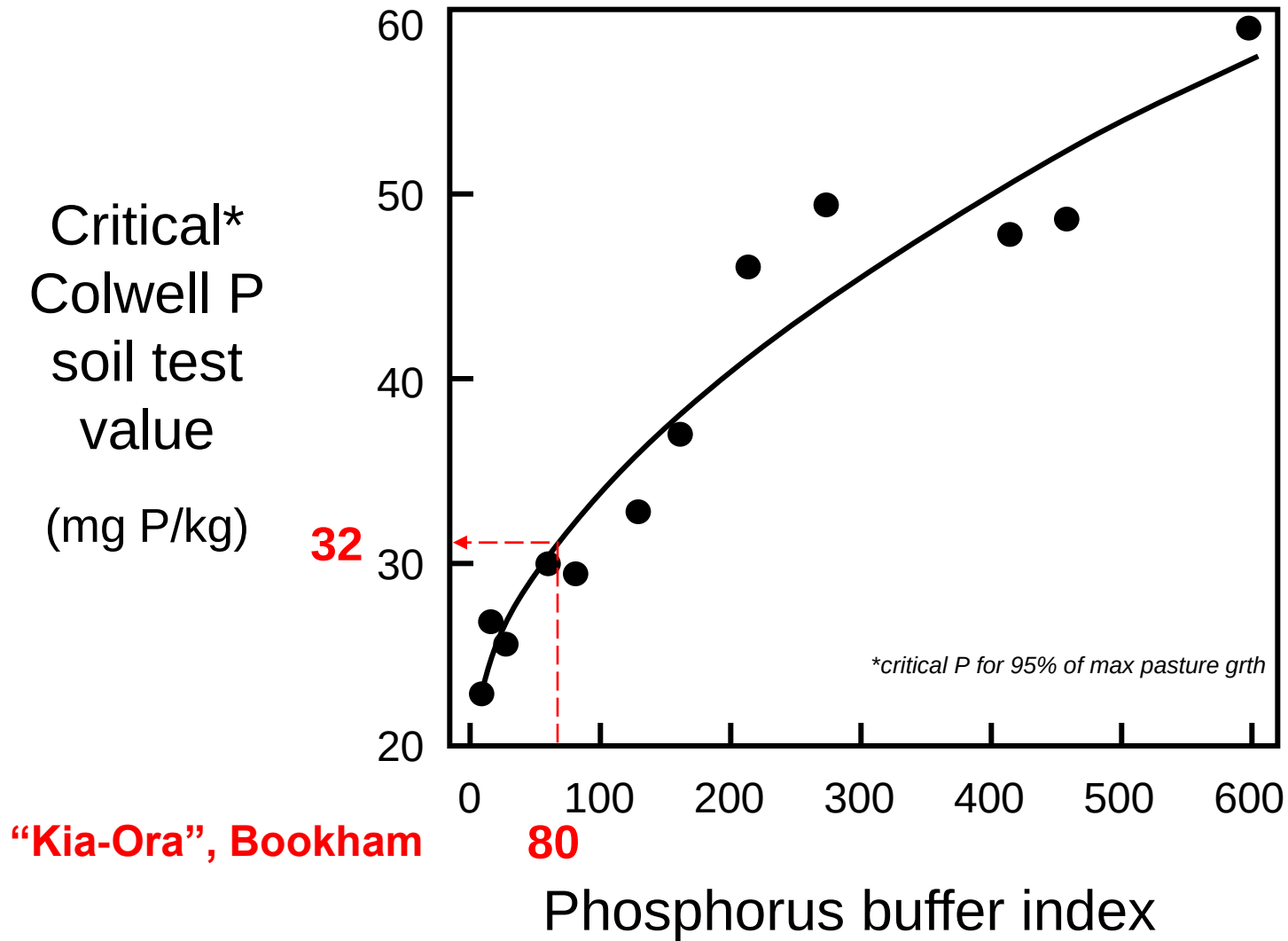
250 kg superphosphate/ha

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

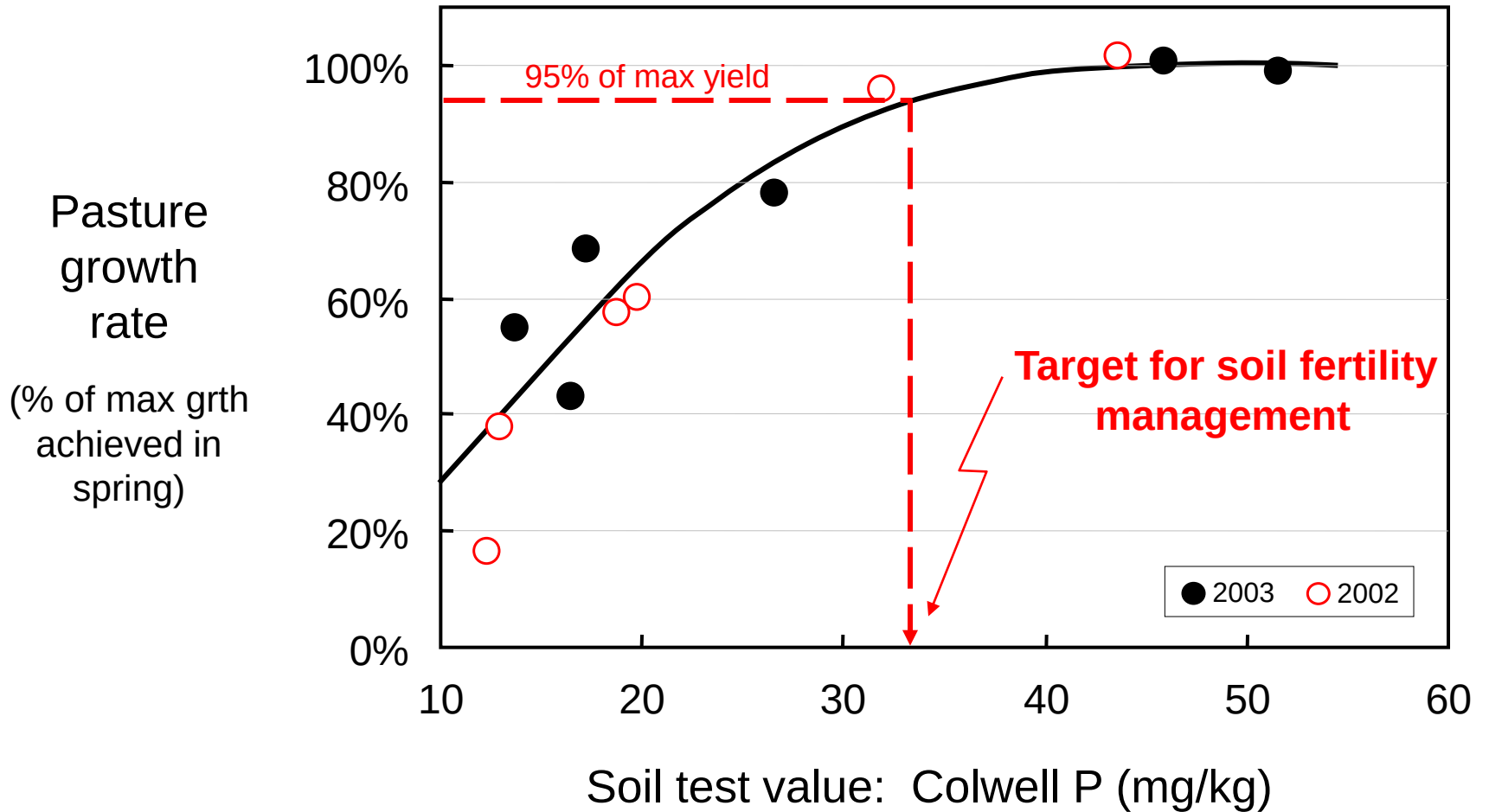


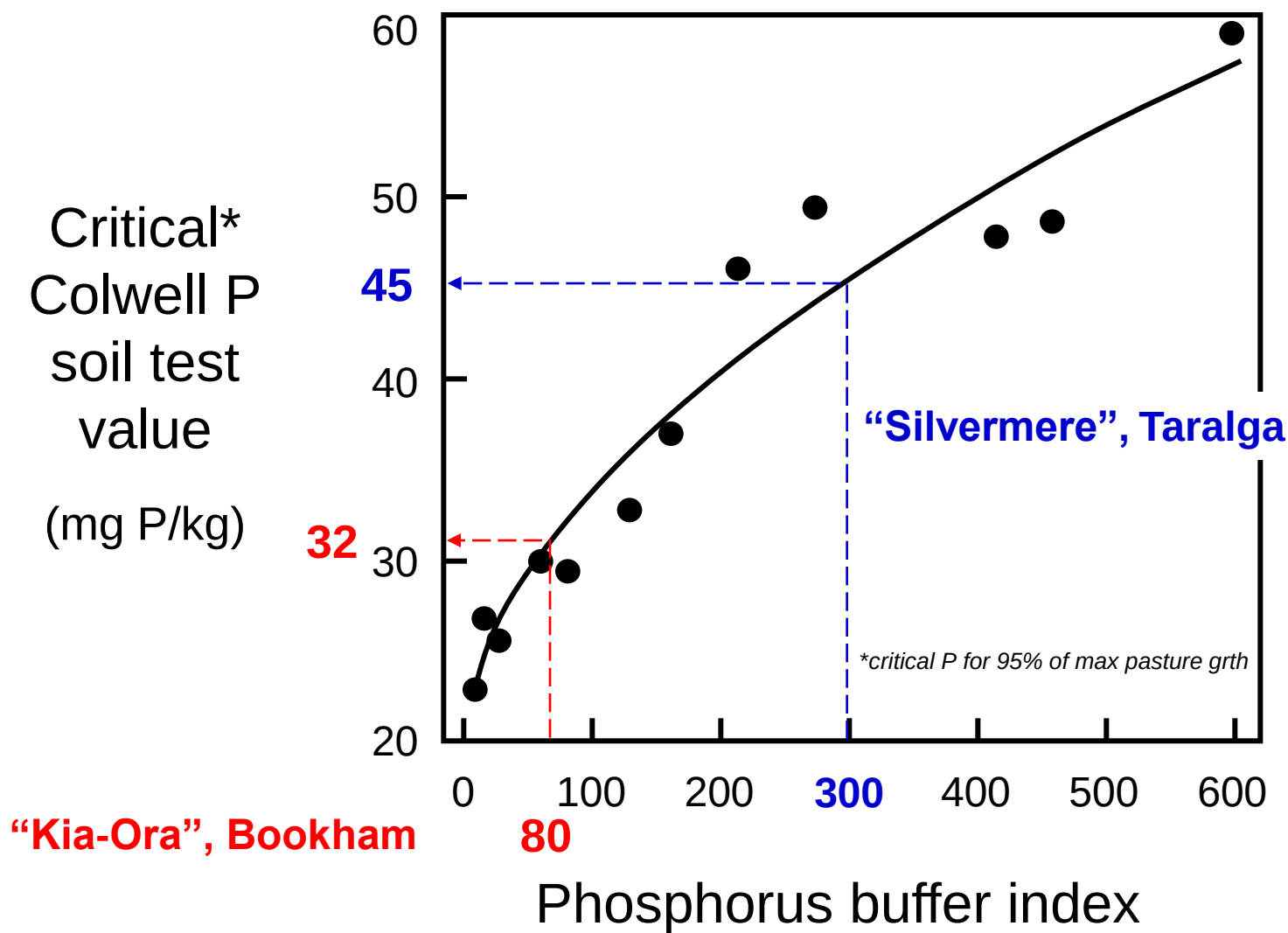
PBI is used to predict the Colwell soil test value for near-max pasture growth



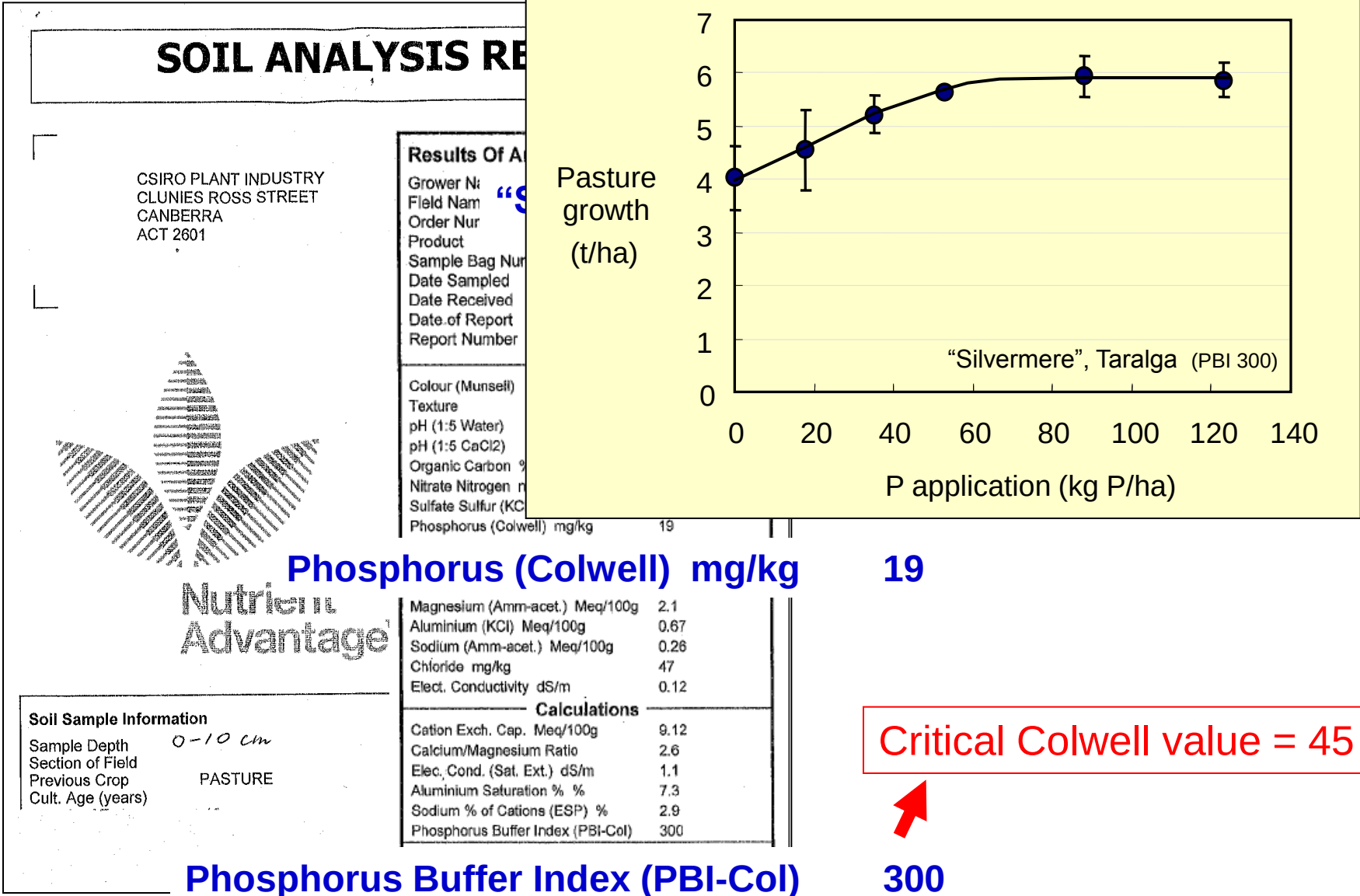
Clover-based pasture (“Kia-Ora”, Bookham)

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





Colwell P and Phosphorus Buffering Index (PBI) must be used together



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 MFS soil test results*):

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

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

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

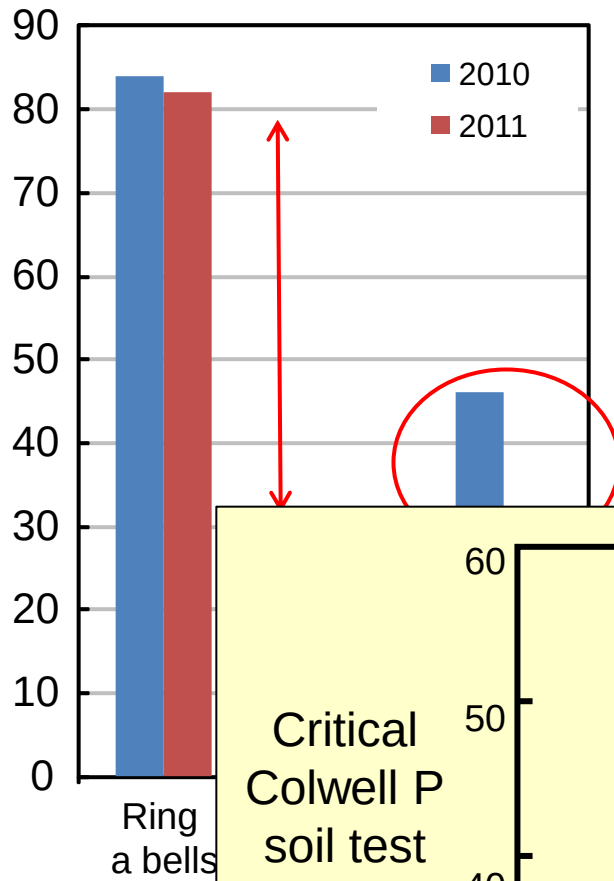
FOR MORE INFORMATION

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>

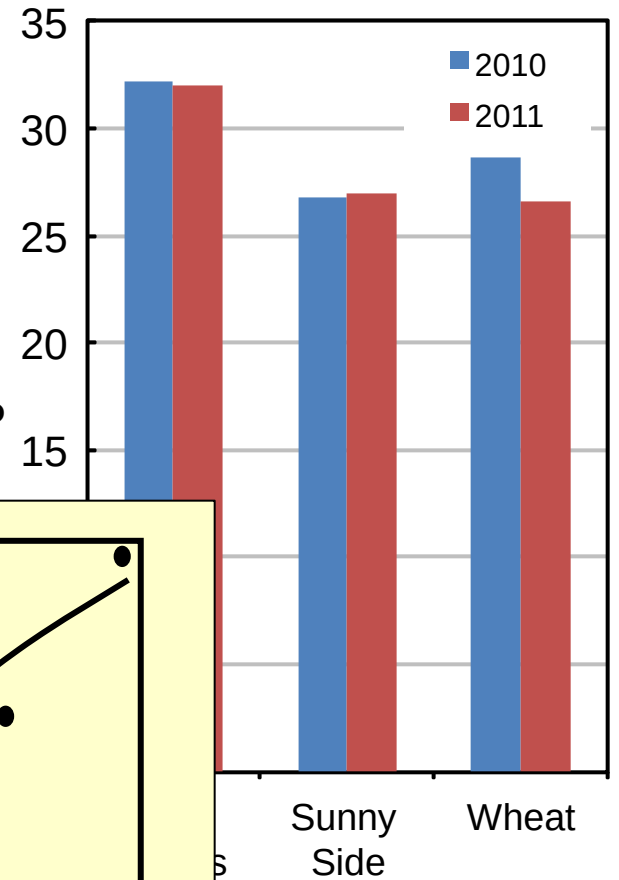
MFS used 2 “standard soil” samples to check the “lab” results

Soil Test	“basalt soil”		“granite soil”	
	2010	2011	2010	2011
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

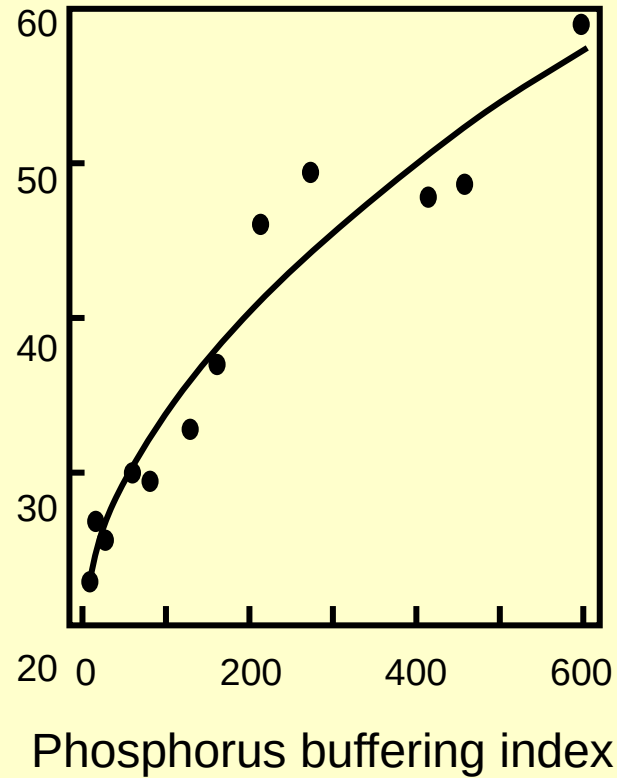
Phosphorus
Buffering
Index



Critical
Colwell P
(mg/kg)



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



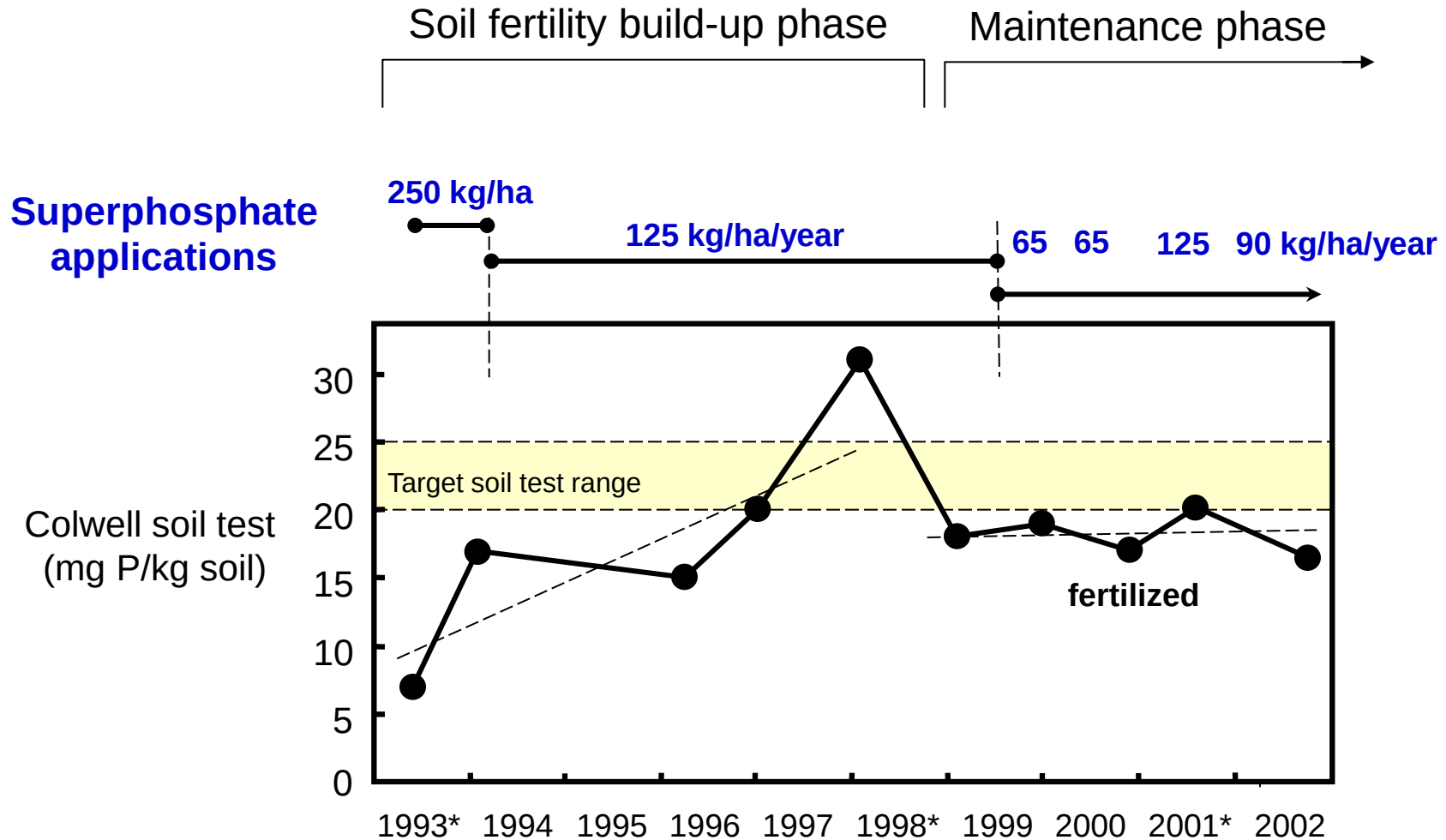
MFS: internal standards

Soil Test	“basalt soil”		“granite soil”	
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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

Recognizing and managing “odd” soil test results

Arthur Haylock (basalt) Soil Test	Lake Hill		Coonerang	
	2010	2011	2010	2011
pH (CaCl ₂)	5.6	5.6	6.1	6.3
Phosphorus buffering index	48	180	140	150
<i>Predicted critical Colwell P (mg/kg)</i>	29	39	36	37
Colwell P (mg/kg)	100 (3.5x)	62 (1.6x)	70 (1.9x)	61 (1.6x)
Colwell K (est) (mg/kg)	937	576	384	316
KCl ₄₀ Sulphur (mg/kg)	10	4.8	8.6	5

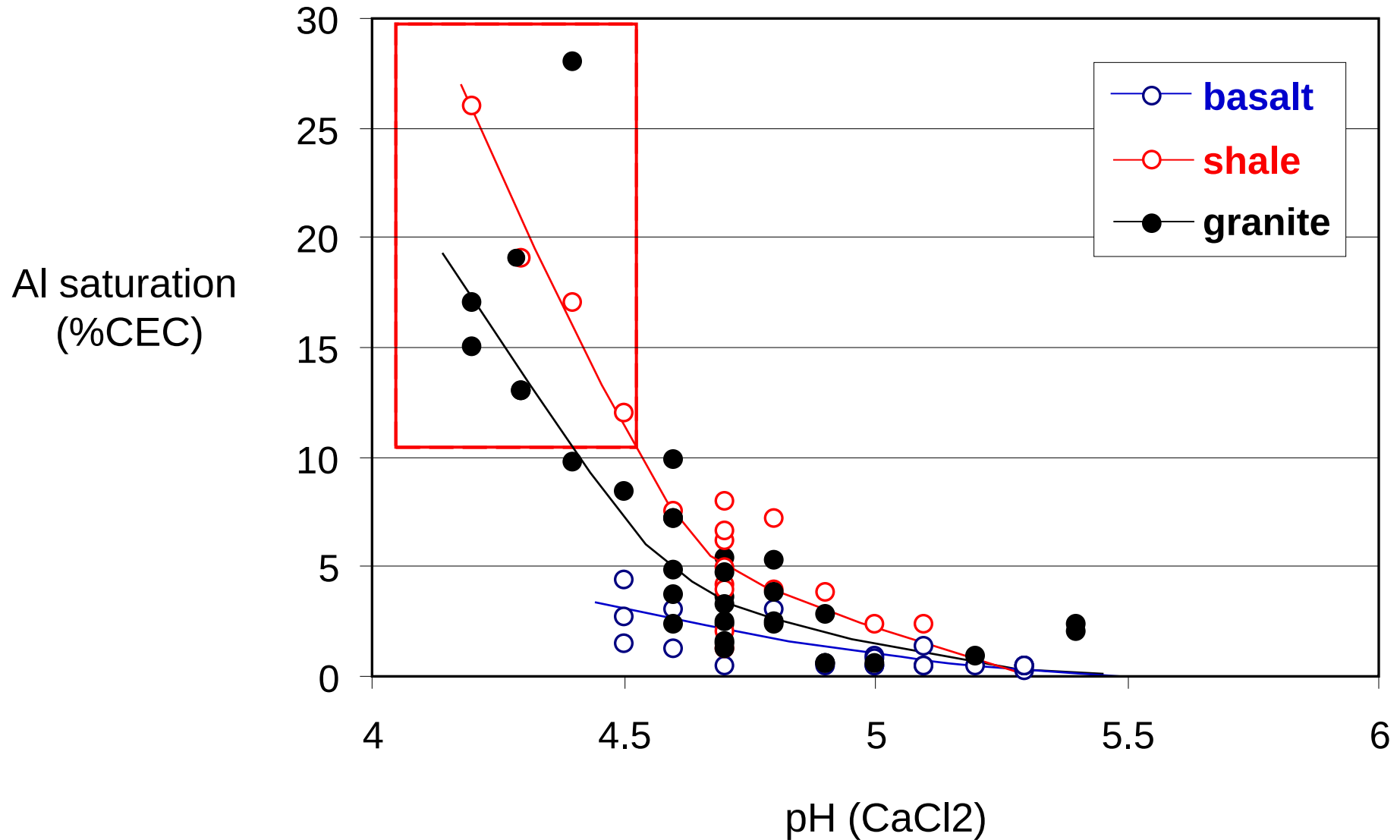
Regular soil testing: Bookham Grazing Demonstration





MFS soil test results 2011

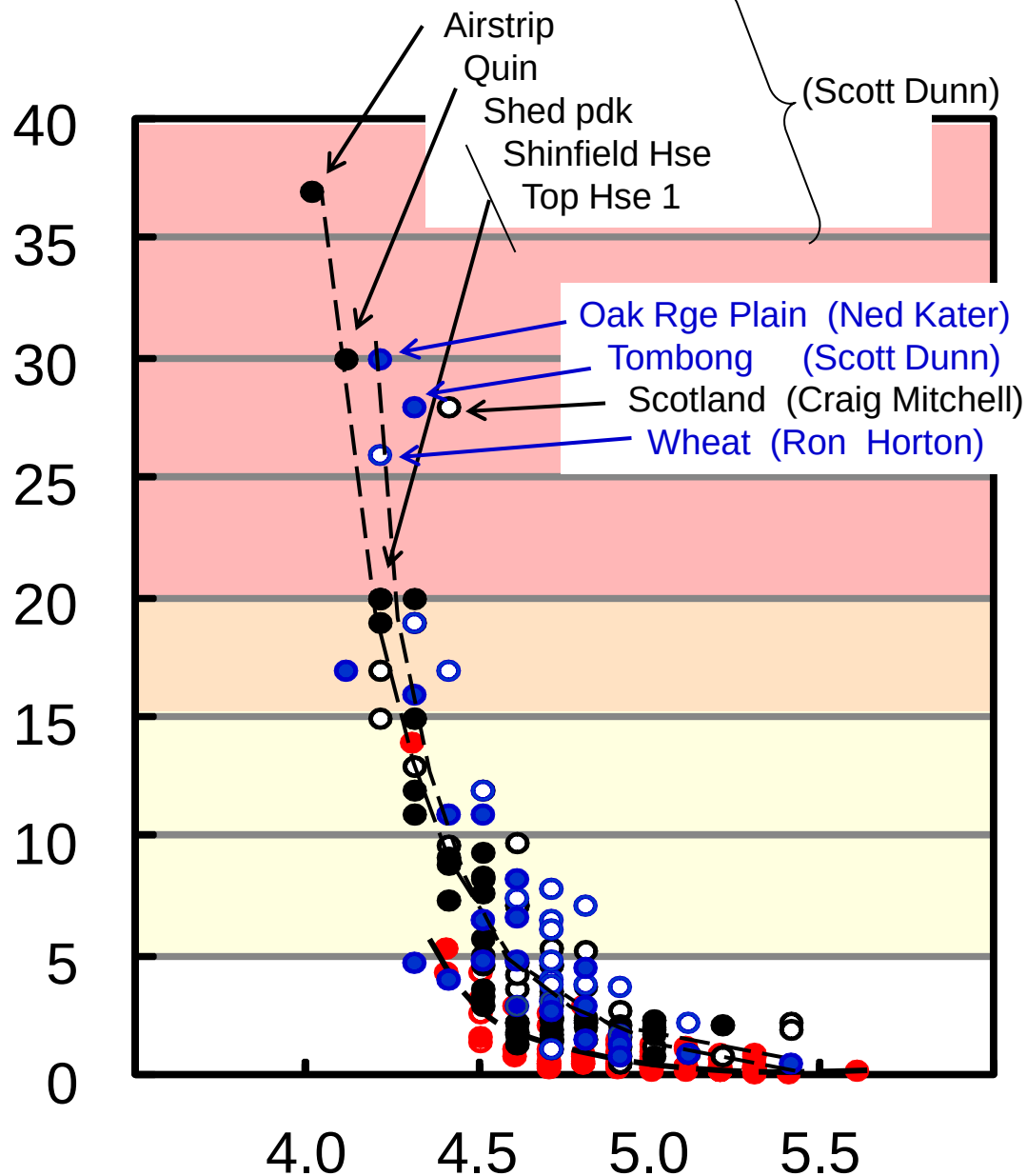
General features of the Monaro soils (2010 results)

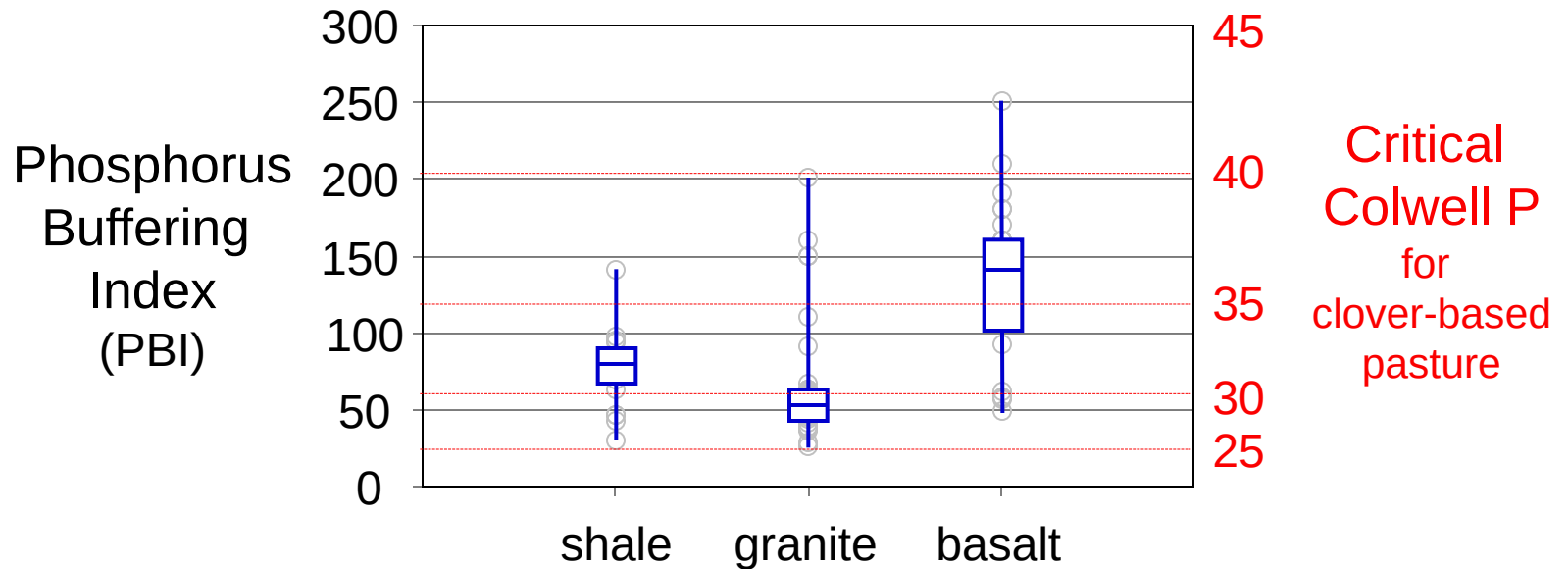
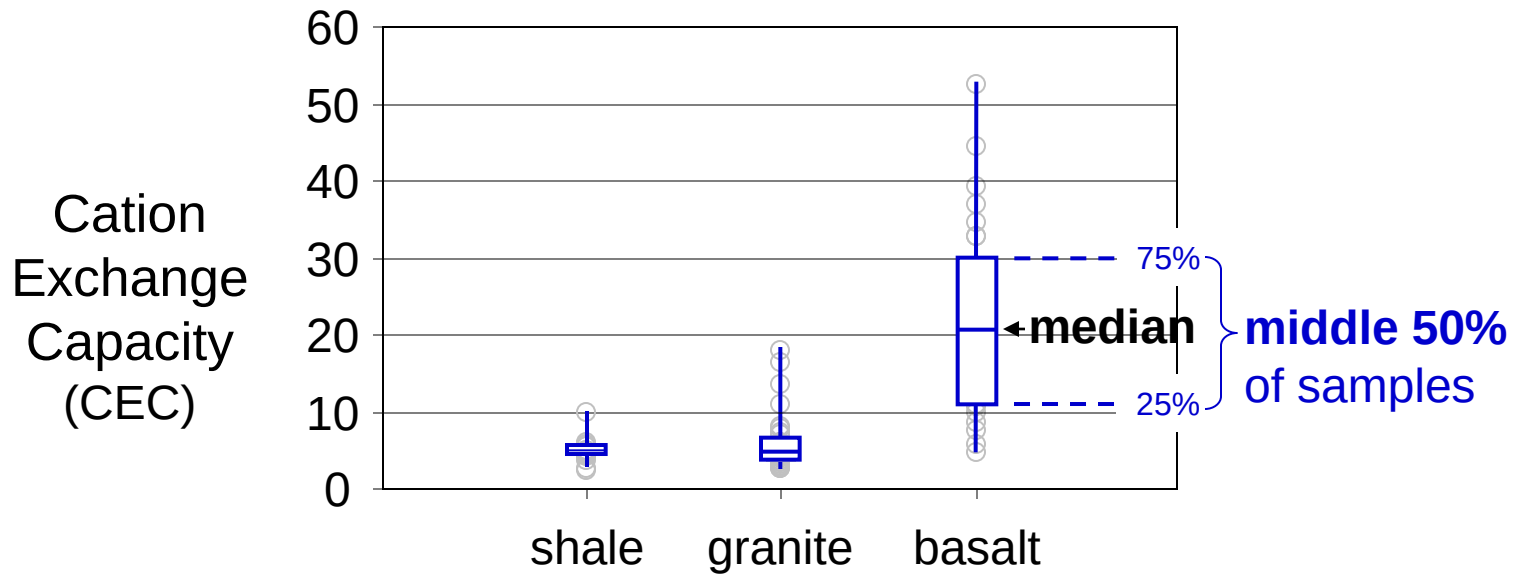


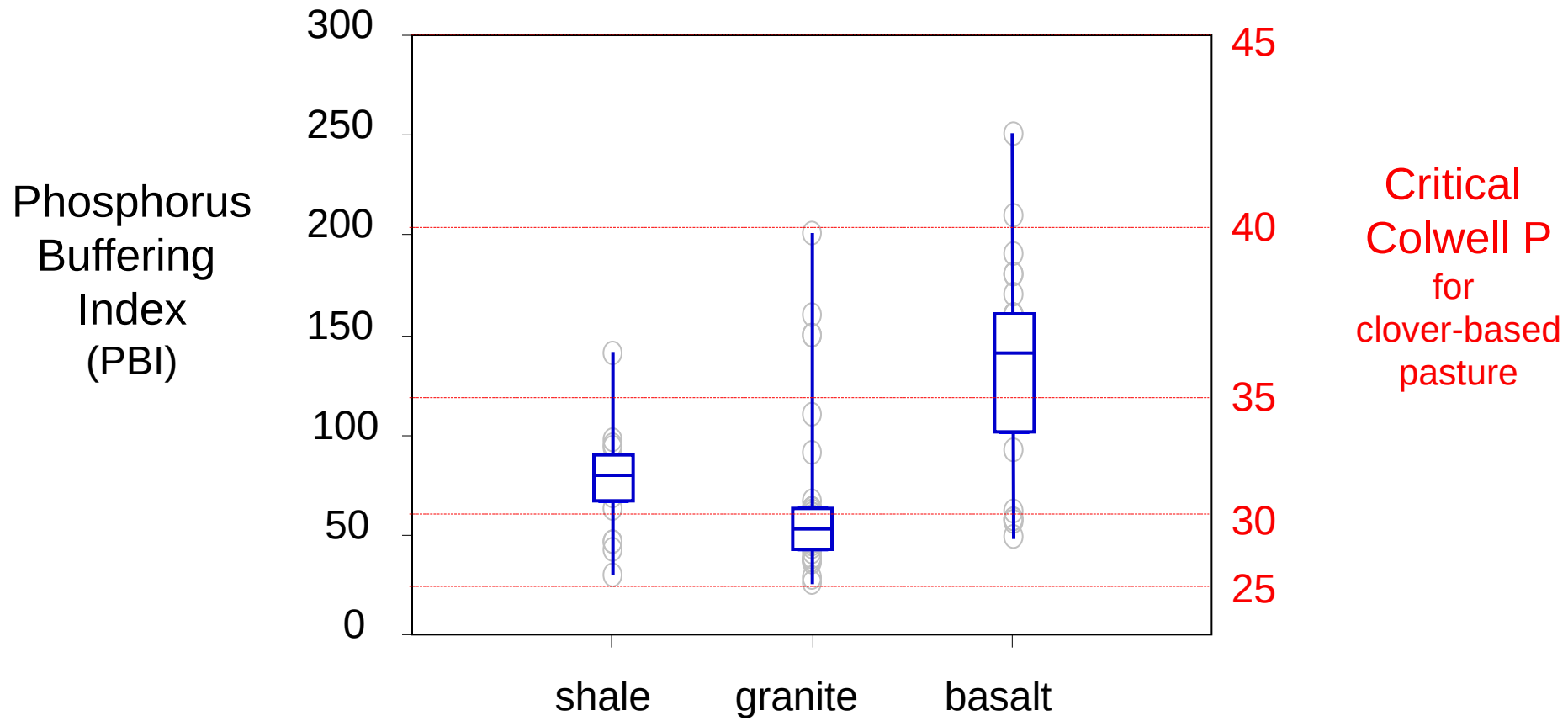
Aluminium
saturation
(% CEC)

40
35
30
25
20
15
10
5
0

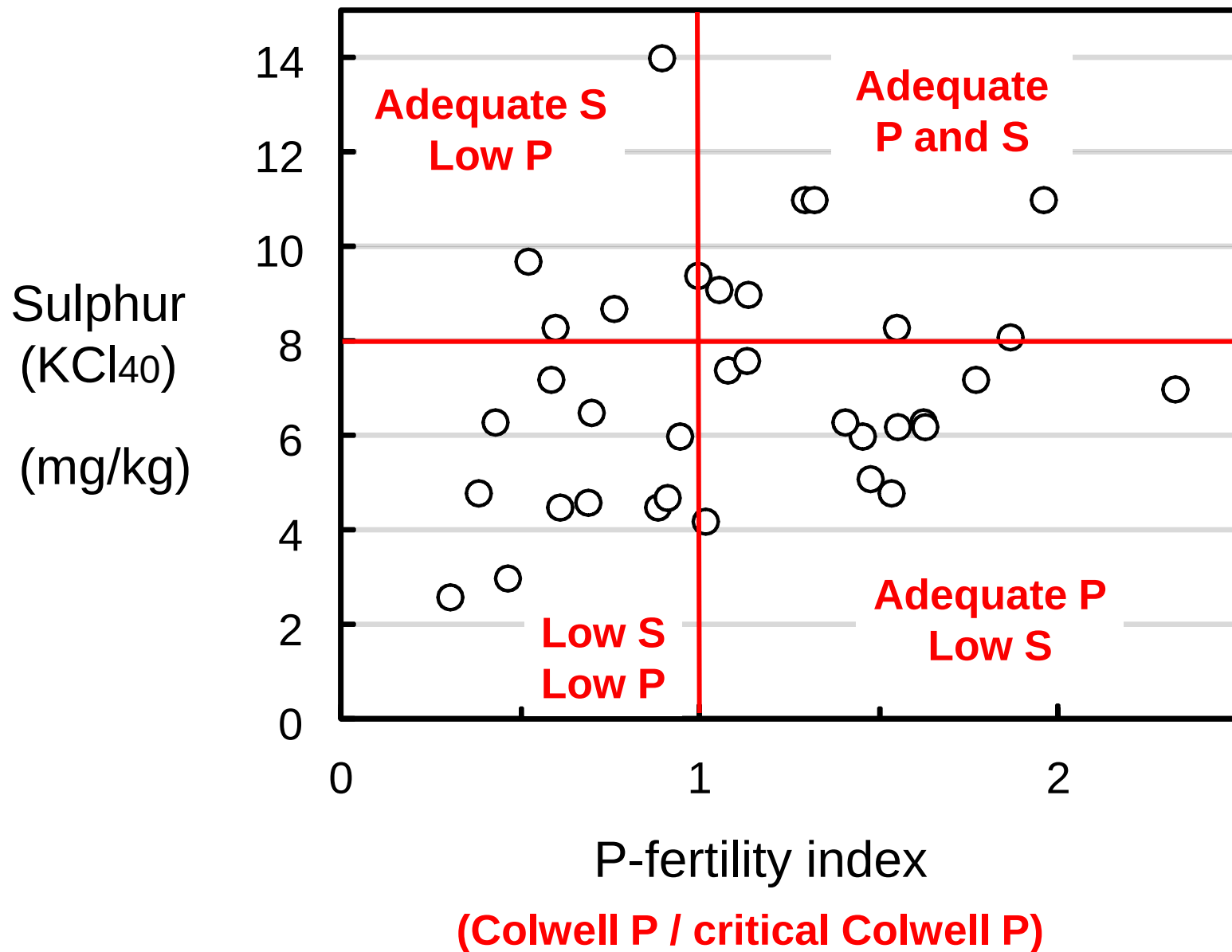
4.0 4.5 5.0 5.5
pH (CaCl₂)







Granite soils 2010



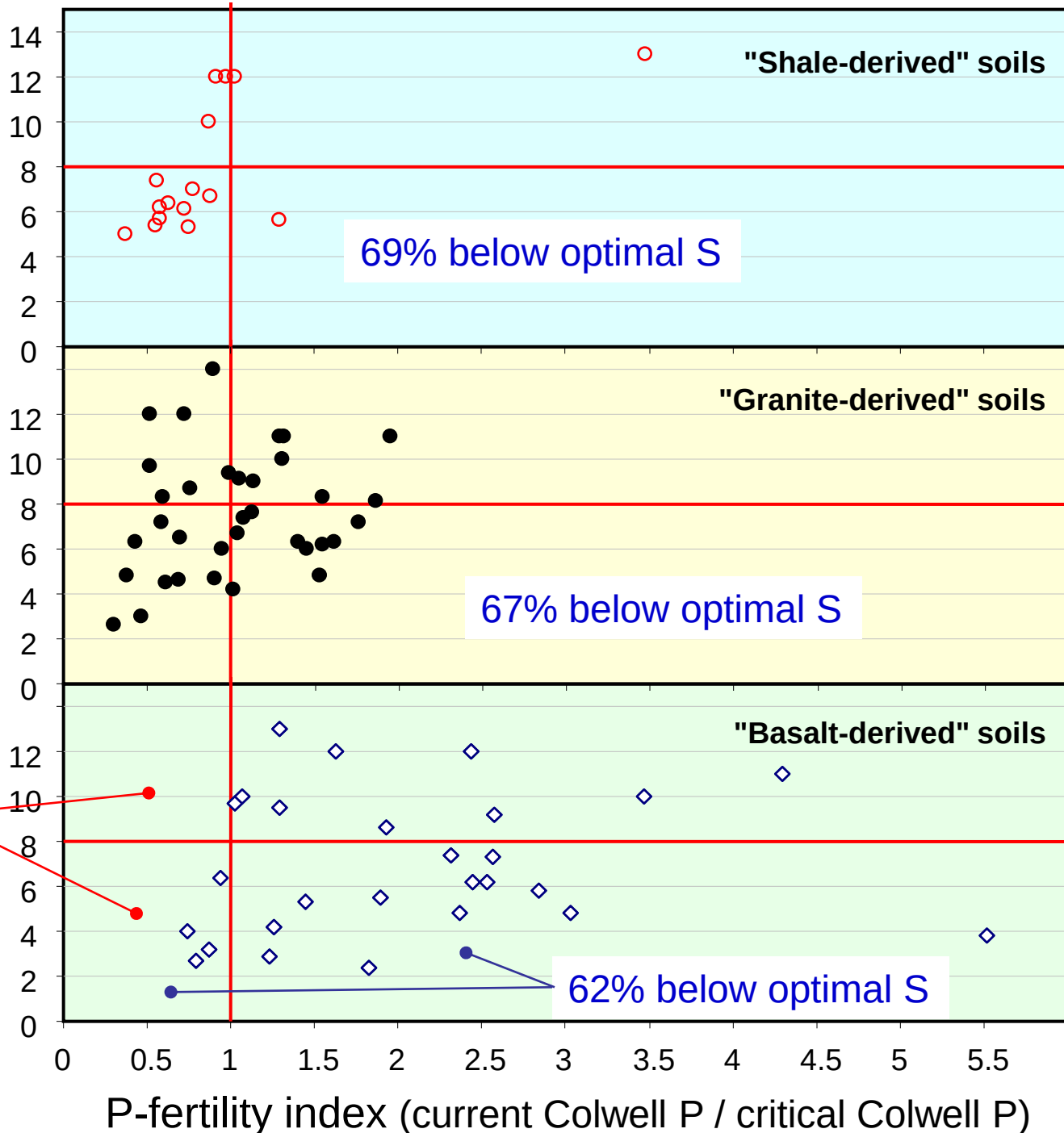
2010 results

81% below
optimal P

46% below
optimal P

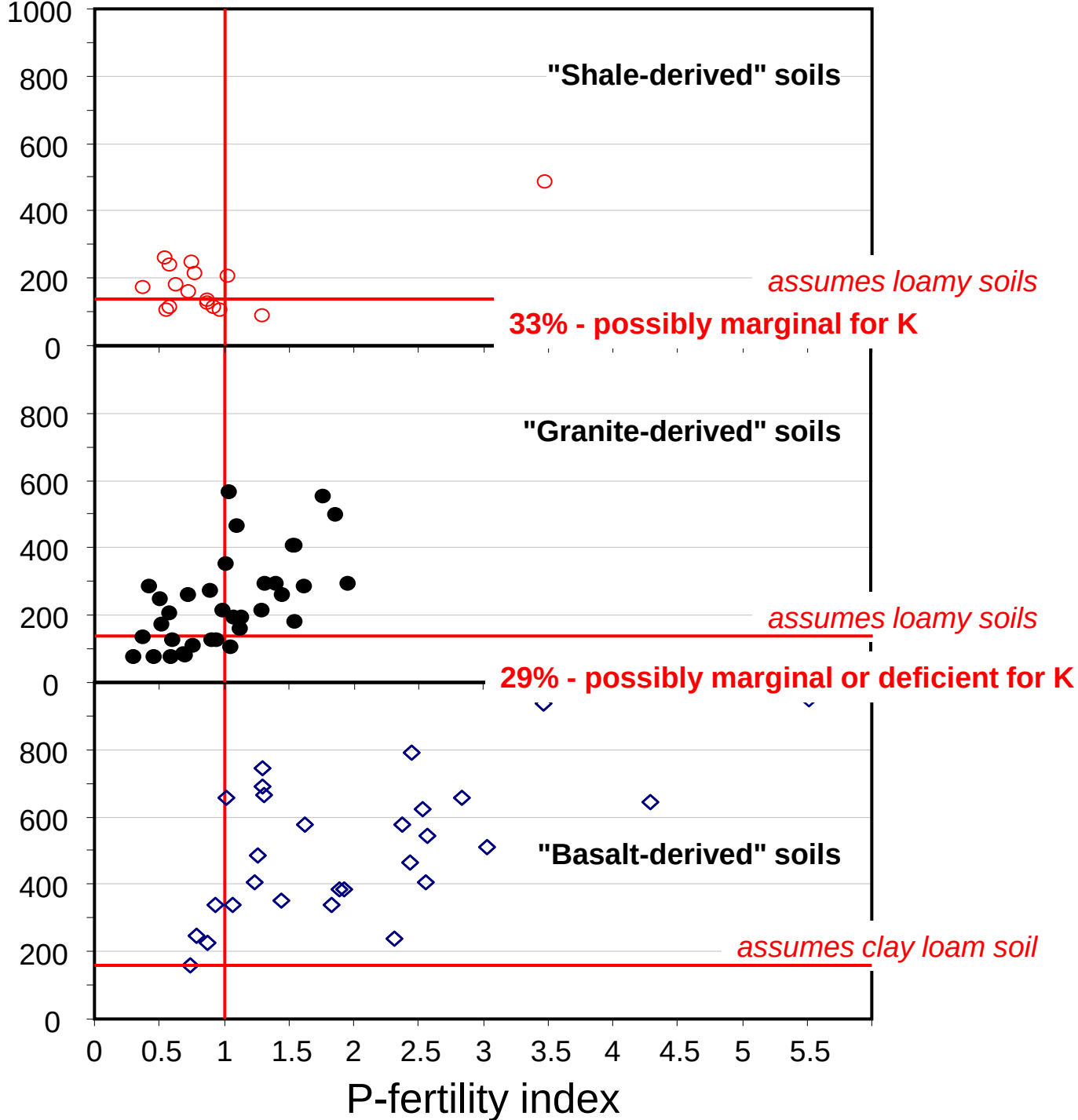
Sulphate-S
(KCl40)
mg/kg

8% below
optimal P

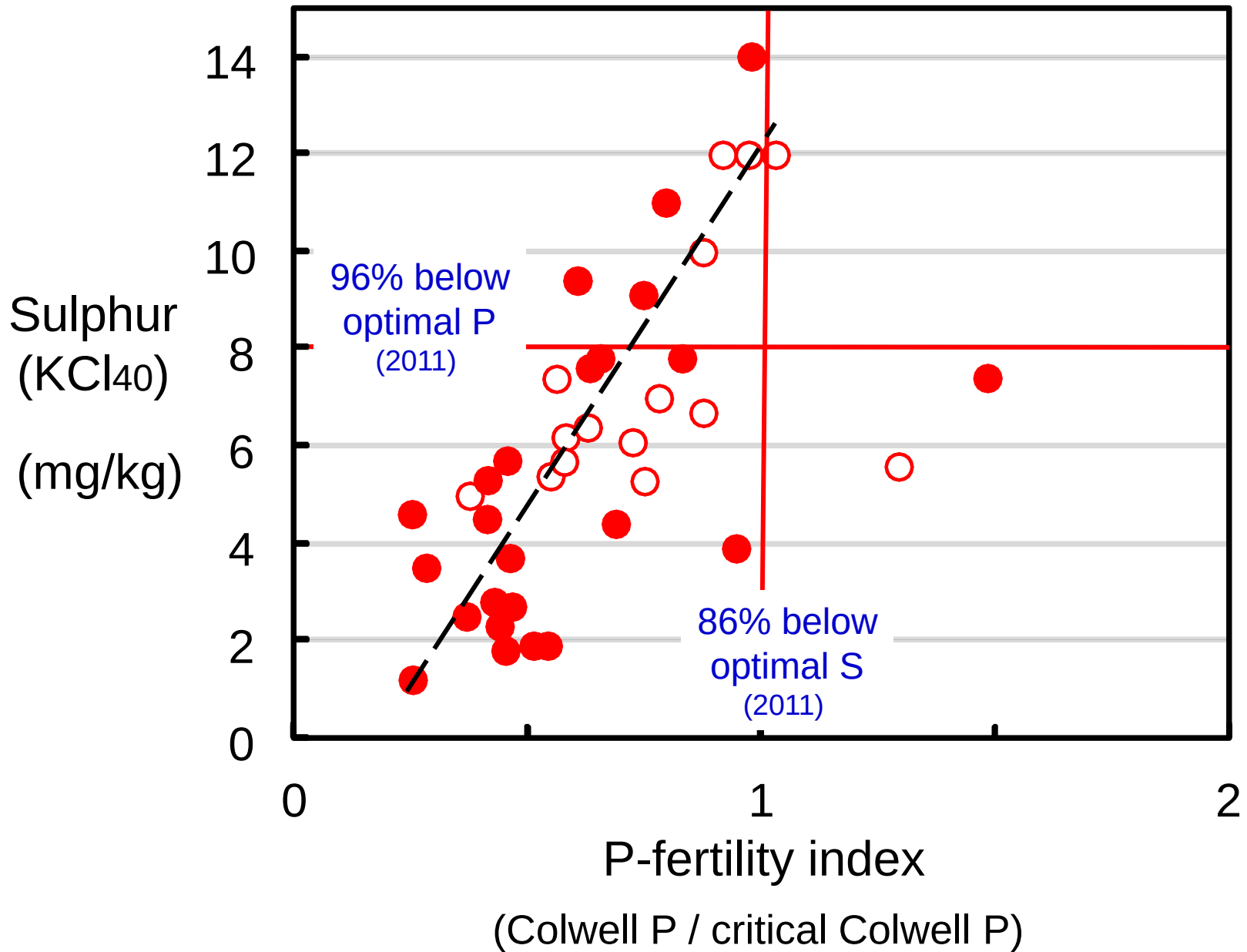


2010 results

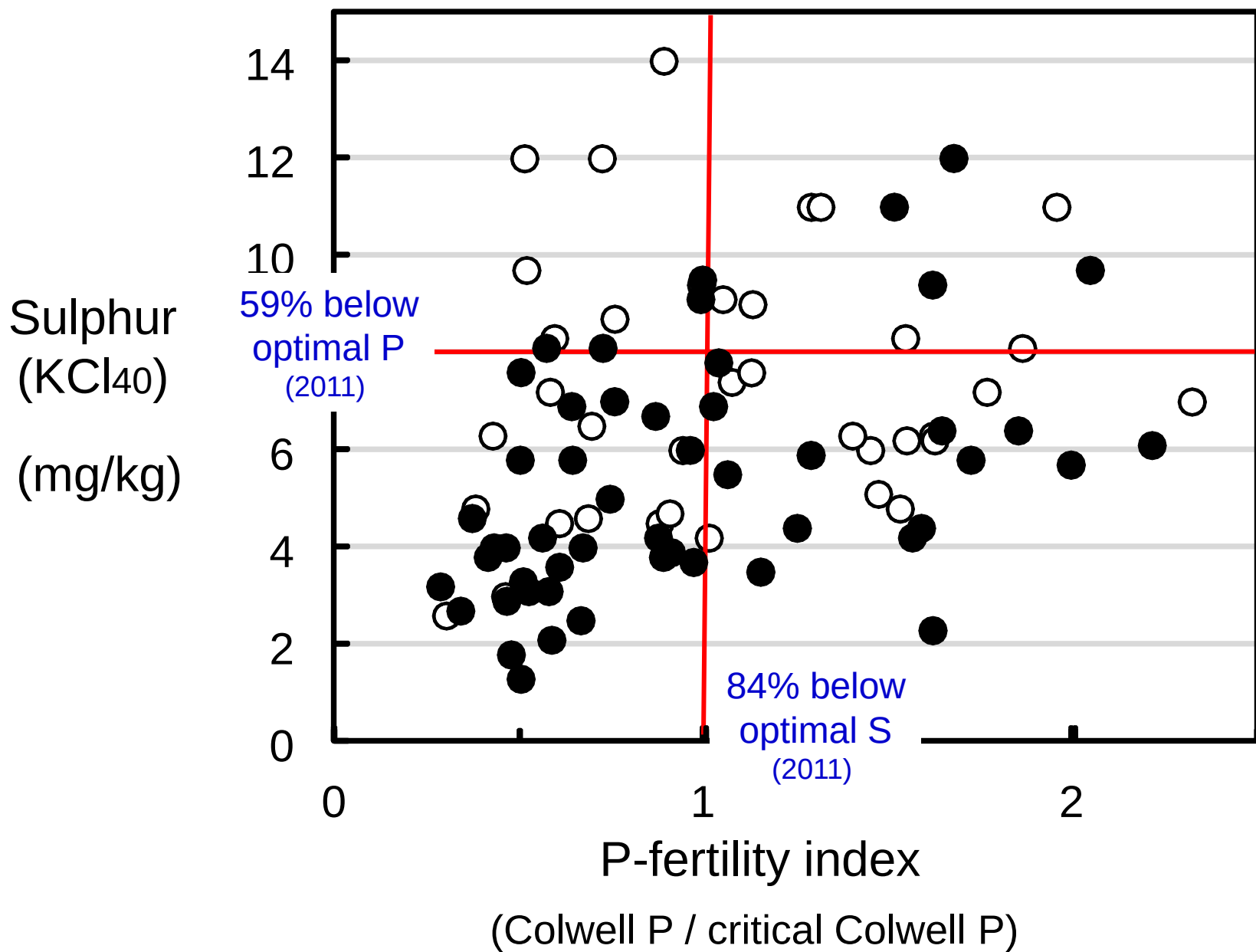
Available
potassium
(est Colwell K)
mg/kg

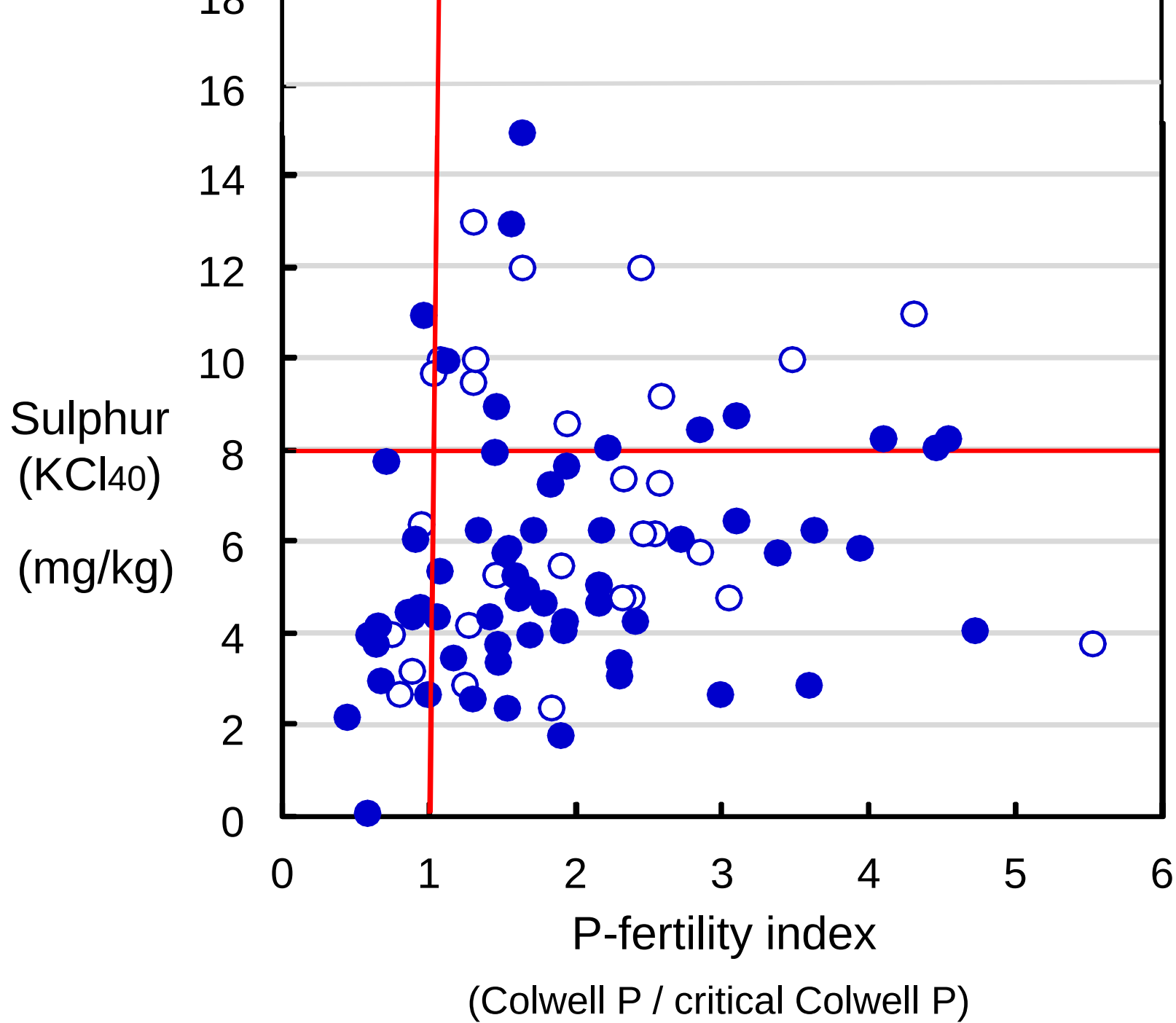


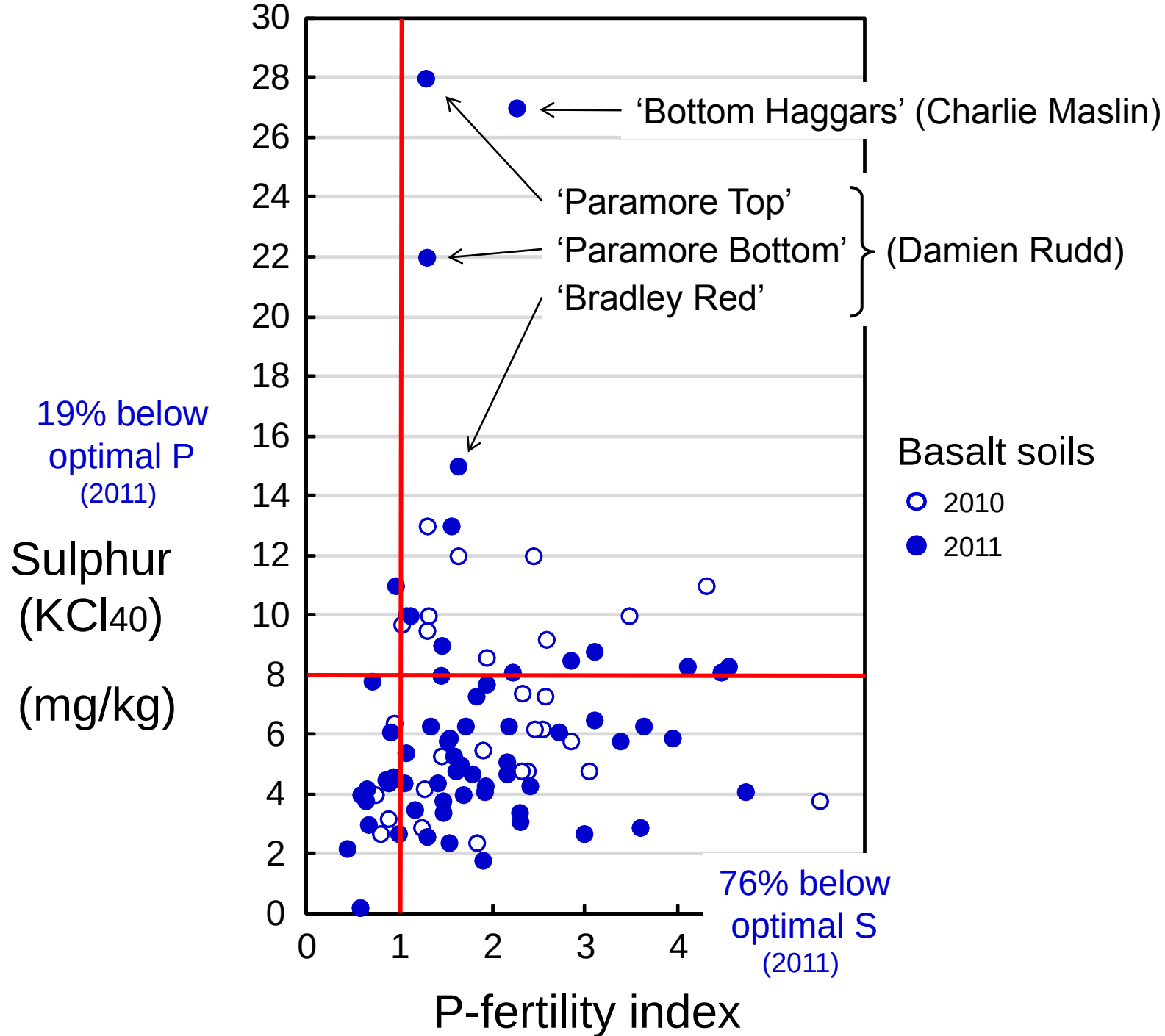
Shale (slate) soils ○ 2010 ● 2011



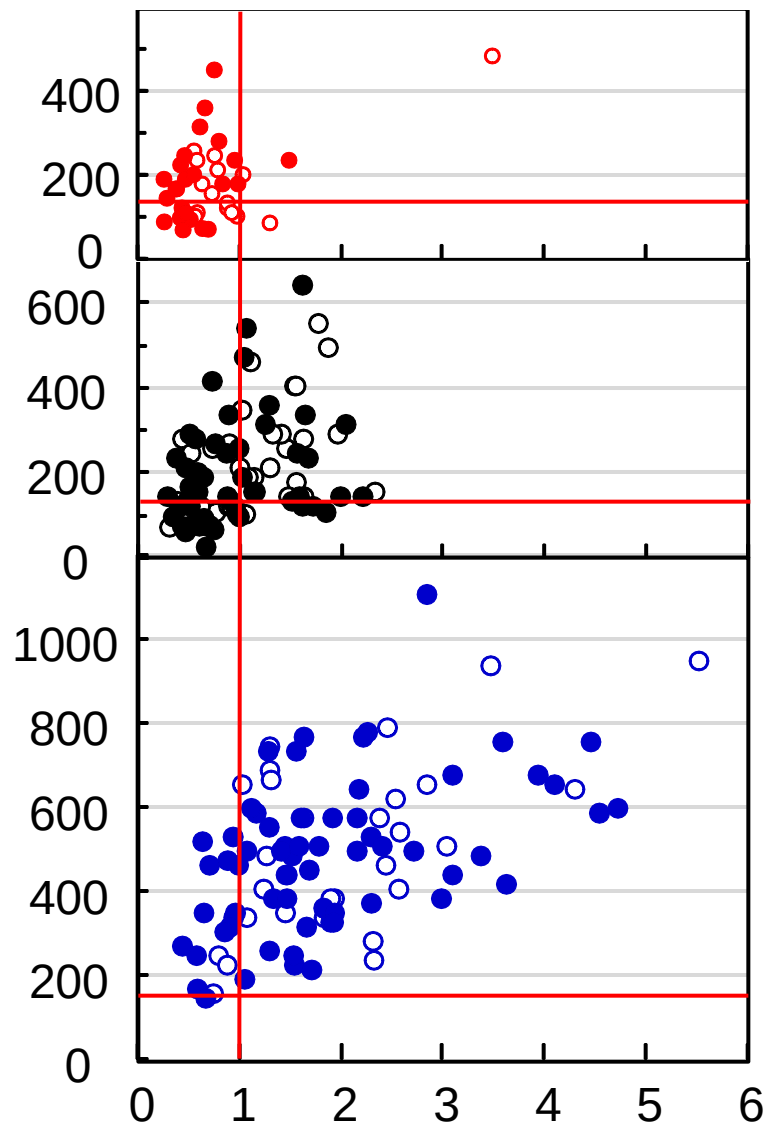
Granite soils ○ 2010 ● 2011







Colwell
Potassium
(est)
mg/kg



○ 2010
● 2011

Shale

33% below
optimal K
(2011)

○ 2010
● 2011

Granite

39% below
optimal K
(2011)

○ 2010
● 2011

Basalt

Conclusions from 2010/2011 data:

Basalt soils

8-19% below optimum for P
65-76% below optimum for S
Adequate to high K levels

Granite soils

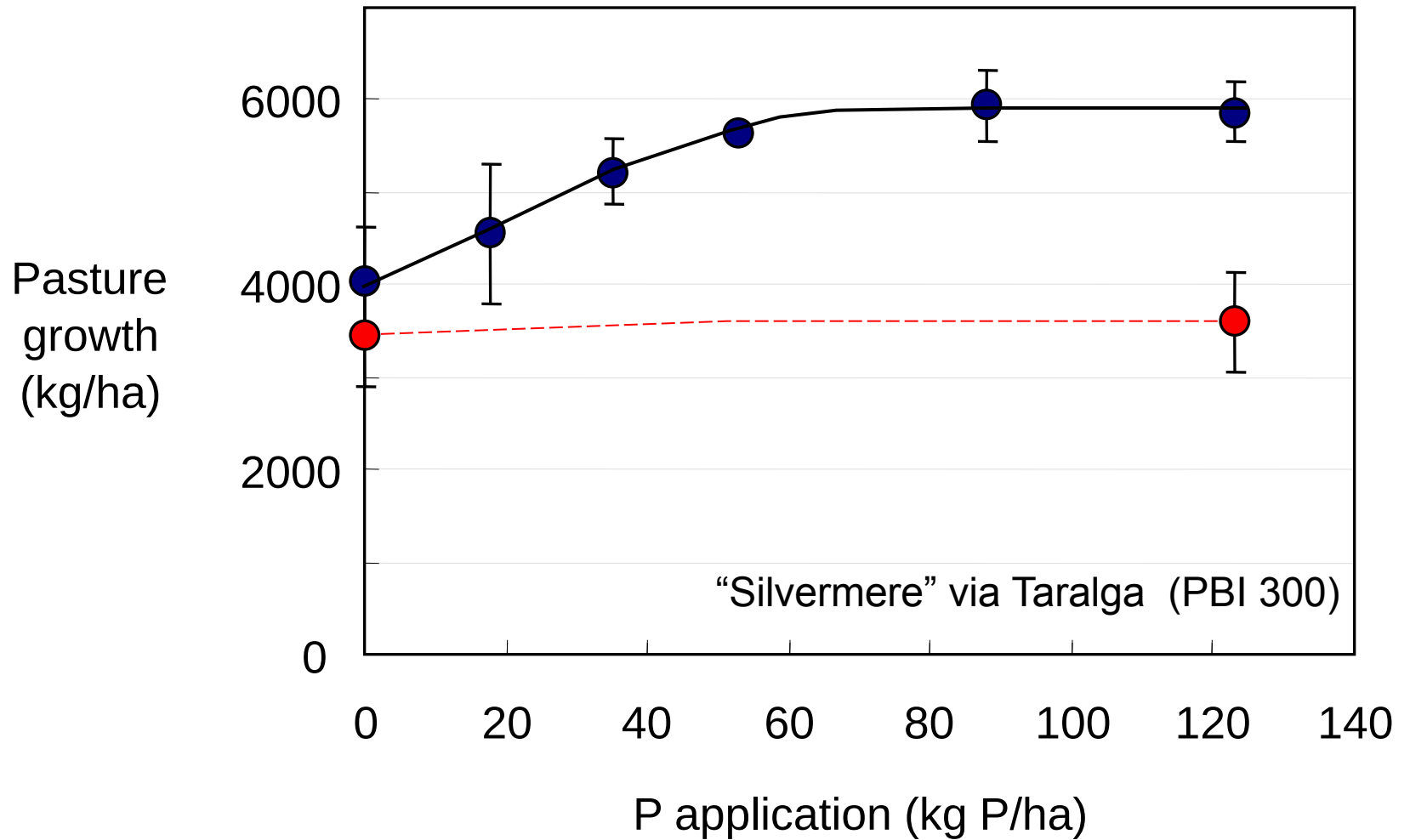
46-59% below optimum for P
65-84% below optimum for S
33% below optimum for K
Some soils may benefit from lime

Shale soils

81-96% below optimum for P
65-86% below optimum for S
33% below optimum for K
Some soils may benefit from lime

Bottom line: within these soil groups, paddocks can differ considerably
- *get to know your own soil !*

Impact of “other” nutrient limitations





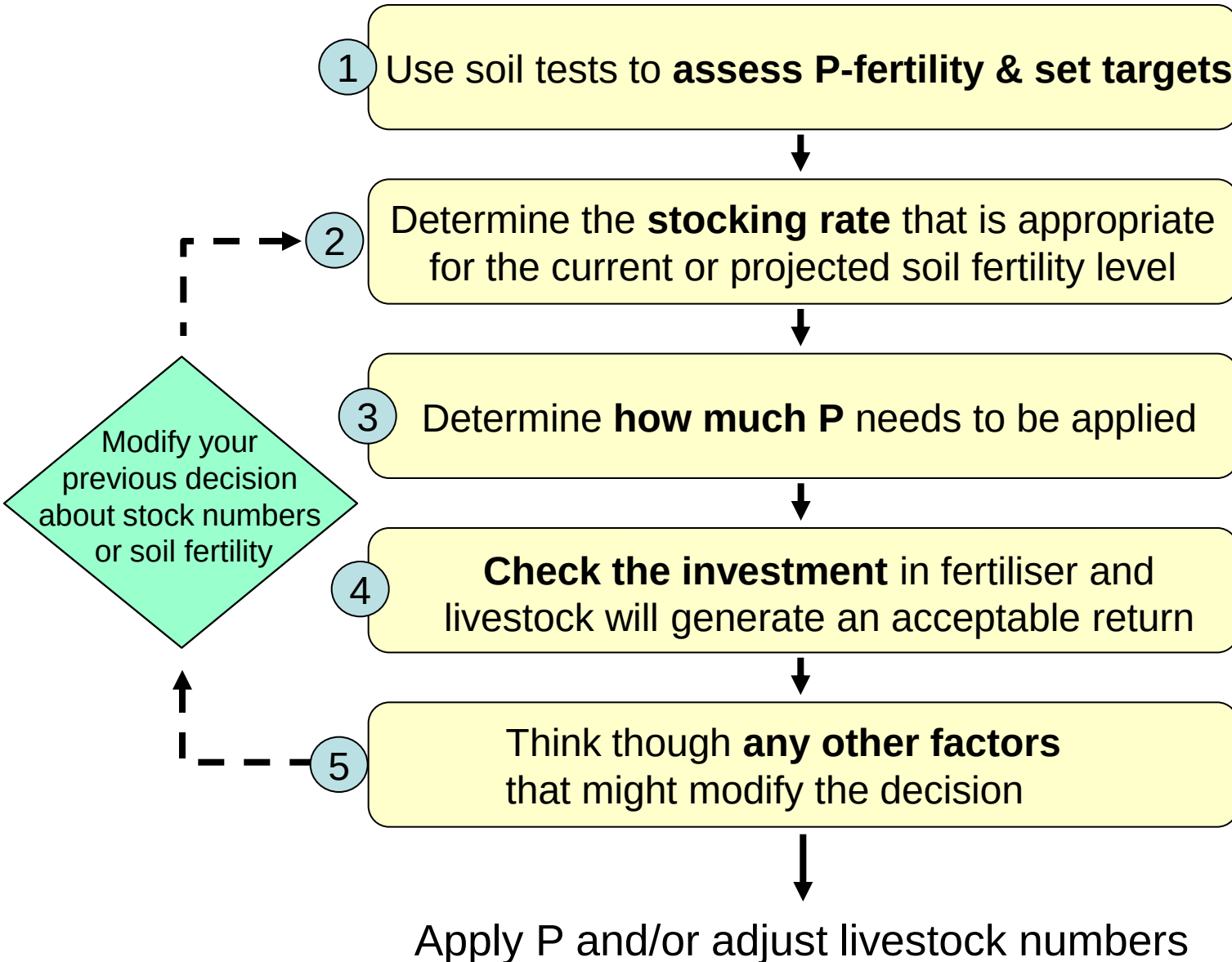
Fertiliser decisions

Targeting *optimal* soil fertility is fine, BUT....

- (i) need enough livestock to eat the extra grass,**
 - (ii) need clover in the pasture to ensure a response to the fertiliser.**
- 

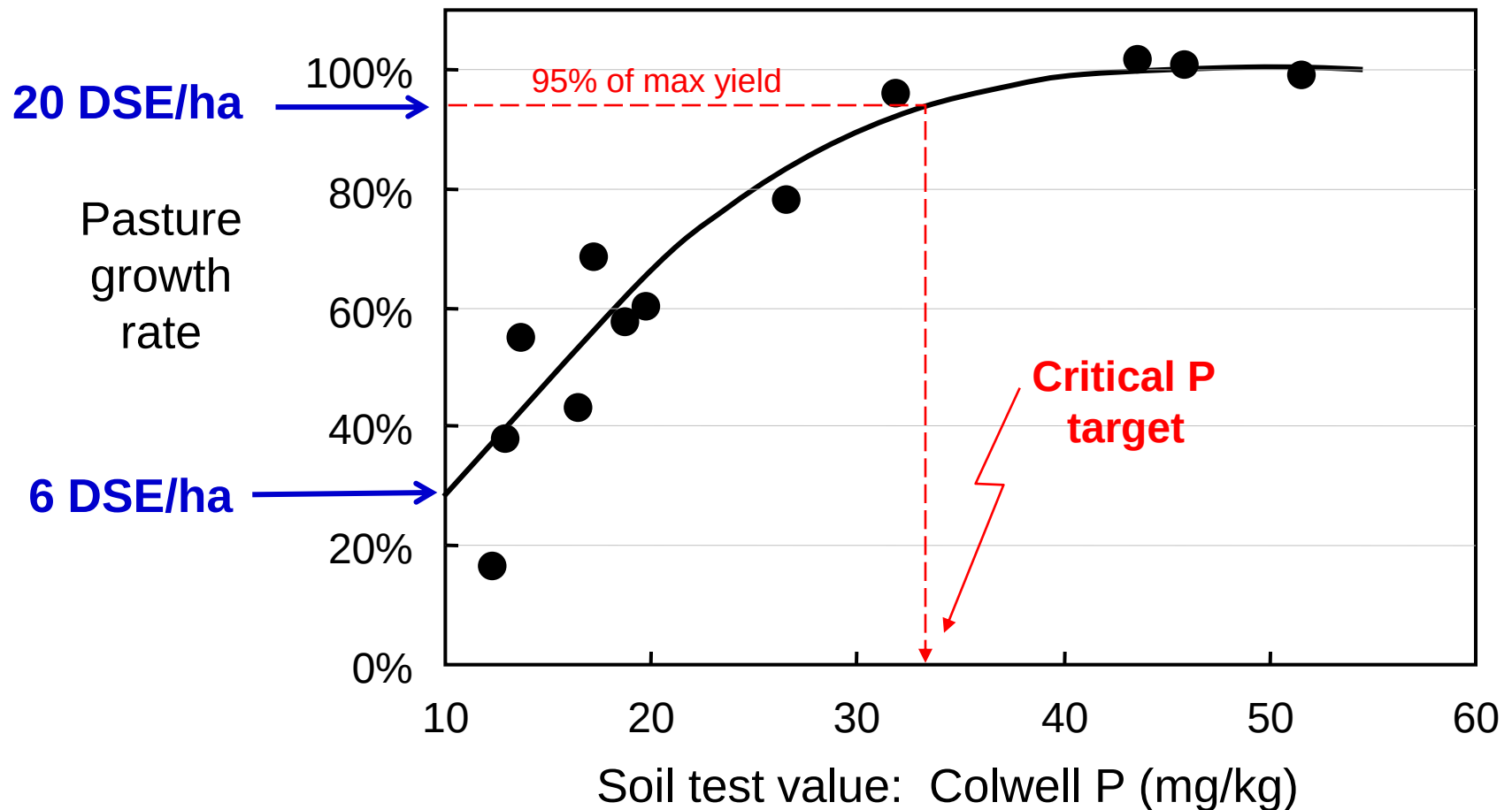
Lisa Phillips (granite) Soil Test	'Beesnest'		'Swimming hole'		'To Teds'	
	2010	2011	2010	2011	2010	2011
pH (CaCl ₂) Al (%CEC)	4.6 4%	4.7 2%	4.9 2%	4.9 2%	5.0 2%	5.0 2%
Phosphorus buffering index	48	62	67	60	43	43
<i>critical Colwell P (mg/kg)</i> <i>(predicted from PBI)</i>	29	30	31	30	28	28
Colwell P (mg/kg)	67	60	27	29	46	28
<i>critical Colwell K ~ 140 (mg/kg)</i> Colwell K _(est) (mg/kg)	158	147	124	105	147	99
<i>critical KCl₄₀-S: 8 (mg/kg)</i> KCl ₄₀ Sulphur (mg/kg)	7	5.7	4.5	3.7	6.2	9.5
Fertiliser since Oct 2010:	11 kg P/ha; 11 kg S/ha <i>(superphosphate)</i>		11 kg P/ha; 11 kg S/ha <i>(superphosphate)</i>		20 kg P/ha; 11 kg S/ha 10 kg K/ha <i>(Pasture8 & super)</i>	
Annual carrying capacity:						

Five Easy Steps



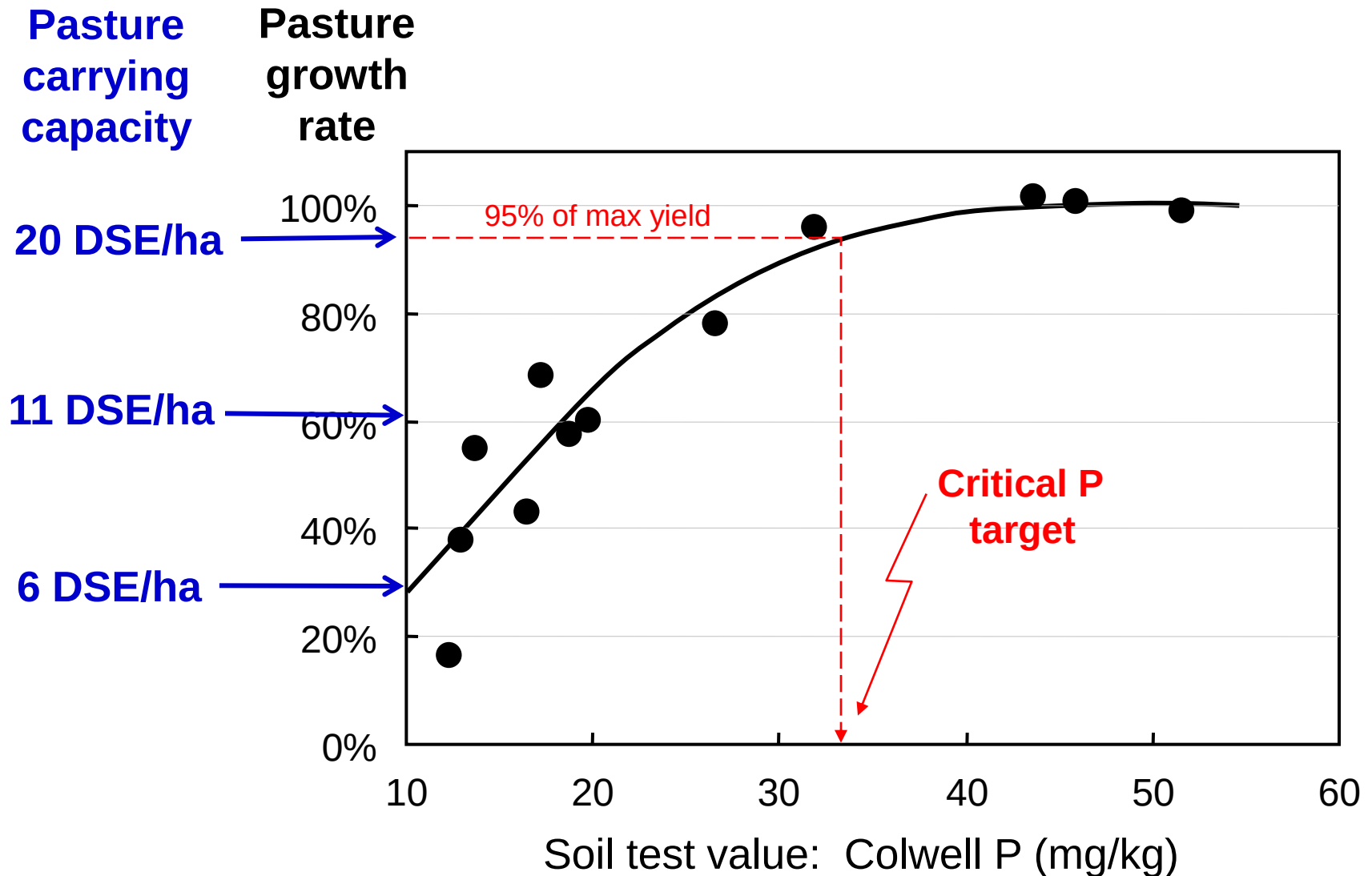
Response of clover-based pasture to phosphorus

(Bookham , NSW - 2001/2003)



Response of clover-based pasture to phosphorus

(Bookham , NSW - 2001/2003)



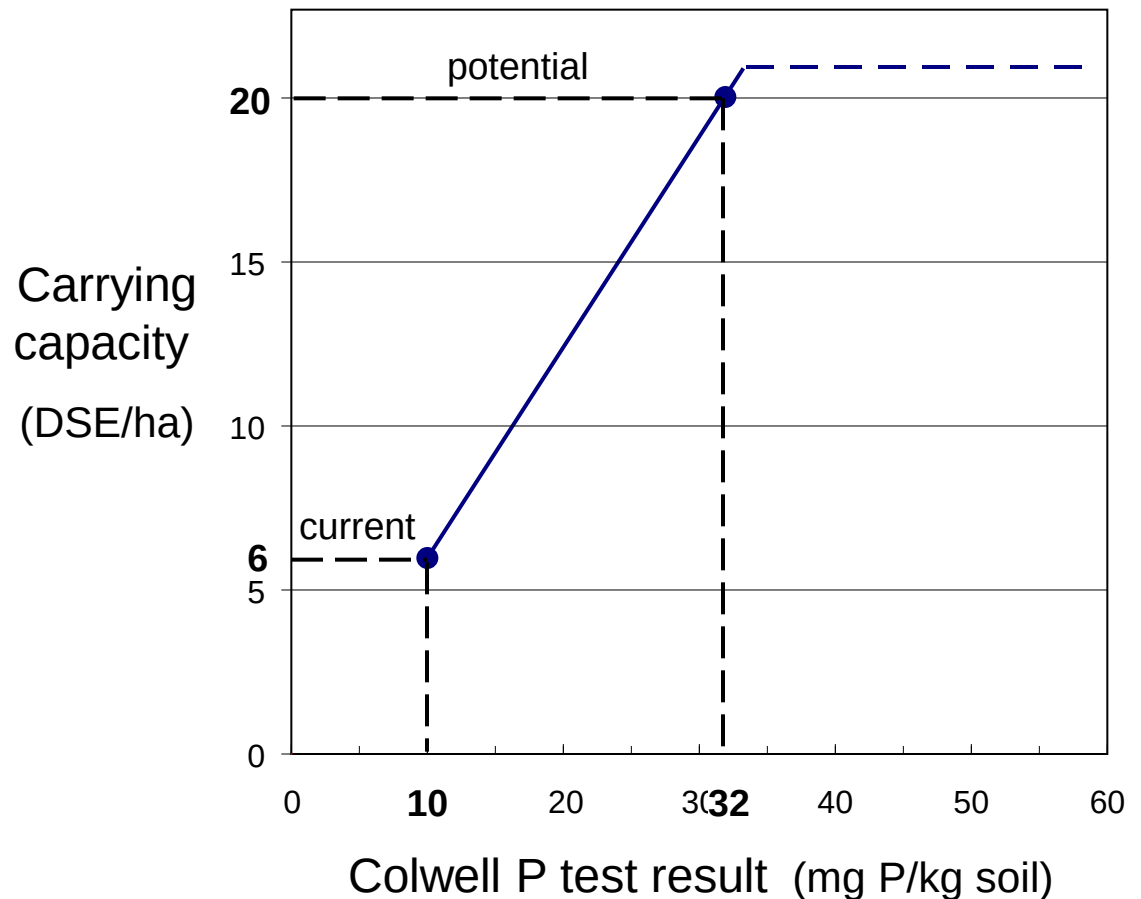
Current soil fertility
Colwell P = 10 mg P/kg

Current carrying capacity
6 DSE/ha (6 Merino wethers/ha)



**PBI = 80 means crit. Colwell P
for near max. pasture growth**
= 32 mg P/kg soil

Potential carrying capacity
20 DSE/ha (GS = 7.5 mths)



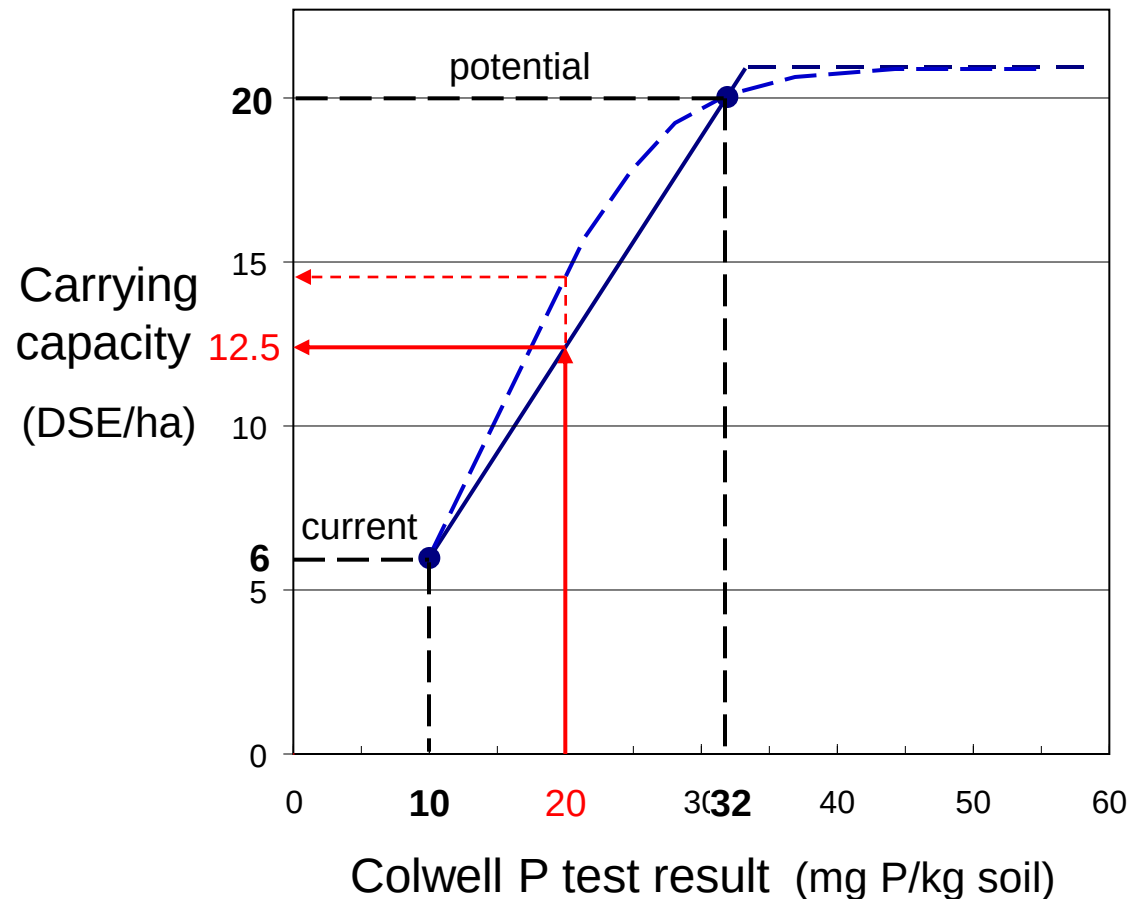
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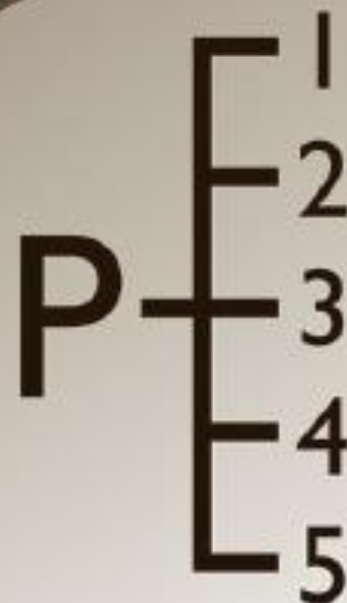
**Critical Colwell P
for near max. pasture growth**
= 32 mg P/kg soil

Potential carrying capacity
20 DSE/ha (GS = 7.5 mths)



Five easy steps

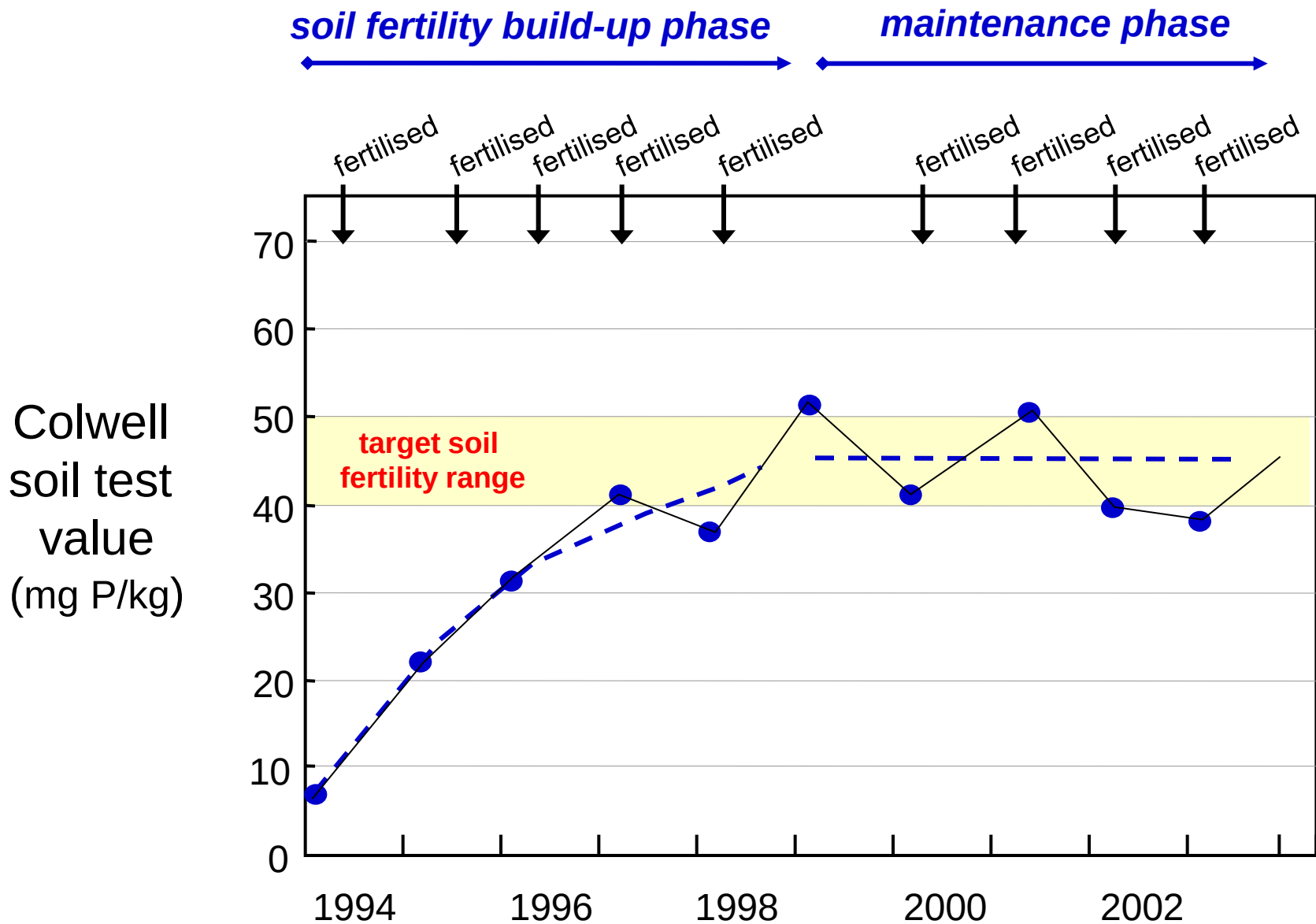
to ensure you are making money from superphosphate



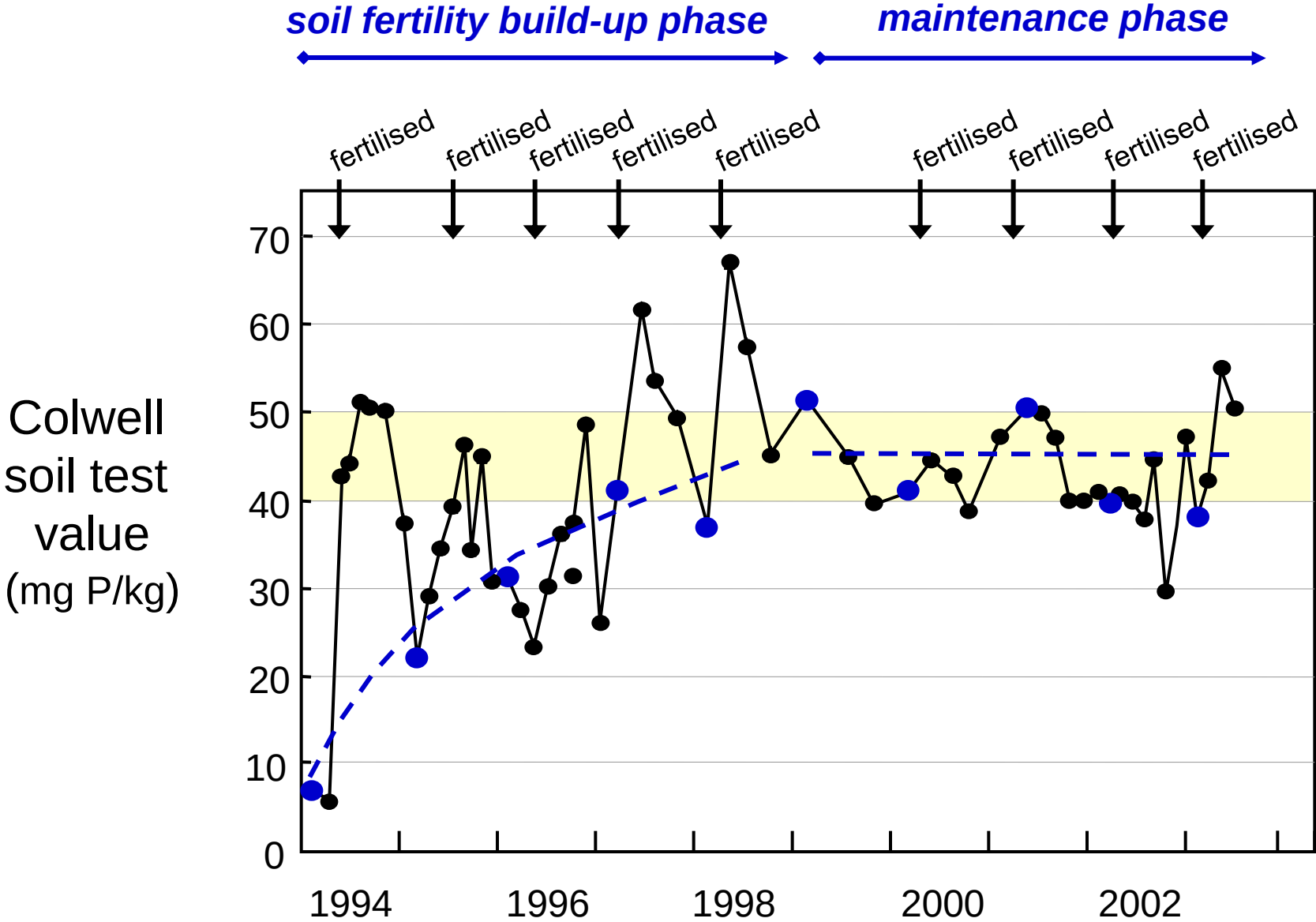
“Five Easy Steps” booklet and tool available for download from:
www.mla.com.au/nutrients

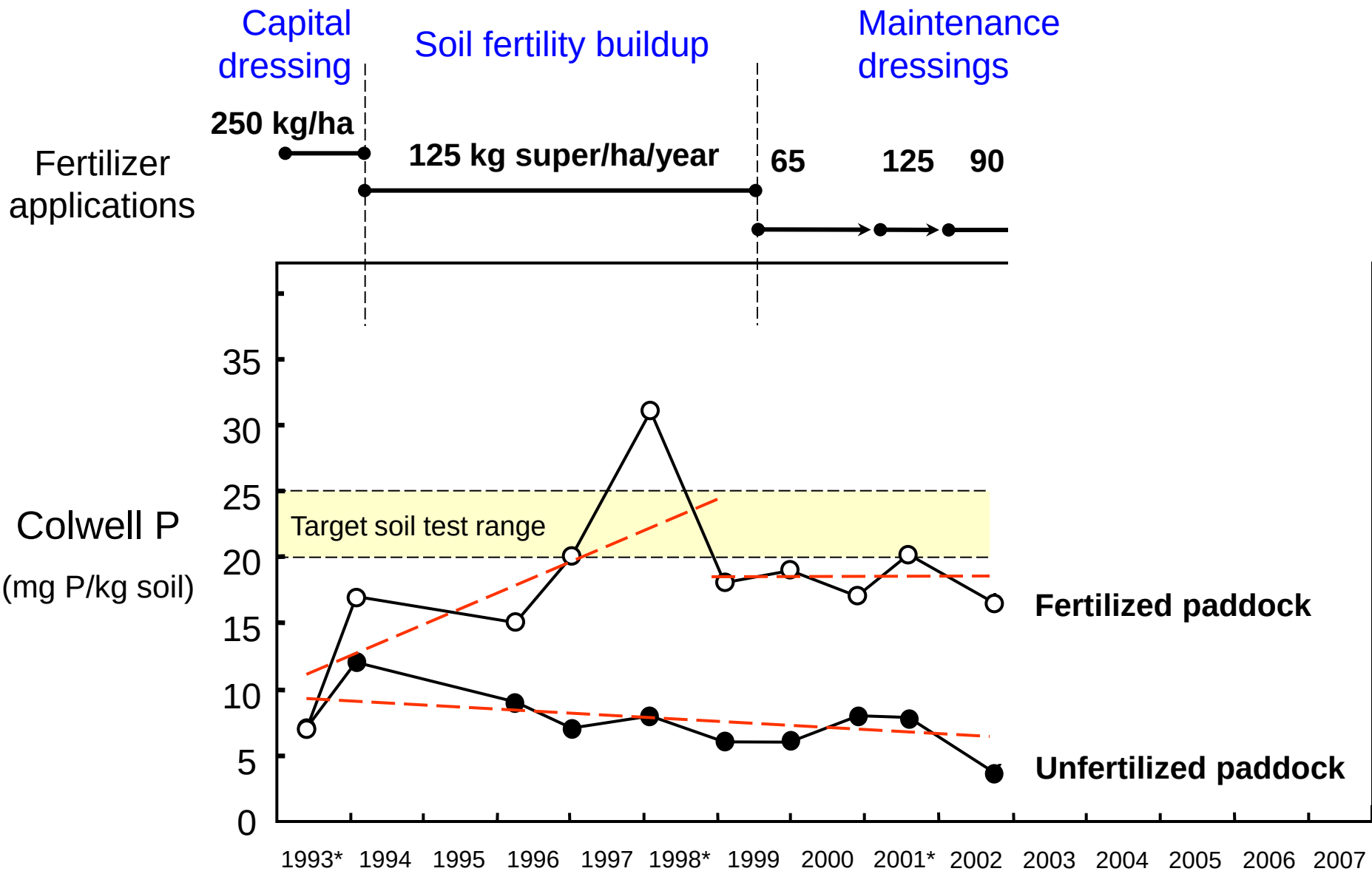


A final word on soil testing



NOTE: importance of regular soil testing





* 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

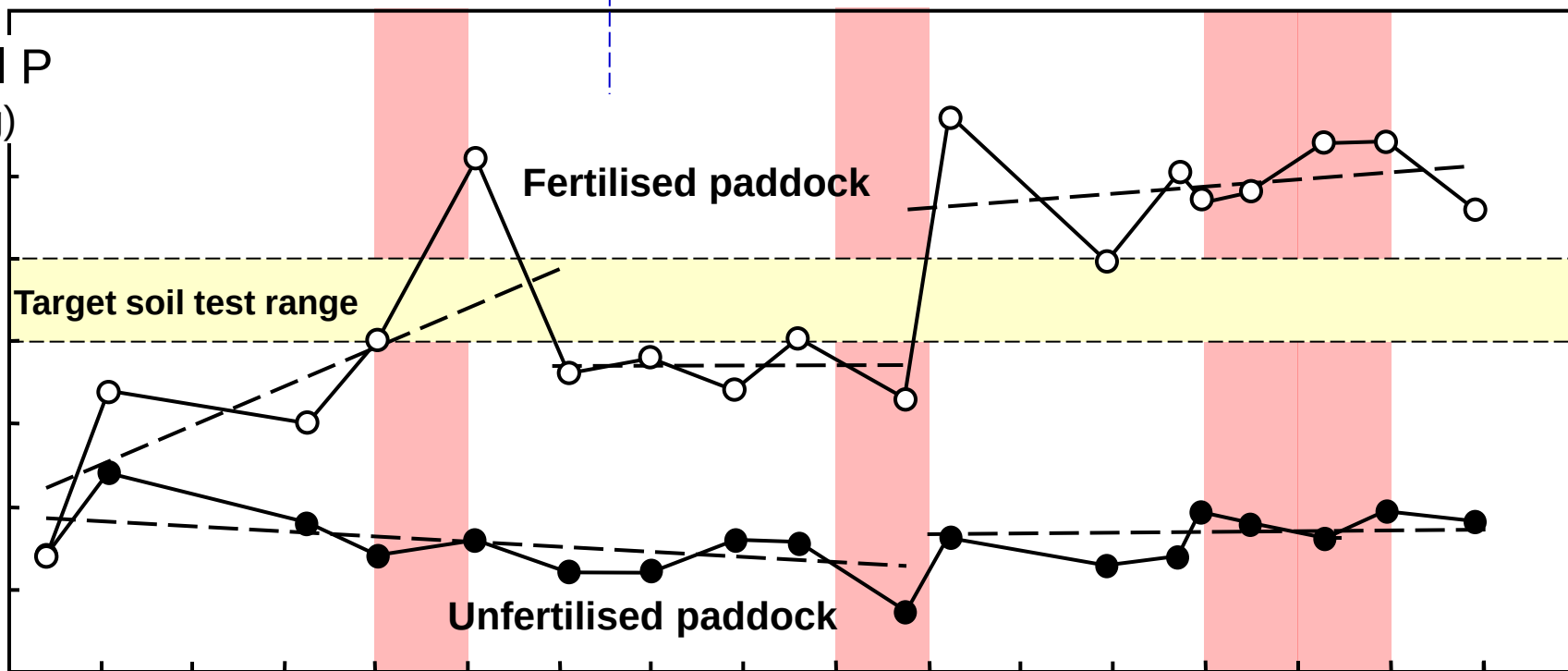
Fertilised paddock

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



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.

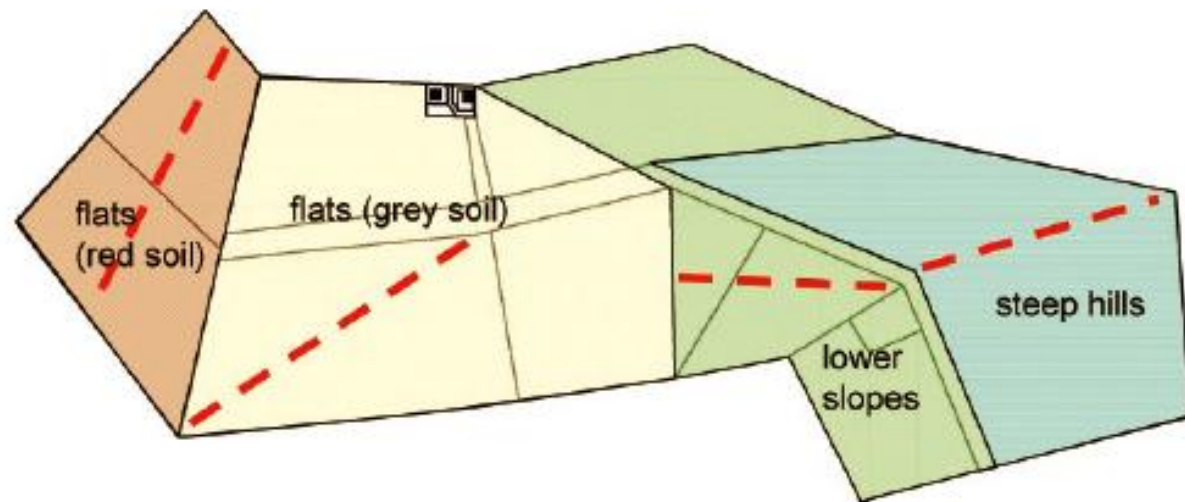
ii. **Mark the site** – Keep a record of the monitor area or transect for future testing. You may do this by noting where you started and finished and the route taken, by taking a series of GPS readings, etc.

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

