

Phosphorus Retention Index (PRI)

The majority of Western Australian soils have relatively low phosphate fixing capacities when compared with soils from Eastern Australia and overseas. This is mainly due to their coarse texture resulting from long periods of weathering. Some coastal soils have almost no capacity to hold applied phosphorous (and other nutrients). For example, the Peel-Harvey catchment. At the other extreme are the gravels and loams of the Darling Plateau - including the Jarrah forest soils of the southwest.

CLASSIFICATION OF P-SORBING PROPERTIES OF WA SOILS BASED UPON PRI		
PRI	CLASSIFICATION	SOIL TYPES
<2	Very weakly adsorbing. (Applied Phosphorus is readily available to the plant, and leachable in higher rainfall.)	Grey sands, Bassendean sands, Badgingarra sands, Wilbay sands
2 - 5	Weakly adsorbing	Grey brown sands, deep duplex soils, Lancelin sands, Jerramungup sands, Coolup sands, Esperance sands
5 - 20	Moderately adsorbing	Grey loamy sands, yellow-brown sands, Coolup loamy sands, Spearwood sands, Dandaragan red earths, Dongara black wattle, Wongan Hills, Merredin sandy loams
20 - 70	Strongly adsorbing	Lateritic gravels, sandy loams, Kununurra clays, Darling Range loams
>70	Very strongly adsorbing. (Phosphorus is “tied up” by elements in the soil, becoming unavailable to the plant.)	Lateritic loams, iron rich peat, karri loams, podzol hardpans

Example: The effect of changing PRI on Phosphorus recommendations.

PRI	P RECOMM	YIELD		
		LOW	MEDIUM	HIGH
1		6	6	6
5		14	18	21
20		28	35	39
75		28	35	39

Trials on high PRI soils have shown the importance of placing some of the Phosphorus close to the seed, not top dressing or deep banding all of the applied P. ([See Trials](#))

In Western Australia the major contributors to high PRI are:

- Reactive Iron
- High free Calcium levels
- Acid soils releasing Aluminium
- High Zinc levels
- Organic carbon

There appears to be no method of releasing phosphorus once it is “locked up” by one of these P sorbing agents.

However, the PRI can be reduced, by saturating the capacity of the soil to absorb further phosphorus ions. Applying high rates of P will eventually bring the PRI levels down.

This series of farmer soil tests clearly shows the increase of P (using up to 30kg/ha of P annually) and the reduction of the PRI as sorption sites become saturated. The farm is on the Albany Highway near Crossmans.

Paddock And Season	Collwell P (ppm)	PRI	Paddock And Season	Collwell P (ppm)	PRI
2			9		
1995	35	70	1996	26	40
1999	45	42	1997	36	37
3			10		
1995	19	49	1995	26	40
1999	45	42	1996	36	37
7			11		
1994	17	99	1994	13	110
1999	32	36	1998	23	40
8			13		
1994	15	179	1994	25	60
1996	17	51	1997	25	45
1997	30	44	1998	37	30
1998	35	36	1999	35	33

What we don't know is how much applied P would be required in this situation to bring the PRI down to below, say, 15 (which is the moderate/high threshold).