Using soil test results to calculate phosphorus rate for high rainfall clover pastures

Use these tables to select the correct rate of phosphorus (P) fertiliser to add to your soil-tested paddocks.

These tables are explained in the [Phosphorus for high rainfall clover pastures](https://www.agric.wa.gov.au/n/2300) web page.

[Table 1 Conversion of different measures of the P-holding capacity (sorption) of soil](#Table1)

[Table 2 Units of P (kg/ha) required for an exceedingly low P-sorbing soil, PRI <0.35, PBI <5, reactive iron <100](#Table2)

[Table 3 Units of P (kg/ha) required for an exceptionally low P-sorbing soil with a PRI 0.35–1, PBI 5–10, reactive iron 100–200](#Table3)

[Table 4 Units of P (kg/ha) required for an extremely low P-sorbing soil with a PRI 1–2, PBI 10–15, reactive iron 200–280](#Table4)

[Table 5 Units of P (kg/ha) required for a very, very low P-sorbing soil with a PRI 2–9, PBI 15–35, reactive iron 280–650](#Table5)

[Table 6 Units of P (kg/ha) required for a very low P-sorbing soil with a PRI 9–28, PBI 35–70, reactive iron 650–1250](#Table6)

[Table 7 Units of P (kg/ha) required for a low P-sorbing soil with a PRI 28–87, PBI 70–140, reactive iron 1250–2500](#Table7)

[Table 8 Units of P (kg/ha) required for a moderate P-sorbing soil with a PRI 87–275, PBI 140–280, reactive iron 2500–4950](#Table8)

[Table 9 Units of P (kg/ha) required for a high P-sorbing soil with a PRI 275–1680, PBI 280–840, reactive iron 4950–14500](#Table9)

[Table 10 For the top 10cm of different soils, phosphorus (P) sorption category, capacity of soil to sorb P measured using reactive iron, PRI and PBI and critical Colwell soil test P values (Critical P) to achieve 95% of maximum production of clover based pastures in high rainfall (>600mm) areas](#Table10)

[Table 11 For the top 10cm of different soils, PBI, and critical Colwell soil test P values to achieve 90%, 85% and 80% of maximum production of clover based pastures in high rainfall (>600mm) areas](#Table11)

[Table 12 Critical plant phosphorus test values for clover and ryegrass](#Table12)

[Table 13 Gradual decline in Colwell soil test phosphorus (P) values when no phosphorus fertiliser was applied since 2000 and pasture dry matter consumed by dairy cows each year](#Table13)

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**Acronyms used in these tables**

PRI phosphorus retention index

PBI phosphorus buffering index

Table 1 Conversion of different measures of the P-holding capacity (sorption) of soil

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| P sorption category | Reactive iron (mg/kg) | PRIA (L/g) | PBIB | Refer to |
| Exceedingly low | 0–100 | <0.35 | <5 | Table 2 |
| Exceptionally low | 100–200 | 0.35–1 | \*5–10 | Table 3 |
| Extremely low | 200–280 | 1–2 | \*10–15 | Table 4 |
| Very, very low | 280–650 | 2–9 | \*15–35 | Table 5 |
| Very low | 650–1250 | 9–28 | \*35–70 | Table 6 |
| Low | 1250–2500 | 28–87 | \*70–140 | Table 7 |
| Moderate | 2500–4950 | 87–275 | \*140–280 | Table 8 |
| High | 4950–14500 | 275–1680 | \*280–840 | Table 9 |

A ranges estimated from reactive iron, PRI and PBI data collected by Summers and Weaver (2006)  
B adapted from Victorian Department of Primary Industries (2007) by DM Weaver and RN Summers

Table 2 Units of P (kg/ha) required for an exceedingly low P-sorbing soil, PRI <0.35, PBI <5, reactive iron <100

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Soil test P (mg/kg) | <2 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 |
| Equivalent P applied to virgin soil (kg/ha) | 0 | 5 | 9 | 14 | 18 | 23 | 28 | 32 | 37 | 41 | 46 |
| Yield with no P applied % | 0 | 46 | 70 | 84 | 91 | 95 | 97 | 99 | 99 | 100 | 100 |
| Yield target 60% | 7 | 4 | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Yield target 65% | 7 | 4 | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Yield target 70% | 7 | 4 | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Yield target 75% | 10 | 7 | 3 | No data | No data | No data | No data | No data | No data | No data | No data |
| Yield target 80% | 12 | 9 | 5 | No data | No data | No data | No data | No data | No data | No data | No data |
| Yield target 85% | 14 | 11 | 7 | 2 | No data | No data | No data | No data | No data | No data | No data |
| Yield target 90% | 16 | 13 | 9 | 4 | No data | No data | No data | No data | No data | No data | No data |
| Yield target 95% | 21 | 18 | 14 | 9 | 5 | No data | No data | No data | No data | No data | No data |
| Yield target 98% | 28 | 25 | 21 | 16 | 12 | 7 | No data | No data | No data | No data | No data |

Table 3 Units of P (kg/ha) required for an exceptionally low P-sorbing soil with a PRI 0.35–1, PBI 5–10, reactive iron 100–200

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Soil test P (mg/kg) | <2 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 |
| Equivalent P applied to virgin soil (kg/ha) | 0 | 5 | 9 | 14 | 18 | 23 | 28 | 32 | 37 | 41 | 46 |
| Yield with no P applied % | 0 | 33 | 55 | 70 | 80 | 87 | 91 | 94 | 96 | 97 | 98 |
| Yield target 60% | 10 | 7 | 3 | No data | No data | No data | No data | No data | No data | No data | No data |
| Yield target 65% | 12 | 9 | 5 | No data | No data | No data | No data | No data | No data | No data | No data |
| Yield target 70% | 12 | 9 | 5 | No data | No data | No data | No data | No data | No data | No data | No data |
| Yield target 75% | 14 | 11 | 7 | 2 | No data | No data | No data | No data | No data | No data | No data |
| Yield target 80% | 16 | 13 | 9 | 4 | No data | No data | No data | No data | No data | No data | No data |
| Yield target 85% | 21 | 18 | 14 | 9 | 5 | No data | No data | No data | No data | No data | No data |
| Yield target 90% | 26 | 23 | 19 | 14 | 10 | 5 | No data | No data | No data | No data | No data |
| Yield target 95% | 33 | 30 | 26 | 21 | 17 | 12 | 7 | 3 | No data | No data | No data |
| Yield target 98% | 44 | 41 | 37 | 32 | 28 | 23 | 18 | 14 | 9 | 5 | No data |

Table 4 Units of P (kg/ha) required for an extremely low P-sorbing soil with a PRI 1–2, PBI 10–15, reactive iron 200–280

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Soil test P (mg/kg) | <2 | 2 | 4 | 6 | 8 | 10 | 12 | 15 | 18 | 20 | 25 |
| Equivalent P applied to virgin soil (kg/ha) | 0 | 5 | 9 | 14 | 18 | 23 | 28 | 35 | 41 | 46 | 58 |
| Yield with no P applied % | 0 | 26 | 46 | 60 | 71 | 78 | 84 | 90 | 94 | 95 | 98 |
| Yield target 60% | 12 | 9 | 5 | No data | No data | No data | No data | No data | No data | No data | No data |
| Yield target 65% | 14 | 11 | 7 | 2 | No data | No data | No data | No data | No data | No data | No data |
| Yield target 70% | 16 | 13 | 9 | 4 | No data | No data | No data | No data | No data | No data | No data |
| Yield target 75% | 21 | 18 | 14 | 9 | 5 | No data | No data | No data | No data | No data | No data |
| Yield target 80% | 23 | 20 | 16 | 11 | 7 | 2 | No data | No data | No data | No data | No data |
| Yield target 85% | 28 | 25 | 21 | 16 | 12 | 7 | 2 | No data | No data | No data | No data |
| Yield target 90% | 35 | 32 | 28 | 23 | 19 | 14 | 9 | 2 | No data | No data | No data |
| Yield target 95% | 44 | 41 | 37 | 32 | 28 | 23 | 18 | 11 | 5 | No data | No data |
| Yield target 98% | 58 | 55 | 51 | 46 | 42 | 37 | 32 | 25 | 19 | 14 | 2 |

Table 5 Units of P (kg/ha) required for a very, very low P-sorbing soil with a PRI 2–9, PBI 15–35, reactive iron 280–650

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Soil test P (mg/kg) | <2 | 4 | 6 | 8 | 10 | 12 | 15 | 20 | 25 | 30 | 35 |
| Equivalent P applied to virgin soil (kg/ha) | 0 | 9 | 14 | 18 | 23 | 28 | 35 | 46 | 58 | 69 | 81 |
| Yield with no P applied % | 0 | 38 | 51 | 61 | 69 | 76 | 83 | 90 | 95 | 97 | 98 |
| Yield target 60% | 16 | 9 | 4 | No data | No data | No data | No data | No data | No data | No data | No data |
| Yield target 65% | 19 | 12 | 7 | 3 | No data | No data | No data | No data | No data | No data | No data |
| Yield target 70% | 23 | 16 | 11 | 7 | 2 | No data | No data | No data | No data | No data | No data |
| Yield target 75% | 26 | 19 | 14 | 10 | 5 | No data | No data | No data | No data | No data | No data |
| Yield target 80% | 30 | 23 | 18 | 14 | 9 | 4 | No data | No data | No data | No data | No data |
| Yield target 85% | 37 | 30 | 25 | 21 | 16 | 11 | 4 | No data | No data | No data | No data |
| Yield target 90% | 44 | 37 | 32 | 28 | 23 | 18 | 11 | No data | No data | No data | No data |
| Yield target 95% | 58 | 51 | 46 | 42 | 37 | 32 | 25 | 14 | 2 | No data | No data |
| Yield target 98% | 76 | 69 | 64 | 60 | 55 | 50 | 43 | 32 | 20 | 9 | No data |

Table 6 Units of P (kg/ha) required for a very low P-sorbing soil with a PRI 9–28, PBI 35–70, reactive iron 650–1250

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Soil test P (mg/kg) | <2 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| Equivalent P applied to virgin soil (kg/ha) | 0 | 12 | 23 | 35 | 46 | 58 | 69 | 81 | 92 | 104 | 115 |
| Yield with no P applied % | 0 | 40 | 64 | 79 | 87 | 92 | 96 | 97 | 98 | 99 | 99 |
| Yield target 60% | 19 | 9 | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Yield target 65% | 23 | 13 | 2 | No data | No data | No data | No data | No data | No data | No data | No data |
| Yield target 70% | 26 | 16 | 5 | No data | No data | No data | No data | No data | No data | No data | No data |
| Yield target 75% | 30 | 20 | 9 | No data | No data | No data | No data | No data | No data | No data | No data |
| Yield target 80% | 35 | 25 | 14 | 2 | No data | No data | No data | No data | No data | No data | No data |
| Yield target 85% | 42 | 32 | 21 | 9 | No data | No data | No data | No data | No data | No data | No data |
| Yield target 90% | 51 | 41 | 30 | 18 | 7 | No data | No data | No data | No data | No data | No data |
| Yield target 95% | 65 | 55 | 44 | 32 | 21 | 9 | No data | No data | No data | No data | No data |
| Yield target 98% | 85 | 75 | 64 | 52 | 41 | 29 | 18 | 6 | No data | No data | No data |

Table 7 Units of P (kg/ha) required for a low P-sorbing soil with a PRI 28–87, PBI 70–140, reactive iron 1250–2500

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Soil test P (mg/kg) | <2 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| Equivalent P applied to virgin soil (kg/ha) | 0 | 12 | 23 | 35 | 46 | 58 | 69 | 81 | 92 | 104 | 115 |
| Yield with no P applied % | 0 | 37 | 60 | 75 | 84 | 90 | 93 | 96 | 97 | 98 | 99 |
| Yield target 60% | 23 | 13 | 2 | No data | No data | No data | No data | No data | No data | No data | No data |
| Yield target 65% | 26 | 16 | 5 | No data | No data | No data | No data | No data | No data | No data | No data |
| Yield target 70% | 30 | 20 | 9 | No data | No data | No data | No data | No data | No data | No data | No data |
| Yield target 75% | 35 | 25 | 14 | 2 | No data | No data | No data | No data | No data | No data | No data |
| Yield target 80% | 39 | 29 | 18 | 6 | No data | No data | No data | No data | No data | No data | No data |
| Yield target 85% | 46 | 36 | 25 | 13 | 2 | No data | No data | No data | No data | No data | No data |
| Yield target 90% | 58 | 48 | 37 | 25 | 14 | 2 | No data | No data | No data | No data | No data |
| Yield target 95% | 74 | 64 | 53 | 41 | 30 | 18 | 7 | No data | No data | No data | No data |
| Yield target 98% | 97 | 87 | 76 | 64 | 53 | 41 | 30 | 18 | 7 | No data | No data |

Table 8 Units of P (kg/ha) required for a moderate P-sorbing soil with a PRI 87–275, PBI 140–280, reactive iron 2500–4950

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Soil test P (mg/kg) | <2 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| Equivalent P applied to virgin soil (kg/ha) | 0 | 11 | 22 | 33 | 44 | 55 | 66 | 77 | 88 | 99 | 110 |
| Yield with no P applied % | 0 | 32 | 54 | 69 | 79 | 86 | 90 | 93 | 96 | 97 | 98 |
| Yield target 60% | 24 | 15 | 4 | No data | No data | No data | No data | No data | No data | No data | No data |
| Yield target 65% | 29 | 20 | 9 | No data | No data | No data | No data | No data | No data | No data | No data |
| Yield target 70% | 33 | 24 | 13 | 2 | No data | No data | No data | No data | No data | No data | No data |
| Yield target 75% | 38 | 29 | 18 | 7 | No data | No data | No data | No data | No data | No data | No data |
| Yield target 80% | 44 | 35 | 24 | 13 | 2 | No data | No data | No data | No data | No data | No data |
| Yield target 85% | 53 | 44 | 33 | 22 | 11 | No data | No data | No data | No data | No data | No data |
| Yield target 90% | 64 | 55 | 44 | 33 | 22 | 11 | No data | No data | No data | No data | No data |
| Yield target 95% | 84 | 75 | 64 | 53 | 42 | 31 | 20 | 9 | No data | No data | No data |
| Yield target 98% | 110 | 101 | 90 | 79 | 68 | 57 | 46 | 35 | 24 | 13 | 2 |

Table 9 Units of P (kg/ha) required for a high P-sorbing soil with a PRI 275–1680, PBI 280–840, reactive iron 4950–14 500

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Soil test P (mg/kg) | <2 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 50 | 60 |
| Equivalent P applied to virgin soil (kg/ha) | 0 | 11 | 21 | 32 | 42 | 53 | 63 | 74 | 84 | 105 | 126 |
| Yield with no P applied % | 0 | 24 | 42 | 56 | 67 | 75 | 81 | 85 | 89 | 93 | 96 |
| Yield target 60% | 34 | 25 | 15 | 4 | No data | No data | No data | No data | No data | No data | No data |
| Yield target 65% | 40 | 31 | 21 | 10 | No data | No data | No data | No data | No data | No data | No data |
| Yield target 70% | 44 | 35 | 25 | 14 | 4 | No data | No data | No data | No data | No data | No data |
| Yield target 75% | 53 | 44 | 34 | 23 | 13 | 2 | No data | No data | No data | No data | No data |
| Yield target 80% | 61 | 52 | 42 | 31 | 21 | 10 | No data | No data | No data | No data | No data |
| Yield target 85% | 72 | 63 | 53 | 42 | 32 | 21 | 11 | No data | No data | No data | No data |
| Yield target 90% | 88 | 79 | 69 | 58 | 48 | 37 | 27 | 16 | 6 | No data | No data |
| Yield target 95% | 114 | 105 | 95 | 84 | 74 | 63 | 53 | 42 | 32 | 11 | No data |
| Yield target 98% | 126 | 117 | 107 | 96 | 86 | 75 | 65 | 54 | 44 | 23 | 2 |

# Critical soil test values for high rainfall clover pastures

The critical soil test value for a soil is the value which produces a target pasture yield expressed as a percentage of the maximum. Intensively grazed pasture systems such as dairies are likely to target 95% of maximum production, whilst less intensive beef and sheep grazing systems may aim for 80% to 85% of maximum production.

## What are critical soil test values?

Critical soil test values are listed for different soil types for 95% of maximum production in Table 10, together with the capacity of that soil to sorb phosphorus, measured using reactive iron, PRI and PBI. These figures are based on the standard soil sampling depth of 10 cm and are derived from [Making better fertiliser decisions for grazed pastures in Australia](http://www.asris.csiro.au/downloads/BFD/Making%20Better%20Fertiliser%20Decisions%20for%20Grazed%20Pastures%20in%20Australia.pdf) (external link PDF 3.3MB). Critical soil test values are listed for different soil types for 90%, 85% and 80% of maximum production in Table 2.

## How to use Table 10 and 11

If the PBI is 18, to achieve 95% of maximum production, the critical Colwell soil test P (High P status) for that soil is a value greater than but not equal to 25. The equivalent PBI value for reactive iron is 280–650 and for PRI is 2–9.

While reactive iron and PRI are no longer used, these values are included in Table 10 so people familiar with these historical measures can compare them. To achieve 80% of maximum production (Table 11) with a PBI of 18, the critical Colwell soil test P for that soil is a value greater than but not equal to 14.

If the Colwell soil test P is well above the high P status critical value, the soil is highly likely to contain more than adequate phosphorus for 95% of maximum pasture production in the next growing season and no fertiliser P is required.

If the Colwell soil test P is well below the high P status critical value, it is highly likely that the soil does not contain sufficient phosphorus to achieve 95% of maximum pasture production in the next growing season so fertiliser phosphorus will be required.

If the soil test P is close to the high P status critical value (±10%), a small application of fertiliser (roughly equivalent to the phosphorus removed in products, and losses in leaching, runoff and P sorption) may be required to maintain the soil phosphorus status of the soil at that critical value.

The most profitable rate of phosphorus to apply will depend on many factors and can be determined in consultation between the farmer and a FertCare-accredited adviser.

Table 10 For the top 10cm of different soils, phosphorus (P) sorption category, capacity of soil to sorb P measured using reactive iron, PRI and PBI and critical Colwell soil test P values (Critical P) to achieve 95% of maximum production of clover based pastures in high rainfall (>600mm) areas (developed by DM Weaver and RN Summers)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Capacity of soil to sorb P | Reactive Iron (mg/kg) A | PRI  (L/g) A | PBI | P status C  Low  Critical P (mg/kg) B | P status C  Medium  Critical P (mg/kg) B | P status C  High  Critical P (mg/kg) B |
| Exceedingly low | 0–100 | <0.35 | <5 | <7 | 7–10 | >10 |
| Exceptionally low | 100–200 | 0.35–1 | ≥5–10 | <10 | 10–15 | >15 |
| Extremely low | 200–280 | 1–2 | ≥10–15 | <15 | 15–20 | >20 |
| Very, very low | 280–650 | 2–9 | ≥15–35 | <20 | 20–25 | >25 |
| Very low | 650–1250 | 9–28 | ≥35–70 | <25 | 25–29 | >29 |
| Low | 1250–2500 | 28–87 | ≥70–140 | <29 | 29–34 | >34 |
| Moderate | 2500–4950 | 87–275 | ≥140–280 | <34 | 34–40 | >40 |
| High | 4950–14500 | 275–1680 | ≥280–840 | <40 | 40–55 | >55 |

A ranges estimated from reactive iron, PRI and PBI data collected by Summers and Weaver (2006)  
B adapted from Victorian Department of Primary Industries (2007) by DM Weaver and RN Summers  
C Lower production targets will reduce the critical Colwell soil test P values. See Table 2 for 90%, 85% and 80% of maximum production critical Colwell soil test P values

Table 11 For the top 10cm of different soils, PBI, and critical Colwell soil test P values to achieve 90%, 85% and 80% of maximum production of clover-based pastures in high rainfall (>600mm) areas (developed by DM Weaver and RN Summers)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Maximum production (%) | 90% | 90% | 90% | 85% | 85% | 85% | 80% | 80% | 80% |
| No data | P status  Low | P status  Medium | P status  High | P status  Low | P status  Medium | P status  High | P status  Low | P status  Medium | P status  High |
| PBI A | Critical P (mg/kg) | Critical P (mg/kg) | Critical P (mg/kg) | Critical P (mg/kg) | Critical P (mg/kg) | Critical P (mg/kg) | Critical P (mg/kg) | Critical P (mg/kg) | Critical P (mg/kg) |
| <5 | <6 | 6–8 | >8 | <5 | 5–7 | >7 | <4 | 4–6 | >6 |
| ≥5–10 | <8 | 8–11 | >11 | <7 | 7–10 | >10 | <6 | 6–8 | >8 |
| ≥10–15 | <11 | 11–15 | >15 | <10 | 10–13 | >13 | <8 | 8–11 | >11 |
| ≥15–35 | <15 | 15–20 | >20 | <13 | 13–16 | >16 | <11 | 11–14 | >14 |
| ≥35–70 | <20 | 20–22 | >22 | <16 | 16–18 | >18 | <14 | 14–16 | >16 |
| ≥70–140 | <22 | 22–25 | >25 | <18 | 18–21 | >21 | <16 | 16–18 | >18 |
| ≥140–280 | <25 | 25–30 | >30 | <21 | 21–25 | >25 | <18 | 18–21 | >21 |
| ≥280–840 | <30 | 30–42 | >42 | <25 | 25–35 | >35 | <21 | 21–30 | >30 |

A refer to Table 10 for equivalent PRI and reactive iron values

Table 12 Critical plant phosphorus test values for clover and ryegrass (from data summarised by Pinkerton, Smith and Lewis 1997)

|  |  |  |
| --- | --- | --- |
| Pasture species | Critical % phosphorus in dry matter  Young tissue | Critical % phosphorus in dry matter  Whole shoots |
| Clover | 0.35 (0.3–0.40) | 0.35 (0.28–0.32) |
| Ryegrass | 0.24 (0.2–0.28) | 0.23 (0.20–0.25) |

Table 13 Gradual decline in Colwell soil test phosphorus (P) values when no phosphorus fertiliser was applied since 2000 and pasture dry matter consumed by dairy cows each year (from Bolland and Guthridge 2007a)

|  |  |  |
| --- | --- | --- |
| Year | Soil test phosphorus for the  nil–phosphorus treatment (mg/kg) | Pasture dry matter consumed  each year (t/ha) |
| 2000 | 73 | 4.9 |
| 2001 | 62 | 9.3 |
| 2002 | 52 | 12.3 |
| 2003 | 52 | 9.6 |
| 2004 | 48 | 11.2 |

## References

Bolland, MDA & Guthridge, IF 2007a, ‘Determining the fertiliser phosphorus requirements of intensively grazed dairy pastures in south-western Australia with or without adequate nitrogen fertiliser’, *Australian Journal of Experimental Agriculture,* vol. 47, pp. 801–814.

Pinkerton, A, Smith, FW & Lewis, DC 1997, ‘Pasture species’, in DJ Reuter and JB Robinson (eds.), *Plant analysis – an interpretation manual,* CSIRO Publishing, Collingwood, Victoria, pp. 287–346. (See summary tables, p. 344 for clover and p. 345 for ryegrass).

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Victorian Department of Primary Industries 2007, ‘Making Better Fertiliser Decisions for Grazed Pastures in Australia’, viewed 9 November 2017, <http://www.asris.csiro.au/downloads/BFD/Making%20Better%20Fertiliser%20Decisions%20for%20Grazed%20Pastures%20in%20Australia.pdf>