

# JFL Gradient vs. Small Plots - Soil Analyses

JAH

## Background

In this literate statistical document, we look at the soil data from the Jianfengling (JFL) transect vs. the data from Dr. Han Xu's network of 164 1/16th of a Ha (25 x 25m) plots that are distributed throughout Jianfengling Forest Reserve.

His data are available as supplementary material for two key publications:

1. *Journal of Ecology* **103** 1325-1333. "Habitat hotspots of common and rare species along climatic and edaphic gradients"
2. *Journal of Applied Ecology* **52** 1014-1052. "Partial recovery of a tropical rain forest a half-century after clear-cut and selective logging"

We compare standardized values of measured soil variables between 300 sites along a 6.6 km gradient along the road from near the field station to well into the 60-Ha plot in Jianfengling to those of previously published.

- We look at these soil variables (units in parentheses):
  - pH (unitless)
  - soil [organic] Carbon (g/kg)
  - total Nitrogen (g/kg)
  - total Phosphorus (g/kg)
  - total Potassium (g/kg)
  - exchangeable Calcium (cmol(1/2Ca<sup>2+</sup>)/kg)
  - exchangeable Magnesium (cmol(1/2Mg<sup>2+</sup>)/kg)
  - available Potassium (cmolK<sup>+</sup>/kg)
  - alkali-hydrolyzable (available) Nitrogen (mg/kg)
  - available Phosphorus (mg/kg)

## Summary Stats

### Xu Han's 1/16th-Ha Plots

```
##          vars  n  mean   sd median trimmed  mad  min   max  range
## pH          1 163   4.81  0.29   4.77   4.80  0.22  3.81  6.09  2.28
## org.mat     2 163  15.55  5.82  14.80  15.20  5.71  4.10 39.80 35.70
## total.N     3 163   1.18  0.33   1.15   1.16  0.28  0.30  2.19  1.89
## total.P     4 163   0.12  0.05   0.11   0.11  0.03  0.06  0.58  0.52
## total.K     5 163  22.15 13.16  21.92  21.40 16.54  2.00 52.43 50.44
## exch.Ca     6 163   0.30  0.78   0.13   0.17  0.09  0.00  9.28  9.28
## exch.Mg     7 163   0.25  0.34   0.16   0.19  0.09  0.04  3.90  3.86
## avail.K     8 163   0.37  0.18   0.35   0.36  0.19  0.08  0.91  0.83
## alk-hyd.N   9 163 158.04 44.42 151.55 155.18 45.86 61.86 324.75 262.89
## avail.P    10 163   1.85  1.02   1.67   1.72  0.79  0.65  7.82  7.17
##          skew kurtosis  se
## pH          0.88    4.43 0.02
## org.mat     0.83    1.40 0.46
```

```

## total.N    0.60    0.79 0.03
## total.P    5.28   44.31 0.00
## total.K    0.37   -0.86 1.03
## exch.Ca    9.54  103.26 0.06
## exch.Mg    7.99   80.98 0.03
## avail.K    0.64   -0.21 0.01
## alk-hyd.N  0.65    0.39 3.48
## avail.P    2.33    8.88 0.08

```

### soil300 - JFL Transect

```

##          vars  n  mean  sd median trimmed  mad  min  max  range
## pH          1 300  4.33 0.29  4.36   4.33 0.29  3.66  5.26  1.60
## org.mat     2 300 36.68 16.74 33.20  34.44 10.48 12.72 163.59 150.87
## total.N     3 300  1.41 0.49  1.31   1.36 0.39  0.54  3.55  3.02
## total.P     4 300  0.12 0.03  0.12   0.12 0.03  0.05  0.22  0.17
## total.K     5 300 17.64 10.64 18.23  17.52 10.73  0.33  42.32  41.99
## exch.Ca     6 300  0.51 0.78  0.26   0.33 0.21  0.01  7.00  6.99
## exch.Mg     7 300  0.20 0.17  0.16   0.17 0.10  0.01  1.49  1.48
## avail.K     8 300  0.22 0.11  0.19   0.21 0.08  0.06  0.67  0.60
## alk-hyd.N   9 300 181.47 61.13 168.15 174.06 48.35 71.17 463.08 391.91
## avail.P    10 300  1.45 1.79  1.10   1.15 1.30  0.10  15.95  15.85
##          skew kurtosis  se
## pH          -0.10   -0.51 0.02
## org.mat     2.47   11.73 0.97
## total.N     1.22    2.18 0.03
## total.P     0.64    0.28 0.00
## total.K    -0.01   -0.84 0.61
## exch.Ca     4.23   23.54 0.04
## exch.Mg     3.08   14.69 0.01
## avail.K     1.35    1.75 0.01
## alk-hyd.N   1.26    2.16 3.53
## avail.P     3.99   24.05 0.10

```

### JFL-transect secondary

```

##          vars  n  mean  sd median trimmed  mad  min  max  range
## pH          1 150  4.39 0.28  4.40   4.40 0.28  3.80  5.26  1.46
## org.mat     2 150 36.56 15.67 33.66  34.90 12.70 12.72  94.09  81.37
## total.N     3 150  1.42 0.49  1.36   1.39 0.46  0.54  2.76  2.22
## total.P     4 150  0.13 0.03  0.13   0.13 0.03  0.05  0.22  0.17
## total.K     5 150 19.89 11.98 20.99  20.06 14.49  0.68  42.32  41.64
## exch.Ca     6 150  0.75 1.03  0.34   0.52 0.32  0.01  7.00  6.99
## exch.Mg     7 150  0.24 0.19  0.18   0.21 0.13  0.02  1.14  1.12
## avail.K     8 150  0.26 0.13  0.24   0.25 0.12  0.06  0.67  0.60
## alk-hyd.N   9 150 176.38 50.50 175.30 174.29 50.04 71.17 318.33 247.16
## avail.P    10 150  1.58 2.33  0.88   1.09 1.07  0.10  15.95  15.85
##          skew kurtosis  se
## pH          -0.01   -0.28 0.02
## org.mat     1.11    1.36 1.28
## total.N     0.56   -0.15 0.04
## total.P     0.34   -0.13 0.00

```

```

## total.K    -0.22    -1.10 0.98
## exch.Ca    2.97     11.15 0.08
## exch.Mg    1.78      4.47 0.02
## avail.K    0.79      0.07 0.01
## alk-hyd.N  0.45      0.11 4.12
## avail.P    3.46     15.08 0.19

```

### JFL-transect primary

```

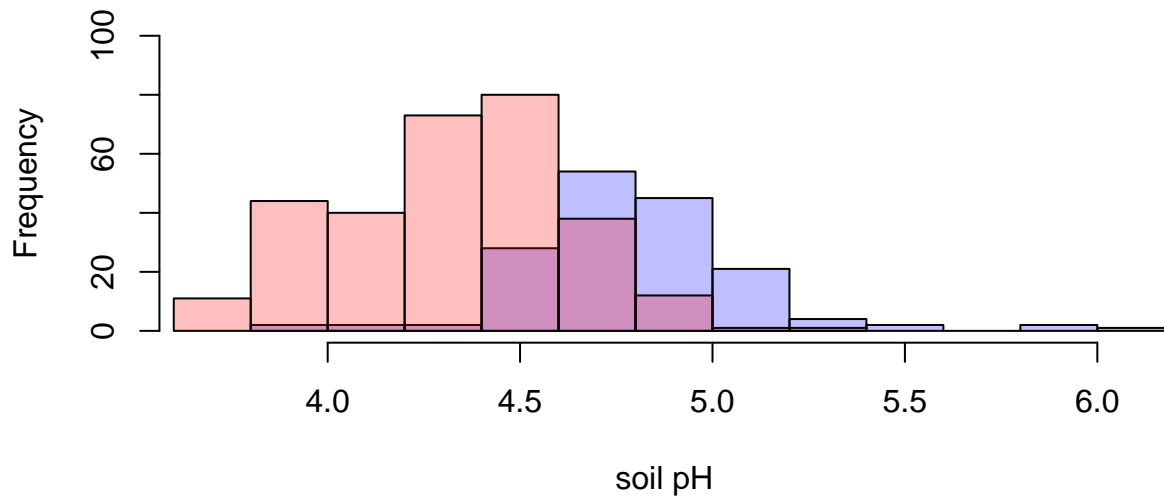
##          vars   n   mean    sd median trimmed   mad   min   max   range
## pH          1 150   4.27  0.29   4.31   4.27  0.31  3.66  4.86   1.20
## org.mat     2 150  36.80 17.80  32.48  33.97  9.22 15.31 163.59 148.28
## total.N     3 150   1.39  0.49   1.28   1.32  0.33  0.70  3.55   2.86
## total.P     4 150   0.11  0.02   0.11   0.11  0.02  0.07  0.17   0.11
## total.K     5 150  15.40  8.58  16.57  15.45  7.75  0.33  34.52  34.19
## exch.Ca     6 150   0.26  0.19   0.22   0.24  0.15  0.01  0.89   0.88
## exch.Mg     7 150   0.16  0.15   0.13   0.15  0.07  0.01  1.49   1.48
## avail.K     8 150   0.19  0.06   0.17   0.18  0.05  0.08  0.49   0.40
## alk-hyd.N   9 150 186.56 69.98 162.43 176.42 46.65 84.33 463.08 378.75
## avail.P    10 150   1.32  0.99   1.30   1.23  1.26  0.10  3.85   3.75
##          skew kurtosis   se
## pH          -0.15    -0.96 0.02
## org.mat     3.35     17.37 1.45
## total.N     1.86      4.53 0.04
## total.P     0.52      0.12 0.00
## total.K    -0.19     -0.74 0.70
## exch.Ca     1.22      1.03 0.02
## exch.Mg     5.72     44.84 0.01
## avail.K     1.45      3.29 0.01
## alk-hyd.N   1.41      1.76 5.71
## avail.P     0.55     -0.57 0.08

```

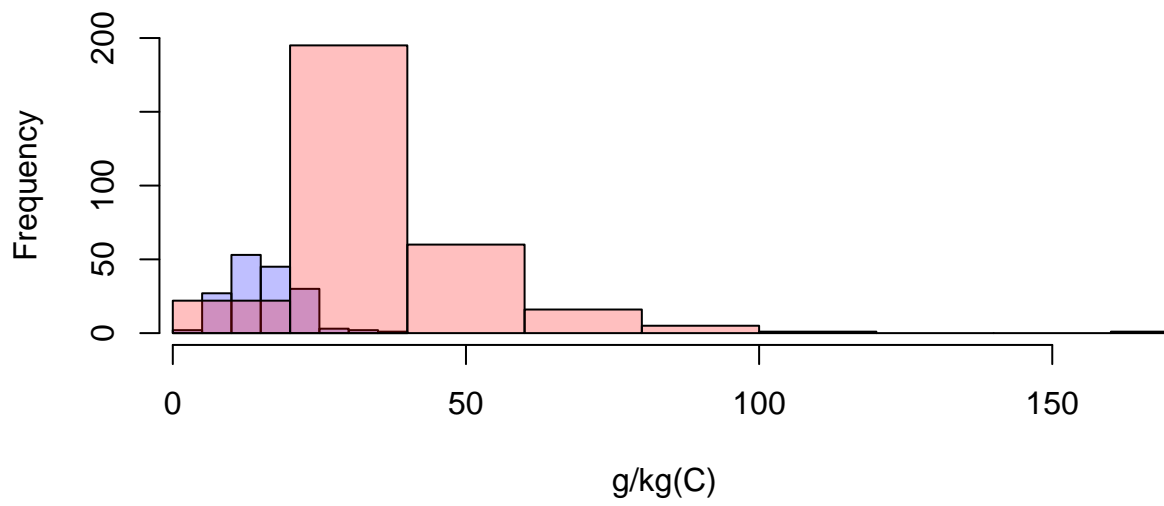
## Histograms

For the following histograms, the transect soil data are shown in red, and Xu Han's 1/16th-Ha plot data are shown in blue.

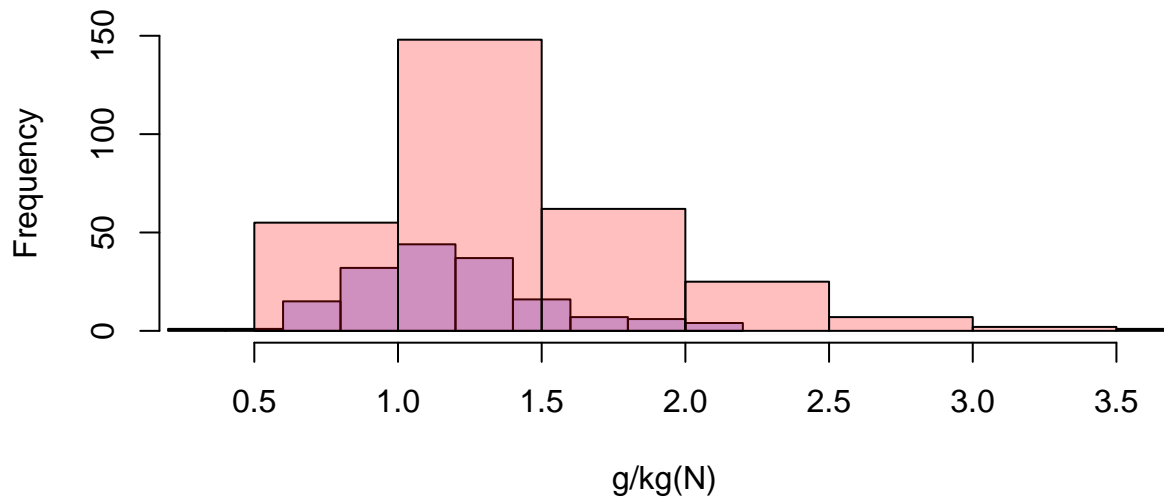
pH



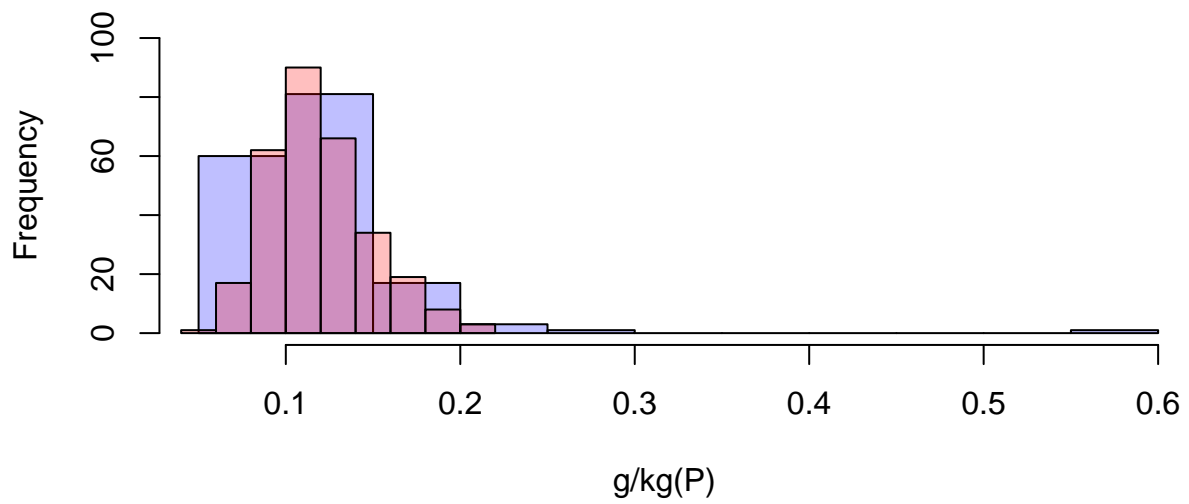
Organic Carbon



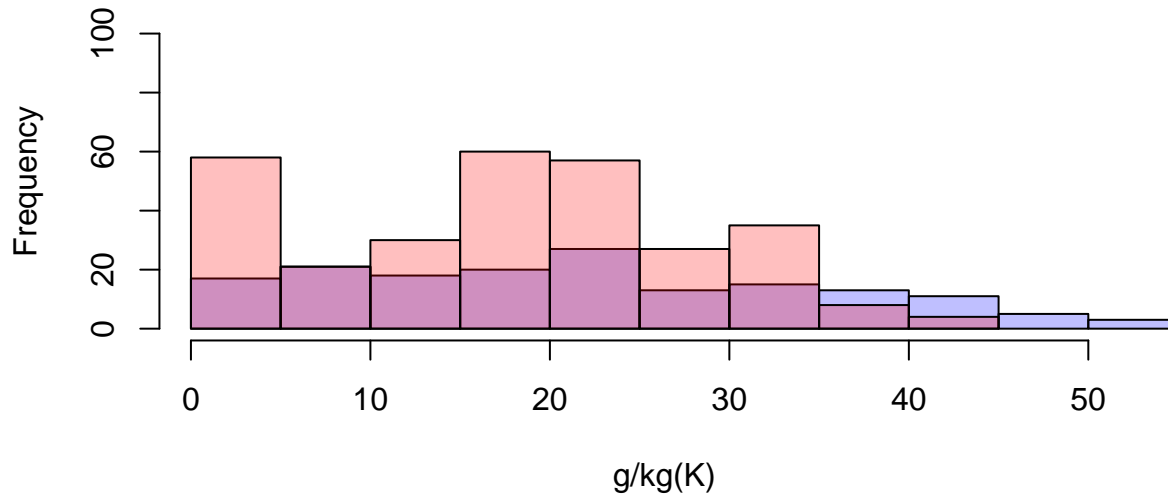
## Total Nitrogen



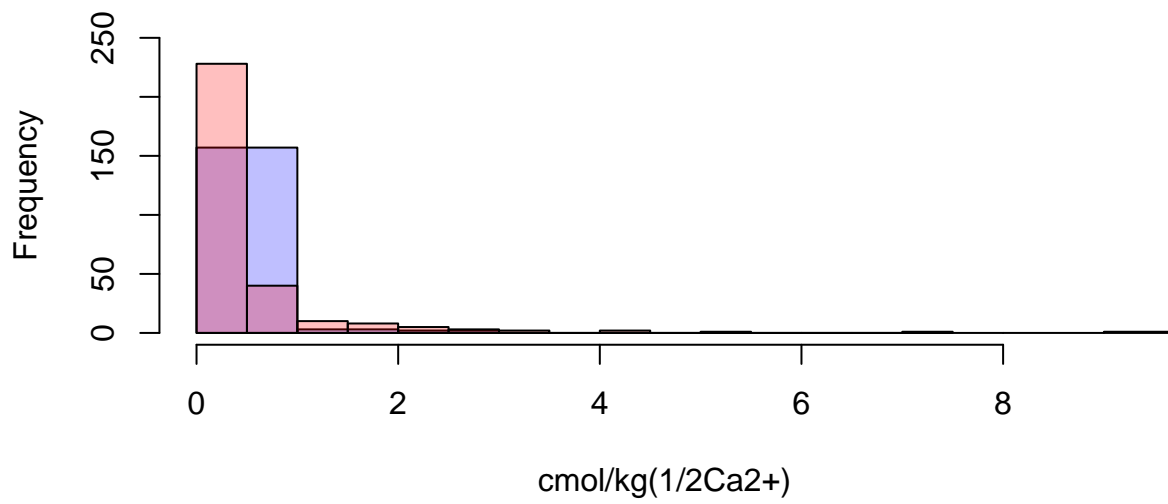
## Total Phosphorus



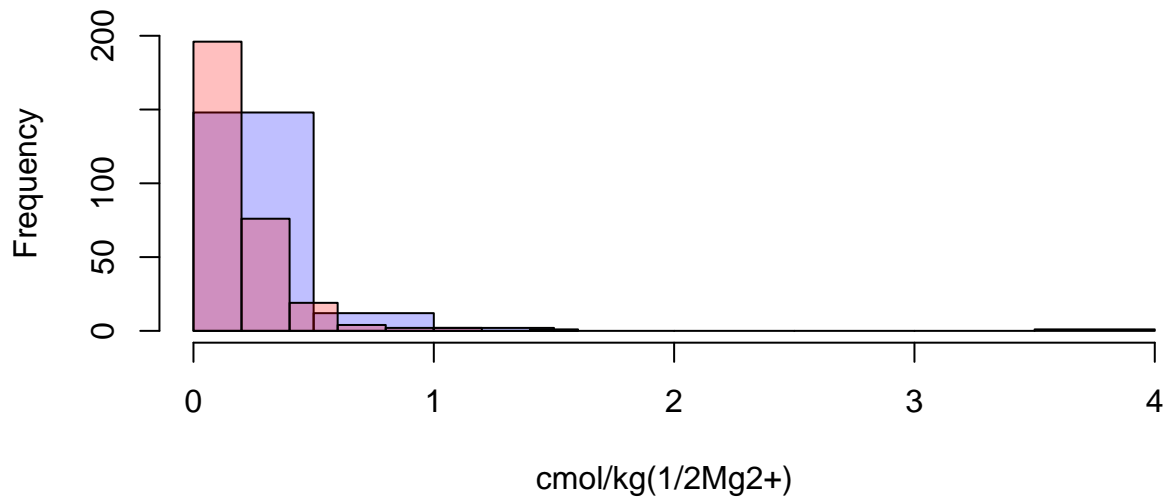
## Total Potassium



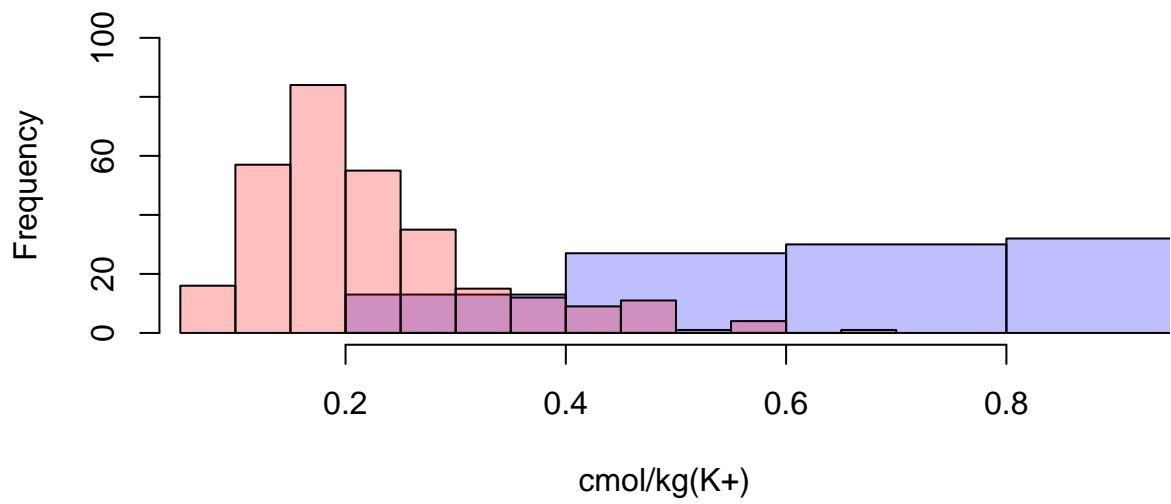
## Exchangeable Calcium



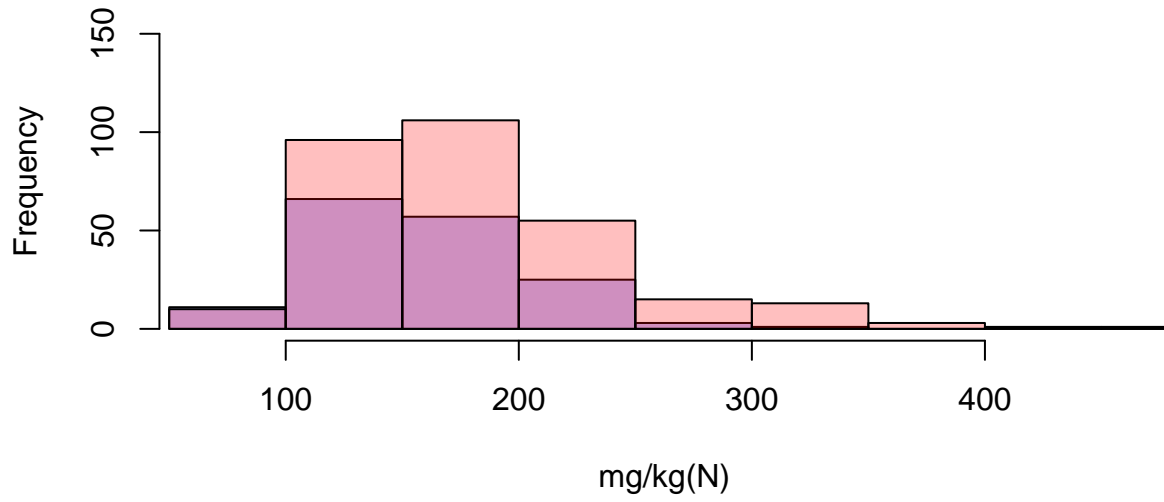
## Exchangeable Magnesium



## Available Potassium



### Alkali-hydrolyzable Nitrogen



### Available Phosphorus

