Cattle manure loadings and legacy effects on Cu and Zn availability under rainfed and irrigated conditions

Srimathie P. Indraratne1\*, Matthew Spengler 2 and Xiying Hao2

1Department of Environmental Studies and Sciences, University of Winnipeg, Winnipeg, MB, Canada R3B 2E9

2Agriculture and Agri-Food Canada, Lethbridge Research and Development Centre, 5403 1st Avenue South, Lethbridge, AB, Canada T1J 4B1

\*Corresponding author, email: s.indraratne@uwinnipeg.ca

Supplemental Material

This section contains one page with one table.

Supplementary Table 1. Total Cu and Zn removals in harvested silage and grain yields from manure applied treatments in 2003, 2008, 2013 and 2018.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 2003 | 2008 | 2013 | 2018 |
|  | Cu | Zn | Cu  | Zn | Cu  | Zn | Cu | Zn |
|  | ------------------------------------------------------ kg ha-1 ------------------------------------------------------------- |
| Mr0*a* | 0.06(±.02)*b* | 0.17(±.04) | 0.37(±.08) | 0.55(±.06) | 0.06(±.04) | 0.26(±.07) | 0.02(±.01) | 0.10(±.01) |
| Mrf | 0.04(±.02) | 0.17(±.04) | 0.37(±.09) | 0.54(±.09) | 0.07(±.02) | 0.30(±.05) | 0.02(±.00) | 0.09(±.01) |
| Mr30 | 0.11(±.04) | 0.28(±.04) | 0.33(±.04) | 0.64(±.02) | 0.12(±.06) | 0.54(±.09) | 0.02(±.01) | 0.11(±.02) |
| Mr60 | 0.06(±.01) | 0.24(±.04) | 0.34(±.09) | 0.67(±.13) | 0.07(±.01) | 0.43(±.08) | 0.01(±.01) | 0.09(±.05) |
| Mr90 | 0.06(±.03) | 0.22(±.03) | 0.33(±.09) | 0.76(±.09) | 0.09(±.03) | 0.48(±.08) | 0.02(±.01) | 0.09(±.05) |
| DDr30 | 0.05(±.01) | 0.19(±.03) | 0.37(±.03) | 0.64(±.10) | 0.04(±.06) | 0.34(±.04) | 0.02(±.01) | 0.11(±.05) |
| DDr60 | 0.10(±.02) | 0.30(±.02) | 0.53(±.03) | 0.97(±.18) | 0.07(±.02) | 0.38(±.05) | 0.02(±.00) | 0.12(±.01) |
| DDr90 | 0.04(±.02) | 0.20(±.02) | 0.32(±.05) | 0.65(±.02) | 0.08(±.03) | 0.38(±.09) | 0.02(±.00) | 0.19(±.04) |
| Dr30 | 0.05(±.01) | 0.12(±.05) | 0.40(±.12) | 0.47(±.10) | 0.08(±.07) | 0.26(±.07) | 0.02(±.00) | 0.09(±.01) |
| Dr60 | 0.12(±.02) | 0.20(±.09) | 0.49(±.19) | 0.59(±.13) | 0.08(±.02) | 0.27(±.09) | 0.02(±.00) | 0.10(±.03) |
| Dr90 | 0.06(±.05) | 0.14(±.07) | 0.44(±.12) | 0.52(±.12) | 0.08(±.05) | 0.24(±.03) | 0.02(±.00) | 0.12(±.09) |
| Mi0 | 0.06(±.01) | 0.34(±.08) | 0.46(±.10) | 0.66(±.17) | 0.08(±.03) | 0.34(±.10) | 0.04(±.01) | 0.25(±.05) |
| Mif | 0.05(±.02) | 0.34(±.10) | 0.55(±.11) | 0.74(±.09) | 0.09(±.04) | 0.40(±.09) | 0.04(±.02) | 0.24(±.03) |
| Mi60 | 0.07(±.05) | 0.34(±.20) | 0.64(±.15) | 1.15(±.19) | 0.10(±.03) | 0.58(±.10) | 0.04(±.00) | 0.33(±.02) |
| Mi120 | 0.20(±.12) | 0.56(±.22) | 0.50(±.14) | 1.17(±.28) | 0.08(±.00) | 0.52(±.33) | 0.04(±.00) | 0.29(±.07) |
| Mi180 | 0.04(±.01) | 0.47(±.10) | 0.45(±.04) | 1.13(±.10) | 0.11(±.03) | 0.64(±.17) | 0.02(±.00) | 0.28(±.18) |
| DDi60 | 0.05(±.01) | 0.37(±.07) | 0.49(±.08) | 0.84(±.05) | 0.11(±.02) | 0.43(±.02) | 0.03(±.01) | 0.36(±.18) |
| DDi120 | 0.06(±.01) | 0.36(±.02) | 0.67(±.15) | 1.14(±.19) | 0.09(±.02) | 0.53(±.09) | 0.03(±.00) | 0.28(±.06) |
| DDi180 | 0.08(±.06) | 0.47(±.02) | 0.67(±.20) | 1.37(±.08) | 0.11(±.01) | 0.55(±.07) | 0.04(±.01) | 0.39(±.11) |
| Di60 | 0.06(±.01) | 0.34(±.02) | 0.51(±.24) | 0.75(±.26) | 0.10(±.02) | 0.30(±.03) | 0.05(±.00) | 0.25(±.05) |
| Di120 | 0.07(±.00) | 0.37(±.00) | 0.49(±.22) | 0.75(±.28) | 0.12(±.06) | 0.50(±.03) | 0.03(±.00) | 0.40(±.07) |
| Di180 | 0.05(±.02) | 0.30(±.14) | 0.57(±.21) | 0.82(±.19) | 0.09(±.02) | 0.35(±.05) | 0.05(±.00) | 0.23(±.01) |

*a*M – Manure continuous applications since 1973; DD- Delayed Discontinued manure in 2003; D- Discontinued manure in 1987; i=irrigated, r=rainfed; 0=control; f=fertilizer N added beginning in 1990, 30, 60, 90, 120, and 180 = manure rates in Mg ha-1

*b*standard deviation