**Table S1.** Two-way analysis of variance (ANOVA) of location by management practice for soil properties and crop performance across trial locations (two on-station and three on-farm sites) and management practices (two and three tillage practices at on-station and on-farm sites, respectively) in Zimbabwe. df, degrees of freedom; *P*<0.05 show significant effect; NS, not significant.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Source of variation** | **On-station trials** | | **On-farm trials** | |
| **df** | ***P*-value** | **df** | ***P*-value** |
| pH | Location | 1 | <.001 | 2 | 0.010 |
|  | Management | 1 | <.001 | 2 | NS |
|  | Location × management | 1 | <.001 | 4 | NS |
| EC | Location | 1 | NS | 2 | 0.002 |
|  | Management | 1 | 0.008 | 2 | 0.023 |
|  | Location × management | 1 | NS | 4 | NS |
| CEC | Location | 1 | <.001 | 2 | <.001 |
|  | Management | 1 | <.001 | 2 | NS |
|  | Location × management | 1 | 0.036 | 4 | NS |
| TC | Location | 1 | <.001 | 2 | <.001 |
|  | Management | 1 | <.001 | 2 | 0.002 |
|  | Location × management | 1 | 0.002 | 4 | NS |
| C stock | Location | 1 | <.001 |  |  |
|  | Management | 1 | <.001 |  |  |
|  | Location × management | 1 | 0.027 |  |  |
| TN | Location | 1 | <.001 | 2 | <.001 |
|  | Management | 1 | <.001 | 2 | 0.002 |
|  | Location × management | 1 | 0.007 | 4 | NS |
| N stock | Location | 1 | <.001 |  |  |
|  | Management | 1 | <.001 |  |  |
|  | Location × management | 1 | 0.054 |  |  |
| MBC | Location | 1 | 0.014 | 2 | <.001 |
|  | Management | 1 | 0.006 | 2 | NS |
|  | Location × management | 1 | NS | 4 | NS |
| NH4+-N | Location | 1 | <.001 | 2 | 0.032 |
|  | Management | 1 | <.001 | 2 | NS |
|  | Location × management | 1 | 0.009 | 4 | NS |
| NO3--N | Location | 1 | <.001 | 2 | <.001 |
|  | Management | 1 | <.001 | 2 | NS |
|  | Location × management | 1 | <.001 | 4 | NS |
| APB | Location | 1 | <.001 | 2 | <.001 |
|  | Management | 1 | <.001 | 2 | NS |
|  | Location × management | 1 | NS | 4 | NS |
| GY | Location | 1 | 0.003 | 2 | <.001 |
|  | Management | 1 | 0.001 | 2 | NS |
|  | Location × management | 1 | NS | 4 | NS |

Note: GY – Grain yield; APB – aboveground biomass; MBC – microbial biomass C; TC – total carbon concentration; TN – total nitrogen concentration; C stock – carbon stock; N stock – nitrogen stock; CEC – cation exchange capacity; NH4+-N – ammonium nitrogen; NO3--N – nitrate N; EC – electrical conductivity. C and N stocks were not measured in on-farm sites.

**Table S2.** One-way analysis of variance (ANOVA) of management practice, as source of variation, at each trial location. There were two management practices at each on-station site (conventional tillage versus no-tillage) and three management practices at each on-farm site (conventional tillage, no-tillage with ripline seeding, no-tillage with direct seeding). Conventional management is based on crop residue removal whereas no-tillage systems included crop residue retention. df, degrees of freedom; *P*<0.05 show significant effect; NS, not significant.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **On-station trials** | | | **On-farm trials** | | |
| **Location** | **df** | ***P*-value** | **Location** | **df** | ***P*-value** |
| pH | Domboshawa | 1 | 0.001 | Madziwa | 2 | NS |
|  | Harare | 1 | 0.011 | Shamva | 2 | NS |
|  |  |  |  | Hereford | 2 | NS |
| EC | Domboshawa | 1 | 0.002 | Madziwa | 2 | NS |
|  | Harare | 1 | 0.043 | Shamva | 2 | NS |
|  |  |  |  | Hereford | 2 | NS |
| CEC | Domboshawa | 1 | <.001 | Madziwa | 2 | NS |
|  | Harare | 1 | 0.003 | Shamva | 2 | NS |
|  |  |  |  | Hereford | 2 | NS |
| TC | Domboshawa | 1 | 0.004 | Madziwa | 2 | <.001 |
|  | Harare | 1 | <.001 | Shamva | 2 | NS |
|  |  |  |  | Hereford | 2 | 0.029 |
| C stock | Domboshawa | 1 | 0.006 |  |  |  |
|  | Harare | 1 | 0.001 |  |  |  |
| TN | Domboshawa | 1 | 0.009 | Madziwa | 2 | <.001 |
|  | Harare | 1 | <.001 | Shamva | 2 | NS |
|  |  |  |  | Hereford | 2 | 0.044 |
| N stock | Domboshawa | 1 | 0.014 |  |  |  |
|  | Harare | 1 | <.001 |  |  |  |
| MBC | Domboshawa | 1 | NS | Madziwa | 2 | NS |
|  | Harare | 1 | 0.002 | Shamva | 2 | NS |
|  |  |  |  | Hereford | 2 | NS |
| NH4+-N | Domboshawa | 1 | <.001 | Madziwa | 2 | 0.041 |
|  | Harare | 1 | 0.011 | Shamva | 2 | NS |
|  |  |  |  | Hereford | 2 | NS |
| NO3--N | Domboshawa | 1 | 0.002 | Madziwa | 2 | 0.040 |
|  | Harare | 1 | <.001 | Shamva | 2 | NS |
|  |  |  |  | Hereford | 2 | NS |
| APB | Domboshawa | 1 | 0.029 | Madziwa | 2 | NS |
|  | Harare | 1 | 0.001 | Shamva | 2 | NS |
|  |  |  |  | Hereford | 2 | NS |
| GY | Domboshawa | 1 | 0.014 | Madziwa | 2 | NS |
|  | Harare | 1 | NS | Shamva | 2 | NS |
|  |  |  |  | Hereford | 2 | NS |

Note: GY – Grain yield; APB – aboveground biomass; MBC – microbial biomass C; TC – total carbon concentration; C stock – carbon stock; TN – total nitrogen concentration; N stock – nitrogen stock; CEC – cation exchange capacity; NH4+-N – ammonium nitrogen; NO3--N – nitrate N; EC – electrical conductivity. C and N stocks were not measured in on-farm sites.

**Table S3**. Bulk density, carbon (C) stock and nitrogen (N) stock of soil (0-10 cm) at Domboshawa and Harare on-station trial sites in Zimbabwe under conventional tillage (CT) with crop residue removal and no-tillage (NT) with residue retention.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sites | Management practice | Bulk density (g soil cm-3) | C stock (mg C ha-1) | N stock (mg N ha-1) |
| Domboshawa | CT | 1.44 | 4.29 ± 0.11a | 0.35 ± 0.01a |
|  | NT | 1.34 | 6.36 ± 0.23b | 0.52 ± 0.03b |
|  |  |  |  |  |
| Harare | CT | 1.26 | 16.51 ± 0.18a | 1.30 ± 0.01a |
|  | NT | 1.22 | 19.46 ± 0.11b | 1.54 ± 0.01b |

Notes: Values are means ± one standard error of the mean. Letters indicate significant differences (*P*<0.05) between treatments within columns for each site. Soil bulk density was determined in previous work (CIMMYT, unpublished).