Supplementary material

|  |
| --- |
| Table S1. Sequential F-test for fixed effects for a model fitted to pearl millet yield in on-station trials. |
| Effect | Description | Numerator DF | Denominator DF | F-value | p-value |
| $$μ$$ | Intercept | 1 | 12 | 451.81 | < 0.0001 |
| $$s\_{a}$$ | Site effect | 1 | 10.6 | 0.02 | 0.8873 |
| $$j\_{b}$$ | Season effect | 1 | 12 | 51.67 | < 0.0001 |
| $$u\_{ab}$$ | Season-specific site effect | 1 | 9.71 | 5.58 | 0.0405 |
| $$r\_{abl}$$ | Block effect | 12 | 11.9 | 1.26 | 0.3470 |
| $$τ\_{i}$$ | Treatment effect | 2 | 14.1 | 80.73 | < 0.0001 |
| $$\left(sτ\right)\_{ai}$$ | Site-specific treatment effect | 1 | 9.09 | 0.31 | 0.5586 |
| $$\left(jτ\right)\_{bi}$$ | Season-specific treatment effect | 2 | 14.1 | 20.3 | < 0.0001 |
| $$\left(uτ\right)\_{abi}$$ | Site- and season-specific “ “ | 1 | 7.61 | 0.004 | 0.9520 |
| F-tests are based on model (1). Response variable was square root-transformed. Random effects: $σ\_{e1}^{2}$ = 211.62 and $σ\_{e1}^{2}$ = 36.98. Denominator degrees of freedom are adjusted with the Method of Kenward and Roger. |

|  |
| --- |
| Table S2. Sequential F-test for fixed effects for a model fitted to millet yield in on-site mother trials. |
| Effect | Description | Numerator DF | Denominator DF | F-value | p-value |
| $$μ$$ | Intercept | 1 | 26.2 | 33249.2 | <0.0001 |
| $$s\_{a}$$ | Site effect (Si) | 1 | 10.5 | 13.81 | 0.0037 |
| $$j\_{b}$$ | Season effect (Se) | 1 | 26.1 | 11.83 | 0.0020 |
| $$τ\_{j}$$ | Water harvesting (WH) | 1 | 22.1 | 41.29 | <0.0001 |
| $$ϕ\_{k}$$ | Main effect fertilizer-regime (F) | 1 | 22.1 | 175.39 | <0.0001 |
| $$\left(τϕ\right)\_{jk}$$ | Interaction of WH and F | 1 | 22.1 | 4.99 | 0.0360 |
| $$(sτ)\_{aj}$$ | Interaction of Si and WH | 1 | 28.1 | 0.21 | 0.6499 |
| $$(sϕ)\_{ak}$$ | Interaction of Si and F | 1 | 28.1 | 10.44 | 0.0031 |
| $$(jτ)\_{bj}$$ | Interaction of Se and WH | 1 | 25.3 | 2.63 | 0.1171 |
| $$(jϕ)\_{bk}$$ | Interaction on Se and F | 1 | 24.3 | 0.77 | 0.3893 |
| $$(sτϕ)\_{ajk}$$ | Interaction of Si, WH and F | 1 | 27 | 12.10 | 0.0017 |
| $$(jτϕ)\_{bjk}$$ | Interaction of Se, WH and F | 1 | 23.3 | 1.51 | 0.2316 |
| F-tests are based on model (2). Denominator degrees of freedom are adjusted with the Method of Kenward and Roger. Response variable was log-transformed. Residual variances: $σ\_{e11}^{2}$ = 0.0889, $σ\_{e12}^{2}$ = 0.0384, $σ\_{e22}^{2}$ = 0.0076 |

|  |
| --- |
| Table S3. Sequential F-tests for fixed effects for a model fitted to millet yield in on-farm trials. |
| Effect | Description | Numerator DF | Denominator DF | F-value | p-value |
| $$μ$$ | Intercept | 1 | 107 | 35176.0 | <0.0001 |
| $$s\_{a}$$ | Main effect of Site (Si) | 1 | 121 | 13.35 | 0.0004 |
| $$j\_{b}$$ | Main effect of Season (Se) | 1 | 61.7 | 3.29 | 0.0746 |
| $$η\_{i}$$ | Main effect of soil (S) | 4 | 75.3 | 1.27 | 0.2888 |
| $$τ\_{j}$$ | Main effect of treatment | 2 | 56.2 | 56.78 | <0.0001 |
| $$\left(ητ\right)\_{ij}$$ | Interaction of S and treatment | 8 | 41.4 | 3.54 | 0.0033 |
| F-tests are based on model (3). Denominator degrees of freedom are adjusted with the Method of Kenward and Roger. Response variable was log-transformed. Random effects were found to be simultaneously non-significant in a likelihood ratio test (DF = 7, χ² = 9.73, p = 0.2046) and therefore removed from the model. |