**Table S1.** Species of cover crops used in 2016 and 2017 study (Adapted from Abagandura et al., 2019)

|  |  |
| --- | --- |
| **Crop** | **% of Mix** |
| field pea | 42.6 |
| stockford barley | 11.7 |
| everleaf oat | 11.7 |
| indianhead lentil | 7.0 |
| german millet | 4.7 |
| sorghum sudan | 4.7 |
| sumflower | 4.7 |
| bayou kale | 2.3 |
| dwarf essex rape | 2.3 |
| purple top turnip | 2.3 |
| berseem clover | 0.7 |
| crimson clover | 0.7 |
| red clover | 0.7 |

**Table S2.** The effect of diversified cropping system on soil pH at 0-5, 5-15, 15-30, 30-45 and 45-60 cm depths in 2016 and 2017

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Treatment Contrasts | Soil Depth (cm) | | | | |
| 0-5 | 5-15 | 15-30 | 30-45 | 45-60 |
|  | **2016** | | | | |
| MC | 5.5 | 5.5 | 6.5 | 6.9 | 7.7 |
| DC | 5.9 | 5.4 | 6.3 | 6.9 | 7.5 |
| *P*-value | NS | NS | NS | NS | NS |
| MC | 5.5 | 5.5 | 6.5 | 6.9 | 7.7 |
| DC(w) | 5.5 | 5.0 | 5.9 | 6.1 | 7.1 |
| *P*-value | NS | NS | NS | NS | NS |
| CC | 6.3 | 6.0 | 6.8 | 7.4 | 7.9 |
| NCC | 5.8 | 5.3 | 6.1 | 6.8 | 7.4 |
| *P*-value | NS | NS | NS | NS | NS |
| LG | 6.1 | 5.2 | 5.9 | 6.9 | 7.6 |
| NLG | 5.8 | 5.5 | 6.4 | 6.9 | 7.5 |
| *P*-value | NS | NS | NS | NS | NS |
|  | **2017** | | | | |
| MC | 5.8 | 5.2 | 6.4 | 7.1 | 7.8 |
| DC | 6.2 | 5.7 | 6.6 | 7.2 | 7.7 |
| *P*-value | NS | NS | NS | NS | NS |
| MC | 5.8 | 5.2 | 6.4 | 7.1 | 7.8 |
| DC(w) | 6.0 | 5.3 | 6.3 | 7.1 | 7.7 |
| *P*-value | NS | NS | NS | NS | NS |
| CC | 6.5 | 6.2 | 7.0 | 7.5 | 7.9 |
| NCC | 6.1 | 5.6 | 6.4 | 7.1 | 7.6 |
| *P*-value | NS | NS | NS | NS | NS |
| LG | 6.0 | 5.4 | 6.5 | 7.1 | 7.7 |
| NLG | 6.2 | 5.8 | 6.6 | 7.2 | 7.7 |
| *P*-value | NS | NS | NS | NS | NS |

Note: MC: mono-cropping (continuous wheat). DC: diversified cropping systems (average of wheat, cover crop, corn, pea/barley, and sunflower). DC(w): wheat in diversified cropping system. CC: cover crop. NCC: average of wheat, corn, pea/barley, and sunflower. LG: legume. NLG: average of wheat, cover crop, corn, and sunflower.

**Table S3**. The effect of diversified cropping system on total nitrogen (TN g kg-1)at 0-5, 5-15, 15-30, 30-45 and 45-60 cm depths in 2016 and 2017

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Contrast | Soil Depth (cm) | | | | |
| 0-5 | 5-15 | 15-30 | 30-45 | 45-60 |
|  | **2016** | | | | |
| MC | 2.1 | 1.4 | 1.0 | 0.9 | 0.8 |
| DC | 2.1 | 1.5 | 1.2 | 1.2 | 0.9 |
| *P*-value | NS | NS | NS | NS | NS |
| MC | 2.1 | 1.4 | 1.0 | 0.9 | 0.8 |
| DC(w) | 2.2 | 1.7 | 1.4 | 1.4 | 1.0 |
| *P*-value | NS | NS | NS | NS | NS |
| CC | 2.2 | 1.6 | 1.2 | 1.0 | 0.9 |
| NCC | 2.1 | 1.5 | 1.3 | 1.2 | 0.9 |
| *P*-value | NS | NS | NS | NS | NS |
| LG | 2.2 | 1.4 | 1.1 | 1.0 | 0.9 |
| NLG | 2.1 | 1.6 | 1.3 | 1.2 | 0.9 |
| *P*-value | NS | NS | NS | NS | NS |
|  | **2017** | | | | |
| MC | 2.2 | 1.5 | 1.1 | 0.9 | 0.8 |
| DC | 2.3 | 1.6 | 1.3 | 1.1 | 1.0 |
| *P*-value | NS | NS | NS | NS | NS |
| MC | 2.2 | 1.5 | 1.1 | 0.9 | 0.8 |
| DC(w) | 2.4 | 1.7 | 1.5 | 1.2 | 1.1 |
| *P*-value | NS | NS | NS | NS | NS |
| CC | 2.5 | 1.7 | 1.2 | 0.9 | 0.8 |
| NCC | 2.3 | 1.5 | 1.3 | 1.2 | 1.0 |
| *P*-value | NS | NS | NS | NS | NS |
| LG | 2.2 | 1.5 | 1.1 | 1.0 | 0.9 |
| NLG | 2.4 | 1.6 | 1.4 | 1.2 | 1.0 |
| *P*-value | NS | NS | NS | NS | NS |

Note: MC: mono-cropping (continuous wheat). DC: diversified cropping systems (average of wheat, cover crop, corn, pea/barley, and sunflower). DC(w): wheat in diversified cropping system. CC: cover crop. NCC: average of wheat, corn, pea/barley, and sunflower. LG: legume. NLG: average of wheat, cover crop, corn, and sunflower.



**Figure S1.** Total monthly precipitation (mm), maximum and minimum air temperature (°C) in 2016, and 2017 at Agrometeorological Station located 25 km way from the study site



**Figure S2.** The effect of diversified cropping system on soil water retention (SWR m3 m-3) at 0-5 cm depth in 2016 and 2017.