

**Table S1.** ANOVA on the effect of cropping season, tillage system and manure rate on sunflower grain yield (GY), head diameter (HD), head dry matter (HDM), 100 seed weight, aboveground dry matter (ADM), leaf area index (LAI), plant height (PH) and stem girth (SG) at flower bud stage (FBS), flowering stage (FS) and maturity stage (MS) during 2021/2022 and 2022/2023 cropping season at Syferkuil.

Sunflower Parameters	Factors						
	Cropping season (CS)	Tillage System (TS)	Manure Rate (MR)	CS×TS	CS×MR	TS×MR	CS×TS×MR
GY	0.0111	0.0001	0.0001	0.2976	0.3057	0.6886	0.7668
HD	0.0001	0.0001	0.0001	0.0159	0.1118	0.0001	0.7513
HDM	0.0001	0.0001	0.0001	0.0001	0.0001	0.2987	0.8779
100 seed weight	0.1379	0.0755	0.3085	0.6466	0.4421	0.7769	0.8301
ADM (FBS)	0.0001	0.0001	0.0001	0.0408	0.0001	0.0602	0.0445
ADM (FS)	0.0001	0.0001	0.0001	0.0001	0.0001	0.8947	0.3934
ADM (MS)	0.0001	0.0001	0.0001	0.0001	0.2738	0.3988	0.2226
LAI (FBS)	0.0021	0.0026	0.0001	0.2200	0.0315	0.7555	0.6410
LAI (FS)	0.0098	0.0263	0.0001	0.0992	0.0195	0.8086	0.5260
LAI (MS)	0.0492	0.7432	0.7636	0.5944	0.5857	0.9689	0.8993
PH (FBS)	0.9559	0.3318	0.0001	0.3798	0.1140	0.5850	0.9705
PH (FS)	0.0001	0.0050	0.0001	0.0014	0.7582	0.5781	0.6538
PH (MS)	0.0001	0.0181	0.0001	0.0157	0.6857	0.6638	0.7233
SG (FBS)	0.0593	0.0966	0.0001	0.6859	0.5610	0.4857	0.9110
SG (FS)	0.0083	0.2636	0.0001	0.2473	0.8959	0.3708	0.3669
SG (MS)	0.0733	0.1810	0.0001	0.4925	0.7666	0.3433	0.5998

**Table S2.** ANOVA on the effect of cropping season, tillage system and manure rate on sunflower grain yield (GY), head diameter (HD), head dry matter (HDM), 100 seed weight, aboveground dry matter (ADM), leaf area index (LAI), plant height (PH) and stem girth (SG) at flower bud stage (FBS), flowering stage (FS) and maturity stage (MS) during 2021/2022 and 2022/2023 cropping season at UNIVEN.

Sunflower Parameters	Factors						
	Cropping season (CS)	Tillage System (TS)	Manure Rate (MR)	CS×TS	CS×MR	TS×MR	CS×TS×MR
GY	0.0046	0.0005	0.0010	0.6630	0.9072	0.9352	0.9723
HD	0.0332	0.0001	0.0001	0.7206	0.7050	0.0001	0.7933
HDM	0.0001	0.6089	0.0001	0.0135	0.1193	0.5255	0.8964
100 seed weight	0.2811	0.9146	0.4306	0.5384	0.6676	0.9469	0.7667
ADM (FBS)	0.0565	0.0001	0.0001	0.5364	0.859	0.2352	0.8026
ADM (FS)	0.035	0.0001	0.0001	0.0647	0.6120	0.5407	0.2613
ADM (MS)	0.0001	0.0001	0.0001	0.0576	0.7124	0.5559	0.6553
LAI (FBS)	0.4738	0.0004	0.0001	0.9981	0.0136	0.4380	0.9874
LAI (FS)	0.0428	0.0001	0.0001	0.0001	0.0001	0.1795	0.9721
LAI (MS)	0.0001	0.0001	0.0001	0.0001	0.0082	0.3969	0.9224
PH (FBS)	0.0042	0.0001	0.0001	0.1251	0.2497	0.0066	0.9744
PH (FS)	0.0040	0.0001	0.0001	0.2351	0.3782	0.5394	0.6283
PH (MS)	0.0241	0.0001	0.0001	0.1244	0.0725	0.9251	0.8007
SG (FBS)	0.0001	0.0001	0.0001	0.2593	0.8011	0.1103	0.6448
SG (FS)	0.0001	0.0001	0.0001	0.0086	0.0093	0.1228	0.5652
SG (MS)	0.2480	0.0001	0.0001	0.2842	0.0189	0.8537	0.3220

