

**Table S1.** The contribution rate in RDA of soil NR and soil nutrients under three irrigation systems.

<b>Name</b>	<b>Contribution %</b>	<b>pseudo-F</b>	<b><i>P</i></b>
Moisture	82.8	33.5	0.008
AVN	7.6	4.7	0.05
NO <sub>3</sub> <sup>-</sup> -N	4.5	4.3	0.102
NH <sub>4</sub> <sup>+</sup> -N	2.2	2.9	0.194
pH	2.2	8.0	0.044
TN	0.6	4.4	0.154

TN, total nitrogen; AVN, available nitrogen; NH<sub>4</sub><sup>+</sup>-N, ammonium nitrogen; NO<sub>3</sub><sup>-</sup>-N, nitrate nitrogen.

**Table S2.** The contribution rate in RDA of soil NiR and soil nutrients under three irrigation systems.

<b>Name</b>	<b>Contribution %</b>	<b>pseudo-F</b>	<b><i>P</i></b>
NH <sub>4</sub> <sup>+</sup> -N	73.8	8.8	0.022
Moisture	6.1	0.7	0.428
pH	7.4	0.8	0.458
AVN	10.8	1.3	0.334
TN	1.7	0.2	0.732
SOM	0.2	<0.1	0.932

TN, total nitrogen; AVN, available nitrogen; NH<sub>4</sub><sup>+</sup>-N, ammonium nitrogen; SOM, soil organic matter.

**Table S3.** Illumina MiSeq sequenced denitrifying bacterial data based on the *nirK* gene.

Samples	Raw_tags	Clean_tags	OTUs
FP1	76194	73195	303
FP2	58390	58023	319
FP3	70913	68467	350
DI1	51720	50686	256
DI2	45973	45766	233
DI3	51511	51328	213
MF1	57208	56914	204
MF2	53417	53057	206
MF3	52109	51810	280

**Table S4.** Illumina MiSeq sequenced denitrifying bacterial data based on the *nirS* gene.

<b>Samples</b>	<b>Raw_tags</b>	<b>Clean_tags</b>	<b>OTUs</b>
FP1	67948	55941	452
FP2	60802	45238	410
FP3	64484	55613	377
DI1	72277	51613	469
DI2	50091	41353	423
DI3	54166	48758	385
MF1	64399	51018	458
MF2	63662	53699	550
MF3	63855	58553	495

**Table S5.** The contribution rate in RDA of soil *nirK*-type denitrifiers community structure and soil nutrients under three irrigation systems.

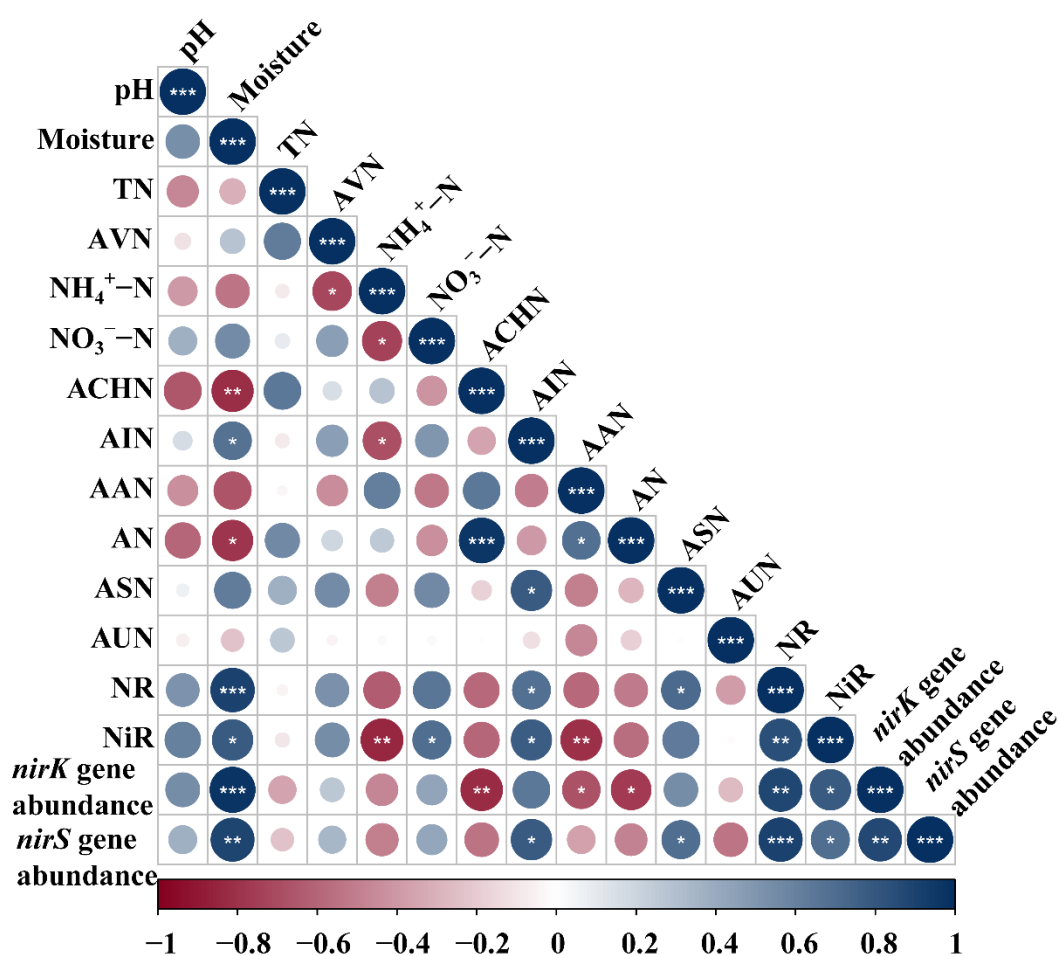
Name	Contribution%	pseudo-F	<i>P</i>
Moisture	46.2	6	0.022
SOM	15.7	2.5	0.05
NH <sub>4</sub> <sup>+</sup> -N	9.1	1.6	0.178
AN	6.4	1.1	0.334
pH	7.2	1.4	0.282
ACHN	6.7	1.5	0.286
TN	4.7	1.1	0.426
NO <sub>3</sub> <sup>-</sup> -N	4.1	<0.1	1

SOM, soil organic matter; NH<sub>4</sub><sup>+</sup>-N, ammonium nitrogen; AN, ammonia nitrogen; ACHN, acid hydrolyzable organic nitrogen; TN, total nitrogen; NO<sub>3</sub><sup>-</sup>-N, nitrate nitrogen.

**Table S6.** The contribution rate in RDA of soil *nirS*-type denitrifiers community structure and soil nutrients under three irrigation systems.

Name	Contribution %	pseudo-F	<i>P</i>
NO <sub>3</sub> <sup>-</sup> -N	28.2	4.3	0.004
ACHN	26.6	4.1	0.01
Moisture	11.5	1.5	0.194
AN	9	1.3	0.206
SOM	7.8	1.1	0.368
TN	5.9	0.9	0.518
pH	4.6	0.5	0.658
NH <sub>4</sub> <sup>+</sup> -N	6.4	<0.1	1

NO<sub>3</sub><sup>-</sup>-N, nitrate nitrogen; ACHN, acid hydrolyzable organic nitrogen; AN, ammonia nitrogen; SOM, soil organic matter; TN, total nitrogen; NH<sub>4</sub><sup>+</sup>-N, ammonium nitrogen.



**Figure S1.** The correlation analysis among *nirK*- and *nirS*-type denitrifiers abundance, soil enzyme activities, and nutrients. TN, total nitrogen; AVN, available nitrogen;  $\text{NH}_4^+\text{-N}$ , ammonium nitrogen;  $\text{NO}_3^-\text{-N}$ , nitrate nitrogen; ACHN, acid hydrolyzable organic nitrogen; AIN, non-hydrolyzable nitrogen; AAN, amino acid nitrogen; AN, ammonia nitrogen; ASN, amino sugar nitrogen; AUN, unidentified hydrolyzable nitrogen; NR, nitrate reductase; NiR, nitrite reductase. \* indicates significance at  $P < 0.05$ , \*\* indicates significance at  $P < 0.01$ , \*\*\* indicates significance at  $P < 0.001$ .