

## **Supporting Information**

### **Interactions between phosphorus availability and microbes in a wheat-maize double cropping system: A reduced fertilization scheme**

#### **Supplementary Table**

**Table S1** Phosphorous fertilizer use efficiency for wheat and maize during 2016 and 2018

**Table S2** ANOVA of percent of community of soil bacterial communities at the phylum level during the V12 period of maize season in 2018.

#### **Supplementary Figure**

**Fig. S1** Soil temperature and water change curve of wheat-maize rotation in 2017-2018

**Fig. S2** Differences of taxonomic composition of soil fungus and bacterial c communities at the order level during the V12 period of maize season in 2018

**Fig.S3** Differences of taxonomic composition of soil fungus and bacterial communities at the phylum level during the V12 period of maize season in 2018.

**Table S1** Phosphorous fertilizer use efficiency for wheat and maize during 2016 and 2018

Treatment	2016/2017	2017/2018	Average
	Wheat-Maize	Wheat-Maize	
PUE (%)			
HP0	-	-	-
HPwm	10.84 a	13.86 b	12.35 b
HPw	10.65 a	16.71 b	13.68 b
HPw2	15.83 a	20.72 a	18.27 a
LP0	-	-	-
LPwm	27.46 a	27.20 a	27.33 a
LPw	28.45 a	29.66 a	29.05 a
LPw2	26.67 a	25.06 a	25.87 a

Treatments: P0 (no P fertilization applied in either season); Pwm (conventional P fertilization applied in both wheat and maize seasons); Pw (P fertilization applied in wheat season only); Pw2 (P fertilization applied in wheat season only but with the conventional annual amount). Means followed by same letters in each column and same Olsen-P soil level were not significantly different based on one-way ANOVAs followed by Duncan's multiple-range tests ( $P > 0.05$ ). A dash (-) indicates no data.

**Table S2** ANOVA of percent of community of soil bacterial communities at the phylum level during the V12 period of maize season in 2018.

Treatment	Proteobacteria	Actinobacteria	Acidobacteria	Chloroflexi	Planctomycetes	Firmicutes
HP0	0.2557a	0.1646a	0.1448a	0.1112a	0.0729a	0.0636a
HPwm	0.2269 b	0.1823a	0.1421a	0.1015a	0.0574a	0.0443 b
HPw	0.2528a	0.1934a	0.1469a	0.1031a	0.0686a	0.0596ab
HPw2	0.2367ab	0.2a	0.1421a	0.096a	0.0605a	0.0661a
LP0	0.2374ab	0.1978a	0.1312a	0.1057ab	0.0711a	0.0772a
LPwm	0.2328 b	0.198a	0.1449a	0.1191a	0.0604a	0.0536 bc
LPw	0.2478ab	0.1706a	0.1234a	0.0946 b	0.0595a	0.0493 c
LPw2	0.271a	0.1716a	0.155a	0.0999 b	0.0634a	0.0681ab

Means within each column and season followed by same letter were not significantly different based on one-way

ANOVAs followed by Duncan's multiple-range tests ( $P > 0.05$ ).

See the key in Table S1 for treatment descriptions.

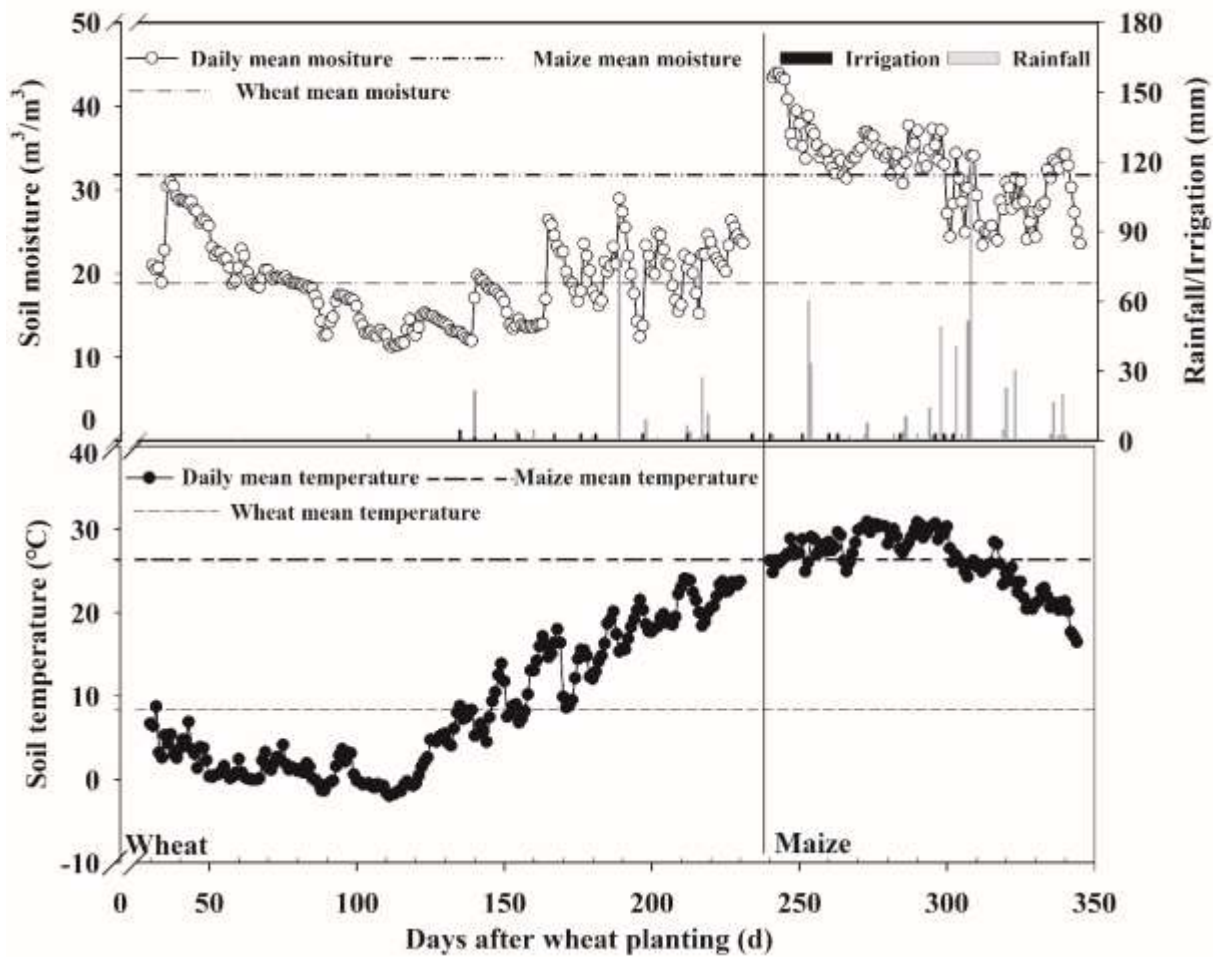
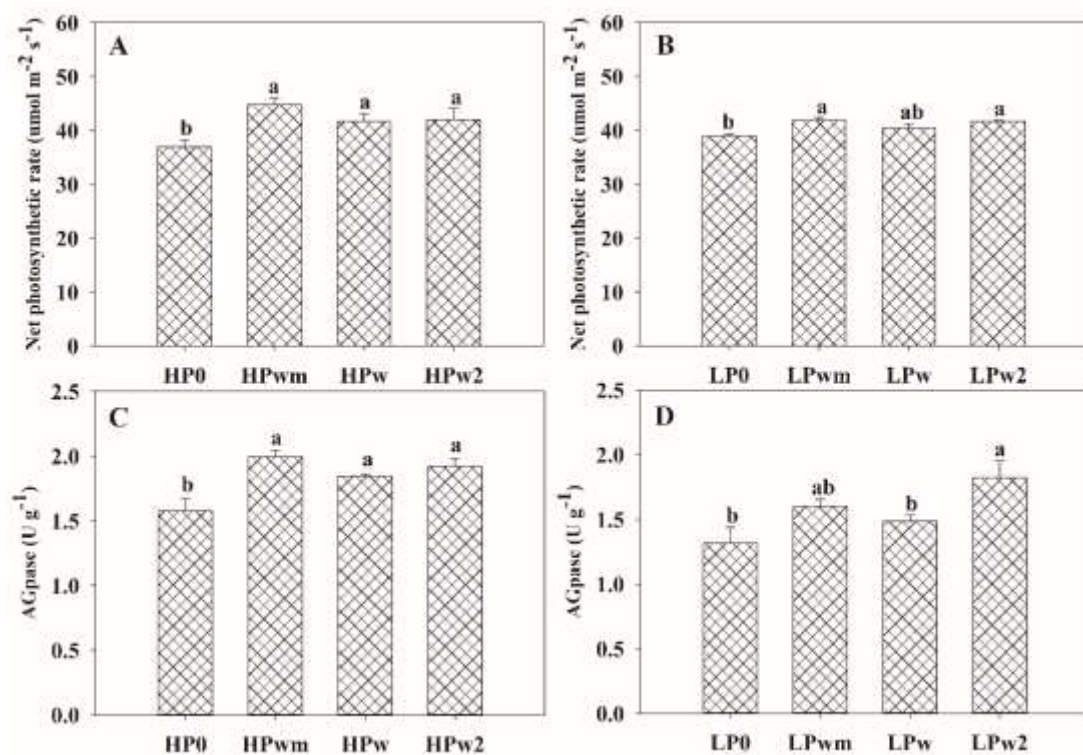
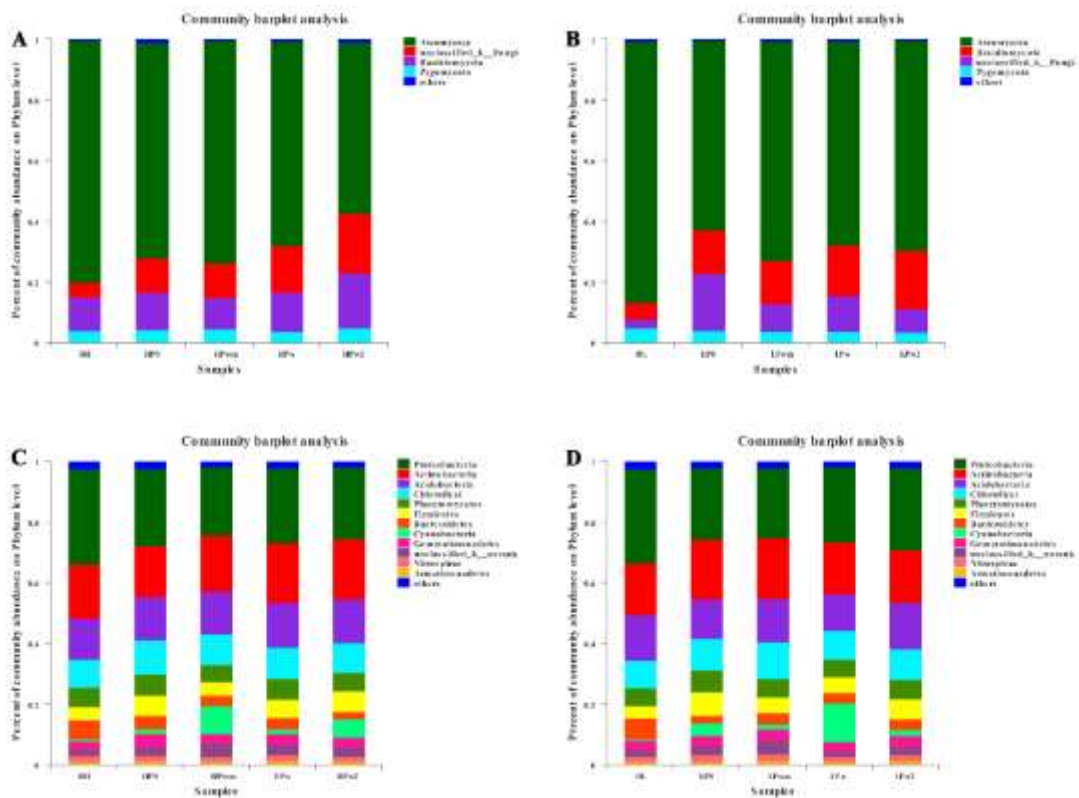


Fig. S1 Soil temperature and water change curve of wheat-maize rotation in 2017-2018



**Fig. S2** Net photosynthetic (A and B) and AGpase (C and D) activity of maize plants to the fertilizer treatments at V12 stage in 2018 maize season

Treatments: P0 (no P fertilization applied in either season); Pwm (conventional P fertilization applied in both wheat and maize seasons); Pw (P fertilization applied in wheat season only); Pw2 (P fertilization applied in wheat season only but with the conventional annual amount). “A and C” stand for high Olsen-P soil and “B and D” stand for low Olsen-P soil. Within each graph, means followed by the same letter were not significantly different based on a one-way ANOVA followed by Duncan’s multiple-range tests ( $P > 0.05$ ) in the same soil.



**Fig.S3** Differences of taxonomic composition of soil fungus and bacterial communities at the phylum level during the V12 period of maize season in 2018. Phylum with >1% relative abundance was included. Figures A and B show fungi, and Figures C and D show bacteria. Treatments: P0 (no P fertilization applied to either season); Pwm (conventional P fertilization applied to both wheat and maize seasons); Pw (P fertilization applied for wheat season only); Pw2 (P fertilization applied for wheat season only but with the conventional annual amount).