Supplemental material

Differences in methanogenic pathways and methanogenic communities in paddy soils under three typical cropping modes

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Table S1 The values of f_{ac} and $\alpha_{(CO_2/CH_4)}$ under different regions

Experimental site	Cropping patterns	Soil texture	$\delta^{13}CH_{4(ac)}$ (‰)	$\alpha_{(CO_2/CH_4)}$	f_{ac} (%)	Reference
Narathiwat province, Thailand	DR	Clay loam	-43	1.071	58~108	Nakagawa et al. (2002)
			-30	1.071	45~83	
Texas, American	RF	Sandy clay loam	-40	1.045	24~67	Tyler et al. (1997)
			-40	1.060	51~80	
Texas, American	RF	Silt loam	-40	1.045	41~ 0	Bilek et al. (1999)
			-40	1.060	62~81	
Konosu, Japan	RF	/	-40	1.049	12~100	Sugimoto and Wada (1993)
Vercelli, Italy	RF	Sandy loam	a	1.070	30~80	Conrad et al. (2002)
Vercelli, Italy	RF	Sandy loam	a	1.045	10~51	Krüger et al. (2002)
			a	1.060	27~67	
Vercelli, Italy	RF	Silt loam	a	1.045	40~85	Fey et al. (2004)
			a	1.073	0	
Vercelli, Italy	RF	/	-37~-33	/	45~62	Ji et al. (2018)

Jurong, China	RW	Silt loam	-36~-48	1.045~1.083	40~67	Zhang et al. (2011)
			-37	1.050	-21~32	
Jurong, China	RW	Silt loam	-37	1.060	8~50	Zhang et al. (2016)
			-43	1.050	-27~42	
			-43	1.060	9~61	
Jurong, China	RW	Silt loam	-37	1.057	50	This study
			-43		60	
Jianyang, China	RF	Clay loam	-37	1.058	84	
			-43		98	
Yingtan, China	DR	Sandy loam	-37	1.062	64	
			-43		75	

a: $\varepsilon_{(ac/CH_4)} = -21‰$ ($\delta^{13}CH_{4(ac)} = \delta^{13}C_{(ac)} + \varepsilon_{(ac/CH_4)}$)

Table S2 The number of nodes and links in Network analysis of the correlation of methanogens under different cropping mode soils

	nodes	lines
RW	13	20
RF	12	33
DR	11	9

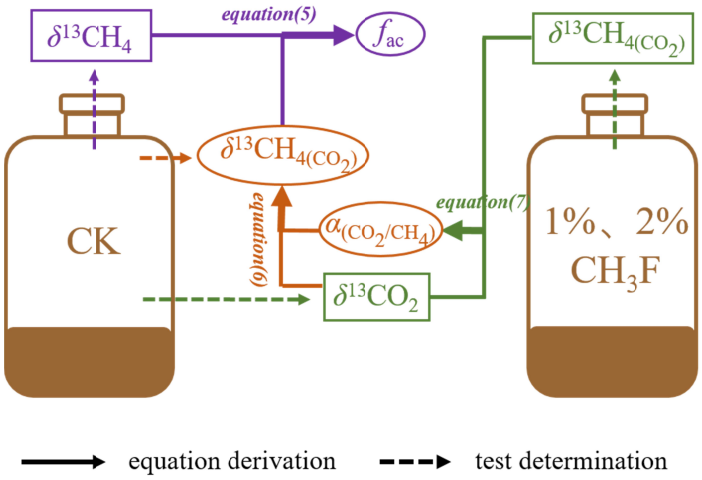
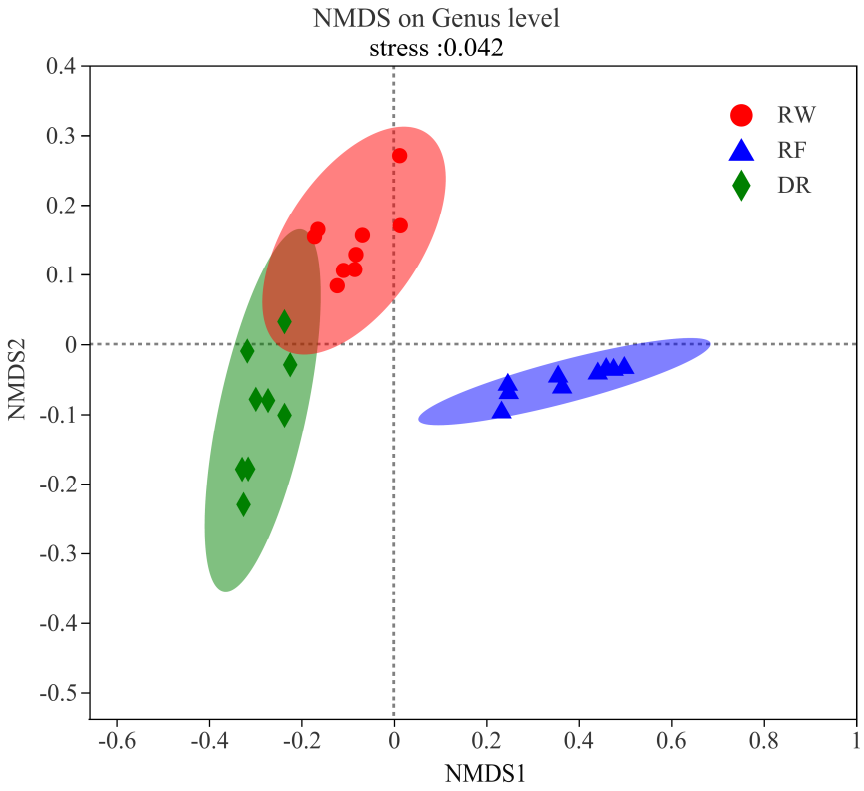


Fig. S1 Evaluation of f_{ac} flow chart using stable carbon isotope method



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26 **Fig. S2** Non-metric multidimensional scaling analysis (NMDS) based on Bray-Curtis dissimilarity

27 calculation of the methanogenic community at genus level with different cropping modes (RW, RF,

28 DR)

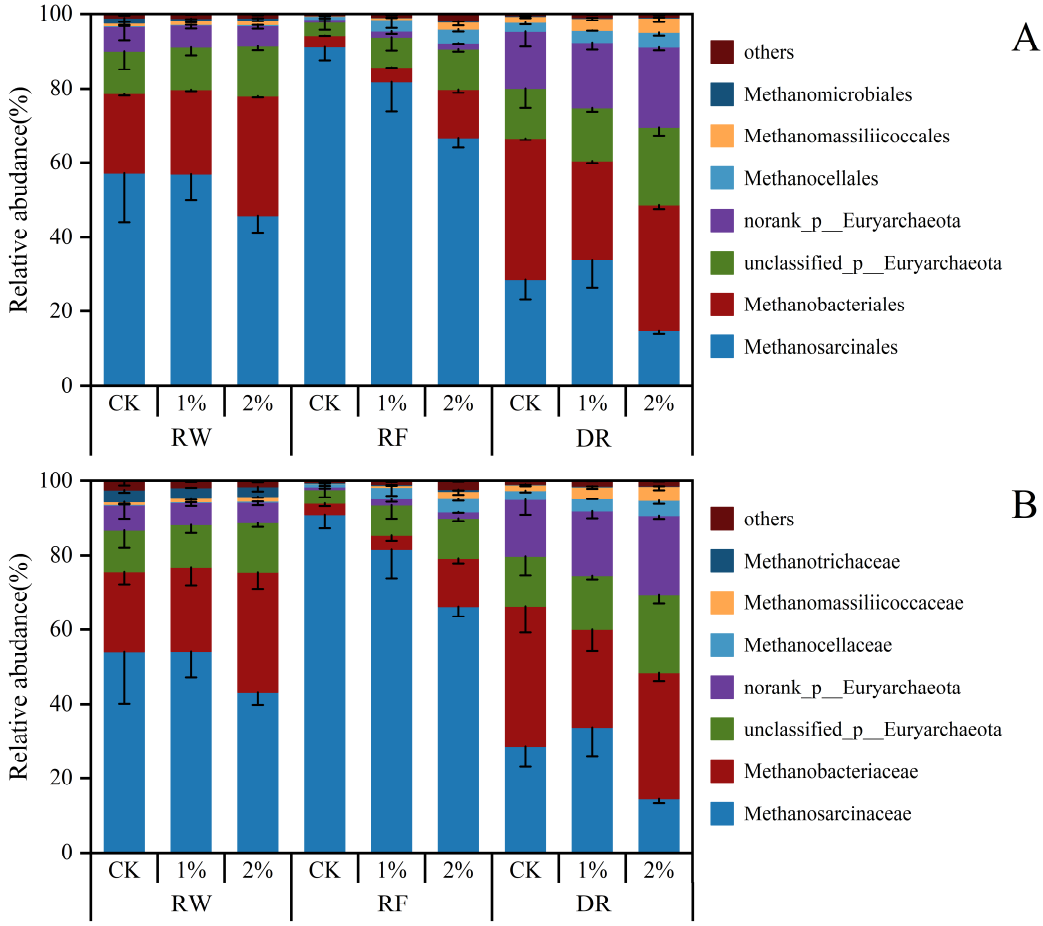

Fig. S3 Relative abundance of methanogens under different cropping modes at the order level (A) and family level (B), respectively. Data are presented as the mean ± SD (n = 3)

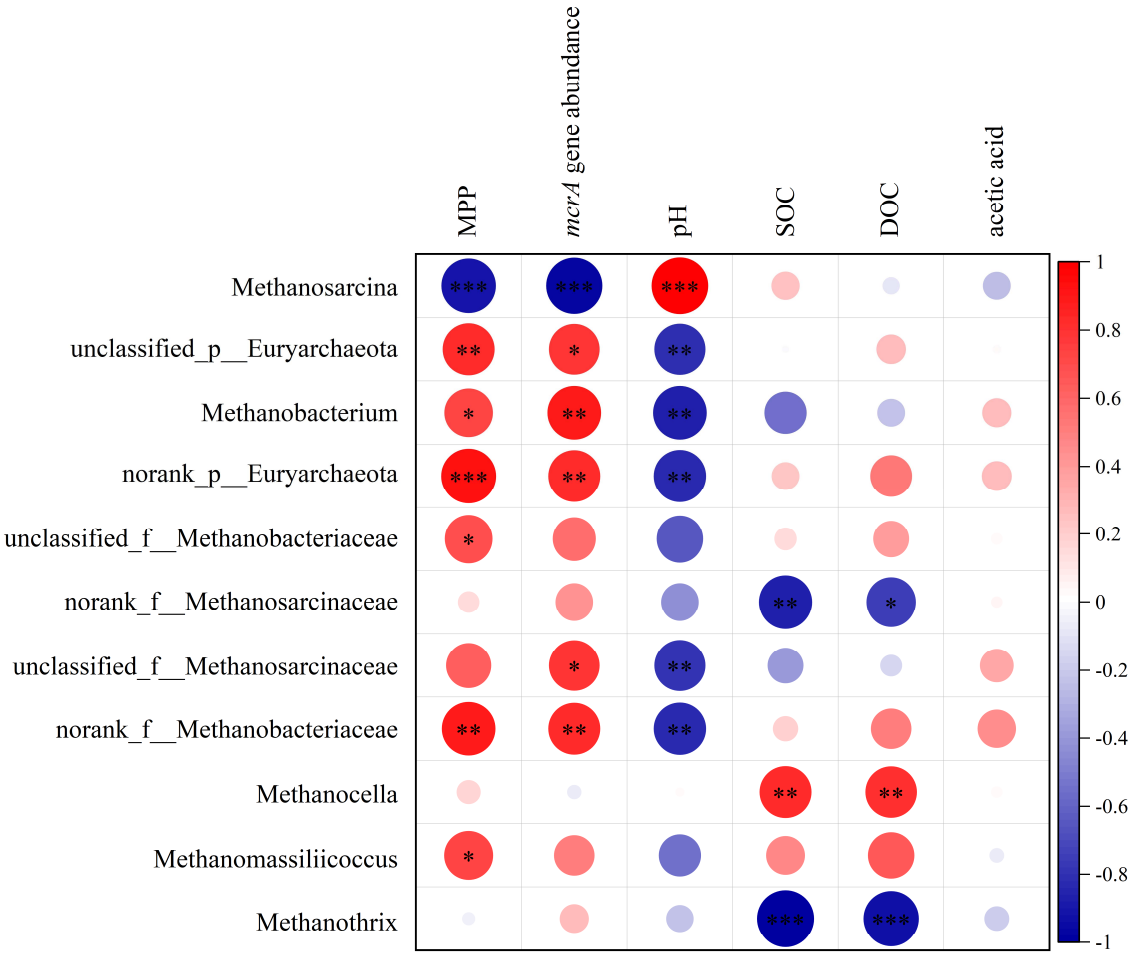

Fig. S4 The heatmap of correlations between methanogenic communities at genus level and soil parameters. MPP is CH_4 production potential. Red is positively correlated, blue is negatively correlated, and the size of the solid circle represents the size of the correlation coefficient. *, **, and *** was significant at $p < 0.05$, $p < 0.01$, and $p < 0.001$, respectively

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