

**Supplementary Table 1.** Daily variation in measured values of soil respiration at the warm grazing site from May 2010 to December 2011 with different grazing intensities.

Year	Month	GI (sheep ha <sup>-1</sup> )	Rs ( $\mu\text{mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$ )		Daily Total C efflux (g CO <sub>2</sub> m <sup>-2</sup> d <sup>-1</sup> )			
			Maximum	time	Minimum	time	Average $\pm$ SE	
2010	May	0	0.90	10:00	0.48	6:00	0.75 $\pm$ 0.06	0.77
		2.7	0.86	10:00	0.49	6:00	0.67 $\pm$ 0.04	0.69
		5.3	1.02	10:00	0.41	6:00	0.69 $\pm$ 0.06	0.72
		8.7	0.82	10:00	0.39	6:00	0.63 $\pm$ 0.03	0.65
	Sep	0	1.69	14:00	0.60	22:00	1.16 $\pm$ 0.05	1.20
		2.7	1.38	14:00	0.54	22:00	0.99 $\pm$ 0.08	1.03
		5.3	1.41	14:00	0.49	22:00	0.91 $\pm$ 0.09	0.94
		8.7	1.62	12:00	0.45	22:00	1.04 $\pm$ 0.09	1.08
	Dec	0	0.32	14:00	0.16	6:00	0.25 $\pm$ 0.04	0.26
		2.7	0.37	14:00	0.23	6:00	0.28 $\pm$ 0.04	0.29
		5.3	0.25	14:00	0.17	6:00	0.22 $\pm$ 0.03	0.23
		8.7	0.360	14:00	0.099	6:00	0.23 $\pm$ 0.08	0.24
2011	May	0	0.55	10:00	0.31	22:00	0.42 $\pm$ 0.05	0.44
		2.7	0.68	10:00	0.30	6:00	0.44 $\pm$ 0.04	0.46
		5.3	0.58	10:00	0.21	6:00	0.39 $\pm$ 0.04	0.40
		8.7	0.58	10:00	0.15	6:00	0.35 $\pm$ 0.03	0.36
	Sep	0	1.69	16:00	1.02	22:00	1.35 $\pm$ 0.08	1.40
		2.7	1.84	16:00	0.81	6:00	1.34 $\pm$ 0.09	1.39
		5.3	1.58	14:00	0.69	6:00	1.16 $\pm$ 0.09	1.20
		8.7	1.62	16:00	0.78	6:00	1.14 $\pm$ 0.06	1.18
Dec	0	0.30	14:00	0.16	6:00	0.24 $\pm$ 0.04	0.25	
	2.7	0.22	14:00	0.084	6:00	0.16 $\pm$ 0.04	0.16	
	5.3	0.34	14:00	0.185	6:00	0.24 $\pm$ 0.05	0.25	
	8.7	0.27	14:00	0.16	6:00	0.22 $\pm$ 0.03	0.22	

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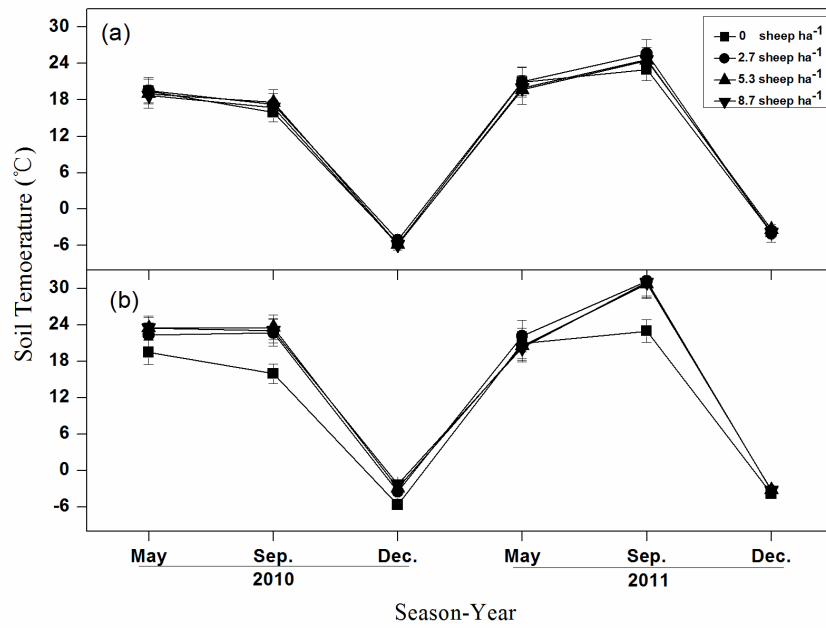
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**Supplementary Table 2.** Daily variation in measured values of soil respiration at the cold grazing site from May 2010 to December 2011 with different grazing intensities.

Year	Season	GI (sheep ha <sup>-1</sup> )	Rs ( $\mu\text{mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$ )				Average $\pm$ SE	Daily Total C efflux (g CO <sub>2</sub> m <sup>-2</sup> d <sup>-1</sup> )
			Maximum	time	Minimum	time		
2010	May	0	0.90	10:00	0.48	6:00	0.75 $\pm$ 0.06	0.77
		2.7	2.17	16:00	1.35	22:00	1.74 $\pm$ 0.08	1.81
		5.3	1.90	16:00	1.27	6:00	1.71 $\pm$ 0.05	1.78
		8.7	1.87	16:00	1.13	6:00	1.60 $\pm$ 0.05	1.66
	Sep	0	1.69	14:00	0.60	22:00	1.16 $\pm$ 0.11	1.20
		2.7	1.86	14:00	1.23	6:00	1.53 $\pm$ 0.05	1.59
		5.3	2.11	16:00	1.18	22:00	1.63 $\pm$ 0.06	1.69
		8.7	2.02	14:00	1.07	6:00	1.55 $\pm$ 0.09	1.61
	Dec	0	0.32	14:00	0.16	6:00	0.25 $\pm$ 0.04	0.26
		2.7	0.46	14:00	0.34	6:00	0.39 $\pm$ 0.04	0.41
		5.3	0.38	14:00	0.30	6:00	0.34 $\pm$ 0.02	0.35
		8.7	0.37	14:00	0.26	6:00	0.33 $\pm$ 0.03	0.34
2011	May	0	0.55	10:00	0.31	22:00	0.42 $\pm$ 0.05	0.43
		2.7	0.69	16:00	0.31	6:00	0.45 $\pm$ 0.03	0.47
		5.3	0.61	10:00	0.23	22:00	0.44 $\pm$ 0.03	0.46
		8.7	0.61	10:00	0.25	6:00	0.42 $\pm$ 0.03	0.44
	Sep	0	1.69	16:00	1.02	22:00	1.35 $\pm$ 0.08	1.40
		2.7	1.02	16:00	0.72	6:00	0.89 $\pm$ 0.03	0.93
		5.3	1.01	10:00	0.77	6:00	0.89 $\pm$ 0.03	0.92
		8.7	0.95	10:00	0.68	22:00	0.81 $\pm$ 0.03	0.84
	Dec	0	0.30	14:00	0.16	6:00	0.24 $\pm$ 0.04	0.25
		2.7	0.28	14:00	0.19	6:00	0.25 $\pm$ 0.03	0.26
		5.3	0.34	14:00	0.17	6:00	0.25 $\pm$ 0.05	0.26
		8.7	0.23	14:00	0.18	6:00	0.21 $\pm$ 0.02	0.21

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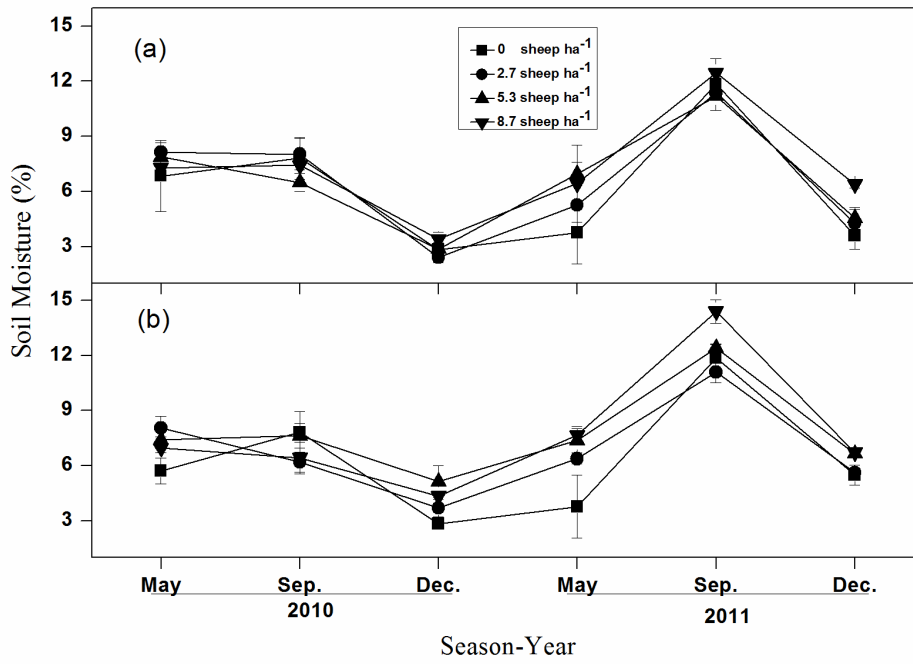


**Supplementary Figure 1** Seasonal dynamics of soil temperature(a) in warm season grazing plots; (b) in cold season grazing plots; Vertical bars represent the standard error of the measurement mean (n=9) for each observation date.

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**Supplementary Figure 2** Seasonal dynamics of soil moisture (a) in warm season grazing plots; (b) in cold season grazing plots; Vertical bars represent the standard error of the measurement mean (n=3) for each observation date.

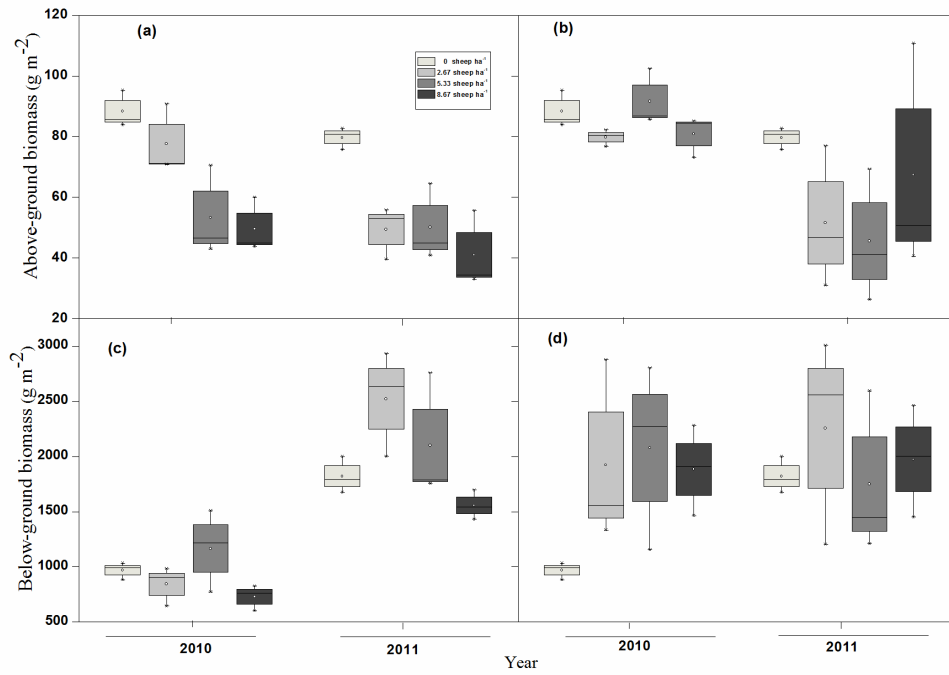
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**Supplementary Figure 3.** Aboveground biomass within (a) warm season grazing plots; (b) cold season grazing plots; belowground biomass within (c) warm season grazing plots; (d) cold season grazing plots from 2010 to 2011. Horizontal lines in boxes show medians and dashed whiskers show data extremes. Open circles and solid whiskers show means  $\pm$  propagated standard errors.

5