

## Infield grass production at northern latitudes: farmers' adaptations to climate change

Atle Mysterud<sup>1,\*</sup>, Anders Nielsen<sup>1</sup>, Øystein Holand<sup>2</sup>

<sup>1</sup>Centre for Ecological and Evolutionary Synthesis (CEES), Department of Biology, University of Oslo, PO Box 1066 Blindern, 0316 Oslo, Norway

<sup>2</sup>Department of Animal and Aquacultural Sciences, Norwegian University of Life Sciences, PO Box 5025, 1430 Ås, Norway

\*Email: atle.mysterud@bio.uio.no

Climate Research 53:55–61 (2012)

### Supplement

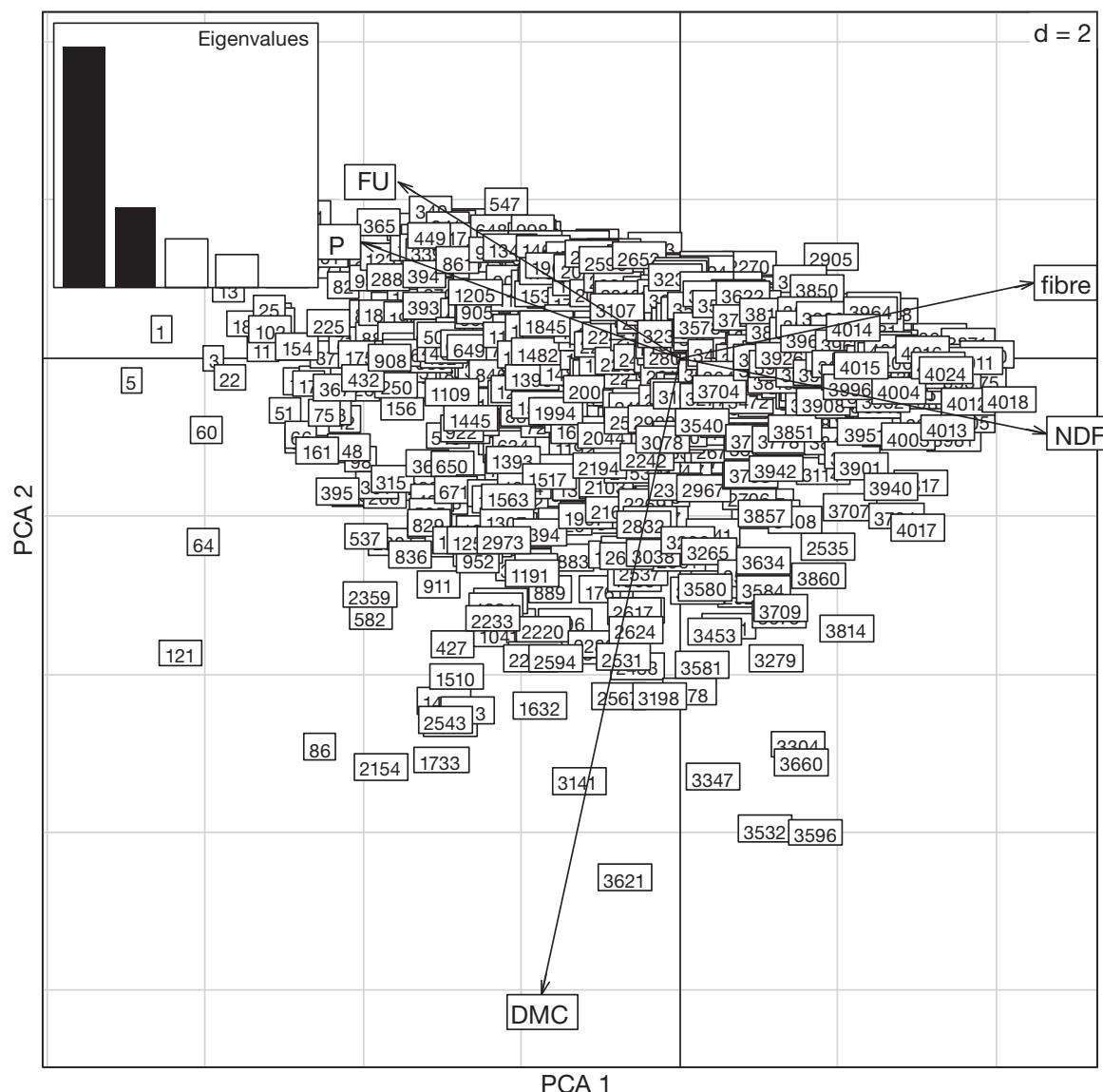


Fig. S1. Principal Component Analysis (PCA) of different proxies of forage quality. P = protein content (%); FU = feed units per kg dry matter content, DMC (%) ; NDF = Neutral Detergent Fibre (%)

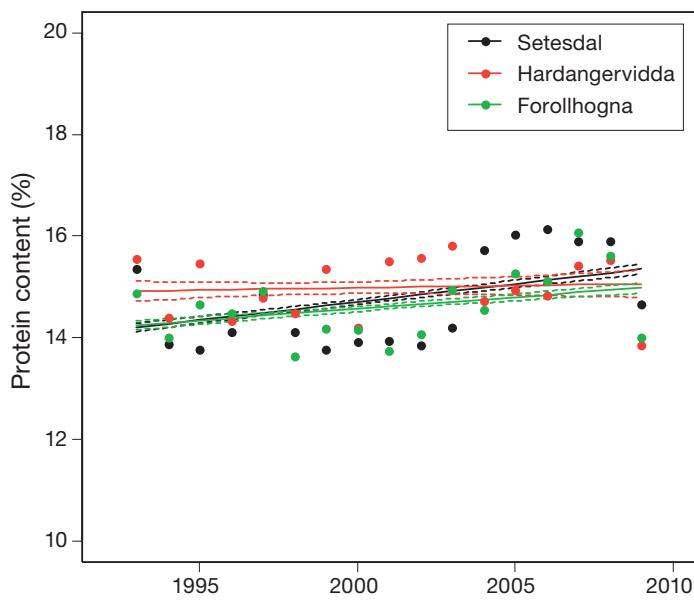


Fig. S2. Protein content (%) in the 1st annual harvesting of infields did not change significantly over the last decades in Norway, as the constant model without the year trend was a more parsimonious model (see Table S4 in this supplement)

Table S1. Sample size for data from infield production of users having alpine outfield summer ranges in Setesdal (Jæren), Hardangervidda and Forollhogna, Norway. The 1st, 2nd and >3rd harvest are raw data on the number of harvests as a proportion

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Sum
Forollhogna	307	179	140	114	93	144	140	122	181	180	154	186	170	136	192	138	143	2719
Hardangervidda	58	48	65	67	26	71	27	40	40	32	39	27	41	31	18	17	11	658
Setesdal	622	438	313	206	246	282	231	240	210	231	213	246	208	115	247	273	154	4475
Sum	987	665	518	387	365	497	398	402	431	443	406	459	419	282	457	428	308	7852
<b>1st harvest</b>																		
Forollhogna	0.84	0.89	0.81	0.89	0.81	0.89	0.90	0.92	0.93	0.84	0.85	0.82	0.79	0.77	0.76	0.79	0.81	0.84
Hardangervidda	0.69	0.73	0.77	0.69	0.73	0.78	0.69	0.69	0.72	0.78	0.73	0.74	0.71	0.81	0.72	0.59	0.73	0.72
Setesdal	0.55	0.55	0.57	0.57	0.56	0.56	0.50	0.55	0.51	0.57	0.53	0.53	0.49	0.48	0.54	0.49	0.53	0.53
<b>2nd harvest</b>																		
Forollhogna	0.16	0.11	0.19	0.11	0.19	0.10	0.10	0.08	0.07	0.16	0.15	0.18	0.20	0.23	0.23	0.21	0.19	0.16
Hardangervidda	0.31	0.27	0.23	0.30	0.27	0.22	0.31	0.31	0.28	0.22	0.27	0.22	0.29	0.19	0.28	0.41	0.27	0.27
Setesdal	0.39	0.38	0.38	0.36	0.39	0.40	0.47	0.39	0.43	0.38	0.40	0.38	0.39	0.43	0.38	0.37	0.36	0.39
<b>≥3rd harvest</b>																		
Forollhogna	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00
Hardangervidda	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00
Setesdal	0.05	0.06	0.05	0.06	0.04	0.04	0.03	0.06	0.06	0.05	0.07	0.09	0.12	0.10	0.08	0.14	0.11	0.07

Table S2. Model selection of how timing of 1st harvesting of the infield has changed over time (1993-2009) for users of outfield grazing ranges in Setesdal (Jæren), Hardangervidda and Forollhogna, Norway. Municipality and year were entered as random terms. NAOw = winter index of the North Atlantic Oscillation; AIC = Akaike Information Criterion; DAIC = difference in AIC relative to best model; temp: temperature. Each row represent one model, and '1' denotes the inclusion of a given parameter

Area	Year (cont.)	NAOw	May temp	Area:year	Area:NAO	Area:May	AIC	DAIC
1	1						39981	77
1	1			1			39907	3
1		1					40000	96
1		1			1		39993	89
1			1				40002	98
1			1			1	40005	101
1		1	1				39982	78
1	1	1		1			39905	1
1	1	1	1	1			39907	3
1	1	1			1		39904	0

Table S3. Model selection of how the proportion of single vs. multiple ( $\geq 2$ ) infield harvests has changed over time (1993-2009) for users of outfield grazing ranges in Setesdal (Jæren), Hardangervidda and Forollhogna, Norway. Other details as in Table S2

Area	Year (cont.)	NAOw	May temp	Area:year	Area:NAO	Area:May	AIC	DAIC
1	1						9275	1
1	1			1			9274	0
1		1					9287	13
1		1			1		9289	15
1			1				9287	13
1			1			1	9291	17
1	1	1		1			9275	1
1	1	1	1	1			9275	1
1	1		1		1		9275	1

Table S4. Model selection of protein content (%, arcsin-square-root transformed) in forage from the 1st harvest of the infield (1993-2009) for users of outfield grazing ranges in Setesdal (Jæren), Hardangervidda and Forollhogna, Norway. DOY: day of the year. Other details as in Table S2

Area	Year (cont.)	DOY	NAOw	May temp	Area:year	Area: DOY	Area:NAO	Area:May	AIC	DAIC
1									-16658	0
1		1							-16637	21
1	1								-16651	7
1	1				1				-16630	28
1	1	1							-16607	51
1	1	1							-16627	31
1	1	1				1			-16625	33
1	1		1						-16618	40
1	1		1					1	-16594	64
1	1			1					-16617	41
1	1			1			1		-16594	64
1				1					-16624	34
1				1					-16625	33