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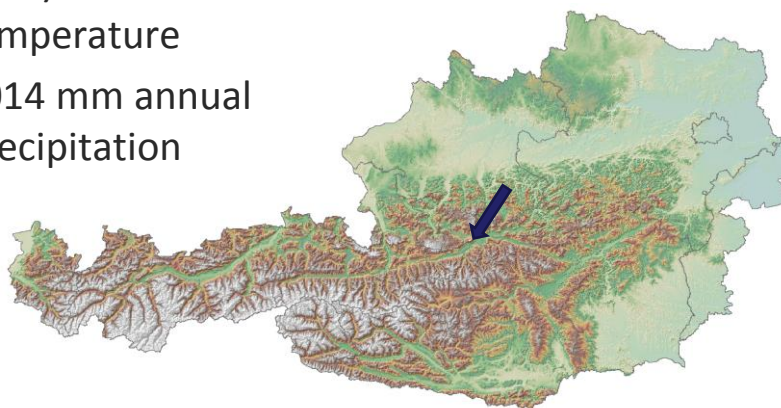MINISTERIUM
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Yield and forage quality of grazed swards in Middle Europe

Mendel University
30.04.2014, Brno

Walter Starz | Bio-Institut | www.raumberg-gumpenstein.at

Trial site

- 740 m altitude
- 7 °C Ø annual temperature
- 1014 mm annual precipitation

Reseeding of *Poa pratensis*

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Botany changes

Parameter	Unit	Variant			SEM	p-value	s_e
		cutting LSMEAN	grazing LSMEAN	grazing + reseed LSMEAN			
Grass	%	73.5	67.9	70.8	1.6	*0.0840*	1.4
Dactylis glomerata	%	15.2 [a]	7.4 [b]	8.0 [b]	2.0	***0.0200***	4.4
Lolium perenne	%	5.6	7.1	6.6	0.6	*0.1671*	4.6
Poa trivialis	%	16.3 [a]	6.4 [b]	5.1 [b]	1.5	***0.0003***	5.3
Poa pratensis	%	11.1 [c]	17.6 [b]	26.6 [a]	1.5	***<0.0001***	1.9
Legumes	%	3.5 [b]	15.2 [a]	13.9 [a]	1.6	***0.0002***	4.3
Herbs	%	18.0 [a]	13.5 [b]	11.8 [b]	0.7	***<0.0001***	4.3

LSMEAN: least square mean; SEM: standard error; s_e: residual standard deviation

- Grazed paddocks showed highest portion of *Trifolium repens* and lowest percentage of herbs
- *Dactylis glomerata* and *Poa trivilalis* decreases during grazing
- *Poa pratensis* increases in grazed and grazed + reseeded variants significantly

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Botany

| without reseeding | reseed with *Poa pratensis* |

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Leaf area index LAI

Parameter	Unit	Variant			SEM	p-value	s_e
		cutting	grazing	grazing + reseed			
		LSMEAN	LSMEAN	LSMEAN			
LAI 0 cm	m² m⁻²	4.8 [b]	5.2 [ab]	5.5 [a]	0.1	**0.0336**	0.7
LAI 10 cm	m² m⁻²	3.1	3.0	3.6	0.2	0.1080	0.8
LAI 20 cm	m² m⁻²	1.5	1.5	1.1	0.2	0.1619	0.7

LSMEAN: least square mean; SEM: standard error; s_e: residual standard deviation

- Highest LAI was measured in reseed variant in comparison to cutting system
- It indicates a denser sward as well as a higher portion of leafs and tillers in *Poa pratensis* dominated sward

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Yield and forage quality

Parameter	Unit	Variant			SEM	p-value	s_e
		cutting	grazing	grazing + reseed			
		LSMEAN	*LSMEAN*	*LSMEAN*			
DM yield	kg ha^{-1}	10,110	9,879	10,416	249	0.3413	705
CP yield	kg ha^{-1}	1,335[b]	1,328[b]	1,475[a]	40	**0.0394**	114
NEL yield	MJ ha^{-1}	56,627	56,862	59,525	1,380	0.2907	3,903
CP concentration	g kg^{-1} DM[-1]	132[b]	144[a]	144[a]	2	**<0.0001**	8
NEL concentration	MJ kg^{-1} DM[-1]	5.60[b]	5.75[a]	5.70[a]	0.03	**0.0073**	0.08

LSMEAN: least square mean; SEM: standard error; s_e: residual standard deviation

- No significant differences between variants were measured
- Highest crude protein yield was assessed in reseed variant
- Energy an crude protein concentration reached highest levels in both grazed variants in comparison to 3-time cutting variant

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Grazing versus cutting

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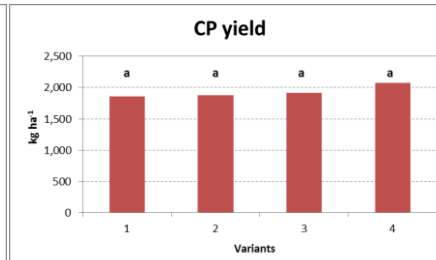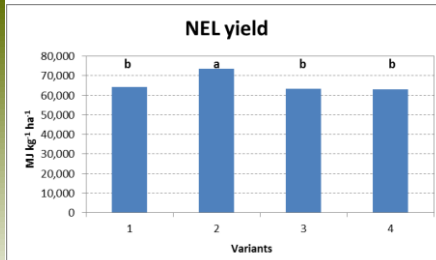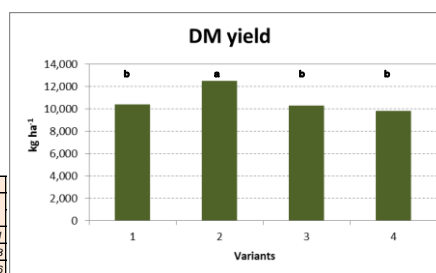
Grazing versus cutting

- impact of continuous grazing in comparison to cutting management on the yield and forage feeding value at permanent grassland swards
- six-year trial (2007-2012) at organic research farm of Raumberg-Gumpenstein
- testing four types of permanent grassland utilisation
  - annual change between cutting management and continuous grazing (*variant 1*)
  - four-times cutting management (*variant 2*)
  - cut of the first growth following continuous grazing (*variant 3*)
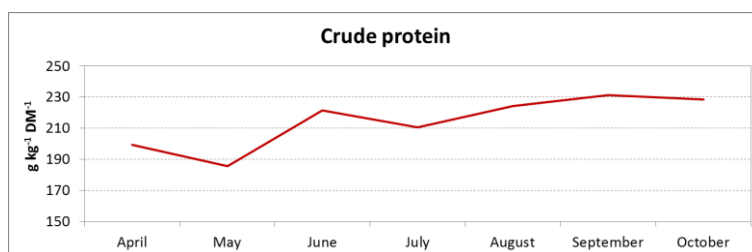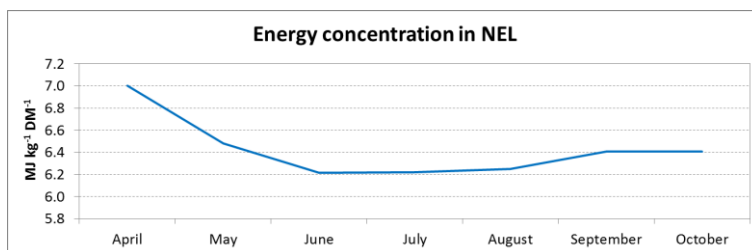 - continuous grazing (*variant 4*)

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Yields

- cutting management reached highest DM and energy yields
- yields without losses
- all yields at a very high level for alpine region

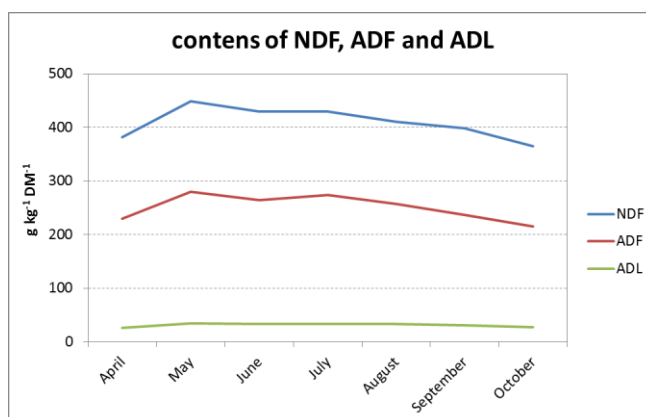| Parameter	Unit	Variant					
		1	2	3	4		
		LSMEAN	LSMEAN	LSMEAN	LSMEAN	SEM	p
DM yield	kg ha^{-1}	10,385 [b]	12,518 [a]	10,273 [b]	9,813 [b]	485	< 0.0001
NEL yield	MJ ha^{-1}	64,143 [b]	73,568 [a]	63,216 [b]	63,189 [b]	3,103	0.0003
CP yield	kg ha^{-1}	1,854 [a]	1,873 [a]	1,916 [a]	2,078 [a]	104	0.0966

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Forage Quality

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NDF, ADF and ADL

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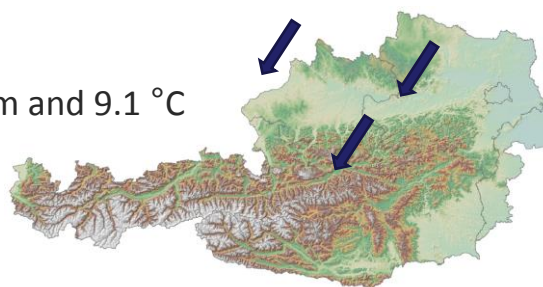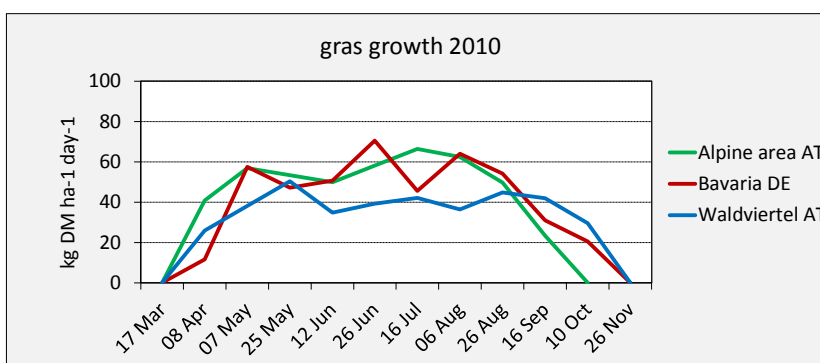
Trial sites

- Alpine area AT
  - 670 m, 1,014 mm and 7 °C
- Bavaria DE
  - 380 m, 870 mm and 8.1 °C
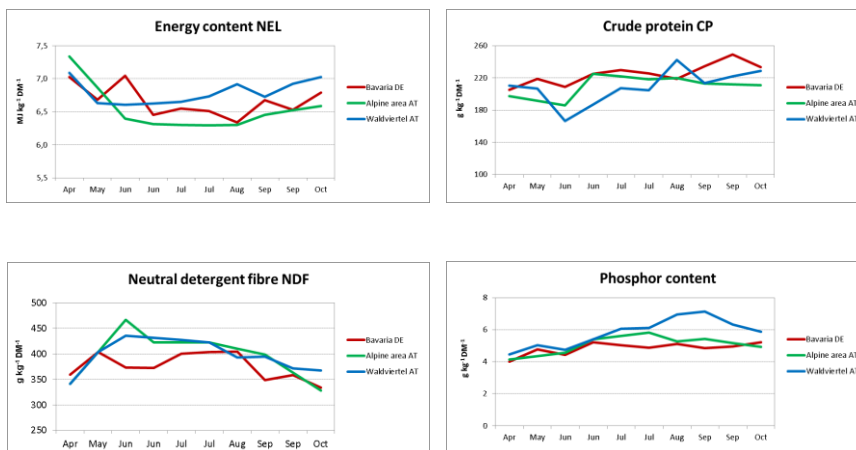- Waldviertel AT
  - 360 m, 745 mm and 9.1 °C

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Yields and grass growth 2010

Parameter	Unit	Bavaria DE LSMEAN	SEM	Alpine area AT LSMEAN	SEM	Waldviertel AT LSMEAN	SEM	P-value	s_e
DM yield	kg ha^{-1}	8,768 [ab]	474	10,193 [a]	422	7,956 [b]	567	0.0194	1,089
NEL yield	MJ ha^{-1}	58,496 [ab]	3,337	66,776 [a]	2,961	54,166 [b]	3,897	0.0429	7,272
CP yield	kg ha^{-1}	2,003 [a]	134	,.138 [a]	120	1,681 [a]	152	0.0637	270

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Contents during vegetation period 2010

Different grazing heights

- trial in 2013 at organic research farm of Raumberg-Gumpenstein
- testing of three different grazing heights
- lowest simulate continuous grazing and highest rotational grazing
- 8 cm was harvested 7 times, 11 cm 6 times and 15 cm 5 times per year
- harvesting area was protected with grazing cages and moved on after harvesting

Different grazing heights

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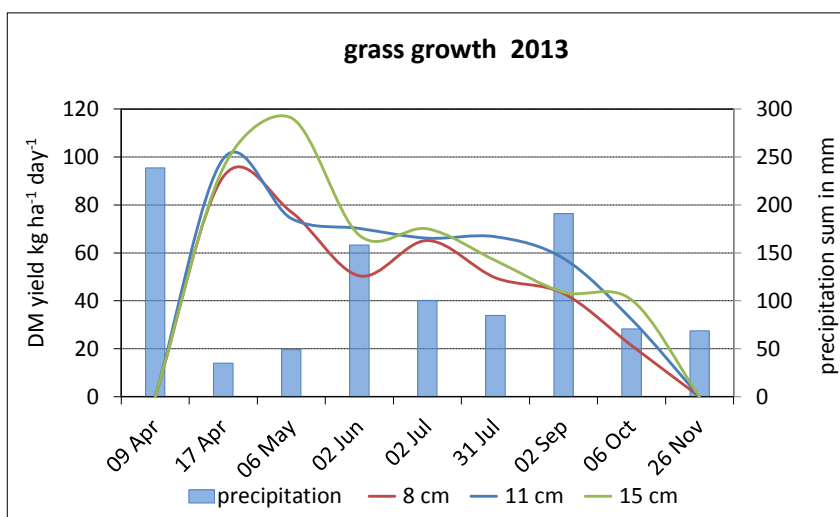
Botany

- 30 vascular plant species
- typical grazed sward species in Alpine area at 700 m altitude
- main species
  - 25 % *Lolium perenne*
  - 20 % *Poa pratensis*
  - 17 % *Trifolium repens*
  - 9 % *herbs*

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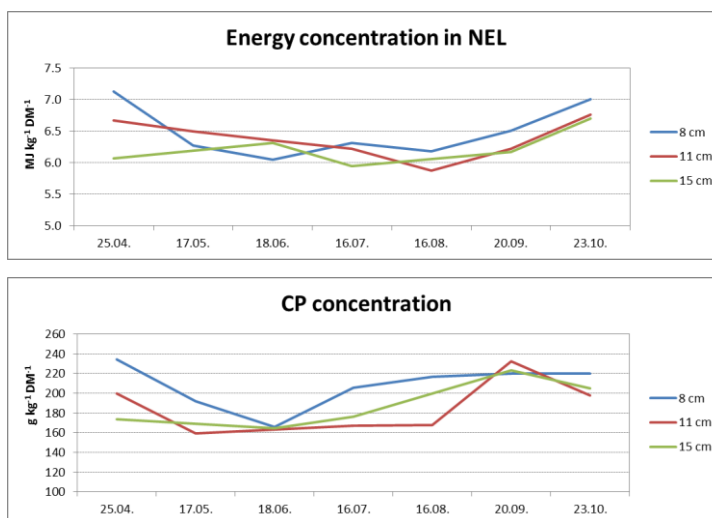
Different grazing heights

- higher swards provides more grass
- area productivity is highest at rotational grazing
- But the management is more complex

Parameter	Unit	Forage height						p	s_e
		8 cm		11 cm		15 cm			
		LSMEAN	SEM	LSMEAN	SEM	LSMEAN	SEM		
DM yield	kg ha^{-1}	10,343[b]	341	12,119[a]	341	12,581[a]	346	0.0007	892
NEL yield	MJ ha^{-1}	66,426[b]	2,069	77,031[a]	2,068	78,131[a]	2,102	0.0010	5,120
CP yield	kg ha^{-1}	2,129[a]	82	2,255[a]	82	2,326[a]	83	0.1238	171
harvesting height	RPM cm	4.9[c]	0.2	6.3[b]	0.2	8.6[a]	0.2	<0.0001	0.6
sward density	kg DM Click[-1] cm^{-1} ha^{-1}	319[a]	8	332[a]	8	315[a]	8	0.3251	22
LAI	m² m[-2]	2.6[c]	0.1	3.3[b]	0.1	4.1[a]	0.1	<0.0001	0.3

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Different grazing heights

grass growth 2013

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Energy and CP during vegetation period

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NDF and LAI during vegetation period

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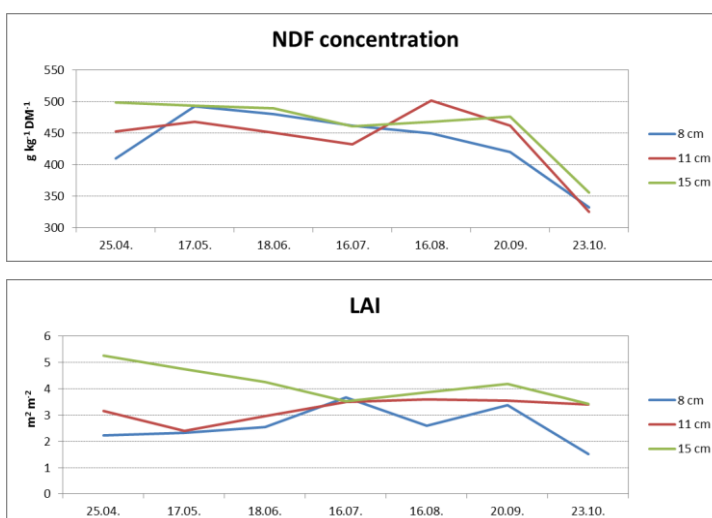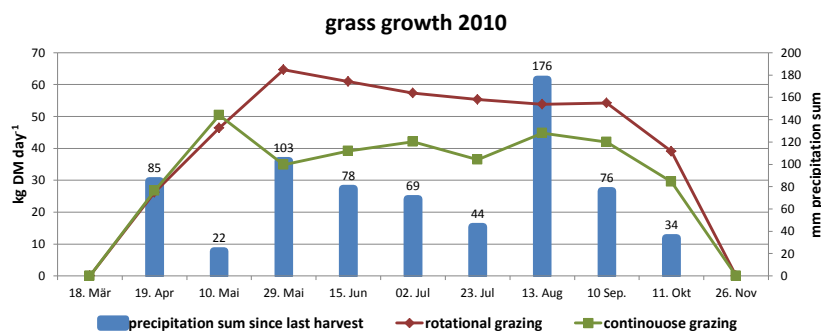
Comparison continuous/rotational grazing

- dry grassland area Ø 745 mm precipitation, 9,1°C, 360 m a.s.l.
- summer drought every second year
- soil parameters: pH 6, humus content 3,7%, low water holding capacity
- utilisation since 2004 as continuous grazing → typical grazed sward species (*Lolium perenne, Poa pratensis, Trifolium repens*)

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Grass growth- continuous/rotational

Comparison of to two grazing system on drought permanent grassland sites in 2010

- DM yield: 7,8 t ha^{-1} continuous grazing and 10,6 t ha^{-1} rotational grazing
- CP deviation: 280 kg ha^{-1}; energy deviation: 15.500 MJ NEL ha^{-1}
- Milk equivalent of 2,400 kg ha^{-1}

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01.05.2014

Conclusions

- Intensive grazed swards reach DM yields like in cutting management
- Grazed grassland reaches highest crude protein yields
- Concentration of CP and energy reach high levels in Alpine regions and is not influenced by a shorter vegetation period
- Regardless of location, grazing is an area-efficient and animal-friendly system of permanent grassland use!

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Thank you for your attention!

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