FiBL Re-Livestock
RESILIENT FARMING SYSTEMS

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Performance of male dairy calves of different breeds raised on various types of grasslands for veal production

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The Re-Livestock project

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Pre-experimental phase

Buying at the age of 4 weeks
n = 36 calves at FiBL
n = 36 calves at Früebüel

Feeding with milk replacer at a drinking robot
→ Total consumption ca. 400 liters

Supplementation of maize and lucerne pellets and hay ad libitum

Beginning of the experiment at 3 months of age

FiBL calves (n=36)

- FiBL n=18
- Wülflingen n=18

Früebüel calves (n=36)

- Früebüel n=18
- Alp Weissenstein n=18

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Experimental design

strickhof

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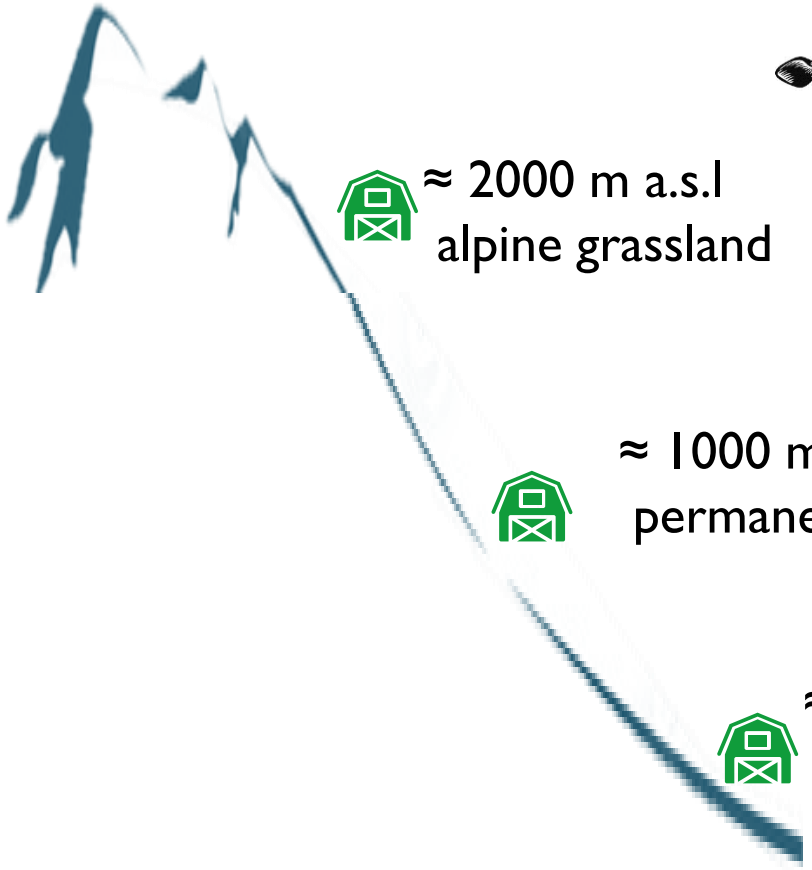
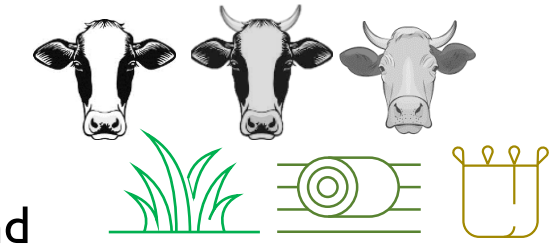
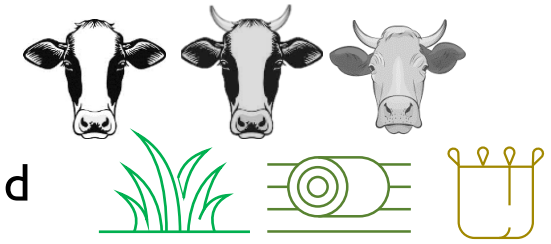


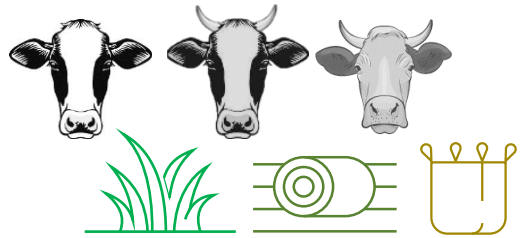
≈ 2000 m a.s.l
alpine grassland



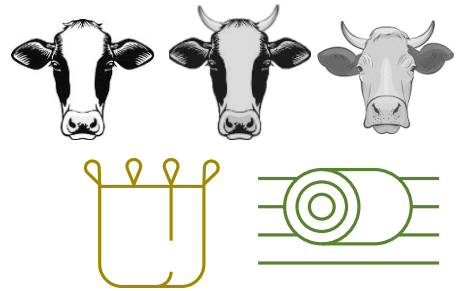
≈ 1000 m a.s.l
permanent grassland



≈ 400 m a.s.l
intensive grassland



≈ 400 m a.s.l
indoor control



Dairy (n=6)
Brown Swiss

Crossed (n=6)
Limousin x Brown Swiss

Dual purpose (n=6)
Swiss Fleckvieh

Pasture

Hay

Pellets + concentrates

Material und methods

- Every two weeks:
  - Measurement of body weight, health status and faeces sampling
  - Pasture samples for measuring available biomass, feed quality and botanical composition
  - Feed samples of supplemental feed
- Slaughtering at the age of 180 days:
  - Measurement of carcass weight, PH-values after 2, 24, 48 hours, L-Value
- After 8 days of maturation:
  - Meat colour, Cooking loss, mean maximal Warner-Bratzlers Shearcraft, Meat quality (Fat, Protein, Watercontent)

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Feeding strategies

Pasture farms

- Pasture access as much as possible (ø ALP = 8.7 ± 2.2 h/d, FRB = 10.2 ± 4 h/d, WUL = 11.9 ± 3.7 h/d)
- Hay ad libitum
- ca. 2.3l milk/day in the first month
- Lucerne 0.5 kg/day and maizepellets 1.3 kg/day on average
- 0.5 kg concentrate/day in the last month

Barn control

- Hay ad libitum
- ca. 2.3l milk/day in the first month
- Lucerne 1.3 kg/day and maizepellets 2.0 kg/day on average
- 0.5 kg concentrate/day in the last month
- 1.8 kg silage/day in the last month

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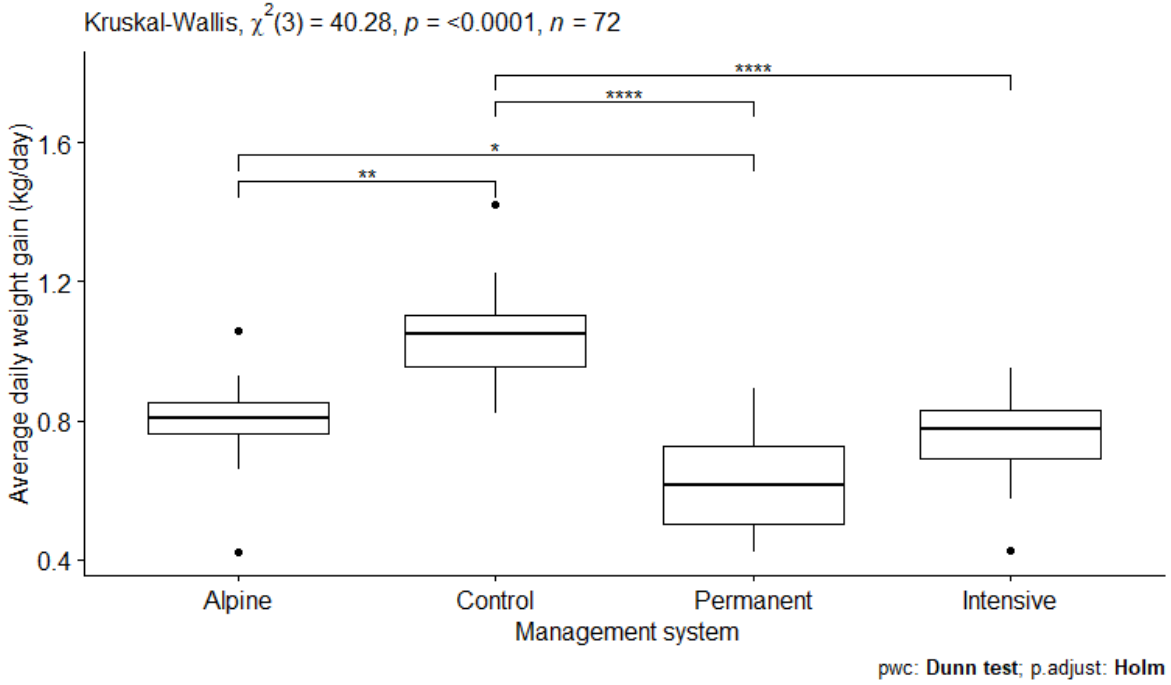
Pasture conditions

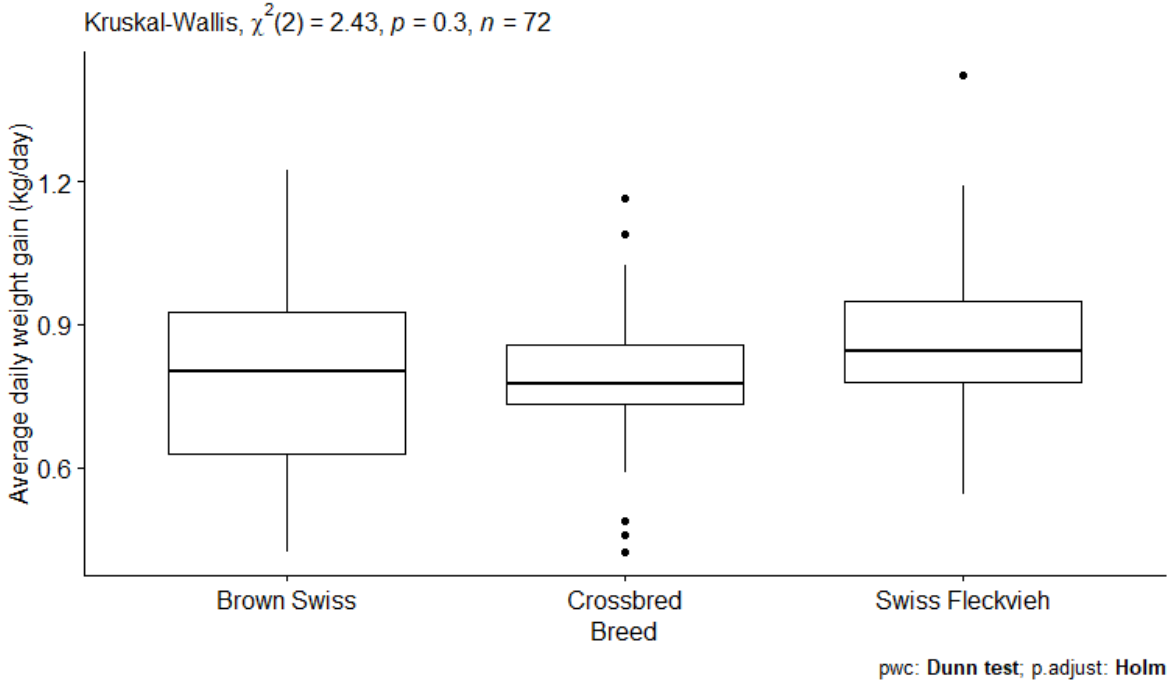
	Alpine (ALP)		Permanent (FRB)		Intensive (WUL)	
	N	Mean + SD	N	Mean + SD	N	Mean + SD
Mean of average grass height mm	8	76.1±10.62	7	104.1±25.66	6	113.5±35.08
Mean of pasture area ha	8	0.27±0.134	7	0.45±0.251	6	0.32±0.159
Drymatter in % (40°C)	51	29.4±5.82	46	22.9±5.71	44	22±4.01
Crude protein g/kgDM	55	143.7±19.11	49	151.7±26.26	44	159.3±26.37
Crude ash g/kgDM	53	7.2±0.98	49	8.5±1.2	44	10.7±0.99
Crude fiber g/kgDM	53	31.3±3.74	49	30.3±5.3	44	32.7±5.21
Neutral detergent fiber g/kgDM	53	406.4±54.42	49	427.1±59.22	44	468.1±61.35
Acid detergent fiber g/kgDM	53	268.9±28.81	49	298±35.03	44	309.3±36.99
Acid detergent lignin g/kgDM	53	33.0±10.55	49	33.9±7.23	44	26.9±6.61
Digestibility of organic matter %	53	74.1±2.85	49	71.3±4.55	44	69.6±5.24
NEV	53	6.2±0.37	49	5.8±0.56	44	5.5±0.65
NEL	53	6±0.29	49	5.7±0.43	44	5.5±0.52
Grasses %	9	58.4±8.7	9	61.8±13.6	8	74.2±5
Legumes %	9	6.3±3.3	9	17±9.7	8	17.3±7.2
Forbes %	9	35.3±9.2	9	21.5±5.7	8	8.5±5.4
Number of Species	61		33		26	

Data preparation and analysis

- Descriptive statistics of pasture conditions are averages over the full pasture period
- R-Studio was used for statistics (R Core, Version 4.3.1)
- Significant differences among production systems and breeds were tested via Kruskal-Wallis and Dunn's pairwise comparison

Average daily weight gain





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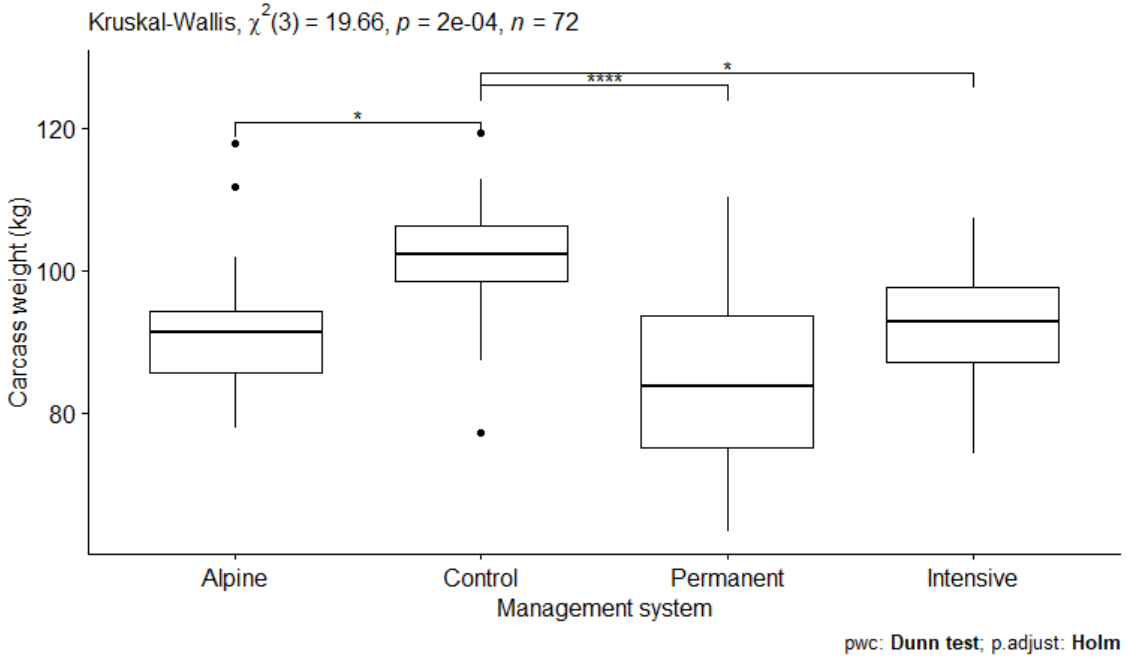
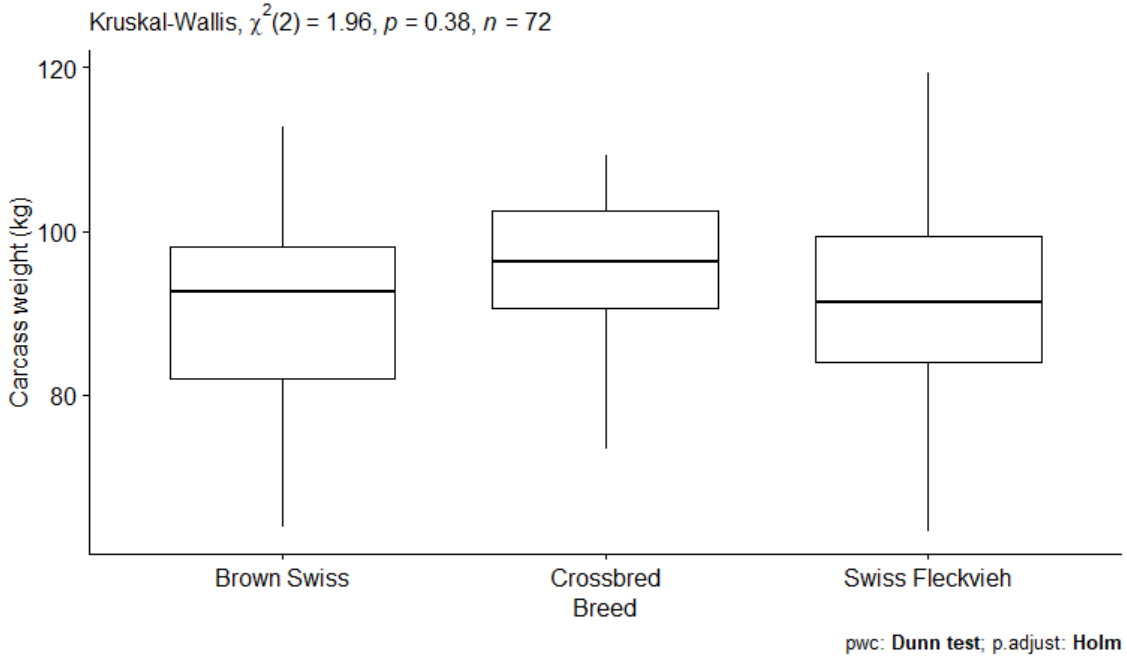
Carcass weight





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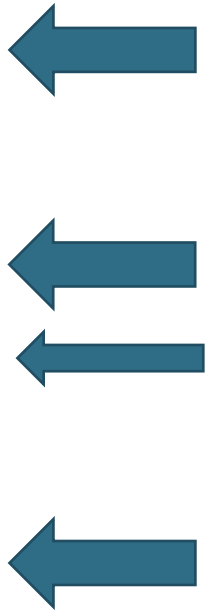
Results – Management systems

	Control	Alpine	Permanent	Intensive
Carcass weight (kg)	101.9 ± 9.38	92.3 ± 10.27	84.6 ± 13.19	91.9 ± 9.37
Average daily weight gain (kg/day)	1 ± 0.15	0.8 ± 0.13	0.6 ± 0.15	0.8 ± 0.13
L-value at slaughtering	43.5 ± 1.49	43.6 ± 1.42	43.2 ± 1.3	42.9 ± 1.21
PH-value after 24 h	5.56 ± 0.066	5.6 ± 0.134	5.83 ± 0.393	5.58 ± 0.126
Cooking loss (%)	33 ± 2.03	32.6 ± 3.62	30.9 ± 4.68	33.2 ± 2.45
Mean maximal Shearcraft (N)	42 ± 14.06	61.1 ± 22.37	58.4 ± 19.22	61.5 ± 19.33
Meat colour L	49.6 ± 1.58	47.8 ± 1.94	48.5 ± 2.67	48.1 ± 2.11
Meat colour a	15.3 ± 1.23	13.4 ± 1.27	15.6 ± 1.85	14.5 ± 1.16
Meat colour b	9.1 ± 0.65	7.5 ± 1.12	9.1 ± 1	8.3 ± 0.89
Protein content in meat (g/100g)	20.7 ± 0.75	19.5 ± 0.76	19.9 ± 0.47	20.6 ± 0.65
Fat content in meat (g/100g)	2.5 ± 1.98	4.6 ± 1.82	3.4 ± 1.25	3 ± 1.03

Results - Breed

	Brown Swiss	Crossbred	Swiss Fleckvieh
Carcass weight (kg)	90.6 ± 13.02	95.1 ± 9.98	92.3 ± 13.24
Average daily weight gain (kg/day)	0.77 ± 0.227	0.78 ± 0.187	0.86 ± 0.196
L-value at slaughtering	43.7 ± 1.47	43.6 ± 1.08	42.7 ± 1.34
PH-value after 24 h	5.65±0.168	5.65±0.33	5.64±0.207
Cooking loss (%)	33.7 ± 4.19	32 ± 1.94	31.5 ± 3.41
Mean maximal Shearcraft (N)	68 ± 20.68	53.6 ± 18.03	46.7 ± 16.2
Meat colour L	48.4 ± 2.47	48.7 ± 1.76	48.4 ± 2.32
Meat colour a	14.6 ± 1.96	14 ± 1.24	15.4 ± 1.33
Meat colour b	8.4 ± 1.29	8.2 ± 1.04	8.8 ± 1.08
Protein content in meat (g/100g)	20.3 ± 0.75	20.3 ± 0.76	19.9 ± 0.92
Fat content in meat (g/100g)	2.9 ± 1.36	3.1 ± 1.22	4.2 ± 2.16



Discussion

- Average daily weight gain and carcass weight are influenced by the management system
- Breed has an effect on meat quality (Colour, cooking loss and Shearcraft)
- There are no significant benefits for crossbreds in pasture-based systems
- Swiss Fleckvieh had darker meat at slaughtering and a higher a-value after maturation → meat more red

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Conclusion

- It is possible to fatten calves on pasture
- Various factors need to be considered (Adaptation to grazing, timepoint of weaning, supplemental feeding strategy)
- Different management systems influence mainly the productivity
- Meat quality is influence by the breed

- Further analysis needs to be conducted

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Thank you for your attention

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