Virtual fencing vs physical fencing - grazing behaviour of goats

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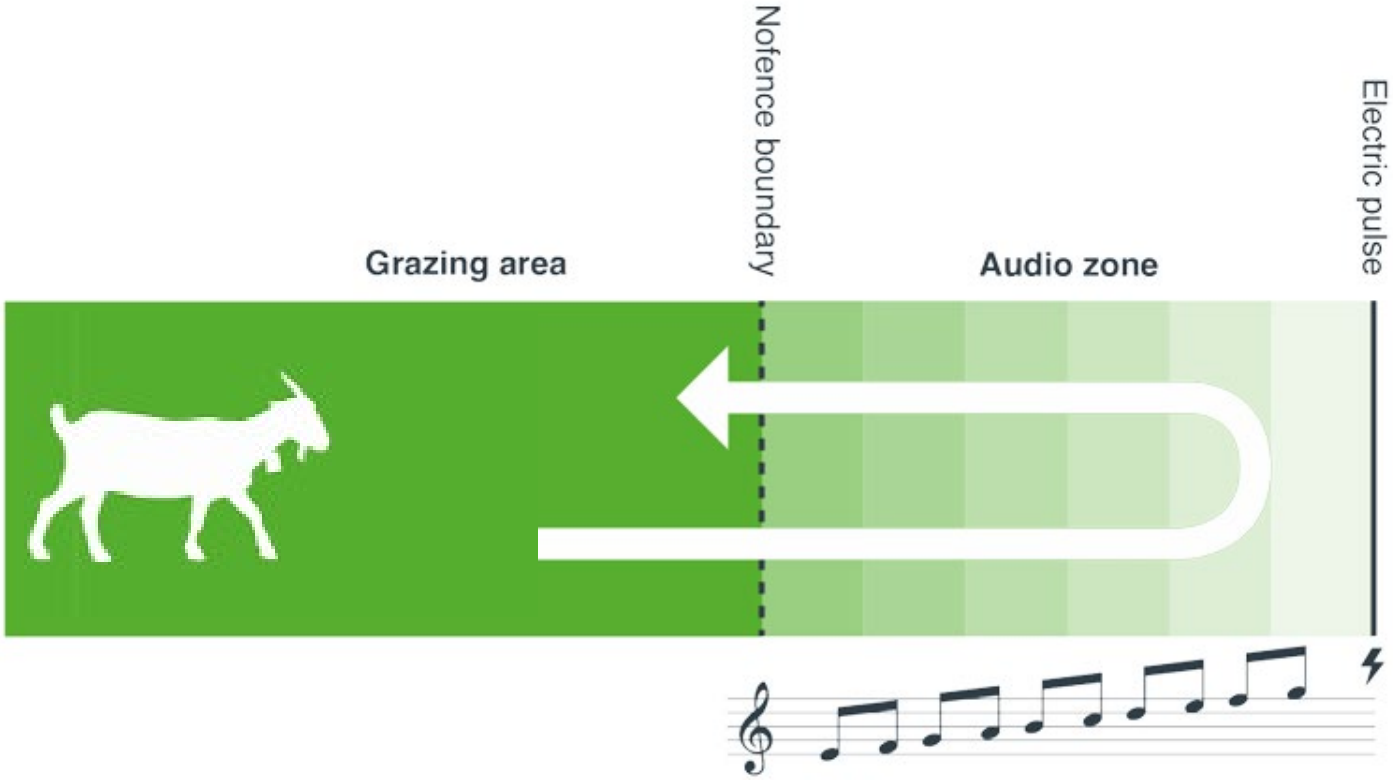
Virtual fencing technology



Nofence user manual, 2023

+

Sheep/goat collar + the Nofence app

Introduction

- cattle/cows show signs of learning (e.g., Lomax et al., 2019; Aaser et al., 2022; Confessore et al., 2022) & VF does not have a negative impact on cattle welfare (e.g., Hamidi et al., 2022; Fuchs et al., 2024)

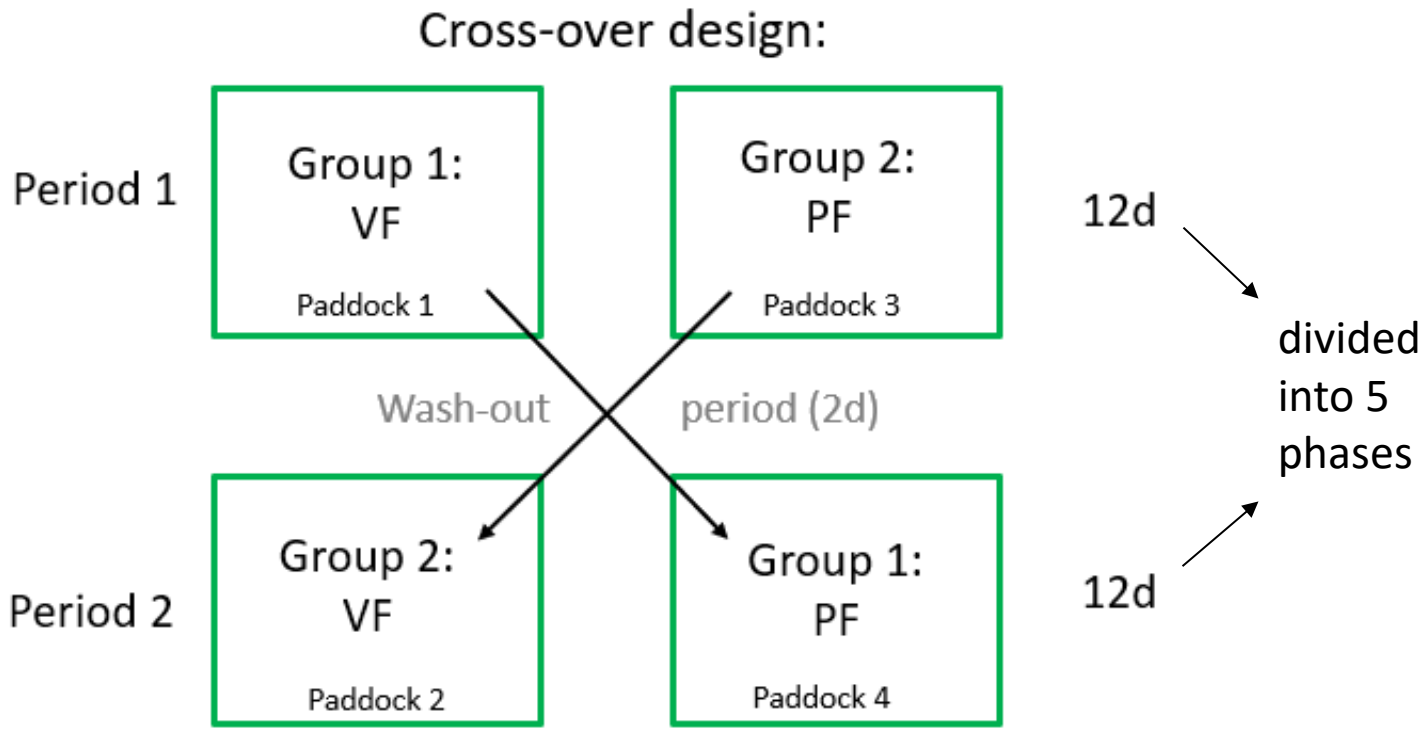
- only 3 VF studies with goats (Fay et al., 1989; Eftang et al., 2022; Log et al., 2022)

goats can learn to aviod the electric pulse

The study

Idea: Assessing learning, behaviour, and stress level in goats while testing a virtual fencing training protocol

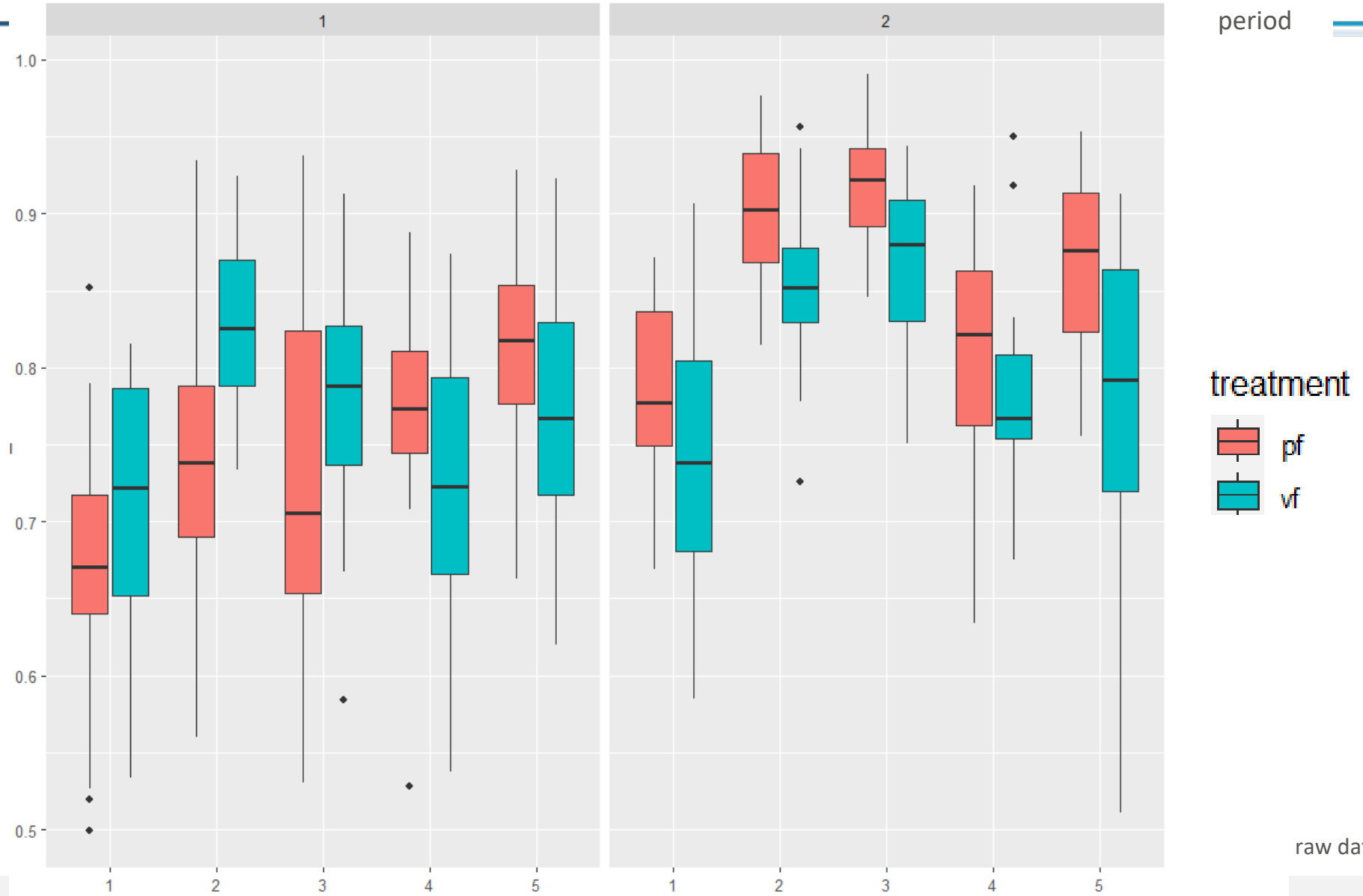
- 20 Blobe goats with offspring
  - ➢ 2 groups à 10 adults
- 4h grazing time per day
- 1 observer per group recording basic behaviours
  - ➢ **grazing**



VF: virtual fence (at one side) PF: physical fence (at four sides)

Längenfeld, Tirol, Austria

Proportions of grazing



raw data

Results

Treatment x period x phase significant (P = 0.44)

	Periode 1		Periode 2	
	Treatment	**Mean ± SE**	**Treatment**	**Mean ± SE**
Phase 1	PF	0.675 0.02447 a	PF	0.786 0.01986 a
	VF	0.712 0.02314 a	VF	0.747 0.02169 a
Phase 2	PF	0.750 0.02153 a	PF	0.902 0.01212 b
	VF	0.829 0.01731 b	VF	0.850 0.01593 a
Phase 3	PF	0.746 0.02007 a	PF	0.920 0.00946 b
	VF	0.780 0.01846 a	VF	0.865 0.01347 a
Phase 4	PF	0.778 0.02025 a	PF	0.812 0.01835 a
	VF	0.734 0.02232 a	VF	0.782 0.01994 a
Phase 5	PF	0.816 0.01653 a	PF	0.870 0.01317 b
	VF	0.775 0.01869 a	VF	0.795 0.01797 a

Conclusion

- significant differences differed periods

⇒no clear impact of the virtual fence detectable

⇒other factors could have played a role
(e.g.uneven standing herbage on offer)

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Thank you for your attention

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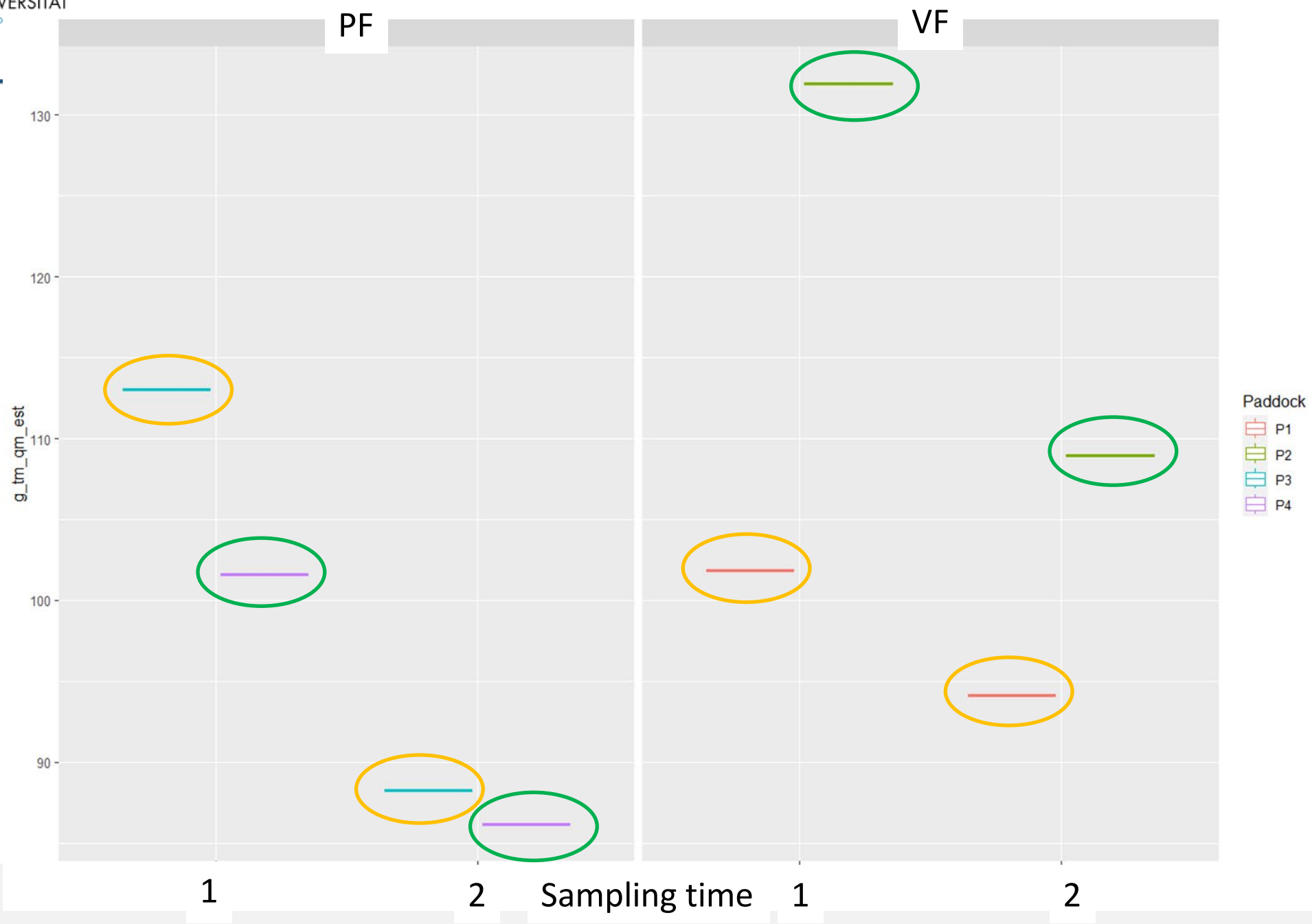
References

- Aaser, M. F., Staahltoft, S. K., Korsgaard, A. H., Trige-Esbensen, A., Alstrup, A. K. O., Sonne, C., Pertoldi, C., Bruhn, D., Frikke, J., Linder, A. C., 2022. Is virtual fencing an effective way of enclosing cattle? Personality, herd behaviour and welfare. Animals, 12(7), 842. https://doi.org/10.3390/ani12070842.
- Confessore, A., Aquilani, C., Nannucci, L., Fabbri, M. C., Accorsi, P. A., Dibari, C., Argenti, G., Pugliese, C., 2022. Application of Virtual Fencing for the management of Limousin cows at pasture. Livestock Science, 263, 105037. https://doi.org/10.1016/j.livsci.2022.105037.
- Eftang, S., Vas, J., Holand, Ø., Bøe, K. E., 2022. Goats are able to adapt to virtual fencing; A field study in commercial goat herds on Norwegian farms. Applied Animal Behaviour Science, 256, 105755. https://doi.org/10.1016/j.applanim.2022.105755.
- Fay, P. K., McElligot, V. T., Havstad, K. M., 1989. Containment of free-ranging goats using pulsed-radio-wave-activated shock collars. Applied Animal Behaviour Science, 23(1-2), 165-171. https://doi.org/10.1016/0168-1591(89)90016-6.
- Fuchs, P., Stachowicz, J., Schneider, M. K., Probo, M., Bruckmaier, R. M., Umstätter, C., 2024. Stress indicators in dairy cows adapting to virtual fencing. Journal of animal science, 102, skae024. https://doi.org/10.1093/jas/skae024.
- Hamidi, D., Grinnell, N. A., Komainda, M., Riesch, F., Horn, J., Ammer, S., Traulsen, I., Isselstein, J., 2022. Heifers don't care: no evidence of negative impact on animal welfare of growing heifers when using virtual fences compared to physical fences for grazing. Animal, 16(9), 100614. https://doi.org/10.1016/j.animal.2022.100614.
- Log, T., Gjedrem, A. M., Metallinou, M.-M., 2022. Virtually fenced goats for grazing fire Prone juniper in coastal Norway wildland-urban interface. Fire, 5, 188. https://doi.org/10.3390/fire5060188.
- Lomax, S., Colusso, P., Clark, C. E., 2019. Does virtual fencing work for grazing dairy cattle?. Animals, 9(7), 429. https://doi.org/10.3390/ani9070429.

Estimated DM in g/m^2

period 1

period 2

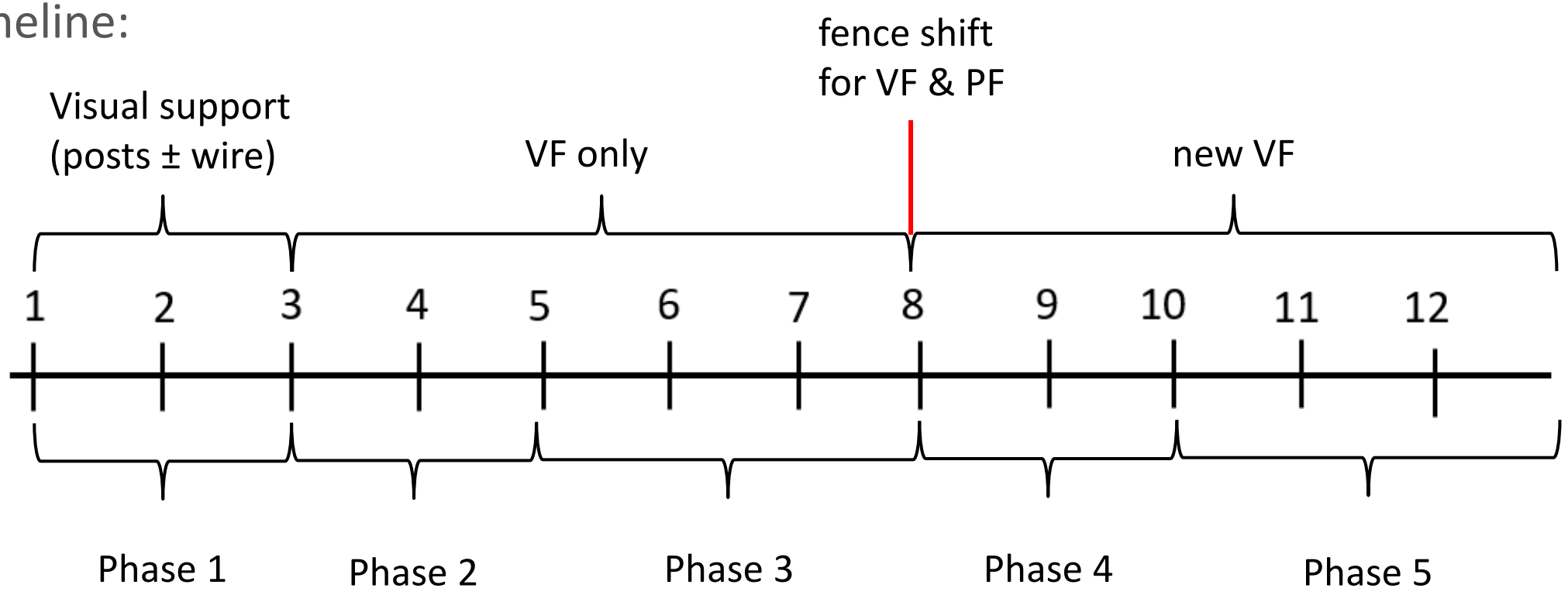


Supplement – Technical data

- Weight: 500g
- Acoustic signal: rising pitch (5-20s)
- Electrical pulse: 0.1 J, max. 3 kV (electric fences can have up to 15 J)

Proportion of grazing behaviour

Timeline:



Supplement - Statistics

- generalised linear mixed effect model
- beta-regression
- fixed: treatment x period x phase
- random: animal-ID