TECH CARE

Integrating innovative TECHnologies along the value Chain to improve small ruminant welfARE management

Promising innovations

Bluetooth

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BLE – Bluetooth Low Energy

Wearable Integrated Sensor Platform (WISP)

- BLE readers with GNSS and real-time transmission capability
- Small, low power BLE beacons

Proxy for:

- Proximity to resources
- Presence /absence detection near valuable resources
- Animal location

Nutritional issues
Mismothering

Reader reads nearest 16 beacons every 5 min

Testing trials in outdoor conditions

Off-sheep testing

- Height & distance of reader

Trial 1: winter feeding

- 100 Ewes weighed, BCS, Welfare Assessment, Neckbanded & Beacons
- 14 WISPS deployed (6 on posts, 4 on hay feeders, 4 on block)

Nutritional issues
Presence/absence

Trial 2: lambing 2023

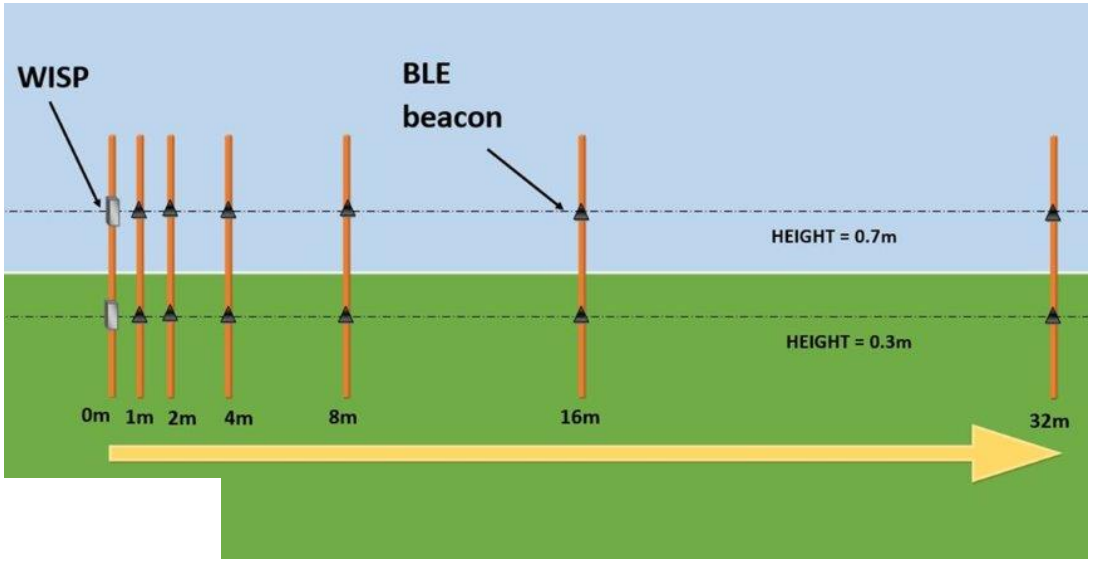
- 6 weeks over lambing
- 30 ewes & 60 lambs (Lleyn & Blackface)
- BLE beacons on lambs, WISP on ewes

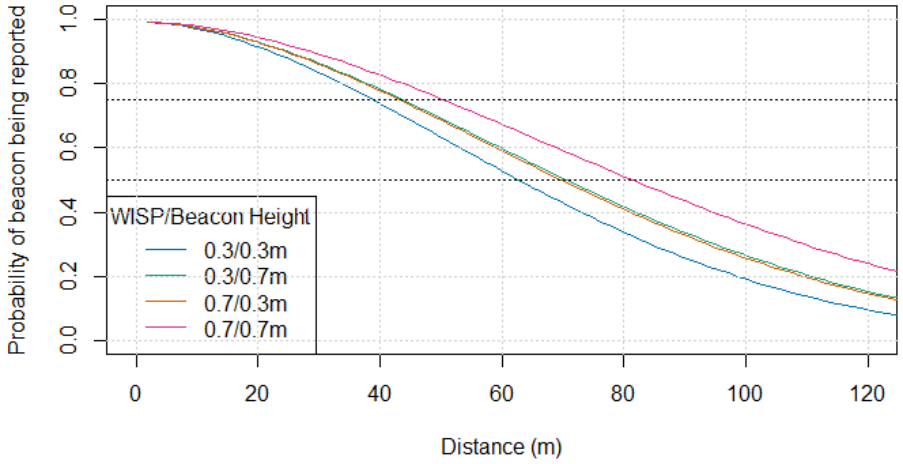
Mismothering

Testing trials in outdoor conditions

Off-sheep testing

- Height & distance of reader





From Walker et al. (2024). *Animal*, Article 101276. https://doi.org/10.1016/j.animal.2024.101276

Testing trials in outdoor conditions

Trial 1: winter feeding

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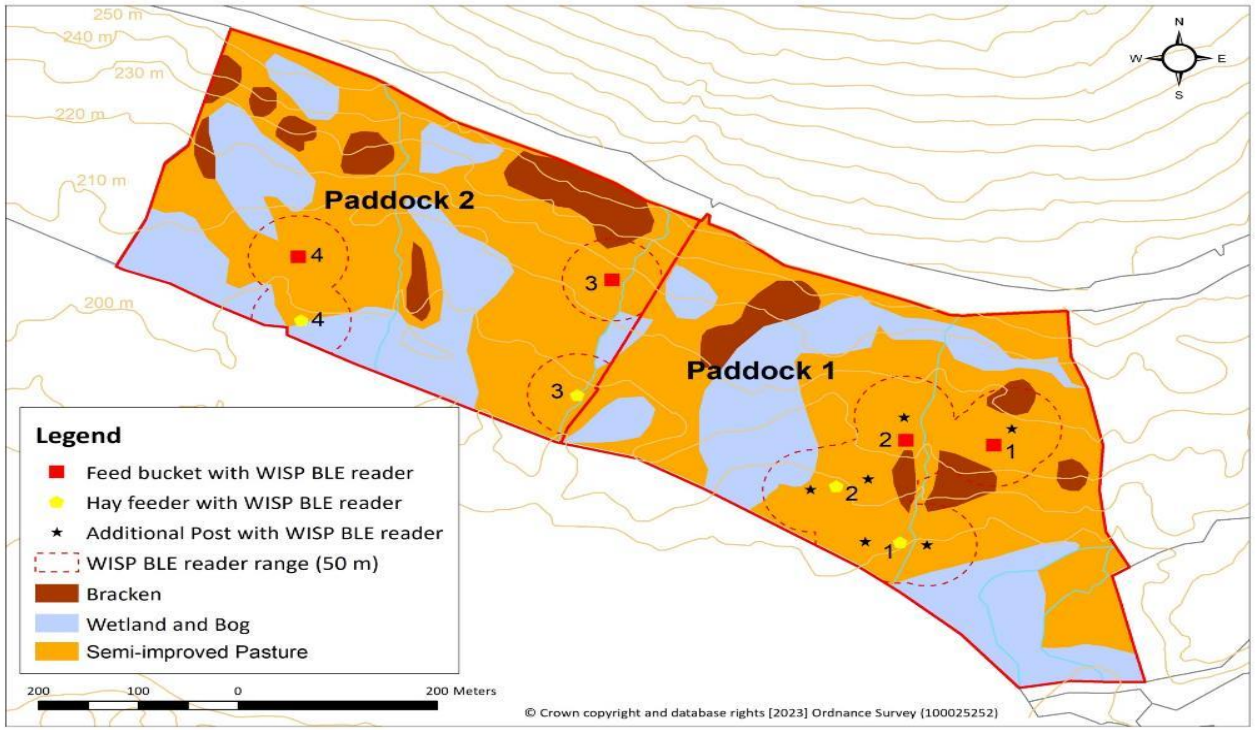


Testing trials in outdoor conditions

Trial 1: winter feeding

Red: 0 -9 contacts
Amber: 10-199 contacts
Green: 200+ contacts

Daily contacts

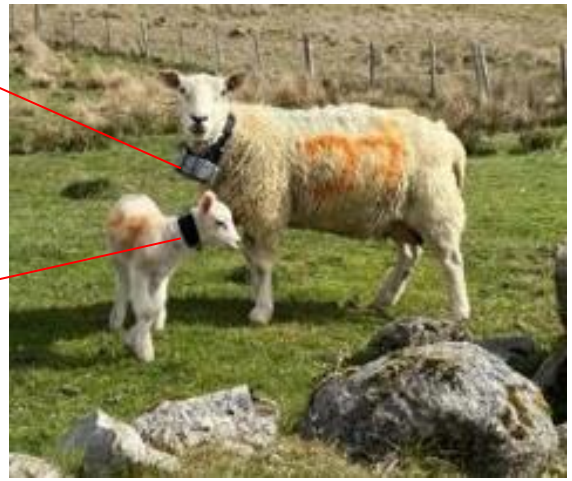
Row Labe	4011	4012	4018	4020	4021	4025	4029	4030	4031	4037	4041	4044	4046	4047	4048
16-Feb	66	110	120	97	45	44	150	92	56	108	101	111	109	58	167
17-Feb	234	226	279	380	261	321	376	328	362	234	271	378	244	282	198
18-Feb	218	374	319	447	354	331	375	304	315	203	237	411	225	305	345
19-Feb	268	269	241	133	443	346	324	397	391	374	248	387	210	303	343
20-Feb	341	363	268	0	417	364	322	379	355	432	396	147	216	293	268
21-Feb	245	381	220	0	320	311	293	186	318	342	200	288	146	297	157
22-Feb	309	455	94	0	302	339	315	309	276	345	125	138	336	337	370
23-Feb	262	424	0	0	340	309	256	385	280	275	0	0	144	159	202
24-Feb	187	325	0	0	317	202	198	342	220	243	0	0	160	195	297
25-Feb	286	111	1	5	267	250	94	504	235	408	0	3	0	171	343
26-Feb	376	375	11	5	489	412	269	336	350	180	0	140	73	214	323
27-Feb	407	207	62	68	448	398	339	494	278	479	0	545	408	407	282
28-Feb	189	316	35	55	309	88	375	288	0	284	0	272	126	204	373
Grand Tot	3388	3936	1650	1190	4312	3715	3686	4344	3436	3907	1578	2820	2397	3225	3668

*Extract from a Red, Amber, Green (RAG) table of **counts of total contacts per ewe beacon** (column) per day (row), 'colour-coded' for low and zero presence*

Green = everything OK
Amber = something is maybe an issue (welfare)
Red = sheep disappears or very low – serious concern (major welfare issue).

Waterhouse et al. 2023, *Resource use and proximity technology in extensive systems - getting useful information on livestock at lower costs?*. 384-391. US PLF Conference 2023.
https://pure.sruc.ac.uk/files/73003980/USPLF23_proximity_paper_final_submitted_Waterhouse_author_copy.pdf

Testing trials in outdoor conditions



Trial 2: lambing 2023

- 6 weeks over lambing
- 30 ewes & 60 lambs (Lleyn & Blackface)

Differences in contacts ewe-lamb

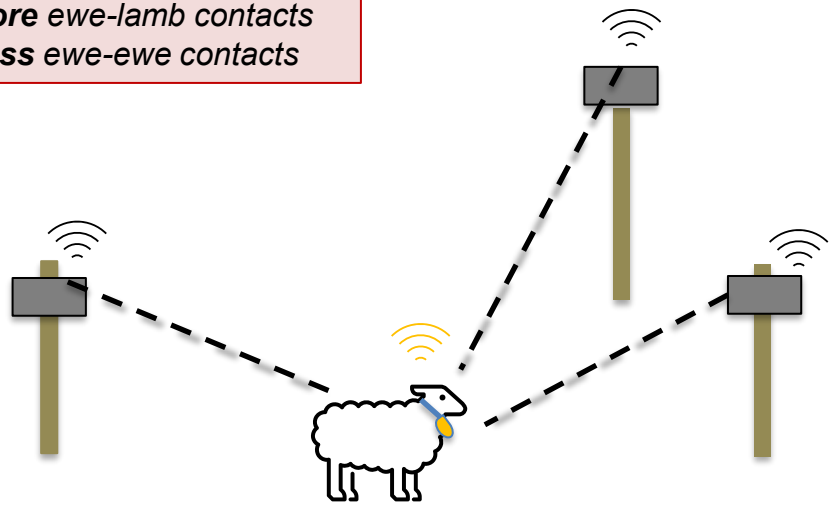
- by breed
- by age
- due to welfare issues

When ewe is lame:

- ***More*** *ewe-lamb contacts*
- ***Less*** *ewe-ewe contacts*

Localisation with static reader

- accuracy of ~22 m



From Walker, A. (2025) Investigation of Bluetooth Low Energy (BLE) as a precision livestock monitoring tool in grazing sheep systems. PhD thesis. University of Glasgow/SRUC

Conclusions

- **Promising** innovation for welfare:
  - ✓ Presence/absence at resource points
  - ✓ Ewe-lamb contacts
  - ✓ Behavioural change over time, potentially across and within days

- **Issues to consider** for future use**:**
  - ✓ Battery power (capacity~10 days)
  - ✓ Prototype unwieldy (comfort, waterproofing, weight)
  - ✓ Range of effective distance reading
  - ✓ Communication network (e.g. LoRaWAN, N-BIoT or 5G) for near real-time alerts/results