Sheep feed intake

SRUC meat sheep data

SRUC

Smarter
SMAll RuminanTs breeding for Efficiency and Resilience

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Grant Agreement n°772787

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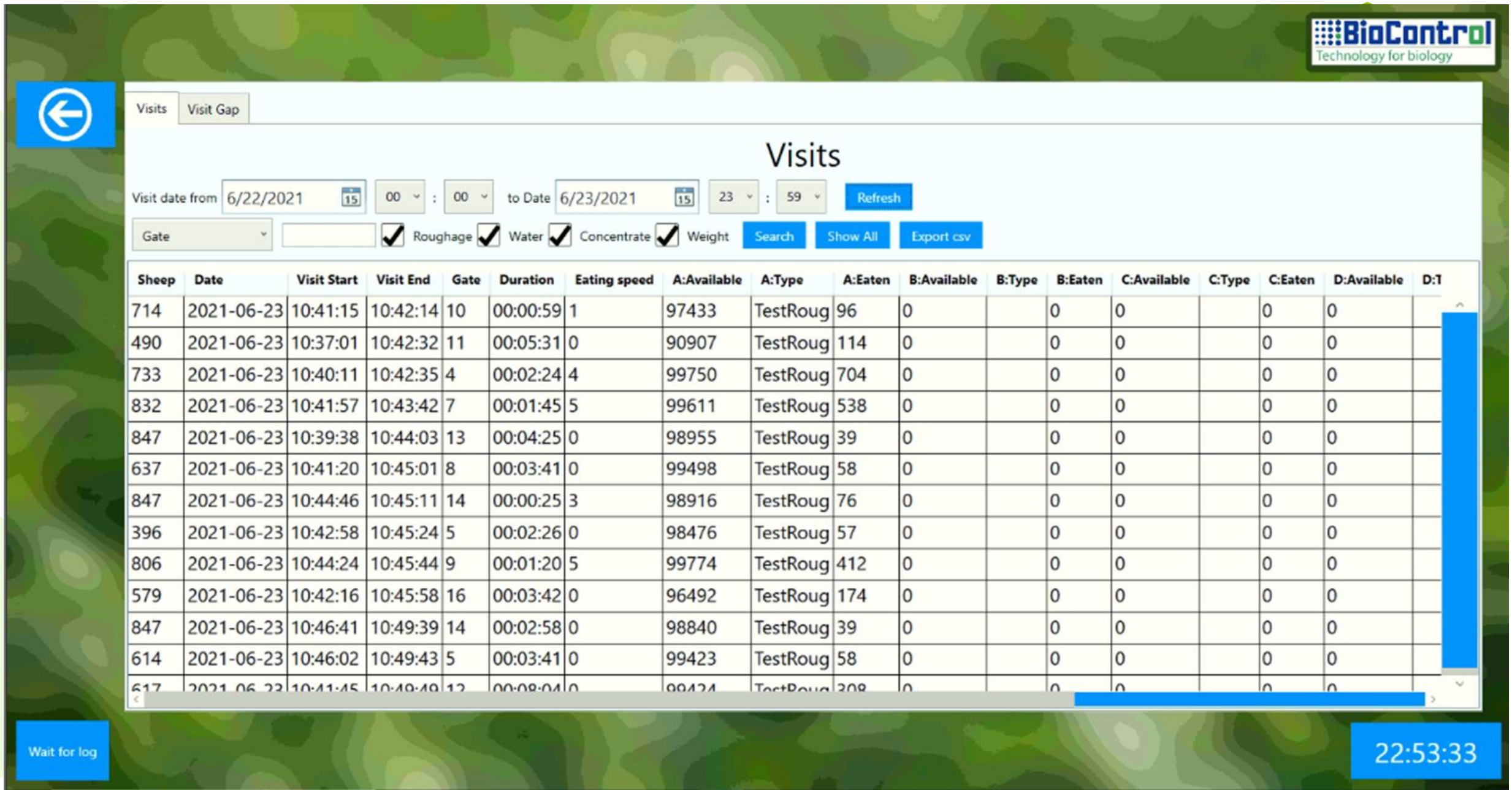
Grass To Gas project – FI data

- Summer **2021 and 2022**
- Texel x Mule finishing lambs (n = 239)
  - females and castrated males
  - sired by performance-recorded Texel sires (EBV range)
  - recorded through feed intake recording equipment
  - forage-based diet (grass nuts)
- CT and ultrasound scanned at start & end
  - body composition for efficiency calculations
  - CT rumen volume as methane predictor
- Weekly live wts and feed quality measured
- Prediction equations for feed efficiency

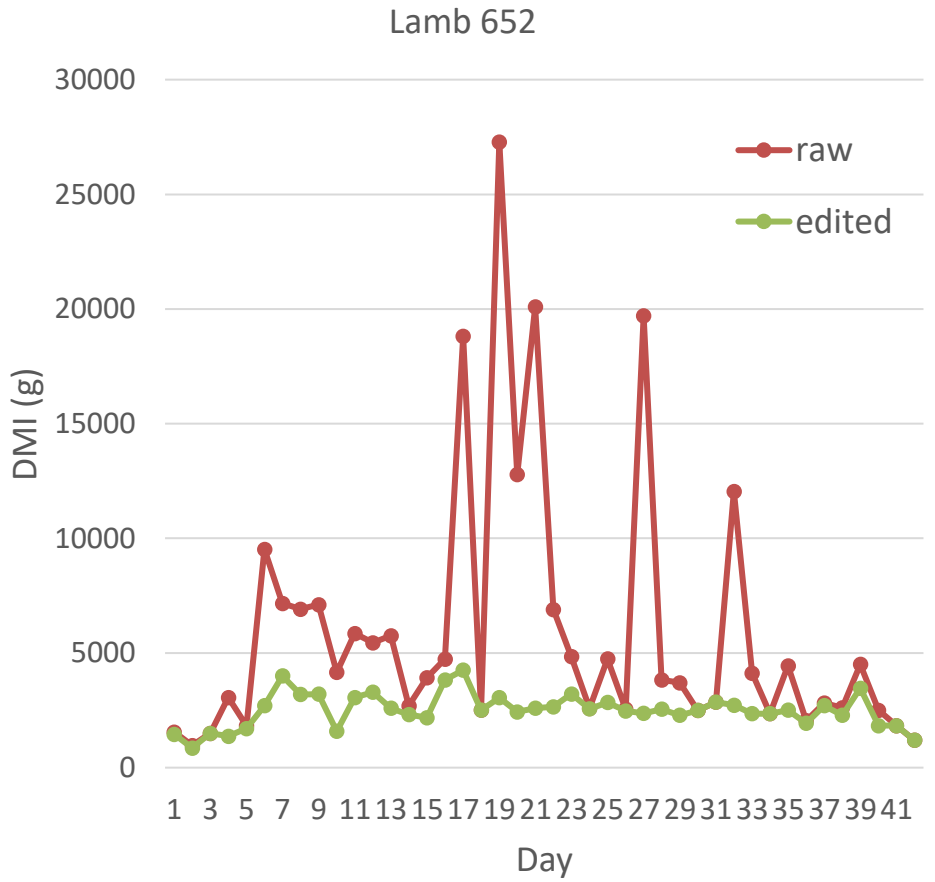
Feed intake recording @ SRUC Kirkton

- ~120 Texel x Mule lambs per year
- 1 pen, 16 feed bins
- 2 weeks training, 6 weeks test
- Grass nut only diet


BioControl
Technology for biology
Visits
Visit Gap
Visits
Visit date from 6/22/2021 00 : 00 to Date 6/23/2021 23 : 59 Refresh
Gate Roughage Water Concentrate Weight Search Show All Export csv
Sheep Date Visit Start Visit End Gate Duration Eating speed A:Available A:Type A:Eaten B:Available B:Type B:Eaten C:Available C:Type C:Eaten D:Available D:T
714 2021-06-23 10:41:15 10:42:14 10 00:00:59 1 97433 TestRoug 96 0 0 0 0 0
490 2021-06-23 10:37:01 10:42:32 11 00:05:31 0 90907 TestRoug 114 0 0 0 0 0
733 2021-06-23 10:40:11 10:42:35 4 00:02:24 4 99750 TestRoug 704 0 0 0 0 0
832 2021-06-23 10:41:57 10:43:42 7 00:01:45 5 99611 TestRoug 538 0 0 0 0 0
847 2021-06-23 10:39:38 10:44:03 13 00:04:25 0 98955 TestRoug 39 0 0 0 0 0
637 2021-06-23 10:41:20 10:45:01 8 00:03:41 0 99498 TestRoug 58 0 0 0 0 0
847 2021-06-23 10:44:46 10:45:11 14 00:00:25 3 98916 TestRoug 76 0 0 0 0 0
396 2021-06-23 10:42:58 10:45:24 5 00:02:26 0 98476 TestRoug 57 0 0 0 0 0
806 2021-06-23 10:44:24 10:45:44 9 00:01:20 5 99774 TestRoug 412 0 0 0 0 0
579 2021-06-23 10:42:16 10:45:58 16 00:03:42 0 96492 TestRoug 174 0 0 0 0 0
847 2021-06-23 10:46:41 10:49:39 14 00:02:58 0 98840 TestRoug 39 0 0 0 0 0
614 2021-06-23 10:46:02 10:49:43 5 00:03:41 0 99423 TestRoug 58 0 0 0 0 0
Wait for log
22:53:33

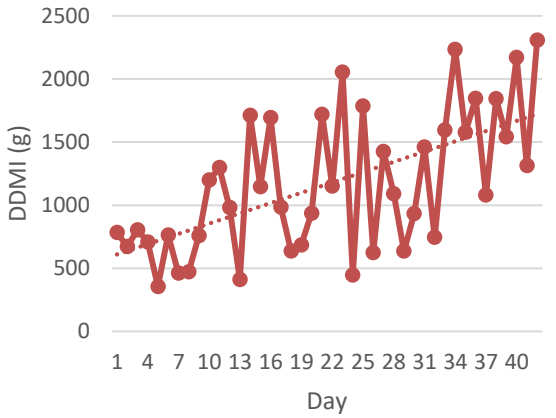
Data cleaning

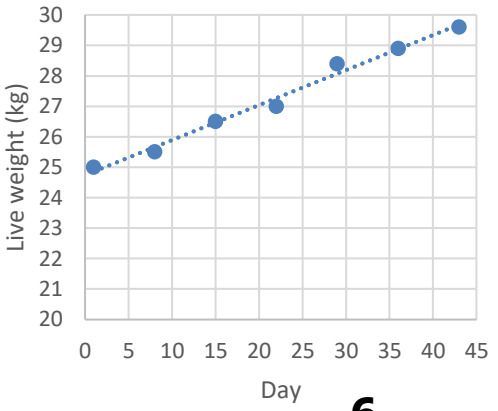
- Visit records: year 1 = 145428 records in 42d; year 2 = 156459 records 43d
- Visit record removed if:
  - Feed eaten >1kg (2%)
  - eating speed >10 g/s (4.6%)
  - visit duration 0 (0.2%)
  - feed eaten 0 (20%)
  - duration <1min and feed eaten >300g (0.2%)
  - eating speed >2 and feed eaten >500g (<0.01%)
- Removed a few lambs from analysis
  - ill / poor; feeding behaviour (jumped into bins)



Data cleaning / processing

- Fresh intake corrected for dry matter → dry matter intake (DMI)
  - based on feed analysis per tonne bag
- Regression - DMI values against day per lamb
  - Removed values >2 SD from predicted regression line
  - Remaining values averaged → average daily dry matter intake (ADDMI)
- Regression - live weight against day per lamb
  - removed any outliers to increase R^2 (aim all >0.8)
  - Calculated mid-test metabolic live weight (MMWT = predicted LWt @ 21d ^0.75)





Data set to analyse

ANIM_ID	SEX	YEAR	LSB	LSR	AGE_S	BW_S	BW_E	MMWT	ADG	UFD_S	UFD_E	UFDchg	UMD_S	UMD_E	UMDchg	CTFWT_S	CTFWT_E	CTFchg	CTMWT_S	CTMWT_E	CTMchg	ADDMI
11423	2	2022	3	2	103	40.4	50.4	17.93	0.421	3.27	4.3	1.03	25.81	29.78	3.97	3.483	3.893	0.410	12.238	13.266	1.027	556
11643	1	2022	2	2	98	41.6	55.8	18.90	0.152	2.63	4.27	1.64	26.13	34.38	8.25	2.124	3.555	1.432	13.524	16.845	3.322	653
11121	2	2022	2	2	109	34.8	46	16.08	0.247	2.2	5.23	3.03	25.6	29.08	3.48	1.864	3.375	1.511	10.809	12.931	2.122	663
10858	2	2021	2	1	77	25.7	33.9	12.62	0.197	1.97	2.3	0.33	20.17	23.2	3.03	0.461	0.906	0.445	9.226	10.696	1.469	752
11664	1	2022	3	2	84	26.1	36	13.22	0.398	1.5	2.53	1.03	17.66	21.95	4.29	0.381	1.304	0.922	7.559	10.257	2.698	868
11422	2	2022	2	2	103	39.7	57.8	18.52	0.342	3.17	3.73	0.56	26.35	35.85	9.5	2.661	4.305	1.644	13.385	16.834	3.449	980
10740	2	2021	3	2	95	31.7	42	14.84	0.220	2.17	3.83	1.66	19.86	22.05	2.19	1.036	1.901	0.866	9.661	11.996	2.335	989
10637	2	2021	2	2	98	38.3	47.4	16.65	0.232	2.67	5	2.33	23.93	25.93	2	3.062	3.890	0.828	11.489	13.212	1.722	1108
10832	2	2021	2	2	84	25.8	30.1	11.97	0.116	1.3	2.13	0.83	17.66	20.38	2.72	0.174	0.502	0.328	8.222	9.372	1.151	1131

Animal info

live wts (start and end)

ultrasound fat and muscle (start, end, change)

CT fat and muscle (start, end, change)

Average daily dry matter intake

Residual feed intake

- Explanatory model for ADDMI
- Goodness of fit: Adj R^2, RMSE
- Have a play with the SRUC data

Variable	Significant
Sex	?
Year	?
ADG	?
MMWT	?
Live weight (start of trial)	?
Live weight (end of trial)	?
CT fat weight (end of trial)	?
CT muscle wt (end of trial)	?
CT fat change (end-start)	?
CT muscle change (end-start)	?
UFD (start of trial)	?
UMD (start of trial)	?
UFD (end of trial)	?
UMD (end of trial)	?

Residual feed intake – example calculated

- Explanatory model for ADDMI

- $R^2 = 0.32$
  - Literature ~0.6-0.8

- Reasons?
  - 2 sexes
  - 3 breeds in cross
  - stage of growth?
  - heat / environment
  - accuracy of DMI / edits (various tested)
  - system (group size, spillage, ID assignment…)

Variable	Significant
Sex	✓
Year	✓
ADG	✓
MMWT	✓
Live weight (start of trial)	X
Live weight (end of trial)	✓
CT fat weight (end of trial)	✓
CT muscle wt (end of trial)	✓
CT fat change (end-start)	✓
CT muscle change (end-start)	X
UFD (start of trial)	X
UMD (start of trial)	✓
UFD (end of trial)	X
UMD (end of trial)	✓

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