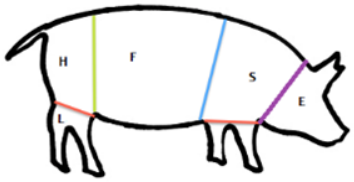
Supplementary material: welfare assessment protocols, staff feedback questions and QBA PCA results

Pigs- Welfare Assessment Protocol

Lameness		
Observation		Observe each pig walk a few steps from behind and the side, ideally on an even surface
Scoring	**0**	Normal gait; long, fluid, even strides; minimal 'swagger' of the hind end
	1	Uneven gait, shortened strides, hind end swagger, likely identify an affected limb
	2	Minimal weight-bearing on the affected limb whilst standing and when moving
	3	No weight bearing on the affected limb
Record		Lameness score for each pig

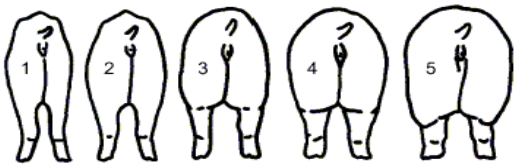
Skin condition		
Observation		Observe the condition of the skin that can be seen in at least a 10cm x 10cm area
Scoring	**0**	No skin abnormality
	1	Skin is flaky/dry
	2	Skin is scabby/pink
	3	Cracks or open sore areas are present
Record		The maximum score seen in any area of skin at least 10cm x 10cm

Body marks		
Observation		Stand near the pig and observe one side only
Scoring	**0**	No lesions or less than mild lesions as described below
	1	A skin-depth linear lesion longer than 10cm OR 3 or more 3cm lesions OR a circular area larger than 1cm diameter
	2	Lesion or area of lesions ≥ 5x5cm diameter OR the lesions cover a large percentage (>25%) of the skin OR lesion that extends >0.5cm into deeper layers of tissue
	3	>1cm deep lesion at least 3cm long
Body Regions		**Ears and head (E)** **Shoulder (S)** **Flank (F)** **Hindquarters (H)** **Legs (L)**
Record		The score for each body region for each pig



Neck skin thickness	
Observation	Use calipers to record the skin thickness over the jugular vein
Record	The caliper reading (mm)

Weight tape		
Observation		Use the weight tape on sows during handling
Record		The girth beind the elbow (cm) The length of the body (cm) The estimated weight of the sow (kg)

Body condition		
Observation		Visually assess from the side and behind, using manual palpation when possible
Scoring	**Thin**	Score 1 or 2: Ribs, backbone, 'H' bones and 'pin' bones obvious (or easily detected with pressure)
	Moderate	Score 3: Ribs, backbone, 'H' bones and 'pin' bones barely visible (or barely felt with firm pressure)
	Fat	Score 4 or 5: Ribs, backbone, 'H' bones and 'pin' bones cannot be seen (or felt even when pressure is applied) or fats deposits are clearly visible
		
Record		Thin (T), Moderate (M) or Fat (F) for each sow

Handling Stress		
Observation		Observe each pig during handling procedures
Scoring	**0**	Normal skin colouration, no vocalisation
	1	Nose and/or tip of ears red/purple. May vocalise at this stage
	2	Red blotchy colour extended beyond the nose/tip of ears. Likely to vocalise
	3	Red blotchy colour extends to at least 75% of the body. Likely to vocalise
	4	Body has turned purple/blue, no vocalisation
Record		Handling stress score for each pig

Behavioural observations		
Observation		Observe all the pigs in turn, every 15 seconds, for a total of 10 minutes. Ideally conducted at approximately the same time of day
Ethogram	**Resting**	lying not engaged in other activities, may be asleep
	Positive social behaviour	sniffing/nosing/licking/moving gently away. No flight reaction
	Negative social behaviour	aggressive or other act that elicits a response from the other animal
	Exploratory behaviour towards manipulable material/object	sniffing/nosing/licking/rooting clean manipulable materials such as straw or earth
	Exploratory behaviour toward pen fixtures	sniffing/nosing/licking pen fixtures
	Eating/drinking	eating/drinking not associated with exploratory behaviour
	Play	any form of social/locomotor or object play
	Other	any other behaviour
Record		Tally mark in each behaviour category for each pig

Mood score		
Observation		Following the behavioural observations make a qualitative assessment of each pig
Scoring		Rate each pig on a 20 point scale for their mood
	1	the worst mood a pig could experience- e.g. severe pain, apathy, fear
	20	the best mood a pig could experience- e.g. excitement, great contentment, happily busy
Record		Circle a number from 1 to 20

Response to training		
Observation		Following a training session make an assessment of the demeanour of each pig
Scoring		Rate each pig on a 20 point scale for their demeanour during training
	1	the worst experience a pig could have- frustrating, fearful
	20	the best experience a pig could have- highly enjoyable, exciting, pleasurable
Record		Circle a number from 1 to 20

Pigs- Welfare Assessment

Observer | Date | Time

Sow ID | Lameness 0/1/2/3 | Body condition T/M/F

Body Marks 0/1/2/3	Ears/head	Shoulders	Flank	Hindquarters	Legs	Skin thickness (mm)

Weight tape	girth (cm)	length (cm)	weight (kg)	Handling stress 0/1/2/3/4

Response to training | Skin Condition 0/1/2/3 | Extremely positive

Extremely negative

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Sow ID | Lameness 0/1/2/3 | Body condition T/M/F

Body Marks 0/1/2/3	Ears/head	Shoulders	Flank	Hindquarters	Legs	Skin thickness (mm)

Weight tape	girth (cm)	length (cm)	weight (kg)	Handling stress 0/1/2/3/4

Response to training | Skin Condition 0/1/2/3 | Extremely positive

Extremely negative

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Sow ID | Lameness 0/1/2/3 | Body condition T/M/F

Body Marks 0/1/2/3	Ears/head	Shoulders	Flank	Hindquarters	Legs	Skin thickness (mm)

Weight tape	girth (cm)	length (cm)	weight (kg)	Handling stress 0/1/2/3/4

Response to training | Skin Condition 0/1/2/3 | Extremely positive

Extremely negative

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Comments:

Sow ID | Lameness 0/1/2/3 | Body condition T/M/F

	Ears/head	Shoulders	Flank	Hindquarters	Legs
Body Marks 0/1/2/3					

Skin thickness (mm)

	girth (cm)	length (cm)	weight (kg)
Weight tape			

Handling stress 0/1/2/3/4

Response to training | Skin Condition 0/1/2/3

Extremely negative ... Extremely positive

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Sow ID | Lameness 0/1/2/3 | Body condition T/M/F

	Ears/head	Shoulders	Flank	Hindquarters	Legs
Body Marks 0/1/2/3					

Skin thickness (mm)

	girth (cm)	length (cm)	weight (kg)
Weight tape			

Handling stress 0/1/2/3/4

Response to training | Skin Condition 0/1/2/3

Extremely negative ... Extremely positive

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Sow ID | Lameness 0/1/2/3 | Body condition T/M/F

	Ears/head	Shoulders	Flank	Hindquarters	Legs
Body Marks 0/1/2/3					

Skin thickness (mm)

	girth (cm)	length (cm)	weight (kg)
Weight tape			

Handling stress 0/1/2/3/4

Response to training | Skin Condition 0/1/2/3

Extremely unpleasant ... Extremely enjoyable

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Comments:

Pigs- Behavioural observations

Observer | Date | Time | No. of pigs

Scan	Rest	Pos social	Neg social	Expl manip	Expl pen	Eat/drink	Play	Other
Start								
15								
30								
45								
1 min								
15								
30								
45								
2 min								
15								
30								
45								
3 min								
15								
30								
45								
4 min								
15								
30								
45								
5 min								
15								
30								
45								
6 min								
15								
30								
45								
7 min								
15								
30								
45								
8 min								
15								
30								
45								
9 min								
15								
30								
45								
10 min								
Totals								

Mood score Sow ID

worst mood best mood

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Mood score Sow ID

worst mood best mood

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Mood score Sow ID

worst mood best mood

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Mood score Sow ID

worst mood best mood

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Mood score Sow ID

worst mood best mood

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Opportunities for pleasure since last observation:

Any suggestions for changes:

Any other comments:

Unit C cattle- Welfare Assessment Protocol

Behavioural observations

Observation Observe all the cattle in turn, every 15 seconds, for a total of 10 minutes. Systematically change the time and day according to the pre-determined schedule in order to build up an overall picture of the activity of the animals.

Ethogram

Lying inactive	Lying not engaged in other activities, may be asleep
Standing inactive	Standing not engaged in other activites
Observer	Either standing at, or approaching, the observer (door)
Ruminating standing	Rhythmic chewing without ingesting whilst standing
Ruminating lying	Rhythmic chewing without ingesting whilst lying
Moving	Walking or faster movement
Eating/drinking	When no exploratory behaviour is also performed
Use of enrichment (state type)	Using enrichment- e.g brush/ investigatory box
Exploratory behaviour toward pen fixtures	sniffing/nosing/licking pen fixtures
Exploratory behaviour toward bedding	sniffing/nosing/licking bedding
Positive social behaviour	Social licking; head play- playful touching headhorn base/neck where neither takes advantage of the other
Negative social behaviour	Head butt- forceful; chasing- aggressive; fighting; displacement
Self-grooming	Licking or scratching any part of own body
Play	Any form of social, locomotor or object play
Abnormal behaviour	Non-functional behaviours. May be repetitive (stereotypic) including oral (e.g. tongue rolling) or locomotor (e.g. pacing)
Other	Any other behaviour
Out of sight	Unable to be viewed

Record Tally mark in each behaviour category. Use a new sheet for each animal

Qualitative behavioural Assessment

Observation Following the behavioural observations make a qualitative assessment of **each animal**
If it has not been possible to get an adequate assessment of each animal then spend additional time observing each pen before performing the qualitative assessment.
If you have insufficient time to observe all cattle in the unit just focus on one or two pens.

Scoring Consider HOW the animal is, rather than what they have been doing. Rate them against each of the qualities
In addition, rate each animal on a 20 point scale for their overall mood from:
a) the worst mood cattle could experience- e.g. severe pain, apathy, fear TO
b) the best mood cattle could experience- e.g. excitement, great contentment, happily busy

Record A mark on each line for each quality.

Unit C cattle - Qualitative behavioural assessment

Observer | Date | Time | Animal | Pen

Active

Relaxed — Min. / Max.

Fearful — Min. / Max.

Agitated — Min. / Max.

Calm — Min. / Max.

Content — Min. / Max.

Indifferent — Min. / Max.

Frustrated — Min. / Max.

Friendly to people — Min. / Max.

Bored — Min. / Max.

Playful — Min. / Max.

Positively occupied — Min. / Max.

Lively — Min. / Max.

Inquisitive — Min. / Max.

Irritable	Min. — Max.
Uneasy	Min. — Max.
Sociable to cattle	Min. — Max.
Apathetic	Min. — Max.
Happy	Min. — Max.
Distressed	Min. — Max.

Overall mood	worst — Best

How willing would you be to take on the life this animal is living?

Extremely unwilling																		Extremely willing
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

Opportunities for pleasure since last observation:

Any notable stressors since last observation?

Any suggestions for changes:

Any other comments:

Unit C cattle - Behavioural observations

Observer

Date

Time

ID of animals in pen 1		
ID of animals in pen 2		

ID of animals in pen 3		
ID of animals in pen 4		

Scan		Lying inactive	Standing inactive	Observer	Ruminating standing	Ruminating lying	Approaching observer	Moving	Eating/drinking	Enrichment……	Enrichment……	Enrichment……	Enrichment……	Enrichment……	Enrichment……	Explore pen	Explore bedding	Positive social	Negative social	Self-groom	Play	Abnormal behaviour	Other	Out of sight
1	Pen 1																							
	Pen 2																							
	Pen 3																							
	Pen 4																							
2	Pen 1																							
	Pen 2																							
	Pen 3																							
	Pen 4																							
3	Pen 1																							
	Pen 2																							
	Pen 3																							
	Pen 4																							
4	Pen 1																							
	Pen 2																							
	Pen 3																							
	Pen 4																							
5	Pen 1																							
	Pen 2																							
	Pen 3																							
	Pen 4																							

Time

Scan		Lying inactive	Standing inactive	Standing/approaching door	Ruminating standing	Ruminating lying	Approaching observer	Moving	Eating/drinking	Enrichment.....	Enrichment.....	Enrichment.....	Enrichment.....	Enrichment.....	Enrichment.....	Explore pen	Explore bedding	Positive social	Negative social	Self-groom	Play	Abnormal behaviour	Other	Out of sight
6	Pen 1																							
	Pen 2																							
	Pen 3																							
	Pen 4																							
7	Pen 1																							
	Pen 2																							
	Pen 3																							
	Pen 4																							
8	Pen 1																							
	Pen 2																							
	Pen 3																							
	Pen 4																							
9	Pen 1																							
	Pen 2																							
	Pen 3																							
	Pen 4																							
10	Pen 1																							
	Pen 2																							
	Pen 3																							
	Pen 4																							

	Total pen 1																							
	Total pen 2																							
	Total pen 3																							
	Total pen 4																							

Goats- Welfare Assessment Protocol

Behavioural observations

Observation Observe all the goats in turn, every 15 seconds, for a total of 10 minutes. Systematically change the time and day according to the pre-determined schedule in order to build up an overall picture of the activity of the animals.

Ethogram

Lying inactive	Lying not engaged in other activities, may be asleep
Standing inactive	Standing not engaged in other activites
Observer	Approaching/ staring at observer
Ruminating standing	Rhythmic chewing without ingesting whilst standing
Ruminating lying	Rhythmic chewing without ingesting whilst lying
Moving	Walking or faster movement
Eating/drinking	When no exploratory behaviour is also performed
Use of enrichment (state type)	Using enrichment- e.g brush/ investigatory box
Exploratory behaviour toward pen fixtures	sniffing/nosing/licking pen fixtures
Positive social behaviour	Social licking; head play- playful touching headhorn base/neck where neither takes advantage of the other
Negative social behaviour	Head butt- forceful; chasing- aggressive; fighting; displacement
Self-grooming	Licking or scratching any part of own body
Play	Any form of social, locomotor or object play
Abnormal behaviour	Non-functional behaviours. May be repetitive (stereotypic) including oral (e.g. tongue rolling) or locomotor (e.g. pacing)
Other	Any other behaviour
Out of sight	Unable to be viewed

Record Tally mark in each behaviour category. Use a new sheet for each animal

Qualitative behavioural Assessment

Observation Following the behavioural observations make a qualitative assessment of **each animal**
If it has not been possible to get an adequate assessment of each animal then spend additional time observing each goat before performing the qualitative assessment.

Scoring Consider HOW the animal is, rather than what they have been doing. Rate them against each of the qualities
In addition, rate each animal on a 20 point scale for their overall mood from:
a) the worst mood goats could experience- e.g. severe pain, apathy, fear TO
b) the best mood goats could experience- e.g. excitement, great contentment, happily busy

Record A mark on each line for each quality.

Goat - Qualitative behavioural assessment

Observer | Date | Time | Animal

Aggressive

Agitated

Alert

Bored

Content

Curious

Fearful

Frustrated

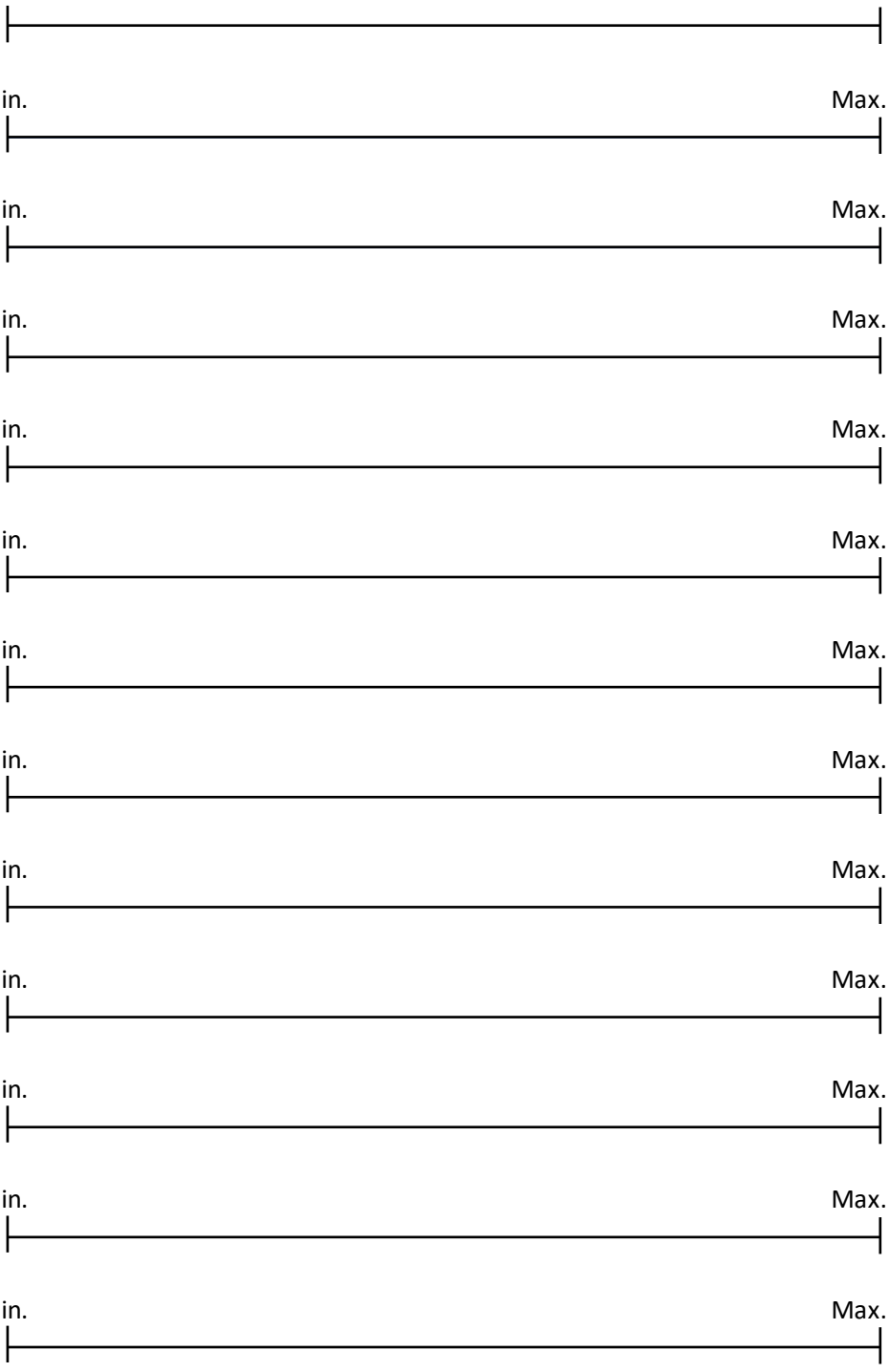
Irritated

Lively

Relaxed

Sociable

Suffering



Overall

worst — Best

How willing would you be to take on the life this animal is living?

Extremely unwilling — Extremely willing

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Opportunities for pleasure since last observation:

Any notable stressors since last observation?

Any suggestions for changes:

Any other comments:

Goat- Behavioural observations

Observer

Date

Time

Scan	Lying inactive	Standing inactive	Ruminating standing	Ruminating lying	Moving	Eating/drinking	Use of enrichment 1	Use of enrichment 2	Use of enrichment 3	Explore pen	Positive social	Negative social	Self-groom	Play	Abnormal behaviour	Other
Start																
15																
30																
45																
1 min																
15																
30																
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9 min																
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45																
10 min																
Totals																

Calves protocol

Behavioural observations		
Observation	Observe the cattle for a total of 10 minutes within 1 hour of new feed being provided.	
Ethogram	A new bout is recorded if there is a 10 second pause between bouts	
	Head Butt	Physical pushing of head onto another animal (no displacement)
	Displacement	Any type of physical contact that results on another animal moving
	Chasing	chaser makes another animal flee by fast or agitated movements
	Fighting	Two contestants pushing vigorously
	Forced rising	Physical contact that makes another animal rise
	Social licking	Licks any part of the body of another animal
	Horn/head play	Mutual head play with physical contact but no negative response
	Play	Any form of locomotor, object or social play
Record	Tally mark for each occurance of behaviour observed in the 10 minutes	

Coughing	
Observation	Observe the cattle for a total of 10 minutes within 1 hour of new feed being provided.
Scoring	A coughing bout from one animal is heard. A new bout is recorded with each new animal that coughs, and if the same animal has at least a 10 second break between coughs.
Record	Tally mark for each coughing bout observed in the 10 minutes

Qualitative behavioural assessment (QBA)		
Observation	Following the behavioural observations make a qualitative assessment of the group If it has not been possible to get an adequate assessment of the group then spend additional time observing before performing the qualitative assessment.	
Scoring	Consider HOW the animal is, rather than what they have been doing. Rate them against each of the qualities In addition, rate each animal on a 20 point scale for their mood	
	1	worst mood cattle could experience- e.g. severe pain, apathy, fear
	20	best mood cattle could experience- e.g. excitement, great contentment, happily busy
Record	A mark on each line for each quality. Circle a number from 1 to 20 representing the mood of that group.	

Level of social integration		
Observation	Observe the cattle both formally for 10 minutes and informally during routine care	
	1	cattle are in clear familiar groups, not uniformly spaced out
	20	cattle are completely integrated across mixed groups
Record	Circle a number from 1 to 20 relating to level of social integration	

Calves recording sheet

Observer
Observed housing | at pasture | circle

Date
Time

Days since arrival

No. in group

		Record a tally for each occurance in 10 minutes	Total
Antagonistic behaviours	Head Butt		
	Displacement		
	Chasing		
	Fighting		
	Enforced rising		
Cohesive behaviours	Social licking		
	Horn/head play		
	Play		
	Coughs		

Calves - Qualitative behavioural assessment

Observer | Date | Days since arrival | No. in group

Observed: housing | at pasture | circle — Time

	Min. — Max.
Active	
Relaxed	
Uncomfortable	
Calm	
Content	
Tense	
Enjoying	
Indifferent	
Frustrated	
Friendly to humans	
Bored	
Positively occupied	
Inquisitive	
Irritable	
Nervous	

Boisterous	Min. ——— Max.
Uneasy	Min. ——— Max.
Sociable to animals	Min. ——— Max.
Happy	Min. ——— Max.
Distressed	Min. ——— Max.

Overall

worst mood — best mood

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Level of social integration

groups separated — groups totally integrated

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Any enrichments provided?

Any suggestions for changes:

Any other comments:

Sheep Welfare Assessment Protocol

Behavioural observations

Observation	Observe all the sheep every 30 seconds, for a total of 10 minutes. Count how many sheep are doing each behaviour in turn.
Ethogram	
Lying	Lying, may be resting or ruminating or may be asleep
Standing	Standing inactive or ruminating
Eating…….	Eating (state food available)
Using enrichment	engaging in enrichment or observing other using enrichment
Exploratory behaviour toward pen fixtures	sniffing/nosing/licking pen fixtures
Social behaviour	either positive or negative close interaction with another sheep
Play	Any form of social, locomotor or object play
Other	Any other behaviour, including walking, grooming, drinking
Record	Tally mark in each behaviour category. Use a new sheet for each session

Enrichment use observations

Observation	Opportunistically observe the sheep and count how many are using enrichment(s) Complete these observations interspersed in daily routines when sheep behaviour not disturbed by observer's presence
Record	The number of sheep using each enrichment(s)

Qualitative behavioural Assessment

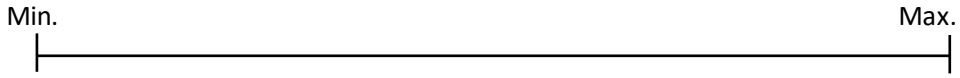
Observation	Following the behavioural observations make a qualitative assessment of the group If it has not been possible to get an adequate assessment of the group then spend additional time observing before performing the qualitative assessment.
Scoring	Consider HOW the animal is, rather than what they have been doing. Rate them against each of the qualities In addition, rate each animal on a 20 point scale for their mood
1	worst mood sheep could experience- e.g. severe pain, apathy, fear
20	best mood sheep could experience- e.g. excitement, great contentment, happily busy
Record	A mark on each line for each quality. Circle a number from 1 to 20 representing the mood of that group.

Sheep- Qualitative behavioural assessment

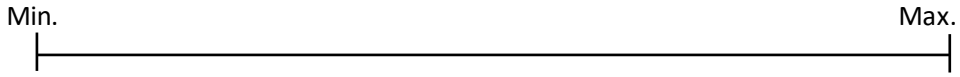
Observer | Date | Time | Group

Alert	
Active	Min. — Max.
Relaxed	Min. — Max.
Fearful	Min. — Max.
Content	Min. — Max.
Agitated	Min. — Max.
Sociable	Min. — Max.
Aggressive	Min. — Max.
Vigorous	Min. — Max.
Subdued	Min. — Max.
Physically uncomfortable	Min. — Max.
Defensive	Min. — Max.
Calm	Min. — Max.
Frustrated	Min. — Max.
Apathetic	Min. — Max.

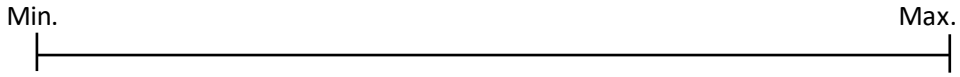
Wary



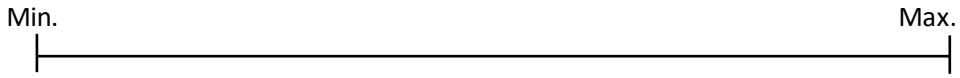
Tense



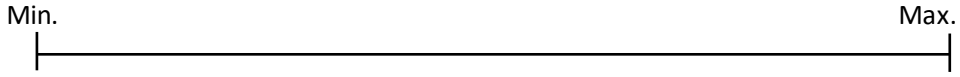
Bright



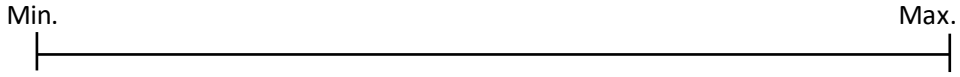
Inquisitive



Assertive



Listless



Overall

worst mood best mood

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Opportunities for pleasure since last observation:

Any notable stressors since last observation?

Any suggestions for changes:

Any other comments:

Sheep- Behavioural observations

Observer

Date

Time

No in group

Scan	Lying	Standing	Eating	Eating	Enrichment.....	Enrichment.....	Enrichment.....	Explore pen	Social behaviour	Play	Other
Start											
30											
1 min											
30											
2 min											
30											
3 min											
30											
4 min											
30											
5 min											
30											
6 min											
30											
7 min											
30											
8 min											
30											
9 min											
30											
10 min											
Totals											

Staff feedback questions

1) Thinking about the process as a whole, please rate the following statements:

(completely disagree; somewhat disagree; neither agree nor disagree; somewhat agree; completely agree)

   a) The protocol reflected my ideas in the workshop
   b) The assessments were easy to carry out
   c) I had enough time to conduct the assessments
   d) Doing the assessments positively influenced how I worked with the animals
   e) Reviewing the data is useful in understanding the welfare of the animals
   f) I would recommend developing and conducting similar welfare assessments to a colleague in a similar position

2) Imagine a colleague of yours at a similar institute asks whether they should get involved in an equivalent initiative. What would you say would be the positives about doing so?
3) And what would you tell your colleague might be some of the challenges?
4) Please provide any comments on how any part of the process could be improved.
5) Do you have any other comments?

Pig Assessment Results

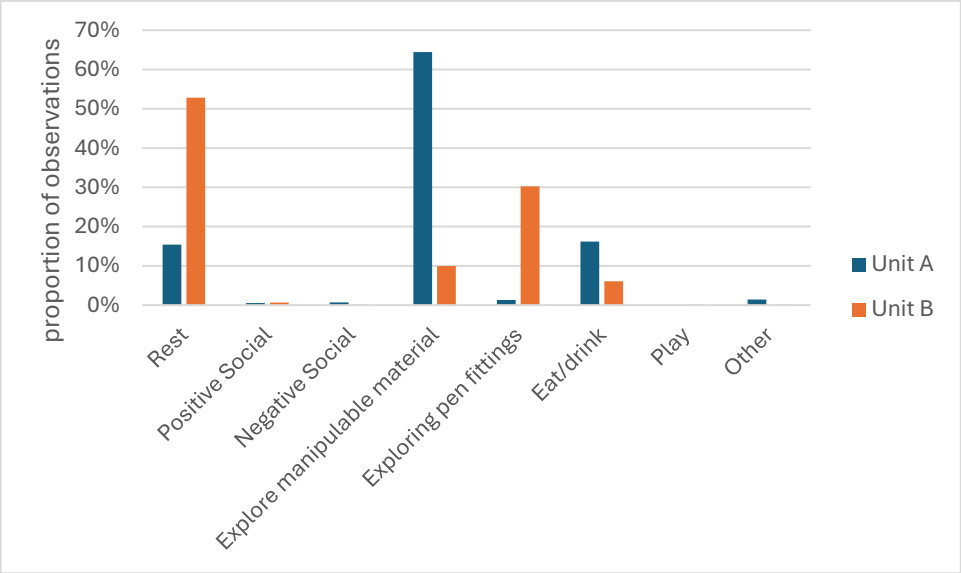


Figure S1 The proportion of observations that pigs spent performing each behaviour (rest; positive social behaviour; negative social behaviour; exploratory behaviour towards manipulable material / object; exploratory behaviour towards pen fixtures; eating/drinking; play; other) during observations at Unit B (n=15 pigs, 70 observation sessions) and Unit A (n=4 pigs, 23 observation sessions).

Cattle assessment results

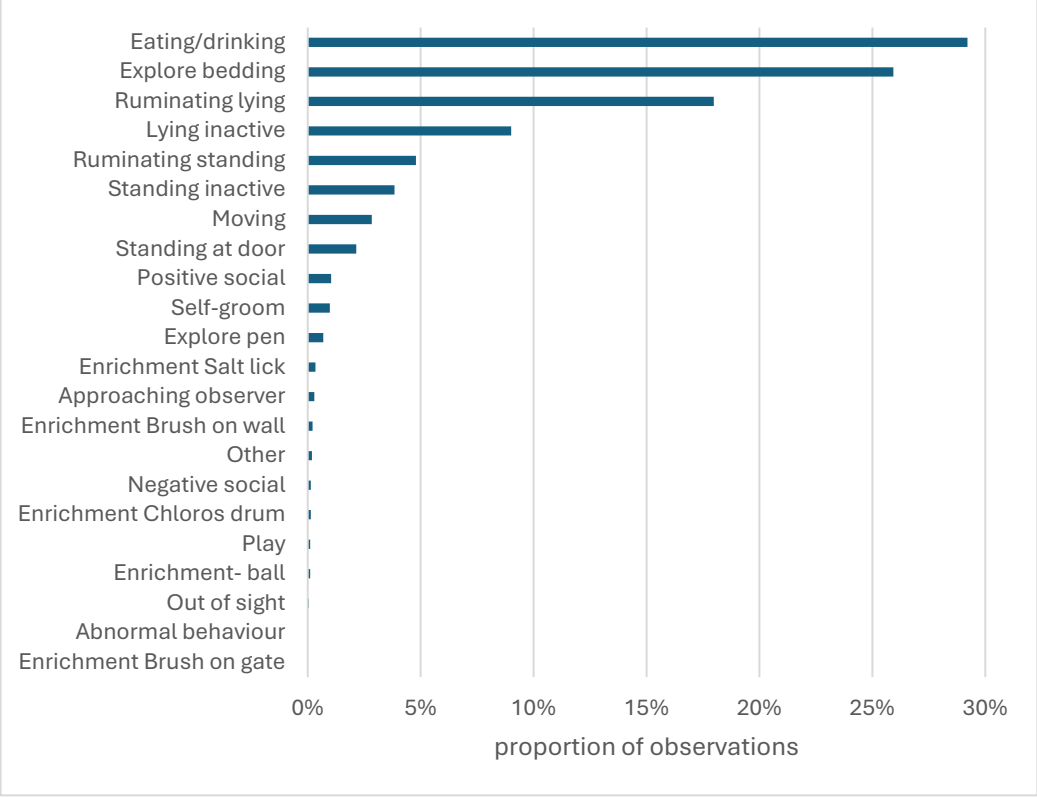


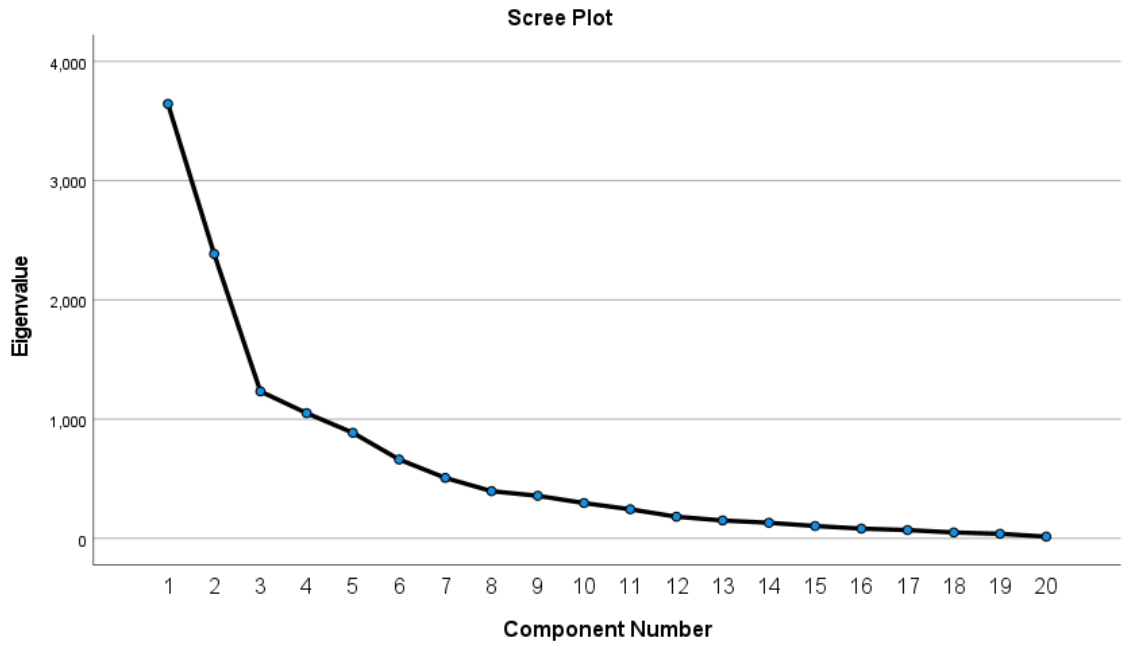
Figure S2. The proportion of observations that cattle (n=8) were observed performing each behaviour during observation sessions (n=27).

QBA results

Principal component analysis (PCA, covariance matrix, no rotation) was conducted in SPSS vs27 on QBA term scores to derive the loadings of each term on the major components.

Total Variance Explained

Component		Initial Eigenvalues[a]			Extraction Sums of Squared Loadings		
		Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
Raw	1	3644.538	29.157	29.157	3644.538	29.157	29.157
	2	2385.961	19.088	48.245	2385.961	19.088	48.245
	3	1233.520	9.868	58.114	1233.520	9.868	58.114
	4	1051.159	8.410	66.523	1051.159	8.410	66.523
	5	886.462	7.092	73.615	886.462	7.092	73.615
	6	662.765	5.302	78.918	662.765	5.302	78.918
	7	508.307	4.067	82.984			
	8	397.163	3.177	86.162			
	9	358.063	2.865	89.026			
	10	297.368	2.379	91.405			
	11	244.971	1.960	93.365			
	12	182.663	1.461	94.826			
	13	151.090	1.209	96.035			
	14	131.825	1.055	97.090			
	15	104.842	0.839	97.929			
	16	82.781	0.662	98.591			
	17	70.695	0.566	99.156			
	18	50.608	0.405	99.561			
	19	39.315	0.315	99.876			
	20	15.528	0.124	100.000			



Loadings of terms on each component

Component 1	Component 2	Component 3

Playful	0.816	Uneasy	0.651	Friendly	0.766
Active	0.808	Agitated	0.569	Sociable	0.661
Inquisitive	0.775	Indifferent	0.541	Bored	0.291
Lively	0.749	Bored	0.465	Playful	0.275
Positively occupied	0.631	Fearful	0.458	Fearful	0.240
Irritable	0.617	Frustrated	0.377	Active	0.198
Agitated	0.542	Irritable	0.321	Inquisitive	0.197
Frustrated	0.489	Distressed	0.299	Lively	0.182
Uneasy	0.351	Apathetic	0.182	Indifferent	0.152
Happy	0.339	Playful	0.085	Positively occupied	0.076
Relaxed	0.289	Inquisitive	-0.015	Happy	0.039
Bored	0.085	Sociable	-0.032	Relaxed	0.019
Fearful	0.013	Happy	-0.077	Distressed	-0.010
Indifferent	-0.005	Lively	-0.079	Calm	-0.013
Content	-0.071	Friendly	-0.184	Irritable	-0.103
Distressed	-0.072	Active	-0.276	Agitated	-0.112
Calm	-0.230	Positively occupied	-0.475	Apathetic	-0.122
Friendly	-0.428	Content	-0.713	Uneasy	-0.131
Apathetic	-0.472	Relaxed	-0.752	Frustrated	-0.359
Sociable	-0.556	Calm	-0.774	Content	-0.363

Goat assessment results

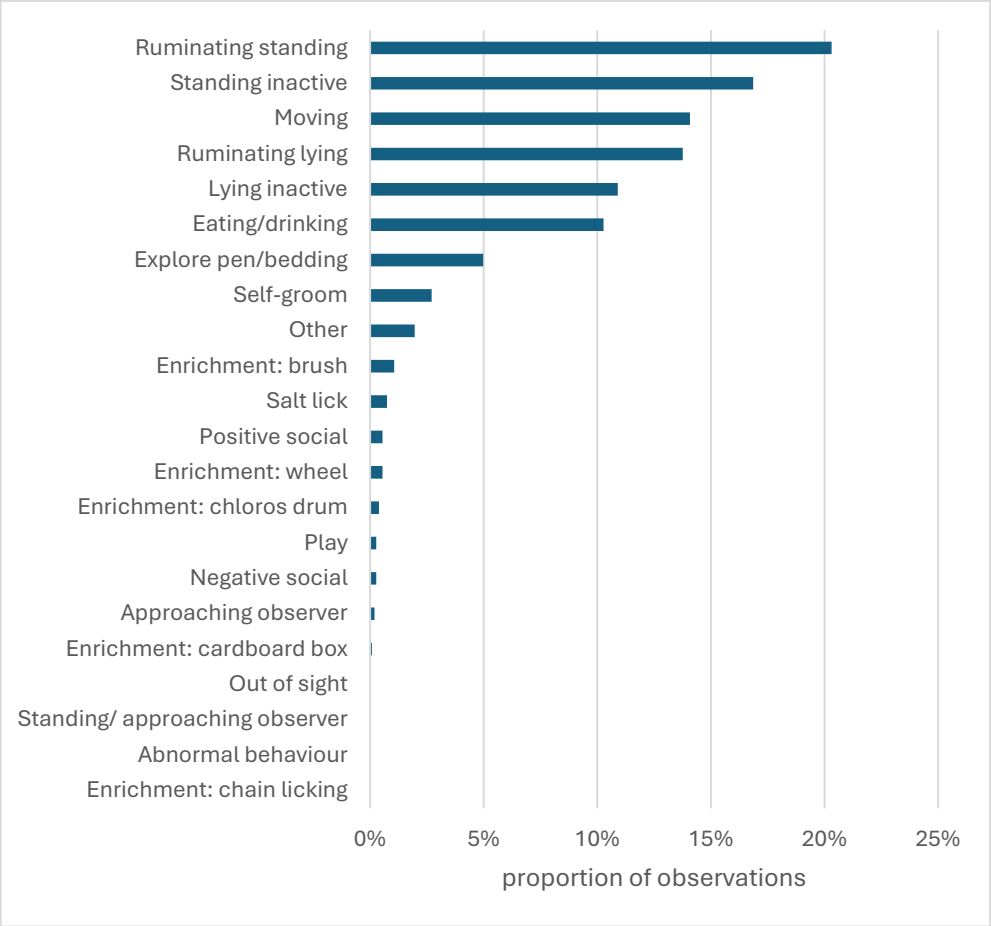


Figure S3: The proportion of observations that goats (n=3) spent performing each behaviour (ruminating standing; standing inactive; moving; ruminating lying; lying inactive; eating/drinking/ explore pen/bedding/ self-groom; enrichment: brush; salt lick; positive social; enrichment: wheel; enrichment: empty disinfectant drum; play; negative social; approaching observer; enrichment: cardboard box; standing/approaching observer; abnormal behaviour; enrichment: chain licking; out of sight; other) during observations (n=28 observation sessions).

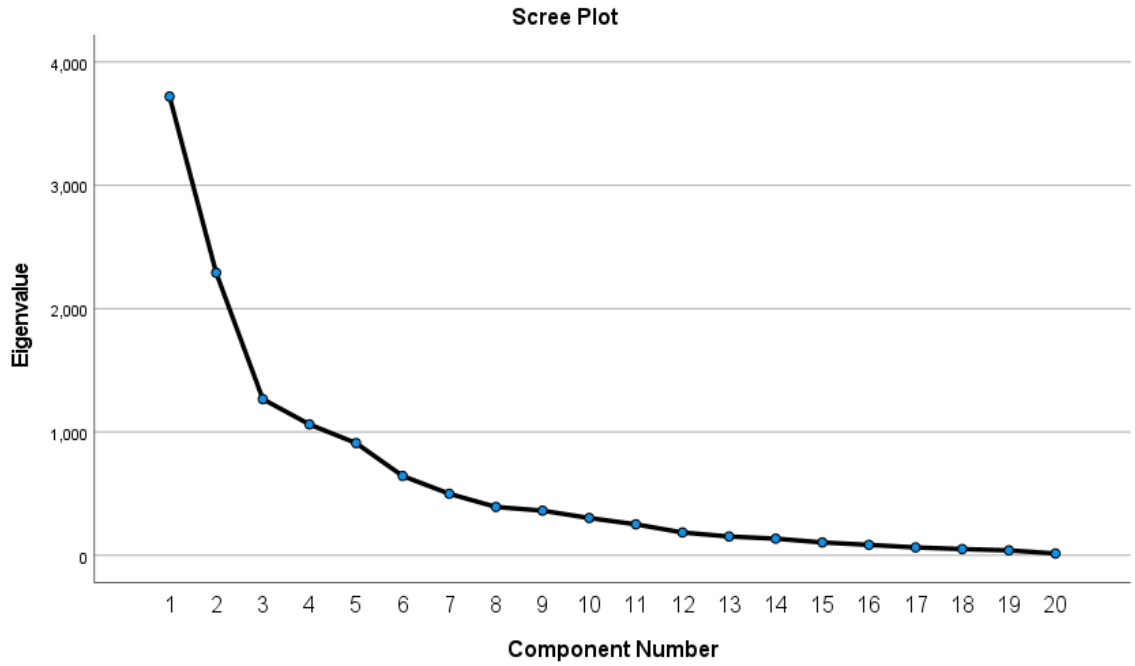
QBA results

Principal component analysis (PCA, covariance matrix, no rotation) was conducted in SPSS vs27 on QBA term scores to derive the loadings of each term on the major components.

Total Variance Explained

Component		Initial Eigenvalues[a]			Extraction Sums of Squared Loadings		
		Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
Raw	1	3720.673	29.684	29.684	3720.673	29.684	29.684
	2	2291.479	18.282	47.965	2291.479	18.282	47.965
	3	1266.811	10.107	58.072	1266.811	10.107	58.072
	4	1061.906	8.472	66.544	1061.906	8.472	66.544
	5	910.170	7.261	73.805	910.170	7.261	73.805
	6	643.515	5.134	78.939	643.515	5.134	78.939
	7	499.188	3.983	82.922			
	8	392.141	3.129	86.050			
	9	362.152	2.889	88.940			
	10	302.633	2.414	91.354			

11	251.592	2.007	93.361			
12	185.203	1.478	94.839			
13	152.563	1.217	96.056			
14	135.373	1.080	97.136			
15	104.398	0.833	97.969			
16	84.842	0.677	98.646			
17	64.033	0.511	99.157			
18	50.734	0.405	99.561			
19	40.146	0.320	99.882			
20	14.827	0.118	100.000			



Loadings of individual terms on each component

	Component 1		Component 2		Component 3
Active	0.815	Uneasy	0.668	Friendly	0.774
Playful	0.814	Agitated	0.594	Sociable	0.662
Inquisitive	0.787	Indifferent	0.549	Bored	0.294
Lively	0.752	Bored	0.484	Playful	0.276
Positively occupied	0.649	Fearful	0.451	Fearful	0.242
Irritable	0.604	Frustrated	0.398	Inquisitive	0.200
Agitated	0.519	Irritable	0.349	Active	0.197
Frustrated	0.473	Distressed	0.276	Lively	0.182
Happy	0.395	Apathetic	0.188	Indifferent	0.154
Relaxed	0.329	Playful	0.133	Positively occupied	0.075
Uneasy	0.322	Inquisitive	0.063	Happy	0.044

Bored	0.066	Happy	0.048	Relaxed	0.017
Fearful	-0.010	Lively	-0.050	Distressed	-0.010
Content	-0.021	Sociable	-0.061	Calm	-0.012
Indifferent	-0.027	Friendly	-0.173	Irritable	-0.101
Distressed	-0.091	Active	-0.280	Agitated	-0.111
Calm	-0.187	Positively occupied	-0.457	Apathetic	-0.120
Friendly	-0.416	Content	-0.675	Uneasy	-0.130
Apathetic	-0.475	Relaxed	-0.737	Frustrated	-0.358
Sociable	-0.556	Calm	-0.750	Content	-0.382