

Welfare assessment in farms in the Northwest of Spain: main facility mistakes and strengths

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SUPPLEMENTARY FILE

Supplementary materials and methods: Data collection protocol

Data were collected after the first milking in all farms. First, measurements were recorded following the order indicated in the template (Supplementary Table 1). Second, a survey was conducted on each farm to gather additional information (questions in italics). Once all the information was collected, data were classified into five groups (resting area, circulation area, cow area, feeding area, ventilation area, and milking area) and evaluated according to Supplementary Table 2 criteria.

Supplementary Table 1: Data recorded for each farm, including questions made to the farmer (italics).

Pen:
Resting area
General
<i>Stocking density</i> → <i>n° milking:</i> <i>n° stalls</i> <i>/n° dry:</i> <i>n° stalls:</i>
Quarantine pen: YES / NO
Calving pen: YES / NO
Individual stalls
Bedding materials: sand-straw-mattress-rubber-concrete Calcium carbonate <input type="checkbox"/>
Dry bedding: YES / NO
Level bed surface: YES / NO
<i>Bedding maintenance (freq./day):</i>
Stalls (measurements in drawing (cm.))
Curb height (cm.):
Width crossovers (cm.):
Width free stall alley (cm.):
Width fed alley (cm.):
Cows
Presence of ectoparasites: YES / NO
Presence of biting flies: YES / NO
<i>Presence of >1 cow with horns:</i> YES / NO
<i>Presence of cows with tail:</i> YES / NO
Flight zone: <75 cm / >75 cm
Stress for a scarce commodity: YES / NO
Cow crowding: YES / NO
Flooring
Stripped surface: YES / NO
Accumulation of manure in the alley: YES / NO
Slatted floor: YES / NO

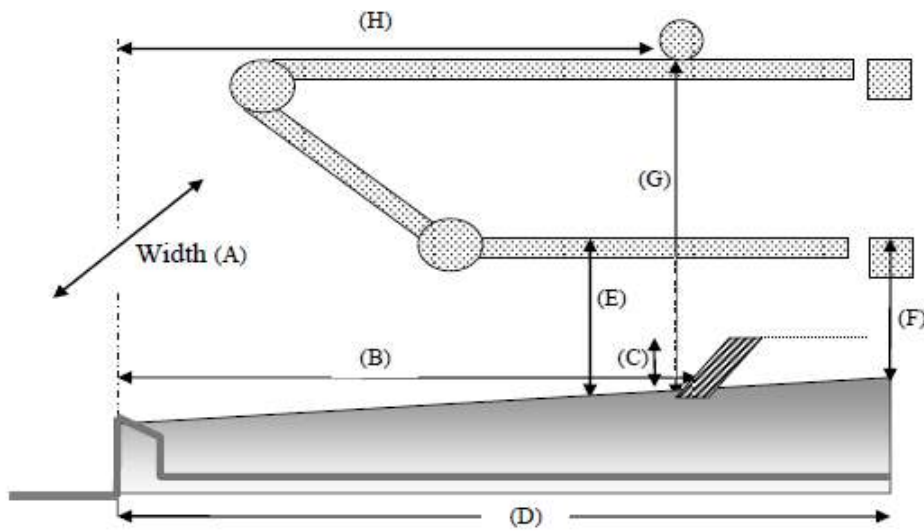
Rubber floor: YES / NO
Stripped/rubber flooring over waiting area: YES / NO
Preventive claw trimming (times/year): YES / NO
Slurry pit under barn: YES / NO
Feeding area
General
Feeding table smooth and clean: YES / NO
Cleaning feeding table: $\geq 1/\text{day}$ / $< 1/\text{day}$
Continuous feed availability ($>22\text{h/d}$): YES / NO
Feeding table with shadow: YES / NO
Feeding table covered: YES / NO
Height from feeding table to cow foot (cm.):
Water analysis: YES / NO
Cleaning water troughs: $\geq 1/\text{day}$ / $< 1/\text{day}$
Water troughs design: Flip / Flip and fixed / Only fixed
Water troughs at the exit of the milking parlour: YES / NO
Dimensions
Width of headlocks (cm.):
Cm. of water troughs/cow: length(____)*n°(____)=_____/cows(____)
Ventilation area
Orientation:
Air movement on the face of the cow: Slight / Excessive / NO
Condensation: YES / NO
Ceiling insulation: YES / NO
Height to ridge (m.):
Lateral opening: YES / NO
Sidewall height (m.):
Blind alleys: YES / NO
Forced ventilation systems: YES / NO
Humidity: YES / NO
Spiderwebs: YES / NO
Milking area
General
Milking time (h.):
Defecation/kicks: YES / NO
Abrupt turns: <2 / ≥ 2
Waiting area of milking parlour: YES / NO
Space/cow waiting area (m ²): length(____)*width(____)=_____/n° max cows(____)
Slope of the waiting area (%):
Animals can see milking parlour from waiting area: YES / NO

Footbaths: YES** / NO

Welfare objects (mechanical rotating brushes): YES / NO

**Presence, use of proper products, frequent renewal and placed in a walk-through area

Figure S1: Stall measurements:



- (A): Stall width
- (B): Brisquet broad distance from curb
- (C): Brisquet broad height

- (D): Total stall length
- (G) Neck rail height
- (H): Neck rail distance from curb
- (E) and (F): not measured

Supplementary Table 2: Objectives to be met (zero score) for the different facility-based parameters evaluated. Adapted from Verdes *et al.* 2020 (resting, circulation, cows, feeding, and ventilation areas) and Juaristi *et al.* 2004 (milking area).

Area	Parameter	Score	
		0	1
Resting	Stocking density	≤ 100	>100
	Quarantine pen	Yes	No
	Calving pen	Yes	No
	Dry bedding	Yes	No
	Level bed surface	Yes	No
	Bedding maintenance	≥ 2	< 2
	Bedding materials	Sand/straw/mattress	Rubber/concrete
	Calcium carbonate	Yes	No
	Stall width	117-127 cm.	< 117/> 127 cm.
	Brisket broad distance from curb	178-183 cm.	< 178/> 183 cm.
	Brisket broad height	< 15 cm.	15 cm.
	Total stall length	> 270 cm.	≤ 270 cm.
	Neck rail distance from curb	178-183 cm.	< 178/> 183 cm.
	Neck rail height	117-127 cm.	< 117/> 127 cm.
Curb height	15-20 cm.	< 15/> 20 cm.	
Circulation	Width crossovers	≥ 250 cm. without water troughs ≥ 420 cm. with water troughs	< 250 cm. without water troughs < 420 cm. with water troughs
	Width fed alley	≥ 420 cm	< 420 cm.
	Width free stall alley	≥ 300 cm.	< 300 cm.
	Stripped surface	Yes	No
	Rubber floor	Yes	No
	Blind alleys	No	Yes
	Slippery floor	No	Yes
	Slatted floor	No	Yes
	Slurry pit under barn	No	Yes
	Accumulation of manure in the alley	No	Yes
Cows	Presence of ectoparasites	No	Yes
	Presence of biting flies	No	Yes
	Presence of cows with horns	≤ 1	>1
	Presence of cows with tail	Yes	No
	Flight zone	≤ 75 cm.	> 75 cm.
	Stress for a scarce commodity	No	Yes
	Cow crowding	No	Yes
	Preventive claw trimming	≥ 1/year	No
	Footbaths	Yes	No
Welfare objects	Yes	No	
Feeding	Feeding table smooth and clean	Yes	No
	Cleaning feeding table	≥ 1/day	< 1/day
	Continuous feed availability	Yes	No
	Feeding table with shadow	Yes	No
	Feeding table covered	Yes	No
	Height from feeding table to cow foot	10-15 cm.	< 10/>15 cm.
	Water analysis	Yes	No
	Cleaning water troughs	≥ 1/day	< 1/day
	Water troughs design	Flip	Flip and fixed/Only fixed
	Cm. of water trough/cow	≥ 8 cm./cow	< 8 cm./cow
Water trough at the exit of the milking parlour	Yes	No	
Width of headlocks	≥ 60 cm.	<60 cm.	
Ventilation	Orientation	East-West	Other
	Air movement on the face of the cow	Yes, slight	No/Yes, excessive
	Condensation	No	Yes
	Ceiling insulation	Yes	No
	Sidewall height	≤ 4 m.	> 4 m.
	Lateral opening	Yes	No
	Cow curtain	Yes	No
	Height to ridge	≥6 m.	< 6 m.
	Forced ventilation systems	Yes	No
	Humidity	No	Yes
Spiderwebs (sign of poor ventilation)	No	Yes	
Milking	Milking time	≤ 1 h./group	> 1 h./group
	Waiting area of milking parlour	Yes	No
	Slope of the waiting area	2-4%	No/>4%
	Space/cow waiting area	≥ 1,3 m ² /cow	< 1,3 m ² /cow
	Stripped/rubber flooring over waiting area	Yes	No
	Defecation/kicks	No	Yes
	Abrupt turns	< 2	≥ 2
	Animals can see milking parlour from waiting area	Yes	No