Evaluation Model of Cattle Welfare and Performance during Transportation in Camara Nusantara Ship

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Goal

evaluate sea transportation using Camara Nusantara ship on cattle welfare aspect and cattle performance

METHODOLOGY

KM CAMARA NUSANTARA

ROUTE KUPANG-TANJUNG PRIUK

The research was conducted in December 2018. The research took place at KM Camara Nusantara 3 which carried cattle from Kupang to Tanjung Priok

LIVESTOCK

Bali Cattle

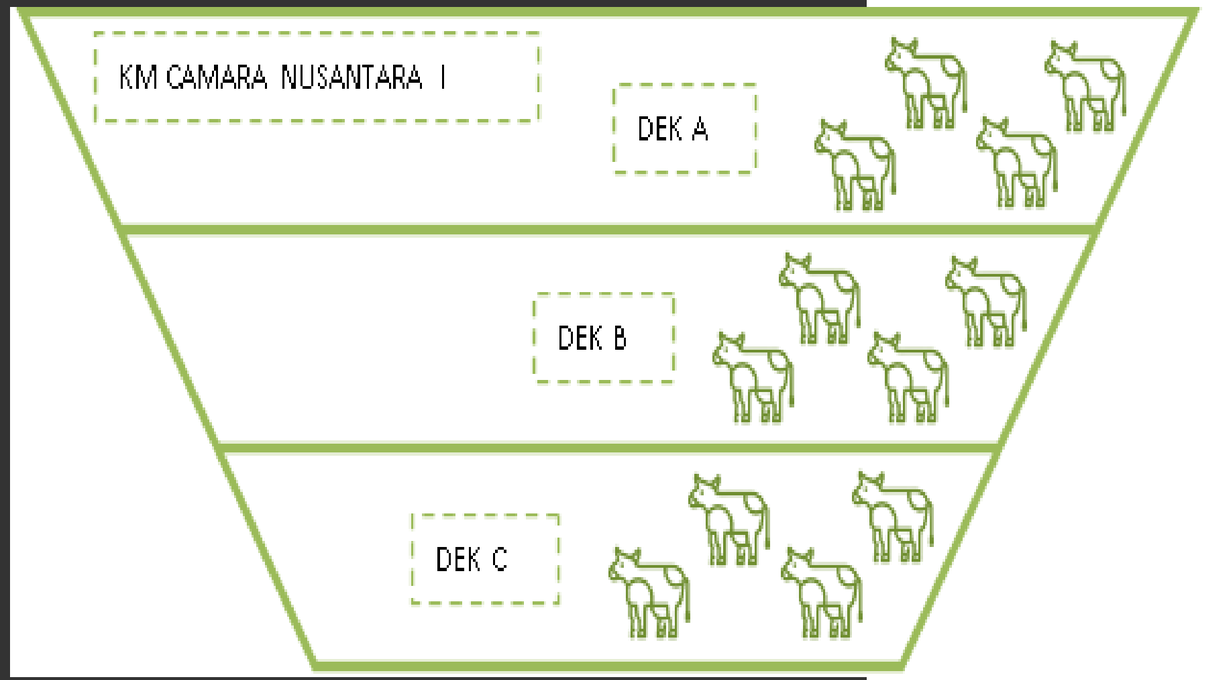
Total of 60 cattle from 3 decks, each deck was chosen in randomly 20 cattle

PARAMETERS

Prinsiple	Parameters
Free of hunger and thirst	Feed consumption amount Weight Loss Availability and cleanliness of drinking water
Free from inconvenience/physical torture	Space Allowance Temperature Humidity Index (THI)
Free to be able to express behave/natural life	Eat and drink Lying down Agonistic Interaction
Free of pain, injury, and illness	Bruising or wounds Lameness Slip/Fall Coercion Mortality
Free from fear and distress	Loading duration and unloading Panting Foaming Respiration Body temperature Freeze while loading and unloading

Table 1. Development of the asessment based on five wellbeing livestock principles passed by the British Government (Farm Animal Welfare Council 1993).

PROCEDURE



60 Bali cattle (each of the 20 cattle on the A, B and C decks) were selected for observation.

Livestock are observed every day for 15 minutes in the morning 07.00 WIB, 12.00 WIB, and 16.00 WIB.

Observation was done from loading, transportaion, until unloading process. It took 5 days in total

Measurements of cattle live weight are done before and after the sea transportation.

Data Analysis

- A descriptive-qualitative analysis of qualitative parameters done by presenting data in the form of tables, graphs, and research documentation.

- Quantitative data analysis (amount of feed consumption, weight lost, environmental temperature and humidity, mortality, and physiology) in livestock on decks A, B, and C are analyzed with complete random design.

  P1: Cattle on deck A
  P2: Cattle on deck B
  P3: Cattle on deck C

Data Analysis

- The mathematical model of the complete random draft experimental design follows the Steel and Torrie Mathematical Models (1993) as follows:

$$Yij = \mu + \tau i + \varepsilon ij$$

Description:

Yij :Test response from the to-I treatment and J-Deuteronomy

μ : General Rataan

τi : Effect of the I-treatment

εij : Error I and Deuteronomy

- Data was processed with SPSS and Microsoft Excel application. The scoring value, analyzed using the descriptive statistics application using Microsoft Excel.

Overall Score Rating

Data scoring was done using the rubric table, based on the corresponding literature on each parameter. This data scoring will then be combined and averaged to get the final result.

Average overall score rating =

$$\frac{\text{Total overall score}}{19}$$

RESULTS

Freedom from hunger and thirst

Estimated feed consumption

Tabel 1. Type of feed dan estimated feed consumption

Measurements	Deck A	Deck B	Deck C
Feed type	Hay	Corn Straw	Corn Straw
estimated feed consumption (kg/day)	0.546 ± 0.211^{b}	1.584 ± 0.14^{a}	1.392 ± 0.27^{a}

The estimated feed consumption of each deck is significant ($P < 0.05$). Consumption of cattle feed during the trip is still under the standard of cattle feed consumption per day. The low number of consumption can be caused by inappropriate feed type or stress due to environmental change.

Estimated weight Loss

Measurement	Deck A	Deck B	Deck C
Day 1 (kg)	198.725	219.535	205.79
Day 5 (kg)	188.695	209.505	197.53
Estimated weight loss (kg)	10.03	10.03	8.25

The difference location of deck does not give a significant effect on the estimation of cattle-weight loss ($P > 0.05$). This value is above the standard where the weight loss in the transportation process ranges from 2%-3% body weight (Coffey et al. 2018). The cattle weight lost in KM Camara Nusantara 3 ranges between 4.13% - 5.05%. of the body weight, so that the scoring value obtained is 1.

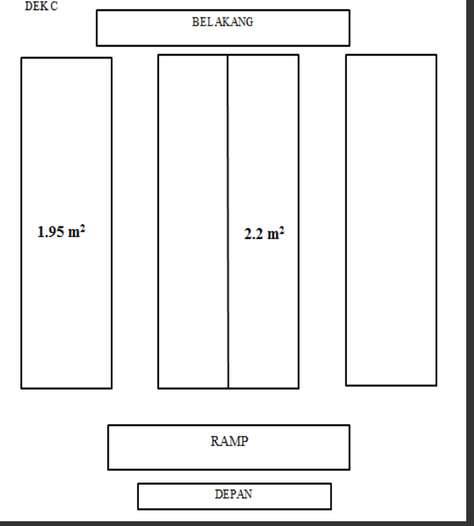
Availability and cleanliness of feed and drinking water

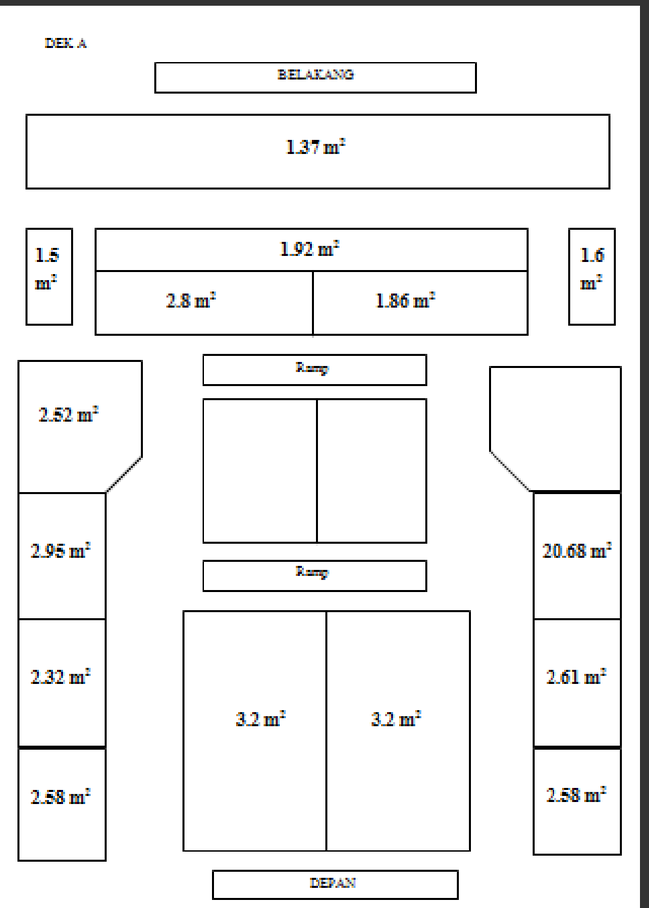
Measurement	Deck A	Deck B	Deck C
Availability and cleanliness of feed and drinking water	1±0	1±0	1±0

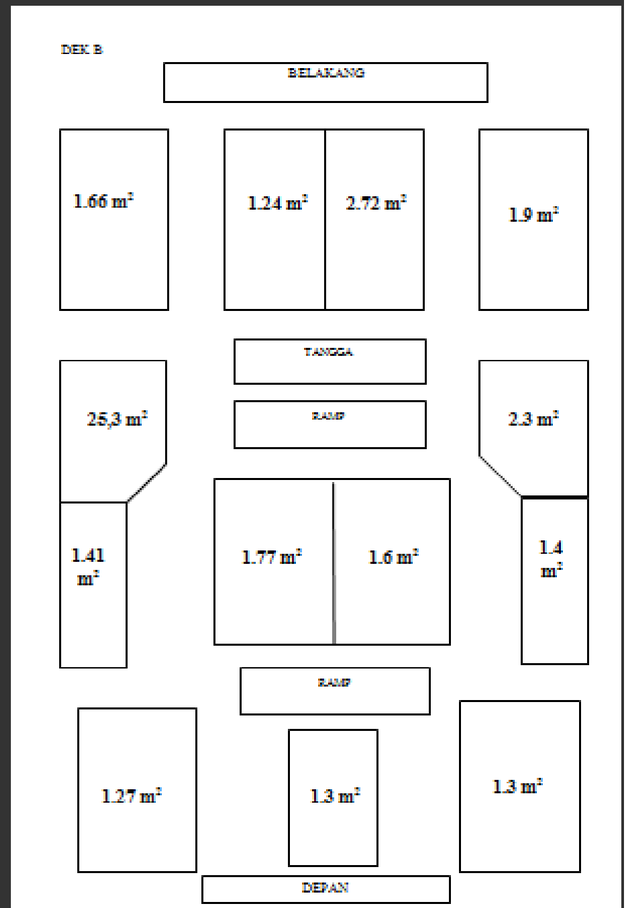
Tabel 3. Scoring of the availability and cleanliness of feed and drinking water

The scoring of **feed and water availability and cleanliness** during the trip is 1 on the third deck, A, B, and C. The value signifies the place of the feed or the place of drinking water and the unavailability of drinking water or feed at the time of inspection . The drinking water provided is also limited. Drinking water is only done once a day, with uncertain delivery time.

Free from inconvenience/ physical torture







Space Allowance

- The space allowance in KM Camara ranges from 1.27-20.68 m2./head.
- The high number of space allowance is caused by a less precise allocation of cattle. This is due to a Bali cattle that must be tied to the fence, and the cattle is concentrated only on one or two sides of the pen, so that the middle or back of the pen is empty
- When calculating the density area of the enclosure without taking into account the empty part of the pen, the density of the cage ranges between 0.6-0.8 m2/tail,
- The target of Petherick and Phillips (2009), the area of density required for livestock is worth 0.93 m2/tail.
- so that the scoring value obtained is scoring 3

Temperature Humidity Index

Parameter	Deck A	Deck B	Deck C
Temperature at (^{0}C)			
09.00	30.98	29.28	29.46
12.00	31,82	30.32	31.72
16.00	31,56	30.22	30.82
Humidity at (%)			
09.00	72.92	72.12	69.82
12.00	69.14	70.48	70.68
16.00	70.16	72.82	73.46
THI	83.467 ± 1.76^a	81.267 ± 1.67^b	83.067 ± 2.12^a
Category	danger	danger	danger

Temperature, humidity, THI dan category each deck

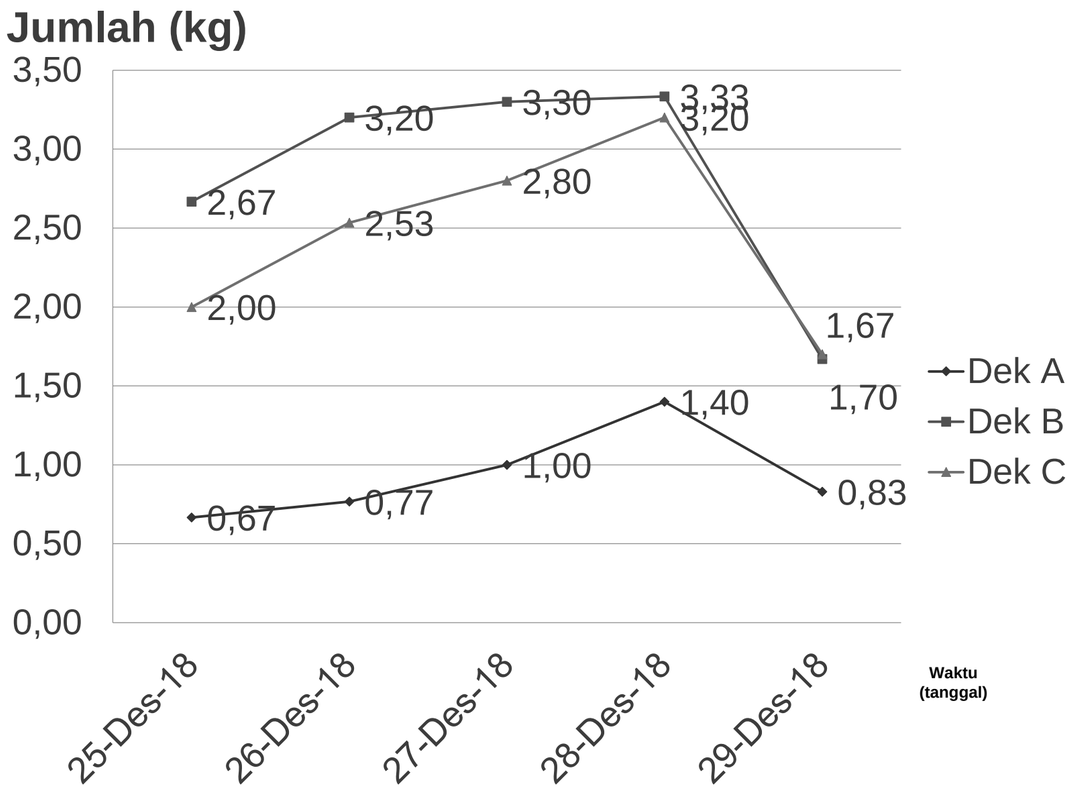
THI on each of decks is significant ($P < 0.05$). Deck B has a lower THI value compared to the other two decks. When entering danger categories, it is necessary to attempt to prevent excessive heat. The value of THI cattle on KM Camara Nusantara is in a dangerous category, so the scoring value obtained is 2.

Freedom to Express Normal Behaviour

Parameter	Deck A	Deck B	Deck C
Eating behaviour			
Eating (%)	13	14	13
No Eating (%)	87	86	87
Agonistic Interaction			
Agonistic Interaction(%)	11.72	9.16	14.78
No agonistic interaction (%)	88.28	90.84	85.22
Laying Score	2.53±1.4	2.6±1.36	2.47±1.41

Cattle behaviour during transportation

Eating



- The number of livestock that have a very low eating and drinking activity, which is around 13%-14%.
- The low number of livestock that perform this behavior can be caused by different types of feed given
- The feed adaptation is very important so that livestock is not surprised by the sudden change in the type of feed (Ministry for Primary Insdustries of New Zealand 2013)
- The value of cattle feeding on KM Camara Nusantara is 13-14%, so that the scoring value is 2.

Agonistic Interactions

- The agonistic interactions of cattle transported with KM Camara Nusantara vessels ranging between 9.16%-14.78%.
- This low number can be caused by strict ties of cattle, so that of cattle cannot be freely moving.
- Many of the agonistic interactions encountered during the transport process on Camara Nusantara were pushing each other's heads.
- The value of agonistic cattle behavior on Camara Nusantara vessels ranges from 9-14%, so the scoring value obtained is 2.

Laying

- The scoring value of the behavior lay cattle ranged from 2.47-1.6.
- The value of the cattle is likely to choose to lie down, but with the position 2/3 the cattle’s body is out of its current territory.
- 2/3 the cattle’s body out from teritorry means, there’s no enough space for cattle to laying down
- So that, scoring for laying down is 2

Parameter	Loading	Unloading
Bruising or wounds	3.98±0.13	3.22±0.41
Slip or fall	2.77 ±1.14	2.68 ±1.22
Lameness	3.93 ± 0.25	3.83 ± 0.45
Coercion	1.20 ±0.51	1.05 ±0.28
Freeze	2.01 ±1.08	2±1.14

Tabel 6. Cattle handling scoring during loading and unloading

Freedom from Pain, Injury, and Disease

Bruising or wounds

- Table 6 shows the scoring value of a bruising or wound in the loading process indicating a number 3.98 ± 0.01 and unloading process 3.21 ± 0.41
- There are significant results ($P < 0.05$) between the loading and unloading process
- The wound is caused by too tight ties, or in the process of loading the cattle before, the cattle is pulled too strong

Slip or fall

- The scoring on the indicator slipped or dropped on the loading and unloading process of 2.76 ± 1.14 and 2.68 ± 1.22.
- The cattle slipped 3-4 times on the loading or unloading process
- Based on the results of a comparison between the loading and unloading process, there are insignificant results (P > 0.05). there are no significant handling differences during the loading and unloading process
- The cause of the cattle fell or slipped due to the slippery floor of the vessel or the cattle was required to turn (U-turn) sharply.
- The slippery surface of the floor also becomes one of the livestock factors slipped during the process of loading and unloading in KM Camara Nusantara.

Lameness

- The scoring of lameness during loading or unloading is 3.93 ± 0.25 and 3.83 ± 0.45
- The number most of the cattle walking normally without having any problem
- There are no significant results (P > 0.05), between the loading and unloading process
- Lameness is an important aspect of determining the livestock worthy to be transported.
- This is due to the transportation process that requires balance.

Coercion

- Coercion is defined as the use of objects when handling live animals, examples of electric sticks, sticks, whip, etc.
- The cattle coercion assessment ranging at 1.2 ± 0.51 for loading and 1.11 ± 0.58 for the unloading process
- Based on the results of a comparison between the loading and unloading process, there are insignificant results ($P > 0.05$).
- Coercion given to various cattle. As it was hit, kicked, whipped, used a electric goad, or bent its tail.
- The beaten cattle can be at risk of bruising.

Mortality

- The death rate of cattle on shipping using Camara Nusantara 3 with Kupang route to Jakarta is 0%.
- All the cattle were transported and delivered in a living state.
- The death rate of a cattle being transcaled using marine transportation should be less than 1% of the total amount of the cattle being transported. (MLA 2000)
- The value of cattle mortality transported using Camara Nusatara 3 ships indicates a value of 0, so that the scoring value obtained is 4.

Free from fear and distress

Parameter	Deck A	Deck B	Deck C	Control
Foaming	4±0	4±0	4±0	
Panting	3.82 ±0.44	3.98±0.1	3.93 ± 0.26	
Respiration (times/minute)	27.11 ± 2.62^{a}	20.133 ± 3.96^{c}	21.33 ± 3.78^{b}	10-30 times
Body surface temperature (^{0}C)	34.633 ± 1.19^{a}	32.931 ± 0.93^{c}	34.281 ± 1.12^{b}	32-35^{0}C

Behaviour and Physiology responds during transportation

Foaming

- Foaming on cattle is characterized by the emergence of foam on the animal's mouth.
- Although the THI value on deck A, deck B, and deck C are in dangerous category, but no cattle shows signs of foaming mouth.
- It can be regued by the physiology of Bali's cattle that can withstand high ambient temperatures
- Bali cattle do not show foaming mouth, because evaporation of cattle can already release his body heat

Duration of Loading and Unloading

- The process of loading cattle on the ship Camara Nusatara required a total of 38 hours
- The loading of one cattle truck took 5-10 minutes to ± 10 cattle. The loading of cattle on deck A and Dek B took approximately 13 hours (10.00-23.00 WIT).
- Wating time for loading cattle on deck C approximately ± 20 hours after deck A and deck B finished loading.
- The Waiting time between all cattle loaded into the vessel and the ship begins to loose anchors ranging from ± 10 hours
- Loading duration takes only ± 4 hours
- The average time to load a single truck requires a time of 5-18 minutes
- Compared with time loading time to load one cattle truck in Tanjung Priok tends to be slower
- During unloading process, cattle handling is done by the expedition and carried out by more than 10 people, so many are passing through the ramp or gangway which causes the cattle to stop or afraid to walk.

Panting

- Panting as one of the manifestations of excessive heat stress.
- The panting cattle score during the journey ranged between 3.82-3.98.
- only a few cattle are just panting
- the cattle does not show panting as a hot-spring maifestation, but indicates a higher respiration rate.

Respiration

- The cattle respiration transported using the KM Camara Nusantara has significant results ($P < 0.05$)
- Cattle on deck A having higher respiration than deck B and C.
- The condition shows the cattle on deck A in heat-choked state, which is characterized by an average respiration of more than 25 times per minute
- This is in line with THI on deck A that has a higher value than other decks
- The cattle respiration ranges from 10-30 per minute, while in the case of stress the cattle respiration ranges in 26-50 times per narrow (Eley 2011)
- The scoring rate for the cattle respiration that is transported using the ship Camara Nusantara 3 is 3, based on Eley (2011).

Body Surface Temperature

- The surface temperature value of the cattle’s body that is transported by Camara Nusantara 3 has a significant difference ($P < 0.05$) of each deck.
- The body's surface temperature on the high deck A is aligned with respiration rate and high THI.
- Lysyk (2008) which mentions the surface temperature of the cattle’s body ranged from 32-35^{0}C
- The scoring rate for the cattle respiration that is transported using the ship Camara Nusantara 3 is 2, based on Lysyk (2008).

Freeze during Loading and Unloading

- Freeze when loading or unloading has the meaning of not moving during the process of loading or unloading cattle
- The loading or unloading process has an average scoring two.
- This figure means that cattle do not move for 3-4 seconds in the process of loading or unloading.
- The time is not moving that long enough because of the number of people who are passing or the condition of trucks that are not ready in the process of unloading. This can affect longer loading or unloading durations.

Final score Determination

The final score of the welfare aspect is determined by totaling the number of scores of each aspect and then averaged.

Average overall scoring score =

$$\frac{\text{Total overall score}}{19} = \frac{42}{19} = 2.21$$

Average overall rating score **2.21**

Design of the fence

Cattle’s head often get stucked between the fences

The number of feed

Cattle’s feed was run out before the ships reached Tanjung Priok

Surface of the floor

Surface of the floor often made

cattle slipped or fell

The number of Garbage

The number of garbage often can be found next to the cattle

CONCLUSION

- The cattle welfare aspect on the ship Camara Nusantara 3 is at a score 2.21 of 4.
- There are several strokes that need to be repaired and upgraded, such as in the availability and hygiene of cattle feed, coercion, and the duration of loading and unloading cattle on the vessel.
- It is supported by a high number of weight loss, where this weight loss can be a financial disadvantage to the various stakeholders


THANK YOU