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Assessment of Nutrient Sufficiency Through Body Condition Score: A Study Case at The Ongole Cross-Breed Cattle Breeding Center, Kebumen, Central Java

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ABSTRACT

This study aimed to evaluate the feeding practices and nutritional intake of Ongole crossbred (PO) cattle in Kebumen, Central Java. This study focused on body condition scores (BCSs) and their implications for cattle performance. The parameters observed in this study included the feed composition, nutrient content, and impact of different BCSs on nutrient intake. The results of this research revealed that PO cattle with poor BCS did not receive sufficient feed, resulting in suboptimal nutrient intake. Moreover, those with medium BCS receive sufficient feed but still lack protein intake. In contrast, PO cattle with optimum BCS demonstrated the higher performance compared to other BCS groups, with crude protein intake of 0.57 kg (8.81%), 0.15 kg of extract (2.32%), 2.08 kg of crude fibre (32.15%), 3.81 kg of neutral detergent fiber (58.89%), 2.27 kg of acid detergent fiber (35.08%), and 4.00 kg of total digestible nutrient (61.82%) of the total dry matter intake, amounting to 6.47 kg. The findings underscore the importance of proper feeding practices tailored to the nutritional needs of cattle to optimize cattle performance.

Keywords: *Body condition scores, Feeding practices, Nutrient intake, PO cattle*

Introduction

The increase in the population of beef cattle is closely related to cattle breeding, which is still predominantly carried out by smallholder farmers at the microscale. One example of cattle breeding found in the community is Ongole crossbred or Peranakan Ongole (PO) cattle breeding in the Kebumen Regency. Kebumen Regency has the fifth largest beef cattle population in Central Java Province, with a population of 65,632 heads, 85% of which are PO cattle (BPS 2023). According to Ngadiyono *et al*. (2017), PO cattle in Kebumen demonstrate superior performance compared with the standards set by the Indonesian National Standardization Agency (SNI). This superiority is evidenced by their greater maximum body weight, height, width, and good body length, accompanied by rapid growth and easy handling.

The breeding of PO cattle in the Kebumen Regency serves as a foundation for the development of superior-quality local cattle. The development of the cattle population must be accompanied by providing feed that can meet the needs of the animals so that the breeding stock can reproduce effectively (Romjali, 2019). The fulfilment of feed requirements can be determined by the body condition score (BCS) of the cattle (Thorup *et al*., 2012).

The body condition score (BCS) is one of the assessment methods used to determine the adequacy of nutrients provided to cattle. According to Pires *et al*. (2013), BCS values are determined by the accumulation of fat and muscle in areas such as the tailhead, pelvic bone (pins, thurl, hooks, and sacral ligaments), ribs, and spine. Observation of the thickness of the fat and meat covering the bones is the basis for determining the BCS value. The accumulation of fat and muscle occurs because excess energy from the nutrient content in the feed is stored in muscle and fat tissues (Park *et al*., 2018). The formation of muscle and tissue does not occur rapidly, so BCS values heavily rely on the feeding practices of farmers. Mulyanti and Keraf (2021) further reported that assessing performance via the BCS is highly effective in evaluating feed sufficiency because an increase in BCS values reflects improvements in nutrient intake over a certain period, whereas low BCS values result from inadequate nutrient intake. Additionally, cattle performance, as assessed by the BCS of the parent stock, influences reproductive performance. Cooke *et al*. (2021) reported that animals with higher BCSs tend to have higher productivity, particularly in the production of weaned calves with good performance.

Both the quality and quantity of feed should suit the nutritional needs of cattle. The feed consumed by cattle is utilized for growth, development, and reproduction (Almoosavi *et al*., 2020). Farmers in rural regions of Kebumen continue to use traditional feed management practices. On a typical basis, farmers are still dependent on pasture and agricultural byproducts as the main feed source, and only a few farmers are already using high-protein feed for their cattle. (Negoro *et al*., 2024). Farmers' lack of awareness of feed nutrition frequently leads to insufficient attention given to the quality and quantity of feed supplied. This is evidenced by the large number of cattle that perform poorly.

The objective of this study was to assess the appropriateness of feed delivery to cattle via the performance of Peranakan Ongole (PO) breeding cattle. No comprehensive research has yet investigated how daily feeding practices influence the BCS of PO cattle in Kebumen Regency, especially in the districts of Puring, Petanahan, Klirong, Bulus Pesantren, Ambal, and Mirit. This research is crucial in educating farmers on the quality and quantity of feed required for achieving optimal performance in breeding cattle.

Materials and Methods

Research time and location

Sampling and data collection were conducted in the PO cattle breeding center areas in Kebumen Regency, specifically in the districts of Puring, Petanahan, Klirong, Buluspesantren, Ambal, and Mirit, from August until September 2023.

Research Materials

Thirty heads of productive PO cows that were given at least one calf was used as research subjects. The cows were owned by members of a group of farmers who were reared intensively, with a sample size of 5 – 6 heads in each subdistrict. The equipment used in this research included a hanging scale, rope, plastic bags, sample envelopes, plastic sample containers, a camera, and record-keeping forms.

Research Methodology

This study investigated farmer feeding management. The data collected in the field included the BCS, types of feed provided, and quantity of feed consumed. Cattle sampling was conducted via the purposive sampling method (Afif *et al*., 2023).

Parameters Observed

The BCS values were classsified into three categories:poor BCS (<2.0);, medium BCS (2.0--2.5); and optimum BCS 3 (2.5--3.0) using a modified approach developed by Pires *et al* (2013). The grouping of BCSs was designed to help farmers understand and easily perform BCS assessments in the field. Poor BCS is defined as thin build-ups of flesh and fat on the pelvic bones so that the pins' bones, thurl bones and hooks are visible. The tail head, spine, and ribs are all highly noticeable. A medium BCS is indicated by a buildup of flesh and fat on the pelvic bones and tail head, but the sacral ligament still forms a depression, and some of the backbone and ribs remain visible. Moreover, in the Optimum BCS, the meat and fat buildup seems thick, resulting in a proportional amount of pelvic and thurl bones, no visible ribs, and no excessive meat or fat buildup.

The feed was weighed individually on the basis of the type of feed to determine the percentage of each feed material in the ration. The feed intake was determined by weighing the given feed and subtracting it from the amount of remaining feed prior to the next morning of feeding (Weber *et al*., 2013). Data on feed intake were collected on three consecutive days.

Nutrient Content

The feed samples were collected from the composites and sampled homogenously for each feed ingredient. The samples were then analysed for nutrient content according to the AOAC method (AOAC, 2009), whereas the crude fibre fractions were analysed according to Van Soest *et al*. (1991). These analyses aimed to determine the complete nutrient content of the feed, which then formed the basis for calculating feed nutrient intake. The observed nutrient parameters included dry matter (DM) (AOAC 934.01), organic matter (OM) (AOAC 942.05), crude protein (CP) (AOAC 990.03), extract ether (EE) (AOAC 920.39), crude fibre (CF) (AOAC 978.10), neutral detergent fibre (NDF), acid detergent fibre (ADF), and total digestible nutrients (TDN). Nutrient intake was calculated via the approach described by Septian *et al*. (2018).

Dry matter intake (DM) (kg/head/day):

$$\text{DM Intake} = \text{DM of feed provided} - \text{DM of leftover feed}$$

Intake of organic matter (OM) (kg/head/day):

$$\text{Organic matter Intake} = \text{DM intake} \times \frac{\text{\% Organic matter of feed}}{100}$$

Intake of crude protein (kg/head/day):

$$\text{Crude Protein Intake} = \text{DM intake} \times \frac{\text{\% Crude Protein of feed}}{100}$$

Intake of extract ether (kg/head/day):

$$\text{Extract ether Intake} = \text{DM intake} \times \frac{\%\ \text{Extract ether of feed}}{100}$$

Intake of Crude Fibre (kg/head/day):

$$\text{Crude Fibre Intake} = \text{DM intake} \times \frac{\%\ \text{Crude Fibre of feed}}{100}$$

Intake of NDF (kg/head/day):

$$\text{NDF Intake} = \text{DM intake} \times \frac{\%\ \text{NDF of feed}}{100}$$

Intake of ADF (kg/head/day):

$$\text{ADF Intake} = \text{DM intake} \times \frac{\%\ \text{ADF of feed}}{100}$$

Intake of TDN (kg/head/day):

$$\text{TDN Intake} = \text{DM intake} \times \frac{\%\ \text{TDN of feed}}{100}$$

Data Analysis

The nutrient intake data analysis was conducted using one-way ANOVA to compare the means of each variable, followed by a post hoc Duncan test if there were significant differences (p<0.05). SAS Studio was deployed to assist in data analysis.

Results and Discussion

Results

The results indicate that the types of feed in the PO Cattle Breeding Center in Kebumen Regency are generally categorized into two main groups: forage and supplementary feed (concentrate), as presented in Table 1. The forage utilized by the farmers consisted of rice straw (*Oryza sativa*), dwarf Napier grass (*Pennisetum purpureum cv. mott*), elephant grass (*Pennisetum purpureum*), and various types of field grass, such as buffalo grass (*Brachiaria mutica*), Setaria grass (*Setaria splendida*), bermuda grass (*Elusin indica*), Pangola grass (Panicum repens), carpet grass (*Axonopus compresus*), and Digitaria grass (*Digitaria* sp.). The utilization of forage feeds in farmer rations ranges from 80% to 100%. These findings indicate that farmers have been engaged in cultivating high-productivity forage feeds, such as elephant grass and Napier grass. According to Santy Asminaya (2022), dwarf Napier grass and elephant grass are cultivated grasses with high productivity, averaging 94 tons/ha/year. Thus, forage feed diversification has occurred, reducing farmers' reliance on seasonal variation and the availability of idle land as a source of forage or cattle grazing area.

Tabel 1. Feedstuffs used

Forages	Supplementary feeds
Rice straw (*Oryza sativa*)	Rice bran
Napier grass (*Pennisetum purpureum cv mott*)	Pollard
Elephant grass (*Pennisetum purpureum*)	Concentrate
Field grass	Cassava dregs
Buffalo grass (*Brachiaria mutica*)	Tofu dregs
Setaria grass (*Setaria splendida*)	
Bermuda grass (*Elusine indica*)	
Pangola grass (*Panicum repens*)	
Carpet grass (*Axonopus compresus*)	
Digitaria grass (*Digitaria sp*)	

Source: (Kebumen, 2023)

Supplementary feed was provided to increase nutrient intake and enhance nutrient digestibility. The supplementary feeds included rice bran, pollard/wheat bran, cassava pulp, and tofu residue, which are the byproducts of the agricultural industry. Supplementary feed can provide additional essential nutrients to support the immune system, maintain reproductive health, and promote weight gain (Herd and Sprott, 2023).

Nutrients or feed constituents are substances that are absorbed and utilized by an animal's body. Therefore, the nutrient content must be considered when providing feed. Table 2 presents the results of the proximate analysis depicting the nutritional values of the feedstuffs provided by the farmers. Data collection assumed that there were no differences in nutrient content among the feedstuffs sampled because there were no noticeable environmental differences between the sampling areas. The results revealed that the highest dry matter content among forages was found in rice straw (21.58%), whereas the lowest dry matter content was found in elephant grass (11.81%). The highest protein content was found in Napier grass (11.5%), whereas the lowest protein content was found in rice straw (3.69%). Moreover, the feed with the highest calculated TDN according to Moran (2005) was elephant grass (60.29%), and the lowest was Napier grass (53.93%).

Table 2. Nutrient content of feedstuffs

Nutrient	Sample (%)							
	Forage				Supplementary feed			
	Rice straw	Napier grass	Elephant grass	Field grass	Rice bran	Pollard	Cassava dregs	Tofu dregs
Dry matter	21.58	17.22	11.81	19.33	82.09	80.58	9.15	18.2
Organic matter	86.16	81.6	85.69	82.75	91.79	96.18	98.71	97.76
Crude protein	3.69	11.5	8.12	10.6	11.27	12.72	2.77	18.37
Extract ether	0.94	2.67	2.21	1.61	2.29	1.02	0.55	8.23
Crude fibre	34.12	33.65	32.21	32.81	14.64	11.16	21.88	25.36
NDF	65.48	57.37	59.57	58.92	30.41	40.68	34.6	40.68
ADF	40.2	32.33	34.98	32.58	19.94	12.63	24.93	29.05
TDN	61.11	53.93	60.29	55.53	76.49	81.59	81.57	73.99

Source: Feed Analysis Laboratory, 2023

This study also revealed that the utilization of forage feeds by Peranakan Ongole (PO) cattle averages 97.53%, with supplementary feeds accounting for 2.47% of the total. In cattle with poor BCSs, almost no supplementary feed was provided, accounting for only 0.07% of the total feed ratio. Rice straw is the primary choice of feed for these cattle, comprising 61.01% of the total ration, followed by Napier grass (32.35%), field grass (4.83%), and elephant grass (1.81%). Similarly, in cattle with a medium BCS, the provision of supplementary feed was not significantly different from that in cattle with a poor BCS, accounting for only 1.08%. Rice straw remains the primary choice of feed, although its proportion decreases (48.08%), and the utilization of cultivated grasses is greater than that of rice straw, comprising 51.93%, consisting of elephant grass (28.94%) and Napier grass (22.99%). In contrast, for cattle with Optimum BCS, supplementary feed provision reached 6.26% of the total ration, with elephant grass being the primary choice for forage provision (49.63%), followed by Napier grass (27.16%) and rice straw (23.21%).

Nutrient intake is derived from the nutrient content of the feed ingredients multiplied by the amount of feed provided by farmers. In smallholder Peranakan Ongole (PO) cattle breeding farms, which utilize intensive methods, feed intake relies heavily on the feed provided by farmers. The average dry matter intake of cattle with a low BCS was significantly different from that of cattle with medium BCSs (6.22 kg) and optimum BCSs (6.47 kg), which were not significantly different. The average organic matter intake for cattle with poor BCSs was significantly different from that for those with medium (5.31 kg) and optimal BCSs (5.78 kg), which were not significantly different. However, for crude protein (CP) intake, cattle with poor and medium BCSs are not significantly different, with intakes of 0.31 kg and 0.41 kg, respectively, but both are significantly different from those of cattle with optimal BCSs, with an average protein intake of 0.57 kg. The intake of extract ether and crude fibre for cattle with poor, medium, and optimum BCSs was significantly different ($p<0.05$), with average fat and fibre intakes of 0.07 kg and 1.68 kg; 0.10 kg and 2.03 kg; and 0.15 kg and 2.08 kg, respectively. Similarly, for fibre fraction intake, such as dry matter intake, cattle with poor BCSs had NDF (2.69 kg) and ADF (1.60 kg) values different from those of cattle with medium BCSs (3.45 kg and 2.06 kg) and Optimum BCSs (3.81 kg and 2.27 kg). The TDN intake values were also similar to the intakes of dry matter, organic matter, and fibre fractions, with poor BCS cattle (2.92 kg) significantly differing from Medium BCS cattle (3.74 kg) and Optimum BCS cattle (4.00 kg).

Discussion

The results of the evaluation of the feed supply for cattle with poor BCSs revealed that it continues to rely on traditional feeding techniques passed down through generations. This tradition involves the use of diets predominantly composed of forage, such as rice straw and grass. Farmers are, however, starting to integrate cultivated grasses such as Napier grass and elephant grass into rations. According to the findings of this study, poor BCS cattle consumed less dry matter than medium and optimum BCS cattle did. This is due to the very low dry matter content of forage, and farmers do not supplement additional feed to meet dry matter requirements. Khan *et al*. (2015) noted that forages are feedstuffs with a high moisture content, requiring larger quantities to fulfil the dry matter requirements of the animals.

Dry matter is a standard component that determines whether cattle receive sufficient feed or not for fulfilling nutrient requirements. Essentially, the nutrient content of the feed can be determined from its dry matter content (Borreani *et al*., 2018); hence, the intake of dry matter may reflect the intake of nutrients contained within it (Mann *et al*., 2015). In this study, the average dry matter intake of breeding cows with poor BCSs was 4.95 kg per day, indicating that dry matter intake was insufficient to meet their daily needs, causing a decline in cattle performance. Huda *et al*. (2018) highlighted that the loss in cattle performance is closely related to the use of feed that does not meet dry matter requirements, resulting in reduced nutritional intake. This dry matter intake was notably different from that of cows with medium and optimum BCSs, which ranged from 6.22 kg to 6.47 kg. Increasing dry matter consumption enhances the utilization of nutrients for metabolism, muscle and fat tissue, and immune system development (Karimizadeh *et al*., 2017; Van de Haar *et al*., 2016).

Dry matter intake directly affects organic matter intake. Organic matter refers to the content within the dry matter of the feed after the ash content is subtracted (Basavaraju *et al*., 2016). OM provides nutrients such as proteins, carbohydrates, lipids, vitamins, and energy, which are used by animals for metabolism and performance (Haryanto, 2012). The differences in organic matter content were strongly influenced by the type of feedstuff used. The nutrient data in Table 2 clearly revealed that the organic matter content in the forages was lower than that in the supplementary feeds. This is due to the high silica content found in forages, which results in the greatest ash content (Indriani *et al*., 2020). The data on organic matter intake indicated that breeding cows with poor BCSs differed significantly from those with medium and optimum BCSs. Providing supplementary feeds to cows can increase organic matter intake because supplementary feeds have an organic matter level of more than 91%, which is 5–12% greater than the organic matter content in forages.

Crude protein is an essential nutrient for cattle, particularly for breeding cows. Proteins have many functions in growth and development (Park *et al*., 2018), tissue regeneration (Paul and Dey, 2015), reproductive well-being, milk production and quality (Bisinotto *et al*., 2018), and overall animal performance (D'Occhio *et al*., 2019). In addition, it plays a role in maintaining good health by producing antibodies, enhancing immunity, and controlling biochemical processes within the body (Beever, 2006). The analysis of protein consumption indicated that there was no significant disparity between cows with poor and medium BCSs. However, cows with an optimum BCS ingested a significantly greater amount of protein than cows with a lower BCS. The protein intakes for cows with these BCSs were 0.31 kg, 0.41 kg, and 0.57 kg, respectively. This value was comparable to 6.3%, 6.6%, and 8.81% of their total dry matter intake. The variance in protein values could be attributed to farmers' feeding strategies, including the inclusion of high-protein supplementary feed such as tofu residue. According to Table 3, farmers allocated 51% of their supplemental feed as tofu residue to the cows within the optimum BCS but not to poor and medium BCS cows. This study demonstrated that the performance of cows consuming a diet high in protein could be improved by promoting the growth of muscle and fat tissues, thereby increasing their body condition score (BCS). This discovery aligns with the findings of Mulyanti and Keraf (2021), who reported that supplementing a diet with a concentrate containing 11% protein can increase the performance of cattle by increasing the overall protein level in the ration to 8%.

Table 3. Amount of use of types of feedstuff

Feedstuffs	Feed intake (kg)					
	Poor BCS	% ration	Medium BCS	% ration	Optimum BCS	% ration
Forages						
Rice straw	454.50	61.01	481.00	48.08	282	23.21
Napier grass	241.00	32.35	230.00	22.99	330	27.16
Elephant grass	13.50	1.81	289.50	28.94	603	49.63
Field grass	36.00	4.83	0	0.00	0	0.00
% Usage in ration		99.93		98.92		93.74
% Mean			97.53			
Supplementary feed						
Rice bran	0	0.00	9.4	86.24	30.15	37.15
Pollard	0.5	100.00	1.5	13.76	0	0.00
Cassava dregs	0	0.00	0	0.00	9	11.09
Tofu residue	0	0.00	0	0.00	42	51.76
% Usage in ration		0.07		1.08		6.26
% Mean			2.47			

Source: Data analysis, 2023

Fat is an energy source with two concentrations of carbohydrates and proteins (Hakim *et al*. 2022). When animals consume feed with fat content, their bodies obtain energy from fat, allowing them to allocate other resources, such as proteins, for growth and muscle formation (Pires *et al*., 2013). The intake of ether extract in optimum BCS cattle was significantly greater than that in poor and medium BCS cattle. This is attributed to the substantial provision of tofu residue by farmers, resulting in increased extract ether intake in these cattle. Consequently, muscle formation and fat deposition in the body of cattle increase. Therefore, adequate fat intake in cattle rations is crucial for effectively enhancing livestock performance (Olijhoek and Børsting, 2023).

Dietary fibre consists of cellulose, hemicellulose, lignin, pectin, and glycoproteins (Slominski, 2018). Compared with those with medium and optimum BCSs, cattle with a poor BCS consumed less crude fibre. This difference is significantly influenced by variations in dry matter, which affects the intake of crude fibre. Cattle require optimal levels of fibre in their diet to maintain the health of their digestive systems. The crude fibre present in feed stimulates the muscles of the digestive tract, preventing the accumulation of undigested feed residues in the rumen (Plaizier *et al*., 2018). However, crude fibre is relatively difficult for cattle to digest because it requires specific digestive enzymes to break down complex bonds for body utilization (Aziz, 2020). The differences in BCS among poor, medium, and optimum BCSs may be due to the total intake of crude fibre, with poor BCS consuming 41.2% of the dry matter of the ration compared with medium and optimum BCS, which consumed 32.6% and 32.15%, respectively. Excessively high levels of crude fibre in the diet can also reduce the availability of other nutrients for utilization by the body, as they become bound with fibre (Das *et al*., 2015).

There was a slight difference in the intake of fibre fractions, namely, NDF and ADF. The intake of NDF and ADF is highly dependent on the intake of dry matter (Jang *et al*., 2017), as shown in Table 4, where there was a statistically significant difference in the intake of NDF and ADF between cattle with a poor BCS and those with medium and optimum BCS. NDF intake reflects the amount of crude fibre consumed by cattle, which can still be utilized because other nutrients, such as protein and fat, are still present in small amounts (da Cruz *et al*., 2021). In addition, Wang *et al*. (2021) reported that ADF indicates the potential amount of fibre that cannot be digested by cattle because ADF only includes fibre fractions that are insoluble in acid. The low BCS value may be due to the high percentage of ADF in the ratio of cattle with a poor BCS, which reached 36.36%, compared with those of cattle with medium and optimum BCSs, which ranged from 33.12% to 35.08%.

Table 4. Nutrient Intake

Nutrient content	Nutrient intake (kg)					
	BCS 1	StD	BCS 2	StD	BCS 3	StD
Dry matter	4.95^{a}	1.07	6.22^{b}	1.61	6.47^{b}	1.66
Organic matter	4.20^{a}	0.88	5.31^{b}	1.33	5.78^{b}	1.49
Crude protein	0.31^{a}	0.12	0.41^{a}	0.20	0.57^{b}	0.24
Extract ether	0.07^{a}	0.03	0.10^{b}	0.05	0.15^{c}	0.06
Crude fibre	1.68^{a}	0.36	2.03^{b}	0.51	2.08^{c}	0.57
Neutral detergent fibre (NDF)	2.69^{a}	1.59	3.45^{b}	1.56	3.81^{b}	1.01
Acid detergent fibre (ADF)	1.60^{a}	0.95	2.06^{b}	0.94	2.27^{b}	0.60
Total digestible nutrient (TDN)	2.92^{a}	0.59	3.74^{b}	0.92	4.00^{b}	0.99

^{abc} Different superscripts on the same line indicate significant differences ($p<0.05$)

The ADF value is also related to the TDN value. The TDN represents the estimated energy absorbed by cattle (Reed *et al*., 2017) and can be used for growth, reproduction, and improvement of cattle performance. This is also related to the low cattle performance when the TDN value in the feed is low. Table 4 shows that the TDN value of cattle with a poor BCS was significantly lower than that of cattle with medium and optimum BCSs. The difference in TDN values may be due to the difference in TDN values of forages, which are relatively low compared with those of supplementary feed. As indicated by the data, the average TDN of forages ranged only between 55% and 62%, unlike that of supplementary feeds, with TDN values ranging from 72% – 82%. This can result in a deficiency in digestible nutrient intake, leading to a relatively low cattle BCS (that is, less than 2). According to Rumne *et al*. (2022), to achieve cattle with a relatively high BCS, supplementary feed with high TDN values needs to be provided, resulting in a TDN of more than 60%. The ADF value is also related to the TDN value. The TDN describes the estimated energy absorbed by livestock (Reed *et al*., 2017) and can be used for growth, reproduction, and livestock performance enhancement. This is also related to the low livestock performance when the TDN value in the feed is low. Table 4 shows that the TDN value of livestock with a poor BCS was significantly lower than that of cows with medium and optimum BCSs. The difference in TDN values may be due to the relatively low TDN values of the forage compared with those of the supplemental feed. As shown in the data, the average TDN of the forage ranged from 55% – 62%, in contrast to that of the supplemental feed, with TDN values ranging from 72% – 82%. This can lead to a deficiency in digestible nutrients, resulting in a livestock BCS of less than 2. According to Rumne *et al*. (2022), to achieve livestock with a relatively high BCS, it is necessary to provide supplemental feed with high TDN values, resulting in TDN values exceeding 60%.

Conclusion

On the basis of these findings, PO cattle with poor BCS do not receive sufficient feed to meet their needs in terms of dry matter intake, which includes all the nutrients that can be utilized by the cattle to improve their condition. PO cattle with medium BCS received an adequate amount of feed to meet their needs; however, protein intake in the rations were still relatively low. The feed intake of PO cattle with optimum BCS represents cattle with optimal performance, with a crude protein intake of 0.57 kg (8.81%), 0.15 kg of extract ether (2.32%), 2.08 kg of crude fibre (32.15%), 3.81 kg of NDF (58.89%), 2.27 kg of ADF (35.08%), and 4.00 kg of TDN (61.82%) of the total dry matter intake amounting to 6.47 kg.

Conflict of interest

The authors have no conflicts of interest to declare. All the authors have reviewed and agreed with the contents of the manuscript.

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