Response of Bali cattle compared to Bali crossed Angus on concentrate feeding

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Abstract. Bali cattle is one of Indonesian native cattle that has potential as a premium beef. Unfortunately, they have a small frame size. Crossing with Angus breed is expected improve the growth, frame size, and meat quality but it needs better feed quality, for example by adding feed concentrate. Fourteen Bali crossed Angus and fourteen Bali cattle at 9-15-month-old were used in this research. Trial was conducted for 30 days in an individual cages. Diet was consisted of roughage (80%) and concentrate (20%) (dry matter based) and contained 11% crude protein (CP) and 56.2% total digestible nutrients (TDN). The concentrate composition was rice bran (55.31%) and copra cake (44.69%). Results showed that total dry matter intake of Bali cross Angus cattle (5.19 kg/head/day or 2.92% body weight) was higher than Bali cattle (3.39 kg or 2.83% body weight). Crude protein intake was no signific difference (0.26 kg vs. 0.26 kg), but TDN intake was lower (1.43 kg vs. 1.90 kg). Feed intake had a positive correlation with average daily gain (0.52 vs. 0.12 kg/head/day). Bali crossed Angus cattle was more adaptive concentrate feed introduction.

1. Introduction

Bali cattle is one of Indonesian native cattle that has excellent prospects to develop for premium meat production. Premium meat has defined as meat that has tenderness point under 3.3 kg/cm², composition of mono unsaturated fatty acid (MUFA) and poly unsaturated fatty acid (PUFA) more than 53% of marbling, meat color score between 2-6, fat color score maximum at 4, marbling score minimum at 3 (25.8%). Premium meat has healthy and delight purpose. The acceleration strategy to upgrade Bali cattle as premium beef production is by crossing and nutrition improvement [1]. Angus cattle is one of the breeds that very sophisticated for crossing with Bali cattle because it has a medium frame size but good on growth and feed efficiency [2]. Bali crossed Angus has developed at Kuamang Kuning, one of the regions at Bungo district, Province of Jambi, Indonesia since 1980. Kuamang Kuning rural farmer preferably to improve Bali crossed Angus than Bali cattle because it has a low risk of dystocia. It was also better in growth than Bali cattle at intensive or extensive management systems [3].

Intensive care system and providing proper nutrition, for example, by adding concentrate feed other than only forage are necessary to produce optimal productivity [4]. Concentrate feed can be made using locally available feed ingredients, such as coconut cake and rice bran for palm oil plantation area [5]. Palm fronds also can introduce to substitute native grass for roughage feed substitute. The
fattening process started with the adaptation phase. During the adaptation phase, cattle introduced to concentrate feed. This research observed the response of Bali cattle that compared to Bali crossed Angus cattle against trial of feeding concentrate on forage basal diet in the fattening adaptation phase.

2. Materials and methods

2.1. Materials
Fourteen Bali crossed Angus and fourteen Bali cattle at 9 to 15-month-old were using in this research at Kuamang Kuning, Bungo Jambi, Indonesia. Bali crossed Angus cattle were have average body weight 180.20±38.29 kg, and Bali cattle were 121.40±27.98 kg. Roughage feed consists of native grass and palm fronds. Palm fronds were chopped to size ±5 cm using a chopper machine. Concentrate feed consist of coconut cake and rice bran. The nutrient composition of feed ingredients shown in Table 1. The nutrient composition of the concentrate mix shown in Table 2.

| Table 1. Nutrient composition of feed ingredients |
|-----------------------------------------------|
|                                     | Native Grass | Palm Fronds | Rice Bran | Coconut Cake |
| Dry matter (%)          | 35.40        | 31.45        | 91.23     | 95.66        |
| Crude protein (%DM)    | 6.70         | 2.60         | 9.96      | 22.72        |
| Total digestible nutrients (%DM) | 56.20    | 29.80        | 60.03     | 77.46        |
| Ether extract (%DM)    | 1.80         | 1.60         | 2.32      | 11.90        |
| Crude Fibre (%DM)      | 34.20        | 33.48        | 15.97     | 13.30        |
| Ash (%DM)              | 9.70         | 5.45         | 11.50     | 8.93         |
| Nitrogen free extract (%DM) | 47.60 | 56.87        | 60.25     | 43.15        |

| Table 2. Nutrient composition of concentrate mix |
|------------------------------------------------|
| Concentrate mix                                  |
| Dry matter (%)        | 93.36        |
| Crude protein (%DM)   | 16.08        |
| Total digestible nutrients (%DM) | 70.90 |
| Ether extract (%DM)   | 6.92         |
| Crude Fibre (%DM)     | 14.69        |
| Ash (%DM)             | 10.27        |
| Nitrogen free extract (%DM) | 52.04 |

2.2. Methods

2.2.1. General. The cattle were cared for 30 days in the individual cages to show their adaptability to feeding trials. Bodyweight measured on the first day and 31st day. The animals were given roughage (80%) and concentrate (20%) (dry matter based), content 11% crude protein (CP) and 56.2% of total digestible nutrients (TDN). Daily feed calculated based on 3% body weight of dry matter [6]. Palm fronds gave for 10% of native grass (dry matter based). The concentrate was given from 7.00 to 8.00 am, palm fronds from 1.00 to 2.00 pm and native grass from 4.00 pm to 5.00 pm. Leftover feed weight measured when the next feed will be giving and on the next day.

2.2.2. Statistic. The parameters observed in this research were roughage and concentrate feed consumption, daily dry matter intake, dry matter intake-body weight ratio, daily protein intake, daily TDN intake, daily gain, and feed conversion ratio. The parameters compared between Bali crossed Angus and Bali cattle. The statistical analyses were performed using the t-student test method [7]. The model used to analyse was:
Where $\bar{x}_a = a$ sample mean, $\bar{x}_b = b$ sample mean, $\mu_a = a$ population mean, $\mu_b = b$ population mean, $s_a = a$ standard deviation, $s_b = b$ standard deviation, $n_a = a$ sample amount, $n_b = b$ sample amount. Significance was declared at $p<0.05$.

3. **Results and discussion**

The response of cattle against the trial of concentrate feed introduction is shown in Table 3. Almost all of the parameters give significantly different $(P<0.05)$ between Bali crossed Angus and Bali cattle, except protein intake and feed conversion ratio. Bali crossed Angus cattle has higher feed consumption, dry matter intake, protein intake and TDN intake than Bali cattle. Bali crossed Angus cattle also have higher daily gain and dry matter intake-body weight ratio. The feed conversion ratio of Bali crossed Angus was lower than Bali cattle, but it did not give significantly different because the coefficient of variation is high (more than 20%). Bali crossed Angus cattle has better consumption of native grass, palm fronds and concentrate.

Based on dry matter intake, protein intake, and TDN intake showed that both cattle have a good response with concentrate feed introduction in the adaptation phase of fattening. Bali crossed Angus cattle need a higher quantity of dry matter intake and quality of feed nutrient, but it can produce a higher daily gain. Bali crossed Angus cattle need higher dry matter-body weight ratio with higher TDN and protein intake than Bali cattle. It because of Bali cross Angus cattle has a bigger frame size than Bali cattle, so it needs more nutrition to maintain basal metabolic nutrient than Bali cattle [8]. Based on daily gain shows that Bali cross Angus has higher productivity than Bali cattle, so it gives more profit for the farmer. The farmer still has profit even in the adaptation phase.

Both of cattle was a treat at an exponential growth phase and adaptation condition. It gave high variation on individual responses to feeding and intensive care conditions [9]. Another cause of high variation of daily gain and feed conversion ratio was because the native cattle farming system at Kuamang Kuning used the extensive system. Every individual of cattle needs more adaptation for changing from extensive into an intensive rearing system [10].

**Table 3. Cattle response against trial of concentrate feed introduction**

| Parameters                  | Bali            | CV (%) | Bali-Angus Cross | CV (%) |
|-----------------------------|-----------------|--------|-------------------|--------|
| Cattle body weight (kg)     | 121.40±27.98$^a$| 23.04  | 180.23±38.29$^b$ | 21.24  |
| Native grass consumption (kg)| 7.91±1.92$^a$    | 24.33  | 9.51±1.45$^b$     | 15.19  |
| Palm fronds consumption (kg)| 0.72±0.37$^a$    | 51.42  | 1.33±0.41$^b$     | 30.61  |
| Concentrate consumption (kg)| 0.46±0.19$^a$    | 40.51  | 1.51±0.28$^b$     | 18.38  |
| Dry matter intake (kg)      | 3.39±0.63$^a$    | 18.56  | 5.19±0.81$^b$     | 15.60  |
| DMI/BW (%)                  | 2.83±0.27$^a$    | 9.60   | 2.92±0.29$^b$     | 10.01  |
| Protein intake (kg)         | 0.26±0.05$^a$    | 19.52  | 0.46±0.07$^b$     | 16.17  |
| TDN intake (kg)             | 1.90±0.37$^a$    | 19.66  | 2.93±0.46$^b$     | 15.66  |
| Daily Gain (kg)             | 0.12±0.16$^a$    | 140.70 | 0.52±0.45$^b$     | 85.49  |
| Feed Conversion Ratio       | 17.82±7.34$^a$   | 41.17  | 13.55±8.26$^a$    | 60.81  |

DMI/BW: dry matter intake/body weight
Different superscript in the same row means significantly different $(P<0.05)$
CV: coefficient of variation
4. Conclusion
Both cattle have a good response with concentrate feed introduction in the adaptation phase of fattening. Bali crossed Angus cattle have a higher quantity of feed intake and quality of nutrient requirement, but give higher daily gain.

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