

Qualitative and quantitative characteristic Angus Grade-Black cattle in sragen regency

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Abstract. This study aims to determine the variation in qualitative and quantitative characteristics of Angus crossbred cattle in Sragen Regency. Study location were selected via purposive sampling based on the population density categories. Qualitative traits evaluated included head color, horns presence or absence, body coat color, and presence or absence of humps. Quantitative traits measured were body length, chest circumference, and body weight. Results indicated that for Angus crossbred cattle in incisor 0 and incisor 1-4 categories, 68.7% and 73% exhibited black heads, 90.6% and 80.9% were hornless, 85.9% and 84.1% showed black body coat, and all were humpless. Incisor 0 bulls had average body length (BL) of 138.6 cm, chest circumference (CC) of 146.8 cm, and body weight (BW) of 300.7 kg, while incisor 1 bulls had BL 147.6 cm, CC 176.3 cm, and BW 485.3 kg. Female cattle showed progressive increase across incisor group 0 to 4 in the same traits, with incisor 4 females reaching BL 154.2 cm, CC 173.3 cm, and BW of 458.5 kg. In conclusion, the quantitative characteristics of Angus crossbred cattle in Sragen, including BL, CC, and BW for both sexes across incisor 0-4, meet the minimum Indonesian National Standard (SNI) for cattle.

1 Introduction

Beef cattle in Indonesia play a crucial role in the economic and food industry sector as a primary source of animal protein essential. The demand for animal protein, including beef, is rising in tandem with population growth and increased public awareness of the importance of balanced nutrition. Indonesia hosts various cattle breeds from different subspecies, among which Angus crossbred cattle. These crossbred result from mating local female cattle of the *Bos indicus* subspecies with Aberdeen Angus semen straw derived from *Bos taurus* subspecies. Crossbreeding effort in Sragen farm has produced cattle exhibiting dominant Angus phenotypic traits highly similar to pure Angus, characterized by a robust body structure, black or dark red coat, absence of humps, hornlessness [1]. Notably, Angus crossbred cattle represent a distinctive breed developed by the Sragen Regency Government [2].

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Information on qualitative and quantitative physical characteristics of cattle is essential for optimizing beef cattle production systems. Qualitative traits, which are phenotypic attributes that cannot be measured numerically but can be categorized, such as body color, head shape, and body shape, enable classification of animals into distinct groups. Quantitative traits, such as chest circumference and body weight in contrast, require direct measurement and exhibit continuous variation influenced by genetic and environmental factors [4]. With regard to Angus crossbred cattle, documenting these traits is critical for assessing productivity and reproduction performance, particularly in evaluating inheritance of desirable characteristics from their parental lines. Artificial insemination using semen from Angus cattle (*Bos taurus*) sires on local *Bos indicus* dams is anticipated to transmit superior traits to progeny, progressively enhancing calf quality across generations [1].

Farmers routinely utilize these physical characteristics for breeding stock in beef cattle operations. Angus crossbred cattle in Sragen Regency result from artificial insemination of local dams with Aberdeen Angus (*Bos taurus*) semen as part of a targeted program to enhance the productivity of local cattle. Crossbreeding integrates superior traits from parental breeds to produce hybrid offspring with improved performance. Qualitative parameters assessed include head color, horn presence, body coat color, and hump status. While the quantitative parameters encompass body length, chest circumference, and body weight. In Indonesia, the Indonesian National Standard (SNI) for cattle establishes benchmarks for seedstock quality, encompassing sire origin, health status, and morphometric traits to support breeding programs [5, 6,7]. Compliance with SNI ensures offspring quality, product safety, market competitiveness, and consumer confidence while maximizing breed potential. Therefore, this study aims to characterize variations in physical characteristics, including qualitative and quantitative traits, of Angus crossbred cattle in Sragen Regency.

2 Materials and Methods

This study employed a survey method involving direct observations, morphometric measurements, and on-site recordings of livestock characteristics, supplemented by structured questionnaires administered to farmers.

2.1 Sampling techniques

Samples were determined using the census method, whereby the entire population was observed and measured. Observations were made on Angus crossbred cattle from September to November in the sub-districts of Sidoharjo, Sukodono, and Sambung Macan in Sragen Regency, Central Java Province, Indonesia, by observing the qualitative characteristics of the livestock, including head color, body coat color, horn characteristics, and hump. Measurements were taken using simple measuring tools, namely a cattle ruler and an animeter, to measure the quantitative characteristics of Angus crossbred cattle in Sragen Regency, including body length, chest circumference, and body weight. Body length was measured using a straight measuring stick from the shoulder joint (tuber humerus) to the rump (tuber ischium) in centimeters [8]. Chest circumference was measured using a measuring tape from behind the front shoulder by wrapping the tape around the chest [9]. Body weight estimation was performed using an animeter measuring tape.

2.2 Age determination

Age classification of Angus crossbred cattle followed the Indonesian incisor system based on permanent incisor eruption (Figure 1). It consists of young cattle (incisor 0, <1.5 years) and adult cattle (incisor 4, >4 years). Specifically, [10] stated that age estimation by observing tooth replacement or incisor is classified into 4 categories, including incisor 0 below 1.5 years, incisor 1 between 1.5-2 years, incisor 2 around 2.5 years, incisor 3 between 3-3.5 years, and incisor 4 above 4 years. Variations across incisor 0 to 4 in Angus crossbred cattle in Sragen is presented in Appendix 7. This dentition-based method provides a practical, non-invasive estimate of chronological age and sexual maturity, serving as an early indicator for artificial insemination timing in breeding program. Age grouping facilitated analysis of quantitative traits progression with maturity in this study.



Fig. 1. Incisor phases in Angus crossbred cattle in Sragen Regency. Description: A (incisor 0), B (incisor 4).

2.3 Ethical clearance

This study was conducted in full accordance with the animal research ethics guidelines established by the Animal Ethics Committee of Universitas Sebelas Maret, under research contract number 371/UN27.22/PT.01.03/2025, ensuring compliance with 3Rs principles (Replacement, Reduction, Refinement) and animal welfare standards.

2.4 Data analysis

Data from this study were analyzed using descriptive statistics, presented as frequency tables, means, standard deviations, and percentages for qualitative and quantitative traits [11].

3 Result and Discussion

3.1 Characteristics of Angus crossbred cattle

3.1.1 Head color

The phenotypes of head color from Angus crossbred cattle are classified into three categories, namely black, black with white markings, and blackish brown, as illustrated in Figure 2.

Black head color predominated among Angus crossbred cattle, comprising 68.7% of young cattle (incisor 0) and 73.0% of adult cattle (incisor >0) within the observed population. The solid black phenotype reflects dominant inheritance from the Aberdeen Angus parent, consistent with MC1R gene-mediated eumelanin expression characteristics

of the breed. White markings observed in some animals likely result from *Bos indicus* introgression via crossbreeding with Ongole or Brahman dams, both exhibiting white facial patterns with black muzzle pigmentation [12].



Fig. 2. Head color of Angus crossbred cattle in Sragen Regency. Description: A (totally black), B (black with white markings), and C (blackish brown).

3.1.2 Horns

The qualitative characteristics of Angus crossbred cattle horns are illustrated in Figure 3, classified into three variants, namely long horns, short horns, and no horns.



Fig. 3. Types of Angus crossbred cattle horns in Sragen Regency | Description: A (long horns), B (short horns), and C (no horns).

Polled or hornless cattle predominated among Angus crossbreds, representing 90.6% of young cattle (incisor 0) and 80.9% of adult cattle (incisor >0) in the observed population. This reflects the dominant polled genetics inherited from Aberdeen Angus sires (homozygous for the polled allele). Horned animals exhibited breed-specific morphologies, particularly thick, short, and blunt horns characteristics of Ongole (PO) or Brahman introgression, according to [12], who stated that the horns of Ongole crossbred cattle are rather short and blunt. Long horns pointing upwards, as shown in Figure 3C, can be inherited from Bali cattle, according to [13], who stated that ideal horns on male Bali cattle grow sideways and then point upwards, while those on females point upwards parallel to the forehead.

3.1.3 Cattle coat color

The color characteristics of the body hair of Angus crossbred cattle are divided into two groups: black and blackish brown as displayed in Figure 4.



Fig. 4. Coat color of Angus crossbred cattle. Description: A (black), B (blackish brown).

Body coat color in Angus crossbred cattle observed in this study was predominantly solid black, observed in young cattle (incisor 0) at 85.9%, while 84.1 % in adult cattle (incisor >0). Body coat color is a phenotypes that is highly influenced by genetic traits, wherein dominantly black color reflects MC1R-mediated eumelanin expression inherited from Aberdeen Angus sires. [10] stated that cattle coat color is very important to identify in order to distinguish a breed or species of cattle. In the other hand, a reddish-black or dark brown coat variations likely stem from introgression of Limousin or Simental genetics, both prominent in Indonesia's national crossbreeding program to expand cattle population using these superior exotic bull breeds alongside Angus [12].

3.1.4 Hump

The hump is a distinctive physical trait found on the front of a cow's back. The hump consists of fat tissue, muscle, and connective tissue, as illustrated in Figure 5.



Fig. 5. Hump type of Angus crossbred cattle The *Bos indicus* breed of cattle has a hump, while *Bos taurus* cattle do not have a hump (Susilorini and Sawitri, 2008).

This study revealed that all Angus crossbred cattle have a 100% humpless phenotypes. The *Bos taurus* cattle gene for body shape characteristics, especially humps, shows a dominant trait in accordance with Gilmore's (1950) statement that the hump characteristic in *Bos indicus* cattle is completely lost when crossed with European cattle such as *Aberdeen Angus* and *Brown Swiss*.

3.2 Quantitative characteristics

3.2.1 *Angus crossbred bulls*

Angus crossbred cattle demonstrated strong environment adaptation and tolerance to low quality forages prevalent in Indonesia. [1] stated that Angus crossbred cattle can utilize feed of poor quality and are tolerant to the environment in Indonesia. Bulls exhibited superior fattening potential compared to females due to faster growth rates and absence of calving constrains, achieving average live weight of 300.73 kg suitable for commercial beef production.

While established breeds in Sragen Regency (Limousin, Simmental, Ongole crossbred) conform to SNI benchmarks for seedstock quality [6], Angus crossbred lack formal standardization. This study observed that at incisor 0, Angus crossbred possessed an average body length at 138.6 cm and chest circumference at 146.8 cm. They have exceeded the national minimum standards for PO cattle: 106 cm and 134 cm, Limousin: 108 cm and 127 cm, and Simental: 111 cm and 130 cm. Angus crossbred cattle in group 1 or over 1.5 years of age also exhibit fairly good quantitative characteristics. Similarly, incisor 1 animals had an average body length of 147.6 cm and a chest circumference of 176.3 cm. Angus crossbred cattle also have superior quantitative characteristics compared to the minimum SNI standards for Limousin cattle: 119 cm and 143 cm, and Simental cattle: 131 cm and 162 cm [6]. This study shows that the Angus crossbred bulls found were only incisor 0 and 1 because they were usually already soCC or slaughtered.

3.2.2 *Female crossbred cattle*

Female Angus crossbred cattle predominated in Sragen Regency population, which reflect its purpose of raising for reproductive asset and source of progeny income. The people of Sragen consider female cattle as assets or a source of side income from the offspring they give birth to [2]. In general, female cattle serve dual purpose. They are a breeding stock production and act to replace aging cows that have passed their productive period. Female cattle are no longer productive when they are over 8 years oCC. Angus crossbred cattle are one of the typical crossbred cattle breeds in Indonesia [7]. This study aims to measure the quantitative characteristics of Angus crossbred cattle. The average quantitative characteristics of female Angus crossbred cattle are presented in Table 1.

Table 1. Average quantitative traits of female Angus crossbred cattle.

Categories	N	BL (cm)	CC (cm)	BW (kg)
Incisor 0	20	141.3 ± 9.6	145.8 ± 16.9	298.5 ± 79.7
Incisor 1	17	147.9 ± 10.3	169.1 ± 12.3	428.3 ± 90.5
Incisor 2	12	151.5 ± 9.1	163.9 ± 7.4	387.5 ± 52.5
Incisor 3	15	156.1 ± 6.3	172.2 ± 7.5	448.8 ± 58.8
Incisor 4	13	154.2 ± 7.2	173.3 ± 8.0	458.5 ± 65.3

Description: BL (Body Length), CC (Chest Circumference), and BW (Body Weight)

This study observed that female Angus crossbred cattle exhibited superior quantitative characteristics compared to other breeds in Sragen Regency, consistently meeting or exceeding Indonesian National Standard (SNI). Incisor 0 represents the period of most

rapid growth, with substantial quantitative differences across ages groups, thus, averages served as the primary basis for SNI comparison. Incisor 0 females averaged 141.3 cm BL and 145.8 cm CC, surpassing class 1 minimums for Ongole crossbred 107 cm and 129 cm, Limousin: 105 cm and 124 cm, and Simental: 111 cm and 130 cm [6]. Female Angus also showed excellent genetic performance. These cattle have a minimum BL of 131 cm and CC of 146 cm, exceeding the minimum standards of other cattle, namely Ongole crossbred cattle: 115 cm and 140 cm, Limousin: 114 cm and 134 cm, and Simental: 117 cm and 139 cm.

Female Angus crossbred cattle exhibited superior quantitative averages compared to previous studies. Incisor 0 to 1 cattle demonstrated enhanced body length and chest circumference characteristics relative to reference data [2]. SNI specify benchmark standards from incisor 0 to incisor 1. The quantitative characteristics of adult Angus crossbred cattle in this study were compared with previous studies. These cattle at incisor 2 showed better average body length, but their chest circumference was slightly below the average, when compared to prior study [2]. The chest circumference of Angus crossbred cattle in this study also decreased compared to incisor 1 cattle, wherein first postpartum period presumably be the main factor. Chest circumference is related to body weight. In early lactation, cows usually experience a decrease in body weight due to declined feed consumption, especially during peak milk production. At stages 3 and 4, the Angus crossbred cows in this study also had superior averages [2].

This study documented average body weights of female Angus crossbred cattle in Sragen Regency. Optimal body weight is critical for reproductive performance, as sub- or over- conditioned cows exhibit reduced fertility. It is in accordance with the statement by [2], that cows with unmatched ideal body weight experience a decline in reproductive quality, while a decline in reproductive quality can also be due to excessive body weight. Larger ovarian size collates with improved artificial insemination conception rates [3].

4 Conclusion

Angus crossbred cattle are extensively raised by smallhoCCer farmers in Sragen Regency. These cattle predominantly exhibit qualitative characteristics typical of pure Angus, particularly solid black head, pilled or hornlessness, dark black coat, and humpless morphology. Quantitative traits, including body length, chest circumference, and body weight, surpassed previous studies and exceeded minimum Indonesian National Standard (SNI) requirements for Limousin, Ongole crossbred, and Simental cattle. Crossbreeding local *Bos indicus* dams with Angus sires yieCCs hybrid vigor, combining Angus-like large frame size and reproductive efficiency with local cattle's environmental adaptability and low-quality feed tolerance.

5 Recommendations

Angus crossbred cattle are a valuable part of Indonesia's cattle diversity that must be preserved collectively. The public needs to be educated about the advantages of this cattle breed. Collaboration between the public, policymakers, and academics is essential to ensure the sustainability of Angus crossbred cattle. The community of Sragen Regency hopes for serious public awareness campaigns and programs about this cattle breed from the government.

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