JURNAL
PRODUKSI
TERNAK
TERAPAN

Vol 06, No 02,Hal 113-118, Juli 2025
http://jurnal.unpad.ac.id/jptt
e-ISSN: 2722-6611
DOI: 10.24198/jptt.v6i2.64641

THE EFFECT OF NON-GENETIC FACTORS ON THE BODY WEIGHT PERFORMANCE OF BRAHMAN INDONESIA CATTLE AT BPTU-HPT SEMBAWA

Mochammad Hafizh Zulkarnaen*, Heni Indrijani*, Asep Anang*, Diky Ramdani*, and Ghoffar Husnu**
*Department of Animal Production, Faculty of Animal Husbandry, Universitas Padjadjaran
**Department of Animal Husbandry, Politeknik Negeri Lampung
Corresponding author : hafizh.zulkarnaen@unpad.ac.id

ABSTRACT

Brahman Indonesia cattle are a superior beef breed developed in Indonesia to increase national productivity, but their performance is influenced by various non-genetic factors. This study aimed to analyze the effect of these factors, specifically calf sex and dam parity, on the body weight performance of Brahman Indonesia cattle at BPTU-HPT Sembawa. Data from 2014-2023, consisting of 5,213 records (2,115 birth weight, 1,672 weaning weight, and 1,426 yearling weight) from the progeny of 31 sires and 649 dams, were analyzed using the General Linear Model (GLM) and Duncan's Multiple Range Test. The results showed that both calf sex and dam parity had a very significant effect (P<0.0001) on all observed growth traits. Male calves were consistently heavier than female calves at all age stages, while dam parity exhibited a performance pattern that was lowest at the first parity and reached its peak at parities 3-6. These findings confirm the importance of correcting for non-genetic factors in selection programs to improve the accuracy of genetic evaluation for Brahman Indonesia cattle breeding stock.

Keywords : *Brahman Indonesia Cattle, Calf Sex, Dam Parity, Growth Traits, Non-genetic Factors.*

Introduction

Indonesian goverment continues its efforts to increase the livestock population and productivity to meet the national demand for animal protein. Report from Central Bureau of Statistics (2025) shows that beef cattle in Indonesia has shown a positive trend, evidenced by a consistent population increase of around 500,000 head per year over the last three years. However, domestic production has not been able to keep up with demand. In 2022, the national beef production is 436.70 thousand tons while the consumption level reaches 695.39 thousand tons, creating a gap that must be met through imports. This condition emphasizes that population growth must be followed by an increase in productivity, of which body weight performance is a main indicator.

Body weight performance is a quantitative trait influenced by a variety of factors, including breed, birth year, sex, and parity. One of the cattle breeds extensively raised in Indonesia, due to its superior growth potential and excellent adaptation to the tropical climate, is the Brahman. Brahman cattle show positive growth performance and physiological responses to tropical climate conditions as indicated by their hair characteristics, body temperature, and sweat rate (Silveira et al., 2021). The assessment of Brahman cattle performance through measurable traits such as birth weight, weaning weight (at 205 days), and yearling weight serves as the foundation for selection programs aimed at producing superior breeding stock. This aligns with the findings of Kurniawan et al. (2022), who stated that birth weight, weaning weight, and yearling weight are critical variables in beef cattle selection, with all three demonstrating a positive genetic correlation.

Variability in body weight performance is also significantly influenced by non-genetic factors, such as the sex of the calf and the parity of the dam. Mahbubul and Hoque (2020) found that the sex of beef cattle influenced body weight performance consistently across different age stages. Male calves generally have higher post-natal growth potential. However, the relationship between calf sex and dam performance is more complex. The higher nutritio-

nal demand of gestating a typically larger male calf may result in lower milk production from the dam post-calving (Djedović et al., 2021).

In addition to sex, dam parity is also a determining factor. Typically, birth and weaning weights tend to increase with dam parity, reaching a peak at a certain parity number. First-parity dams are often still undergoing their own growth, consequently their nutrient intake is partitioned between their own body growth and the developing fetus. Conversely, higher-parity dams tend to have longer lactation periods and higher milk yields. This is supported by the findings of Hoka et al. (2019), who reported that offspring weight performance improves from the first parity, reaching an optimal state in subsequent parities.

Balai Pembibitan Ternak Unggul dan Hijauan Pakan Ternak (BPTU-HPT) Sembawa is one of the Unit Pelaksana Tugas (UPT) under the Directorate General of Livestock and Animal Health Services, responsible for the production and genetic improvement of superior livestock breeds, including Brahman cattle. Although the breeding program has been running, a comprehensive analysis of the variability in the body weight performance of its Brahman Indonesia cattle, as influenced by sex and parity, has not yet been published. Therefore, based on the description, this research should be conducted to analyze the body weight performance of Brahman Indonesia cattle at BPTU-HPT Sembawa.

Materials and Methods

The research took place in January 2024. The research was conducted at Balai Pembibitan Ternak Unggul dan Hijauan Pakan Ternak (BPTU-HPT) Sembawa, Sembawa District, Banyuasin Regency, South Sumatra Province. The research was conducted using the census method, data collection using purposive sampling technique, and processed using descriptive analysis.

Data that utilized in this study were the birth weight, weaning weight, and yearling weight records of male and female Brahman Indonesia cattle born between 2014 and 2023. These records were supplemented with animal identity information, which included identification numbers, pedigree, date of birth, sex, and dam's parity. A total of 5,213 records were analyzed, comprising 2,115 birth weight records, 1,672 weaning weight records, and 1,426 yearling weight records. Records were sourced from the progeny of 31 sires and 649 dams, resulting in 1,078 male and 1,037 female calves.

Birth weight, weaning weight, and yearling weight were presented decriptively by sex and parity with regression analysis using the General Linear Model (GLM) with SAS 9.0. Duncan Multiple Range Test was then conducted to determine the effect of calf sex and dam parity on body weight performance.

$$Y_{ij} = \mu + J_i + P_j + \varepsilon_{ij}$$

Y_{ij} : Observed trait
μ : Average
J_i : Sex
P_j : Parity
ε_{ij} : Error
(Zulkarnaen, et al., 2022)

Results and Discussion

Description of Body Weight Performance

Descriptive analysis of body weight performance of Brahman Indonesia cattle over a 10-year period (2014-2023) is presented in Table 1 and Figure 1. These data show fluctuations in average birth weight (BW), weaning weight (WW) and yearling weight (YW) each year. This indicates the influence of environmental and management factors that varied annually.

Table 1. Average Body Weight Performance of Brahman Indonesia Cattle at BPTU-HPT Sembawa per Year (2014-2023)

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
BW	34.93	34.92	33.22	31.50	35.09	35.10	33.46	31.77	33.82	31.49
WW	139.35	146.23	142.17	120.60	123.43	156.33	148.21	135.49	131.68	145.29
YW	188.06	214.09	170.42	153.96	167.82	222.04	212.99	195.44	181.89	0.00

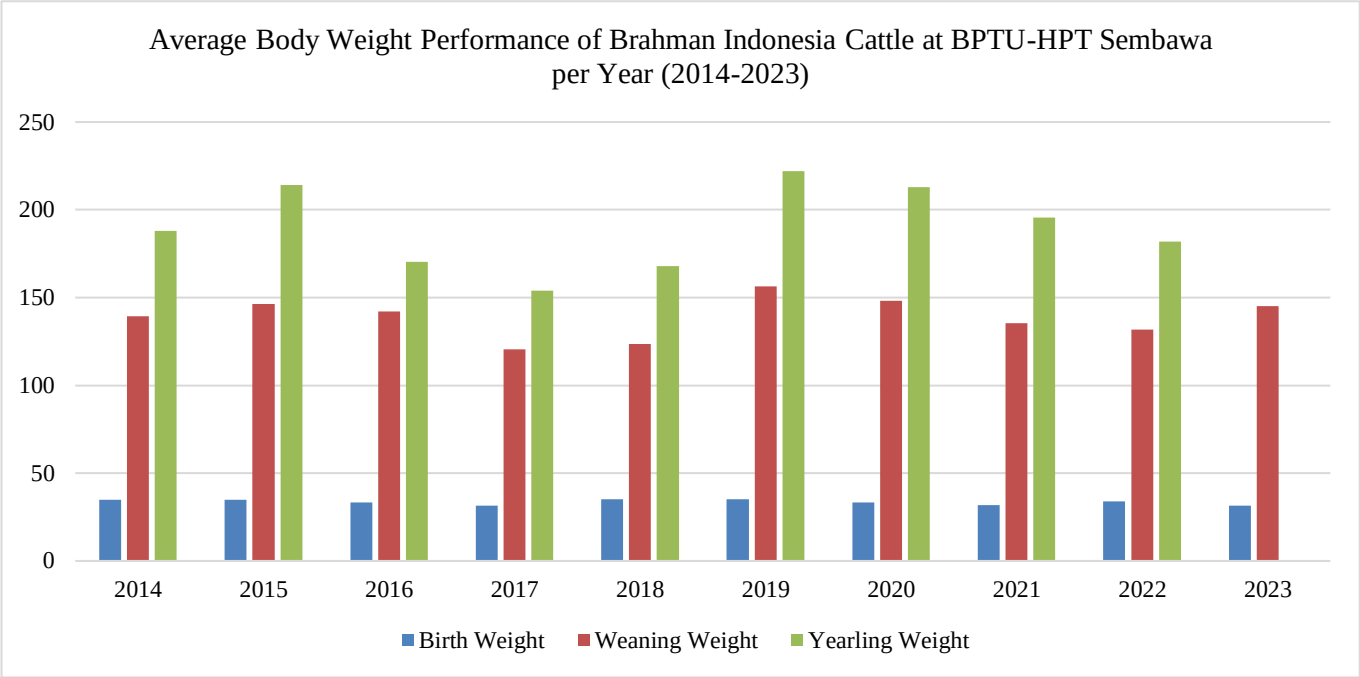

Figure 1. Average Body Weight Performance of Brahman Indonesia Cattle at BPTU-HPT Sembawa per Year (2014-2023)

Average birth weight (BW) in this study, ranging from 31-35 kg, is consistent with research by Bramastya, et al. (2022), who recorded a birth weight of 33.77 kg for Brahman Indonesia cattle at the same location, and by Silveira, et al. (2021), who reported 34.0 kg. The highest average birth weight was recorded for cattle born in 2019 at 35.10 kg, while the lowest occurred in cattle from 2017 and 2023 at around 31.50 kg. A relatively stable birth weight above 30 kg indicates the condition of the mother during pregnancy is quite good (Mwangi, et al., 2025). This result is also higher than the 23.1 kg reported by Kurniawan et al. (2022) for Brahman Cross (BX) cattle. This difference is mainly due to genetic factors between purebred Brahman cattle and crossbred cattle, as well as the quality of dams in the comparative study, which partially consisted of females culled from selection programs in the exporting country (Kurniawan et al., 2022).

Average weaning weight (WW) at 205 days in this study, ranging from 120-156 kg, is in line with findings of Bramastya, et al. (2022), who reported 139.14 kg. Weaning weight performance showed greater variation. The highest average was achieved by cattle born in 2019 at 156.33 kg, while the lowest average was by cattle born in 2017 at 120.60 kg. The significant drop in performance in 2017 for all three weight traits could be due to external factors such as changes in feed management or less favorable climatic conditions during that year. Weaning weight performance observed in this study was lower than that reported by Martins, et al. (2024), who recorded 208.9 kg, likely due to genetic factors and the effects of heterosis. The study by Martins, et al. (2024) specifically evaluated Brahman-Angus crossbred cattle, where the superiority of these crossbreds is attributed to the combination of complementary breed characteristics and heterosis effects.

Average yearling weight (YW), an indicator of post-weaning growth, also showed a similar trend. Average yearling weight in this study ranging from 153-222 kg at 365 days. The highest mean yearling weight was achieved by cattle born in 2019 at 222.04 kg, which positively correlated with their birth and weaning weight performances, which were also the highest. This indicates that calves with high pre-weaning growth rates tend to maintain their performance up to one year of age. It should be noted that yearling weight data for calves born in 2023 were not yet available at the time of this analysis. The observed average yearling weight was lower than the 244.24 kg reported by Bessa, et al. (2021). This is likely due to differences in genetic potential between the two sub-populations: the Brahman Indonesia cattle (BSN, 2020) in the present study and the Brazilian Brahman cattle, which have undergone intensive selection programs for growth traits by the ANCP.

Effect of Sex on Body Weight Performance

Results of ANOVA using GLM showed that sex had a very significant effect (P<0.0001) on birth, weaning, and yearling weights. This finding is in line with Mahbubul & Hoque (2020), who also reported a very significant effect of sex ($P < 0.001$) on nearly all growth traits in crossbred Brahman cattle. Duncan's test (Table 2) confirmed that male calves consistently had higher body weights than female calves at all age stages.

Table 2. Effect of Sex on Brahman Indonesia Cattle Body Weight Performance

Sex	Birth Weight	Weaning Weight	Yearling Weight
	.....(kg).....		
Male (n = 1,078)	34.42[a]	143.61[a]	201.69[a]
Female (n = 1,037)	32.09[b]	136.28[b]	183.61[b]
Average	33.28	139.96	192.41

Note: Different superscripts within the same column indicate a significant difference.

Average birth weight of male calves (33.89 kg) was higher than females (32.59 kg). This difference is also supported by Hoka, et al. (2019) who found that male calves were born heavier (37.1 kg vs 25.2 kg). The difference in weight is increasingly evident in the weaning and yearling weights. Average weaning weight for males reached 143.51 kg, while for females reached 135.79 kg. Similarly, for yearling weight, males reached 200.27 kg and females 183.17 kg. This difference is generally due to the influence of androgen hormones in male calves, which are active *in utero*, stimulating slightly faster fetal growth (Chamwazi, et al., 2023).

This difference, as explained by Bureš & Bartoň (2012), is strongly influenced by testosterone in males, which plays a significant role in protein deposition and muscle growth, resulting in post-natal growth rate to surpass that of females. Interestingly, the relationship between calf sex and dam performance can be more complex. Hoka, et al. (2019) reported that dams with male calves produced more milk. In contrast, Djedović, et al. (2021) stated that gestating a larger male calf compared to a female can lead to a higher distribution of nutrients to the fetus, thereby potentially reducing the dam's post-calving milk production.

Effect of Parity on Body Weight Performance

Dam parity was found to have a very significant effect ($P < 0.0001$) on birth, weaning, and yearling weights performance. Results of the Duncan's test in Table 3 show a pattern of increasing performance as parity increases until it reaches a peak then tends to decrease in older parities.

Table 3. Effect of Parity on Brahman Indonesia Cattle Body Weight Performance

Parity	Birth Weight	Weaning Weight	Yearling Weight
	.....(kg).....		
1st (n = 348)	30.70[ab]	131.21[ab]	178.04[a]
2nd (n = 434)	34.35[b]	140.25[b]	193.40[a]
3rd (n = 384)	34.38[b]	146.40[b]	201.80[a]
4th (n = 319)	33.70[ab]	141.14[b]	188.64[a]
5th (n = 238)	34.16[b]	144.05[b]	195.09[a]
6th (n = 177)	33.30[ab]	139.87[b]	200.17[a]
7th (n = 114)	32.54[ab]	134.37[ab]	191.78[a]
8th (n = 67)	31.24[ab]	132.42[ab]	190.65[a]
9th (n = 24)	30.62[ab]	124.09[a]	184.16[a]
10th (n = 9)	28.78[a]	123.14[a]	191.50[a]
11th (n = 1)	21.00[c]	-	-
Average	33.28	139.96	192.41

Note: Different superscripts within the same column indicate a significant difference.

Lowest performance was consistently produced by first-parity dams, with an average birth weight of only 30.63 kg. This is an expected outcome, as dams in their first parity are still in a growth phase. Consequently, their nutrient intake is partitioned between their own body growth and the developing fetus. Martins, et al. (2024) also reported that younger cows wean lighter calves. Birth, weaning, and yearling weights showed peak performance in dams from parity 3-6. The highest mean birth weight was achieved at parity 3 (34.66 kg), while the best weaning and yearling weights were observed within the range of parities 3-6.

This indicates that dams are in their most productive physiological condition within this parity range, during which uterine capacity and milk production are maximized (Lee and Kim, 2006). This is supported by Hoka, et al. (2019), who found that parity 4 dams delivered calves with the highest birth weights and had the highest daily milk yield. Furthermore, Davis, et al. (2023) reported that multiparous cows produce higher daily milk yields and exhibit more stable physiological indicators compared to primiparous cows, reflecting a more optimal physiological condition in higher-parity dams.

Performance began to show a declining trend from parity 7 onwards. The most drastic decline was observed in parities 10 and 11, which were statistically significantly different from the peak parities. This decline is associated with the decline in physiological function and reproductive efficiency in older dams (Lean, et al., 2023). The extremely low birth weight at parity 11 (21.00 kg) could be due to the small sample size (n=1) or other unobserved factors specific to that particular dam.

Conclusions

The non-genetic factors of calf sex and dam parity were found to have a very significant effect ($P<0.0001$) on the body weight performance of Brahman Indonesia cattle. Male calves consistently outperformed females, and body weight performance peaked in parities 3 through 6. These findings underscore the importance of correcting for these factors in selection programs to improve the accuracy of genetic evaluations.

Acknowledgment

Sincere appreciation is extended to the management and all staff of Balai Pembibitan Ternak Unggul dan Hijauan Pakan Ternak (BPTU-HPT) Sembawa for their invaluable support and cooperation. Their willingness to grant access to the Brahman Indonesia cattle performance records was essential for the completion of this study.

Conflict of Interest

The author(s) declare(s) that there is no conflict of interest.

References

Bessa, A.F.O., Duarte, I.N.H., Rola, L.D., Bernardes, P.A., Neto, S.G., Lôbo, R.B., Munari, D.P., & Buzanskas, M.E. (2021). Genetic evaluation for reproductive and productive traits in Brahman cattle. *Theriogenology*, 173: 261-268. https://doi.org/10.1016/j.theriogenology.2021.08.008.

Bramastya, T.A., Sukaryo, S., Dhiaurridho, M.I., Riyanto, J., Volkandari, S.D., Sudrajad, P., & Cahyadi, M. (2022). Characteristics of body weight and measurement of Peranakan Ongole and Brahman cattle in the tropics. *IOP Conference Series: Earth and Environmental Science*, 1001 012015. https://doi.org/10.1088/1755-1315/1001/1/012015.

BSN (Badan Standarisasi Nasional). (2020). *SNI 7651-1:2020 Bibit Sapi Potong - Bagian 1: Brahman Indonesia*. Jakarta: Badan Standarisasi Nasional

Bureš, D. & Bartoň, L. (2012). Growth performance, carcass traits and meat quality of bulls and heifers slaughtered at different ages. *Czech Journal of Animal Science*, 57(1): 34-43.

Chamwazi, F.M., Nguluma, A., Nziku, Z.C., & Mbaga, S.H. (2023). Pre and post-weaning growth and survivability of three genotypes of cattle at TALIRI Tanga, Tanzania. *Asian Journal of Research in Animal and Veterinary Sciences*, 6(4): 404-417. https://doi.org/10.9734/ajravs/2023/v6i4267.

Davis, L., French, E.A., Aguerre, M.J., & Ali, A. (2023). Impact of parity on cow stress, behavior, and

production at a farm with guided traffic automatic milking system. *Frontiers in Animal Science*, 4. https://doi.org/10.3389/fanim.2023.1258935.

Djedović, R., Stanojević, D., Bogdanović, V., Andrić, D. O., Samolovac, L., & Stamenić, T. (2021). Bias of calf sex on milk yield and fat yield in Holstein Crossbreed cows. *Animals*, 11(9), 2536. https://doi.org/10.3390/ani11092536.

Handelsman, D.J., Hirschberg, A.L., & Bermon, S. (2018). Circulating testosterone as the hormonal basis of sex differences in athletic performance. *Endocrine Reviews*, 39(5): 803-829. https://doi.org/10.1210/er.2018-00020.

Hoka, A.I., Gicheru, M., & Otieno, S. (2019). Effect of cow parity and calf characteristics on milk production and reproduction of Friesian dairy cows. Journal of Natural Sciences Research, 9(10): 41-46. https://doi.org/10.7176/jnsr/9-10-06.

Kurniawan, F.A., Jakaria, & Priyanto, R. (2022). Analisis korelasi genetik antara bobot lahir, bobot sapih, dan bobot yearling pada sapi Brahman Cross (BX). *Jurnal Sains Terapan: Wahana Informasi dan Alih Teknologi Pertanian*, 12(Khusus): 148-153. https://doi.org/10.29244/jstsv.12.Khusus.148-153.

Lean, I.J., LeBlanc, S.J., Sheedy, D.B., Duffield, T., Santos, J.E.P., & Golder, H.M. (2023). Associations of parity with health disorders and blood metabolite concentrations in Holstein cows in different production systems. *Journal of Dairy Science*, 106(1): 500-518. https://doi.org/10.3168/jds.2021-21673.

Lee, J.Y. & Kim, I.H. (2006). Advancing parity is associated with high milk production at the cost of body condition and increased periparturient disorders in dairy herds. *Journal of Veterinary Science*, 7(2): 161-166. https://doi.org/10.4142/jvs.2006.7.2.161.

Mahbubul, M. & Hoque, M.A. (2020). Effect of non-genetic factors on growth performance of Brahman Crossbred cattle of Bangladesh. *Fundamental and Applied Agriculture*, 5(3): 421-428. https://doi.org/10.5455/faa.113271.

Martins, T., Rocha, C.C., Driver, J.D., Rae, O., Elzo, M.A., Mateescu, R.G., Santos, J.E.P., & Binelli, M. (2024). Influence of proportion of Brahman genetics on productivity of Brahman–Angus cows at weaning. *Translational Animal Science*, 8. https://doi.org/10.1093/tas/txae093.

Mwangi, S.I., Buckley, F., Ilatsia, E.D., & Berry, D.P. (2025). Gestation length and its associations with calf birth weight, calf perinatal mortality and dystocia in dairy cattle. *Journal of Dairy Science*. https://doi.org/10.3168/jds.2024-26044.

Silveira, R.M.F., Ferreira, J., Busanello, M., de Vasconcelos, A.M., Valente, F.L.J., & Façanha, D.A.E. (2021). Relationship between thermal environment and morphophysiological, performance and carcass traits of Brahman bulls raised on tropical pasture: A canonical approach to a set of indicators. *Journal of Thermal Biology*, 96. https://doi.org/10.1016/j.jtherbio.2020.102814.

Tahira, K.T., Mahbubul, M., Husain, S.S., & Debnath, S. (2022). Effect of breeding bulls on growth performance and survivability of Brahman Crossbreds in rural areas of Bangladesh. *Journal of Agriculture, Food and Environment*, 3(1): 21-25. https://doi.org/10.47440/JAFE.2022.3104.

Zulkarnaen, M. H., Indrijani, H., Wiyatna, M. F., dan A. Anang. 2022. Performa bobot badan sapi Peranakan Ongole di BPTU-HPT Sembawa Banyuasin Sumatra Selatan. *Jurnal Ilmiah Peternakan Terpadu*, 10 (3): 1–11. https:// doi.org/10.23960/jipt.v10i3.p232-245.