Pre-Weaning Growth Performance and Body Condition Score of *Ongole* Crossbreed (PO) Cattle Based on Cows Parity

La Ode Nafiu[1*], Takdir Saili[1], Muhammad Amrullah Pagala[1], Musram Abadi[1], Widhi Kurniawan[1], Rusli Badaruddin[1]

[1] *Department of Animal Husbandry, Faculty of Animal Sciece, Halu Oleo University*
Jl. H.E.A Mokodompit Bumi Tridharma Kend ari, Southeast Sulawesi, Indonesia
[*]*Corresponding author. Email: ldnafiu@gmail.com*

ABSTRACT
This study aims to determine the growth performance of pre-weaning and Body Condition Score (BCS) of PO calves based on cows parity. This study was conducted 10 months in transmigration settlements, East Kolaka Regency, Southeast Sulawesi Province. A total of 38 PO calves from 38 cows were observed for growth and BCS during the pre-weaning period (age 6 months). Growth and BCS data were analyzed according to the General Linear Model with sources of variation in cow's parity and calf sex. The study results concluded that the birth weight of calves birth to primiparous cows was about 10% lower than that of multiparous mothers, body weight at 6 months was around 6.08%, and daily gain 5.21%. In addition, male calves had a higher average birth weight of about 9.19% than females, 6 months of weight was around 7.91%, and daily gain was around 6.23%. The effect of parity and calf sex on weaning weight, daily gain, and BCS decreases with the increasing age of the cattle.

Keywords: *Body condition score, Body weight, Daily gain, Parity.*

1. INTRODUCTION

One of the best-developed breeds of cattle in Indonesia is the *Ongole* Crossbreed (PO). According to the National Standardization Agency [1], PO cattle are beef cattle that play an essential role in meeting meat needs. PO cattle result from crosses between Sumba *Ongole* cows and local Javanese cows. This cow has been used as one of the local cows in Indonesia [2]. The mating system in PO Cows is generally natural, reaching 85.45% with natural growth of 44.68% [3].

Many PO cattle are cultivated by breeders, especially in Java [4]. Several areas in Southeast Sulawesi also develop PO cattle, especially in transmigration settlements in East Kolaka Regency, because they have several advantages, including (1) good adaptability to high temperature and humidity, (2) Being able to utilize low quality feed, (3) resistant to disease, and (4) can produce organic fertilizers [5] [6] [7].

Livestock productivity, including PO cattle, is influenced by genetic and environmental factors, as well as their interactions. Various attempts have been made to increase PO cattle production, including crossing with Limousine, Simmental, and Friesian Holstein crossbreed [8]. Indicators of increased production can be measured from growth performance and calf body condition scores in the pre-weaning period.

Body weight can be used to monitor the nutritional status and growth of livestock, although it is not always accurate because cows with large frames may have fewer food reserves than cows with small frames. The body condition score is a livestock characteristic that reflects the status of feeding, cows' potential, and maintenance management [9].

One of the factors that influence the growth and BCS of livestock is the parity of cows. This study aims to determine the growth performance and body condition score of PO pre-weaning calves based on parent parity.

2. MATERIALS AND METHODS

This research was conducted 10 months in East Kolaka Regency, Southeast Sulawesi Province. There were 76 cattle used, consisting of 38 PO cows with an age range of 4 - 8 years and body weight of 250 - 350 kg, and 38 PO calves. Calves were observed for growth and body condition scores during the pre-weaning period (age six months).

All PO cows and calves belong to the farmer willing to partner with the researcher. In addition to having PO cows, partner breeders must also be willing to implement the stipulated conditions, for example the breeding system, the mating system by AI, type of feed and how to give it, periodic weighing, and assessing the BCS of calves.

The variables observed were:

Birth weights were weighed within 24 hours of birth.

Body weights aged 1 - 6 months are weighed every month until they are six months old.

Daily gain, calculated based on the final body weight minus the initial body weight and divided by maintenance period, with the formula:

$$Daily\ Gain = \frac{\text{Final Body Weight} - \text{Initial Body Weight}}{maintenance\ period\ (days)}$$

Body Condition Scores used the Scottish / Canadian scoring system (1 - 5) [10].

Growth data and BCS were analyzed according to the General Linear Model with sources of diversity in the parity of cows and calf sex. Data processing uses the IBM SPSS Statistics Version 23 computer program.

3. RESULTS AND DISCUSSION

Unit of Observation

The observation unit in this study was 38 calves, which were descended from 38 cows with different parity. The description of the observation units according to the parity of cows and sex was presented in Table 1.

Based on Table 1, it can be seen that most of the PO cows used in this study already had the experience of giving birth more than one time (multiparous), namely 21 cows, while only 7 cows for first parity (primipara). Meanwhile, the number of male calves is 15 heads and 13 females.

Body Weight and Body Condition Score (BCS)

The performance of body weight and calf BCS at birth to 6 months of age according to parent parity and calf sex was presented in Table 2.

The interaction between cow's parity and calf sex had no significant effect (P>0.05) on birth weight, weight at six months of age, BCS at birth and six months, and daily gain. Parity of cows independently had a significant effect (P<0.05) on calf birth weight, but not significant (P>0.05) on weight at six months, BCS at birth and six months, and daily gain. Likewise, the sex of the calves had a significant effect (P<0.05) on birth weight, but not significant for weight at six months, BCS at birth and six months, and daily gain.

The average birth weight of PO cattle calves in the East Kolaka Regency was 27.19 kg, with a coefficient of variation of 9.78%. Primiparous cows had an average birth weight of 25.21 ± 1.18 kg, which was significantly lower (P<0.01) than multiparous cows (27.86 ± 2.71). The mean body weight at six months of primiparous and multiparous cows was 116.86 ± 5.52 kg and 123.95 ± 21.86 kg, respectively, and daily gain was 509.0 ± 27.8 g and 537.0 ± 105.9 g, respectively. The daily gain of PO calves in this study was higher than the intensively reared heifer buffalo, which was only 460 kg/head/day [11].

Meanwhile, male calves significantly (P<0.05) had a higher average birth weight compared to females (28.39 ± 2.65 vs. 26.00 ± 2.15 kg). Male calves have body weight of 126.71 ± 18.49 kg aged six months, not significantly different (P>0.05) with females, namely 117.64 ± 19.60 kg, although the difference is quite large, namely 9.07 kg. The daily gain average of PO cattle in this study was 530.0 ± 93.0 g, with a coefficient of a diversity of 17.55%. The average male daily gain was 546.0 ± 93.4 g, while the female was 514.0 ± 92.9 g, with a difference of 32.0 g. The daily growth rate of PO cattle in this study was not significantly (P>0.05) influenced by cows parity and calf sex.

The average BCS of PO cows at birth and after six months of age tended not to change, and it was not significantly (P>0.05) influenced by cow's parity and calf sex. This indicates that the BCS of male and female calves are relatively the same in both primiparous and multiparous.

Cows Parity Effect

Body weight and BCS are essential parameters for measuring calf growth performance, as well as determining the maintenance management status, nutritional status, and the condition of the parent. Based

Table 1. Number of observation units according to parent parity and sex of calves

Cows	Calves		Total
	Male	Female	
Primipara	6	5	11
Multipara	15	12	27
Number of calves	21	17	38

Table 2. Body weight and calf body condition score based on cows parity and sex

Source of Variation		Body Weight (kg)		Body Condition Score (BCS)		Daily Gain (gram)
		Birth	Wean	Birth	Wean	
Cows Parity	Primipara	25.21[a]±1.18	116.86 ±5.52	3.39±0.19	3.43±0.24	509±27.8
	Multipara	27.86[b] ±2.71	123.95±21.86	3.40±0.22	3.55±0.27	537±105,9
	Total	27.19[a] ±2.66	122.18±19.26	3.40±0.21	3.52±0.26	530± 92,9
	Significance	*	Ns	ns	ns	Ns
Calves Sex	Male	28.39[a] ±2.65	126.71±18.49	3.37±0.24	3.57±0.28	546± 93,4
	Female	26.00[b] ±2.15	117.64±19.60	3.43±0.24	3.46±	514± 92,9
	Total	27.19±2.66	122.18±19.26	3.40±0.21	3.52±0.26	530± 93,0
	Significance	*	Ns	ns	ns	Ns
Coefficient of Diversity		9,78%	15.75%	6.18%	7.38%	17.55

on Table 2, it is illustrated that cows parity is a source of diversity in body weight and calf BCS, but the effect is only significant on birth weight. Likewise, the sex of calves did not have a significant effect (P>0.05) on the diversity of body weight and calf BCS, except that the birth weight of calves had a significant effect. The cows and sex independently had a significant effect (P<0.05) on calf birth weight, but not significant (P>0.05) for other parameters in this study. Primiparous cows produced calves with a significantly lower birth weight (P<0.05), about 10% of multiparous cows. Similar results were also reported by [12], [13], [14] and [15]. Kertz *et al*. [16] reported that the birth weight of calves from multiparous cows was 7 - 8% higher than the first parity (primiparous). Observations on calves from crossing FH and Jersey showed that primiparous cows had lower birth weight than multiparous (34.0 vs. 36.6 kg) by 7.65% [17]. The cause of low birth weight of calves in primiparous cows from multiparous cannot be clearly explained however primiparous experience more difficulty in giving birth than multiparous cows [18]. This can be related to the immature body size and reproductive organs of primiparous cows. In dairy cattle, peak production is usually at the parity of 2 or more (multiparous) [19] [20] [12] [21] [22]. The same thing happened to goats [23].

Cows parity had no significant effect (P>0.05) on calf body weight at six months of age and BCS at birth and six months of age, and pre-weaning daily gain. Calves from primiparous cows have a weight of 6 months, which is less than multiparous, about 7.9 kg or 6.67%, and a daily gain of 6.23%. This study indicated that the effect of cows' parity on body weight decreased with increasing calf age. The same result was reported by [12].

Makin and Suharwanto [24] reported that peak production (mature equivalent) was reached at the second parity. In contrast to [21], who reported that the peak production was reached at fourth parity at the age range of 5.5 - 7 years. Kurnianto *et al*. [19] explained that Dairy cow's milk production would continue to increase from the age of 3 years to the age of 7 or 8 years, then decrease periodically [26].

Calves Sex Effect

The results showed that sex had a significant effect (P<0.05) on calf's birth weight, but not significant (P>0.05) on body weight at six months and pre-weaning BCS and daily gain. Male calves have a higher birth weight than females, with a difference of 2.39 kg or 9.19%. This result is in line with [25]. Muslim et al. [12] reported that male calves of Brahman Cross cattle had a significantly higher average birth weight (P <0.01) than female calves, with a difference of 1.55 kg or 12.19%. Meanwhile, Raphaka and Dzama [27] reported that male calves in cows had a higher average birth weight of about 2.70 kg or 8.65% than female calves. The average body weight of male calves at the age of 6 months was higher than that of female calves, around 9.07 kg or about 7.91%, although it was not statistically significant. The weight gain for pre-weaning male calves was also around 6.23% higher than that of female calves. The results of this study and previous studies

indicate that although statistically, sex does not significantly affect weaning weight and growth rate, quantitatively, the daily gain of male calves is higher than that of females, so that it is economically more profitable, especially in the fattening program, because male calves faster to reach the ideal market weight.

4. CONCLUSION

Based on the results and discussion, it is concluded that the calf's birth weight to primiparous cows was about 10% lower than that of multiparous, body weight at six months was 6.08%, and daily gain about 5.21%. Besides, male calves had a higher birth weight of about 9.19% than females, 7.91% at six months, and about 6.23% to daily gain. The effect of cow's parity and calf sex decreases with increasing age so that there is no significant effect on weaning weight, daily gain, and BCS.

AUTHORS' STATEMENT

This study has never been carried out in Southeast Sulawesi, Indonesia, and its novelty lies on: (1) cows parity and the calves' sex, which are used as a variation source, and (2) PO cattle breeders are involved in the study, from animal preparation, cattle rearing to data collection (help weighing and measuring body dimensions). This can accelerate the adoption of technology for farmers.

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REFERENCES

[1] National Standardization Agency. 2018. National Standardization. Beef beef breeds - Part 5: Ongole breeds. National Standardization Agency, Jakarta, Indonesia.

[2] Subiharta dan P. Sudrajad 2013. Performance of birth weight for local cattle (Ongole Cross-breed / PO) Kebumen and its potential as a source of high-quality PO cattle breeds. Proceedings of a National Seminar on the Resurrection of Local Prominent Commodities for Agriculture and Marine Affairs, Faculty of Agriculture, Trunojoyo University, Madura. pp 292-299. https://www.researchgate.net/publication/262527667

[3] Rohyan, J., Sutopo and E. Kurnianto. 2016. Population dynamics on ongole grade cattle in Kebumen Regency - Central Java. 2016. J. Indonesian Trop. Anim. Agric. (JITAA): 41(4):224-232. DOI: 10.14710/jitaa.41.4.224-232. https://ejournal.undip.ac.id/index.php/jitaa/article/download/11483/pdf

[4] Hartati, Sumadi dan Tety Hartatik. 2009. Identifikasi karakteristik genetik sapi peranakan ongole di peternakan rakyat (The identification of genetic characteristic of Ongole grade cattle in smallholder farmers). Buletin Peternakan 33(2), 64-73. https://jurnal.ugm.ac.id/buletinpeternakan/article/download/118/474

[5] Nuryadi dan Wahjuningsih 2011. Reproductive performance of Ongole and Limousin crossbred cows in Malang Regency. J. Ternak Tropika 12(1):76-81. https://www.cabdirect.org/cabdirect/abstract/20143364948

[6] Siswanto. M., N.W. Patmawati, N.N. Trinayani, I.N. Wandia, and I.K. Puja. 2013. Reproductive performance of bali cattle under intensive management system in breeding instalation of Pulukan. J. Ilmu Kes. Hewan. 1(1): 11-15. https://docobook.com/penampilan-reproduksi-sapi..

[7] Yulyanto CA, Susilawati T, Ihsan MN. 2014. Reproductive performance of Ongole (PO) and Limousin crossbred cows in Sawoo Subdistrict, Ponorogo District and Tugu District, Trenggalek Regency (Penampilan reproduksi sapi Peranakan Ongole (PO) dan sapi Peranakan Limousin di Kecamatan Sawoo Kabupaten Ponorogo dan Kecamatan Tugu Kabupaten Trenggalek). JIIP. 24:49-57. https://jiip.ub.ac.id/index.php/jiip/article/download/172/242

[8] Nafiu, L.O., T. Saili, M. A. Pagala. 2020. The relative superiority of crossbred using friesian holstein hybrid cement bull to local ongole hybrid cattle. International Journal of Scientific Research in Science, Engineering and Technology (IJSRSET) Volume 7 Issue 3 pp: 372-379. http://ijsrset.com/paper/6474.pdf

[9] Huda, H.A. Bashir, and I. Bushara. 2019. Effect of parity order on body weight and body condition score of baggara attle under the traditional system in West Kordofan State, Sudan. Journal of Animal Husbandry and Dairy Science, 3(I3): 1-8. https://www.sryahwapublications.com/journal-of..

[10] Edmonson, A. J., I. J. Lean, L. D. Weaver, T. Farver, and G. Webster. 1989. Body conditions scoring chart for Holstein dairy cow. 1989 J Dairy Sci 72:68-78. https://www.sciencedirect.com/science/article/pii/S0022030289790810

[11] Nafiu, L.O. and T. Saili, A. Bain, Muhidin, M. Rusdin and R. Badaruddin, 2018. Response of selected heifer buffalo to feed improvement in Bombana regency, Indonesia. Pak. J. Nutr., 17 (12): 683-688. ISSN 1680-5194. DOI: 10.3923/pjn.2018.683.688. https://www.researchgate.net/publication/332140089...

[12] Swali, A., and D.C.Wathes. 2007. Influence of primiparity on size at birth, growth, the somatotrophic axis, and fertility in dairy heifers. Animal Reproduction Science, 102(1):122-136. https://www.sciencedirect.com/science/article/pii

[13] Muslim, K.N. H. Nugroho dan T. Susilawati. 2017. The relationship between mother body weight and calf birth weight for Brahman cross cattle of different sexes. Jurnal Ilmu-Ilmu Peternakan 23 (1): 18 – 24. http://jiip.ub.ac.id.

[14] Curtis, G., C. McGregor, Argo, D. Jones, D. Grove-White. 2018. The impact of early life nutrition and housing on growth and reproduction in dairy cattle. PLOS ONE | https://doi.org/10.1371/journal.pone. 0191687, February 14, 2018. https://www.ncbi.nlm.nih.gov/pubmed/29444092

[15] Said, S., W.P.B. Putra, M. Muzawar and S.A. Kantong. 2020. Selection of Bali cattle based on birth weight and calving interval records at West Nusa Tenggara Province of Indonesia. J. Indonesian Trop. Anim. Agric. (JITAA): 45(1):15-27, March 2020. http://ejournal.undip.ac.id/index.php/jitaa. DOI: 10.14710/jitaa.45.1.15-27.

[16] Kertz, A. F., L. F. Reutzel, B. A. Barton, and R. L. Ely. 1997. Bodyweight, body condition score, and wither height of prepartum Holstein cows and birth weight and sex of calves by parity: A Database and Summary. J Dairy Sci 80:525–529. https://www.ncbi.nlm.nih.gov/pubmed/9098803

[17] Dhakal, K., C. Maltecca, J. P. Cassady, G. Baloche, C. M. Williams, and S. P. Washburn. 2013. Calf birth weight, gestation length, calving ease, and neonatal calf mortality in Holstein, Jersey, and crossbred cows in a pasture system. Dairy Sci. 96:690–698. http://dx.doi.org/10.3168/jds.2012-5817.

[18] Olson, K. M., B. G. Cassell, A. J. McAllister and S. P. Washburn. 2009. Dystocia, stillbirth, gestation length, and birth weight in Holstein, Jersey, and reciprocal crosses from a planned experiment. J. Dairy Sci. 92:6167–6175. https://www.sciencedirect.com/science/article/pii/S002203020971

[19] Kurnianto, E., I. Sumeidiana, and R. Yuniara. 2004. Comparison of the two methods of estimating milk production for dairy cows based on monthly records. J. Indon. Trop. Agric., 29 (4): 1-6. www.jppt.undip.ac.id/pdf/29(4)2004p208-212.pdf

[20] Linden, T. C., R. C. Bicalho, and D. V. Nydam. 2008. Calf birth weight and its association with calf and cow survivability, disease incidence, reproductive performance, and milk production. J. Dairy Sci. 92:2580–2588. DOI:10.3168/jds.2008-1603. https://pubmed.ncbi.nlm.nih.gov/19447990

[21] Murti, T.W., 2014. Management Science and Dairy Industry. Pustaka Reka Cipta, Bandung

[22] Hoka, A.I., M. Gicheru, and S. Otieno. 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. DOI: 10.7176/JNSR. https://www.iiste.org/Journals/index.php/JNSR/article/view/48030

[23] Elmetwally, M.A., A. Montaser, N. Elsadany, W. Bedir, M. Hussein, and S. Zabel. 2016. Effects of parity on postpartum fertility parameters in Holstein dairy cows. Journal of Agriculture and Veterinary Science (IOSR-JAVS) 9(8):91-99. e-ISSN: 2319-2380, p-ISSN: 2319-2372. www.iosrjournals.org

[24] Makin, M. dan D. Suharwanto. 2012. Performance of the characteristics of milk production and reproduction of dairy cows of Fries Holland in West Java. J. Ilmu Ternak, 12 (2): 39-44.

[25] Filian, B.V., S. A. B. Santoso, D. W. Harjanti dan W. D. Prastiwi. 2016. Hubungan paritas, lingkar dada dan umur kebuntingan Dengan produksi susu sapi Friesian Holstein di BBPTU-HPT Baturraden (The relationship between parity, chest circumference and gestational age with milk yield of Friesian Holstein in BBPTU-HPT Baturraden). Agripet, 16 (2): 83-89. http://jurnal.unsyiah.ac.id/agripet/article/viewFile/5102/5125

[26] Hickson, R.E., I.L. Zhang, and L.R. McNaughton. 2015. Birth weight of calves born to dairy cows in New Zealand. Proceedings of the New Zealand Society of Animal Production 2015. Vol 75: 257-259. https://pubmed.ncbi.nlm.nih.gov/19447990

[27] Raphaka, K., and K. Dzama. 2009. Sex of calf and age of dam adjustment factors for birth and weaning weight in Tswana and Composite beef cattle breeds in Botswana. South African Journal of Animal Science, 39 (4):296-300. https://scholar.sun.ac.za/handle/10019.1/9313