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# The Relationship Between Quantitative and Reproductive Traits of Ongole Grade Cow in Rembang Regency

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## ABSTRACT

This study aimed to analyze the relationship between quantitative traits and reproduction traits of Ongole grade cows in Rembang Regency. This study was done from May to July 2022. The number of samples used was 224 Ongole grade cows that have given birth at least once. Quantitative traits were obtained by measuring body condition scores (BCS), body length (BL), body height (BH) and chest circumference (CC). The class was based on Indonesian National Standards for Ongole grade cow breeding cattle in 2015 (Class I, II, III and Non-Class). The BCS used is the American system for beef cattle (score 1 to 9). The BL and BH were measured with a measurement stick. The CC was measured using the weight body Round-O (WB Round-O). The reproductive traits measured included service per conception (S/C), calving interval (CI), days open (DO) and estrus postpartum (EPP), which were obtained by observing cattle and interviewing breeders and inseminators. The analysis used was descriptive statistical analysis with averages and percentages and non-parametric analysis of Spearman's correlation test. This research concludes a significant relationship between quantitative traits and S/C with a very weak negative direction and strength of the relationship.

**Keywords:** Ongole grade cow, quantitative traits, reproductive traits, spearman correlation test

## INTRODUCTION

The Ongole grade cow population in Rembang Regency in 2024 was 51,582, with 152,721 cattle, or 33.78%. The quantitative traits used in this study were primary body size, including body condition scores (BCS), body length (BL), body height (BH) and chest circumference (CC) measurement data are used for the basis classification into class I, II, II and non-class according to the Indonesian National Standard for Ongole grade cows for breeding cattle in 2015 (Table 1). Classification used two age groups (18-24 months and >24 – 36 months). Indahwati et al. (2023) stated that the body sizes showed a highly significant difference ($P<0.01$).

The reproductive traits measured included S/C, CI, DO and EPP. Several important reproductive performance parameters include age at first calving, calving rate, calving interval, service per conception (S/C), and days open (Rahayu, 2015). Christi et al. (2022) stated that S/C is the number of artificial insemination (AI) and/or natural mating carried out on each animal until pregnancy occurs. Prasetyo et al. (2015) say CI is the number of days or months between birth and the next. The success of AI has a very real influence on the CI (Kusmayadi et al., 2018). Calving intervals directly impact the farmer's economy and greatly influence the reproductive efficiency of dairy cows. The distance (days) between the condition of a cow after giving birth until she becomes pregnant again is DO (Hariadi et al., 2011).

Table 1. Minimum quantitative requirements for Ongole grade cow

| Old (months) | Variable | Class I | Class II | Class III |
|---|---|---|---|---|
| 18 - 24 | Body length (cm) | 119 | 116 | 113 |
| | Body height (cm) | 120 | 118 | 117 |
| | Chest circumference (cm) | 138 | 134 | 130 |
| >24 – 36 | Body length (cm) | 129 | 125 | 121 |
| | Body height (cm) | 132 | 129 | 127 |
| | Chest circumference (cm) | 161 | 156 | 139 |

Badan Standarisasi Nasional for Ongole grade cow of breeding cattle (BSN, 2015)

The data on DO was obtained through livestock reproduction records on a breeding farm. Postpartum estrus is the first estrus experienced by a cow after giving birth. There are differences in PPE in various parity I, II and III due to less-than-optimal maintenance management, especially in feed.

The Ongole grade cows have good reproductive performance (Astuti, 2014) and have high reproductive traits (Suyadi, 2014; Rohyan, 2016; Ngadiyono et al., 2017). In general, the reproductive performance of Ongole grade cows in Kragan District, Rembang Regency, is quite good (Panjono, 2022). According to Indahwati et al. (2021), Ongole grade cows in Rembang Regency had 12-month calving intervals and higher conception rates. Other researchers have researched the reproduction of Ongole grade in the Rembang Regency (Sutiyono et al., 2018; Indahwati et al., 2019).

According to Djego et al. (2020), correlation is a method to determine the closeness of the relationship between variables described by the magnitude of the correlation coefficient. A correlation coefficient is a coefficient that describes the degree of similarity of the relationship between two or more variables. The value of the correlation coefficient states the correlation between those variables.

This research aimed to analyze the relationship between quantitative traits and reproduction traits of Ongole grade cows in Rembang Regency. This study hypothesises that there is a relationship between a high class of quantitative traits and the best reproductive traits of Ongole-grade cows in Rembang Regency.

## MATERIALS AND METHODS

This study was done from May to July 2022. The number of samples used was 224 Ongole grade cows in Rembang Regency that have given birth at least once. The data on Ongole-grade cows was taken from the Rembang, Sulang, Bulu, and Pancur sub-districts.

The quantitative traits used in this study were primary body size include BCS, BL, BH and CC. The BCS used is the American system for beef cattle (score 1 to 9). The body length and body height were measured with a measurement stick. The CC was measured with WB Round-O. The measurement method is shown in Figure 1. The BL, BH, and CC measurement data are used for the basis classification into classes I, II, II, and non-class. The reproductive traits measured included S/C, CI, DO, and EPP, obtained by observing cattle and interviewing breeders and inseminators.

Statistical data analysis using descriptive statistical analysis with averages and percentages and non-parametric analysis with Spearman's correlation test for four quantitative traits and four reproductive traits as parameters. Correlation analysis aims to measure the level of linear relationship between two or more variables. The Spearman Correlation Test is a statistical test that determines the relationship between two or more variables on an ordinal scale. Spearman correlation coefficient is a non-parametric statistic. This correlation method calculates the correlation rank starting from -1, which means perfect correlation in negative slope degree, and +1, which means perfect correlation in perfect slope degree. Besides the values -1 and +1, the values between the two numbers, if above 0.5 or below 0.5, are called a moderate or relatively strong relationship. To analyse the Spearman correlation in test statistics using the formula :

$$\mathrm{rs} = 1 - \frac{6 \sum_{i-1}^{n} d_i^2}{\mathrm{n}\,(\mathrm{n}^2 - 1)}$$

rs = Spearman correlation value
d = Difference between X and Y
n = Number of pairs (data)

Figure 1. A = Body length (BL), B = body height (BH) and C = chest circumference (CC)

## RESULTS AND DISCUSSION

### Quantitative Traits

Sample data is grouped by class according to the Indonesian National Standard for Ongole grade cow breeding cattle in 2015. The percentage of each class is shown in Table 2.

Table 2. The percentage data of Ongole grade cow in Rembang regency based on class

| Class | Frequency | Per cent |
|---|---|---|
| Class I | 94 | 42.00 |
| Class II | 42 | 18.80 |
| Class III | 37 | 16.50 |
| Non Class | 51 | 22.80 |

Table 2 shows that most of the Ongole-grade cows in the Rembang regency are by the minimum quantitative requirements of the Indonesian National Standard for Ongole-grade cows (77.20%). The mean of quantitative traits is shown in Table 3. The result of research on Balinese Cattle Breeders at the Farmers' Livestock Sekolah Peternakan Rakyat showed that BCS grade 3 is 43% (Sari et al., 2019). This means the average number of BCS Ongole Grade cows in Rembang Regency is higher than that of Balinese Cattle Breeders on the farm. Bagiarta et al. (2017) stated that the BCS value of livestock depends on the purpose of maintenance, where for livestock that is maintained for fattening purposes, the greater the BCS value, the better, while for breeding or breeding that produces calves, the best value of BCS is 3.

Refer to the research by Sudrajad and Subuharta (2014), the results of this research showed that the BL of Ongole Grade cows in Rembang Regency was higher than Ongole Grade cows in Tuban, Blora and Pacitan but lower than Kebumen and Lamongan. The BH of Ongole Grade cows in Rembang Regency is higher than that of Ongole Grade cows in Tuban, Blora, Pacitan, and Lamongan but lower than that of Kebumen. The later results of this measurement showed that the CC of Ongole Grade cows in Rembang Regency was higher than that of Ongole Grade cows in Tuban, Blora, Pacitan, Lamongan and Kebumen. This shows that the body size of Ongole Grade cows in Rembang Regency is in accordance with Indonesian National Standards and is above the average for Ongole Grade cows in other surrounding areas. This has good potential to be developed further.

The analysis results with non-parametric Spearman's correlations for quantitative traits (BCS, BL, BH and CC) in each class are shown in Table 4.

Table 3. Mean of quantitative traits of Ongole grade cow in Rembang Regency

| Variable | Means ± SD | Median (min-max) |
|---|---|---|
| BCS | 4.65 ± 1.39 | 5 (2 – 8) |
| BL | 132.64 ± 8.24 | 132.50 (114.80 – 162.50) |
| BH | 130.97 ± 6.20 | 131.34 (984.53 – 143.93) |
| CC | 165.84 ±11.24 | 165.25 (126.33 – 201.50) |

BCS = body condition score, BL = body length, BH = body height, CC = chest circumference

Table 4. Correlation between quantitative traits and class

| Variable | Description | Class |
|---|---|---|
| BCS | Correlation coefficient | -314** |
| | Sig. (2-tailed) | .000 |
| | N | 224 |
| BL | Correlation coefficient | -758** |
| | Sig. (2-tailed) | .000 |
| | N | 224 |
| BH | Correlation coefficient | -581** |
| | Sig. (2-tailed) | .000 |
| | N | 224 |
| CC | Correlation coefficient | -580** |
| | Sig. (2-tailed) | .000 |
| | N | 224 |

BCS = body condition score, BL = body length, BH = body height, CC = chest circumference
** Correlation is significant at the 0.01 level (2-tailed)

The relationship between class and quantitative traits is shown in Table 5.

Table 5. The relationship between class and quantitative traits

| Quantitative Traits | Class | Means ± SD | p | r |
|---|---|---|---|---|
| BCS | Class I | 5.12 ± 1.41 | < 0.001* | -0.314 |
| | Class II | 4.52 ± 1.19 | | |
| | Class III | 4.73 ± 1.17 | | |
| | Non-Class | 3.84 ± 1.29 | | |
| BL | Class I | 138.49 ± 6.73 | < 0.001* | -0.759 |
| | Class II | 133.24 ± 4.69 | | |
| | Class III | 130.45 ± 4.45 | | |
| | Non-Class | 122.94 ± 4.75 | | |
| BH | Class I | 134.83 ± 4.07 | < 0.001* | -0.581 |
| | Class II | 130.11 ± 3.58 | | |
| | Class III | 127.66 ± 4.72 | | |
| | Non-Class | 126.97 ± 7.80 | | |
| CC | Class I | 173.04 ± 8.67 | < 0.001* | -0.580 |
| | Class II | 164.79 ± 8.32 | | |
| | Class III | 159.10 ± 8.79 | | |
| | Non-Class | 158.32 ± 11.03 | | |

BCS = body condition score, BL = body length, BH = body height, CC = chest circumference
Note: * significant (p<0.05)

The results of the relationship test between quantitative traits and class using Spearman's correlation test on BCS were obtained p value = <0.001 (p <0.05) and r value = -0.314 (0.2-<0.4), so it can be concluded that there is a significant relationship between class and BCS with a direction and strength of a weak negative relationship. On BL, the value obtained was p = <0.001 (p < 0.05) and r value = -0.759 (0.6 – <0.8), so it can be concluded that the relationship between class and BL has a significant relationship with the direction and strength of the relationship being strongly negative. On BH, the value obtained was p = <0.001 (p < 0.05), and the valuer = -0.581 (0.4 – <0.6), so it can be concluded that the relationship between class and BH has a significant relationship with the direction and strength of the relationship being moderately negative. While in CC, the p-value was obtained = <0.001 (p <0.05) and the r-value = -0.580 (0.4 - <0.6), so it can be concluded that there is a significant relationship between class and CC with a moderate negative direction and strength of the relationship.

## Reproductive Traits

The mean of reproductive traits is shown in Table 6. The S/C is almost similar to Erni (2023) with a result S/C of 1.83±0.92 and Panjono et al. (2022) that was 1.86±1.15. The CI was better than Akriono et al. (2017), which was 399.04±39.97 days. The CI is important to know because the regularity of the birth interval produced by each individual shows continuity in producing offspring in one period of life (Fauziah et al., 2015). Days opened better than other research that was 130.27±20.99 days (Nuryadi et al., 2011). The average PPE was better than Erni's (2023), 171.89±91.25 days.

The analysis results with non-parametric correlations for reproductive traits (S/C, CI, DO and EPP) in each class are shown in Table 7.

Table 6. Mean of reproductive traits of Ongole grade cow in Rembang Regency

| Variable | Means ± SD | Median (min-max) |
|---|---|---|
| S/C | 1.86 ± 0.88 | 2 (1 – 8) |
| CI | 397.29 ± 31.58 | 391 (310 – 520) |
| DO | 117.43 ± 32.20 | 111 (30 – 272) |
| EPP | 99.55 ±25.18 | 90 (30 – 240) |

S/C = service per conception, CI = calving interval, DO = days open, EPP = estrus postpartum

Table 7. Correlation between reproductive traits and class

| Variable | Description | Class |
|---|---|---|
| S/C | Correlation coefficient | -145* |
| | Sig. (2-tailed) | .030 |
| | N | 224 |
| CI | Correlation coefficient | -118 |
| | Sig. (2-tailed) | .079 |
| | N | 224 |
| DO | Correlation coefficient | -118 |
| | Sig. (2-tailed) | .079 |
| | N | 224 |
| EPP | Correlation coefficient | -054 |
| | Sig. (2-tailed) | .422 |
| | N | 224 |

S/C = service per conception, CI = calving interval, DO = days open, EPP = estrus postpartum
* Correlation is significant at the 0.05 level (2-tailed)

The relationship between class and quantitative traits is shown in Table 8.

Table 8. The relationship between class and quantitative traits

| Reproductive Traits | Class | Means ± SD | p | r |
|---|---|---|---|---|
| S/C | Class I | 2.02 ± 1.07 | 0.030* | -0.145 |
| | Class II | 1.89 ± 0.84 | | |
| | Class III | 1.69 ± 0.62 | | |
| | Non-Class | 1.67 ± 0.61 | | |
| CI | Class I | 400.39 ± 29.53 | 0.079 | -0.118 |
| | Class II | 394.57 ± 30.36 | | |
| | Class III | 403.86 ± 40.85 | | |
| | Non-Class | 389.06 ± 27.23 | | |
| DO | Class I | 120.39 ± 29.53 | 0.079 | -0.118 |
| | Class II | 114.55 ± 30.37 | | |
| | Class III | 124.73 ± 43.63 | | |
| | Non-Class | 109.04 ± 27.24 | | |
| EPP | Class I | 99.36 ± 19.04 | 0.422 | -0.054 |
| | Class II | 95.83 ± 23.32 | | |
| | Class III | 110.27 ± 38.11 | | |
| | Non-Class | 95.20 ± 23.37 | | |

S/C = service per conception, CI = calving interval, DO = days open, EPP = estrus postpartum
Note: * significant ($p<0.05$)

The results of the test of the relationship between class and reproductive traits using Spearman's correlation test on S/C, the p-value was obtained = 0.030 ($p < 0.05$) and the r-value = -0.145 (0.0 - <0.2), so that it can be concluded that there is a significant relationship between class and S/C with a very weak negative direction and strength of the relationship. The CI value obtained is $p = 0.079$ ($p > 0.05$), so it can be concluded that there is no significant relationship between Class and CI. The DO value obtained is $p = 0.079$ ($p > 0.05$), so it can be concluded that there is no significant relationship between class and DO. The EPP value obtained is $p = 0.422$ ($p > 0.05$) is received, so it can be concluded that there is no significant relationship between class and EPP.

The best quantitative trait value is in class I, followed by class II, class III and non-class. Meanwhile, in reproductive traits, the smaller the number obtained, the better the value. This means that if there is a significant relationship between class and S/C with a very weak negative direction, the strength of the relationship shows that a good class will have a good S/C value (small number). This is

appropriate with Astuti (2004), that a high S/C value indicates low fertility while a low S/C value indicates high fertility. Service per conception is mainly determined by the condition of the mother, accuracy at mating and the quality of the male.

## CONCLUSION

The study concluded a significant relationship between quantitative traits and S/C, with a weak negative direction and strength. It means there is a relationship that a good class will make a good S/C value (small number). While in other reproductive traits (CI, DO and EPP), there is no significant relationship.

## REFERENCES


Akriono, M. L., S. Wahjuningsih, dan M.N. Ihsan, 2017. Performans Reproduksi Sapi Peranakan Ongole dan Peranakan Limousin di Kecamatan Padang Kabupaten Lumajang. J. Ternak Tropika. 18(1):77-81.

Astuti, M. 2004. Potensi dan keragaman sumberdaya genetik sapi peranakan Ongole (PO). Jurnal Ilmu Ternak. 14(4): 98-106.

Bagiarta, I. W., I.M. Mudita, G.K. Roni and S.A. Lindawati. 2017. Dimensi tubuh sapi Bali di Unit Pelaksana Teknis Pembibitan sapi Bali Sobangan. Peternakan Tropika. 5(1):181-188.

[BSN] Badan Standarisasi Nasional. 2015. SNI 7651.5:2015. Bibit Sapi Potong. Bagian 5: Peranakan ongole. Badan Standarisasi Nasional, Jakarta.

Djego, Y. and Kihe, J. N. 2020. Phenotipe correlation between body measurements with body weight of of broiler, bantam and local sabu crosses at twelve weeks of age. Agricultural and Food Sciences. 7,51-54.

Erni, N, 2023. Kinerja Induk Sapi Jawa, Peranakan Ongole dan Simmental Peranakan Ongole yang Dipelihara pada Kondisi yang Sama. Agriovet. 5(2):39-51.

Fauziah, L.W., W. Busono and G. Ciptadi. 2015. Performans reproduksi sapi Peranakan Ongole dan Peranakan Limousin pada paritas berbeda di Kecamatan Paciran Kabupaten Lamongan. J. Ternak Trop. 16(2):49–54.

Hariadi, M., S. Hardjopranjoto, Wurlina, HA. Hermadi, B. Utomo, Rimayanti, I.. N. Triana dan H. Ratnani. 2011. Ilmu Kemajiran pada Ternak. Cetakan 1. Airlangga University Press, Surabaya.

Indahwati A., E.T. Setiatin and A. Setiadi. 2019. Technical and Economic Analysis of Ovarian Hypofunction Case Therapy in Beef Cattle In Rembang, Central Java, Indonesia. Agromedia. 37. 2 51-61

Indahwati A., E. Kurnianto, E.T. Setiatin and D. Samsudewa. 2022. Morfometrical Traits of Ongole Cow in Rembang Regency Based on Different Class of Indonesian National Standar. International Conference on Agricultural Sustainability. 2022. 1-4

Indahwati A., E. Kurnianto, E.T. Setiatin and D. Samsudewa. 2022. Evaluation of breeder preferences on reproduction aspects of Ongole crossbreed in the breeding area of Rembang Regency. ISSRP.

Kusmayadi, T., M.H. Hadiana dan U.H. Tanuwiria. 2018. Reproductive Performansnces of Friesian holstein dairy cows in different agricultural ecosystems. Buletin Peternakan. 44(2): 71-77. https://doi.org/10.21059/buletinpeternak.v44i2.39917

Ngadiyono, N., Panjono, S.P.S. Budhi dan A.E. Susanti. 2017. Characteristics of Ongole grade cows in the Kebumen Regency Cental Java Province. The 7th International Seminar on Tropical Animal Production, Yogyakarta, 12-14 September 2017.

Nuryadi dan S. Wahjuningsih. 2011. Penampilan Reproduksi Sapi Peranakan Ongole Dan Peranakan Limousin Di Kabupaten Malang. J. Ternak Tropika. 12(1):76-81.

Panjono, A. Priyanti, Aryogi, A. Wibowo, ARS. Putra, B.A. Atmoko, H. Maulana, BW. Prabowo. 2022. Kinerja induk sapi peranakan ongole di Kecamatan Kragan Kabupaten Rembang. Jurnal Ilmiah Fillia Cendekia. 7(1): 66-71.

Prasetyo, Y., M. Hartono dan S. Siswanto. 2015. Calving interval sapi perah laktasi di Balai Besar Pembibitan Ternak Unggul dan Hijauan Pakan Ternak (BBPTU-HPT) Baturraden Purwokerto Jawa Tengah. JIPT. B(1): 54-60.

Rahayu, S. 2015. The reproductive performance of Bali cattle and it's genetic variation. J. Bio. Res. 20(1):28-35.

Rohyan, J., Sutopo dan E. Kurnianto. 2016. Population dynamics on Ongole grade cattle in Kebumen Regency. J Indon Trop Anim Agric 41(4): 224-232.

Sari, DAP., Muladno, S. Said. 2019. Potential and Reproductive Performance of Female Bali Cattle for Supporting Breeding Business at Field Station of Sekolah Peternakan Rakyat. Jurnal Ilmu Produksi dan Teknologi Hasil Peternakan. 8(2): 80-85.

Sudrajad, P. and Subiharta. 2014. Karakter Fenotipik Sapi Betina Peranakan Ongole (PO) Kebumen. Widyariset 17 (2): 283–290.

Sutiyono, Sutopo, Y.S. Ondho, E.T. Setiatin, D. Samsudewa, A. Suryawijaya, DA. Lestari dan E. Kurnianto. 2018. Short communication: genetic diversity of Ongole grade cattle of Rembang District, Central Java, Indonesia, based on blood protein polymorphism. Biodiversitas. 19(4): 1429-1433.