

PAPER • OPEN ACCESS

Calcium and Phosphor Status of Beef Cattle in Upland and Lowland of Jratunseluna River Basin in Central Java

To cite this article: Sutrisno *et al* 2018 *IOP Conf. Ser.: Earth Environ. Sci.* **119** 012013

View the [article online](#) for updates and enhancements.

Related content

- [Prospect development of local beef cattle from South Kalimantan as supporting to food sovereignty in Indonesia](#)
S N Rahmatullah, A Sulaiman, Askalani et al.
- [Determinants Affecting on Smallholder Madura Cattle Farming at Pamekasan Regency, East Java, Indonesia](#)
H. D. Utami, A. Yakin and A. P. Seruni
- [The Function of Credit Scheme to Improve Family Income among Beef Cattle Farmers in Central Java Province](#)
E. Prasetyo, T. Ekowati, W. Roessali et al.

Calcium and Phosphor Status of Beef Cattle in Upland and Lowland of Jratunseluna River Basin in Central Java

Sutrisno¹, A. Subrata¹, Surahmanto¹, M. Christiyanto¹, Surono¹, J. Achmadi¹, F. Wahyono¹ and E. Pangestu^{1*}

¹Faculty of Animal and Agricultural Sciences, Diponegoro University, Semarang, Central Java, Indonesia.

*Corresponding E-mail:ekopangestu57@gmail.com

Abstract

The study was aimed to obtain information regarding feed given and mineral status (Ca, P) in fodder and beef cattle in Jratunseluna river basin. Feed and drinking water given by farmers identified for 14 days and extracted sampling for mineral analysis, t-test was used to compare mineral status in upland and lowland. Results of the research showed that feed given by farmers were varying. The ratio of forage/concentrates in lowland and upland areas was different, i.e. 67: 33 and 30: 70, respectively. Ca content on forage given in upland areas ranged from 0.17 to 0.74%, and concentrates from 0.002 to 0.49%, while Ca content on forage given in lowland areas ranged from 0.33 to 0.52%, and concentrates ranged from 0.38 to 0.49%. P content on forage in upland areas ranged from 0.02 to 0.04%, concentrates ranged from 0.018 to 0.09%, while P content on forage in lowland areas ranged from 0.03 to 0.07%, and concentrates ranged from 0.04 to 0.07%. Ca and P consumption in upland areas were 301.06 and 54.73 g, and 391.92 and 65.70 g in lowland. Ca and P content of beef cattle's hair in upland were 0.14 and 0.01%, while in lowland areas were 0.11 and 0.03%. It can be concluded that Ca and P intake of beef cattle in Jratunseluna river basin were less and mineral status of Ca and P in marginal condition.

1. Introduction

Many river basin has not been handled properly, with the result the river basin areas already damage widespread and severe. Increasing number of population along with the increasing of development had resulted in the shifting pattern of land use, causing various problems, losing of fertile land, and soil contamination. Jratunseluna river basin is a river flow from Jrahah, Tuntang, Serang, Lusi, and Juwana, covers 12 administrative district area in Central Java Province [1]. Jratunseluna river basin area approximately cover 32,544.12 km² (the wide of Central Java around 3,25 million hectares). Livestock population in Central Java in year 2013 around 1,500,077 heads of beef cattle and 103,794 heads of dairy cow [2]. From livestock population above, 54% of beef cattle and 86% of dairy cow were raised in Jratunseluna river basin area. The carrying capacity of Jratunseluna river basin area only 32% of Central Java carrying capacity. The intensity of ruminant livestock, especially cows are supported by the availability of adequate feed. It is supposed to cause low productivity of ruminant livestock in that area [3]. According to Jratunseluna geographic and the availability of inadequate feed will affect nutrient content, especially Ca and P of feed (grass and legume) given to livestock [4; 5]. The topography of Jratunseluna river basin area and the less vegetation that cover the land allow soil leaching which caused the less availability of nutrient or mineral for plant and causing diminish of the mineral on plant or grass, less mineral intake, and finally will decrease livestock productivity. It has been known that mineral is an essential nutrient on feed and metabolism process. Based on the



problems above, study about mineral status (especially Ca and P) on beef cattle livestock in Jratunseluna area should be conducted.

2. Materials and Methods

The study was performed through a survey in Jratunseluna river basin area. The location was selected by stratified random sampling and represent beef cattle livestock condition. The location was selected based on Jratunseluna river basin topography and climate (micro climate), distinguished into upland and lowland area. On each upland and lowland area, selected 2 areas which had a lot of livestock population. The measured variable including total forage and feed given, mineral status (Ca and P) on land, water, feed, and livestock. Feed and water given by farmers were identified for 10 days and the sample was taken for Ca and P analysis. The land sample was taken in 4 areas around forage crops given to livestock for Ca and P analysis. The beef cattle's hair were taken after feed identification. Ca and P analysis was performed in Nutrition and Feed Science Laboratory, Faculty of Animal and Agricultural Faculty Science, Diponegoro University. Data obtained processed statistically using SPSS to determine mineral status of beef cattke, both in upland and lowland area. t-test was used to compare mineral status in upland and lowland area.

3. Results and Discussion

3.1. Composition and Mineral Content of Feed

Livestock in Jratunseluna river basin were given quite various feed, either fibrous feed like rice straw, corn straw, napier grass, *Arenga pinnata* waste, and native grass or other feed like tofu waste, wheat bran, rice bran, cassava waste, and concentrate feed (Table 1).

Table 1 showed that beef cattle in upland of Jratunseluna river basin got straw and grass as a feed with a huge portion compared to the concentrate, with the ratio of 67:33, while beef cattle in lowland of Jratunseluna river basin got concentrate much more than forage feed with forage, with the ratio of 29:71. The fibrous feed given to beef cattle appeared to be compatible with the potential of feed crops in the area, meaning that farmers used the feed crops in the form of straw given to beef cattle, as well as concentrated feed ingredients, utilizing the potential of agricultural products in each region. Tofu waste, rice bran, and *Arenga pinnata* waste often given to beef cattle in upland area, while cassava waste and rice bran as by-product of agricultural industry often given to beef cattle in lowland area. The interesting thing in lowland area of Jratunseluna river basin was the use of commercial concentrate, while in upland of Jratunseluna river basin, commercial concentrate never given to beef cattle. Concentrate feed ingredients provided were adjusted for availability in watershed area, with the exception of wheat bran. Field observations (Table 1) also showed that concentrate feed ingredients of protein source and mineral supplements were not given by farmers in both areas of Jratunseluna river basin.

Ca content in feed given to beef cattle in upland of Jratunseluna river basin for forage/fibrous feed ranged from 0.17 to 0.74%, concentrate ranged from 0.02 to 0.49%, while Ca conten of feed in lowland area for forage/fibrous feed ranged from 0.33 to 0.52%, and concentrate ranged from 0.38 to 0.49%. P content in feed in lowland area for forage/fibrous feed ranged from 0.03 to 0.07%, and concentrate ranged from 0.04 to 0.09%. P content in upland area for forage/fibrous feed ranged from 0.02 - 0.04% and in concentrate ranged from 0.02 to 0.09%. The data in Table 1 indicated that Ca content of feeds in upland were high compared to the requirement of beef cattle (napier grass, native grass, tofu waste, *Arenga pinnata* waste) and some were low (rice straw, rice bran, wheat bran). In lowland area, feedstuff with quite high Ca content were rice straw, napier grass, corn straw, cassava waste and commercial concentrate. P content in feedstuff and plants in upland and lowland areas were classified as 'border line' or low [7; 8]

Table 1. Composition and Content of Ca and P in Feed Consumed by Beef Cattle in Jratunseluna River Basin

1. Upland				2. Lowland			
3. Feed types	4. Proportion	5. Ca	6. P	7. Feed types	8. Proportion	9. Ca	10. P
11.	12. -----(%) -----			13.	14. -----(%) -----		
15. Rice straw	16. 35	17. 0.19	18. 0.02	19. Rice straw	20. 26	21. 0.33	22. 0.03
23. Napier grass	24. 30	25. 0.49	26. 0.03	27. Corn straw	28. 2	29. 0.35	30. 0.03
31. Native grass	32. 2	33. 0.74	34. 0.04	35. Napier grass	36. 1	37. 0.52	38. 0.08
39. Tofu waste	40. 3	41. 0.49	42. 0.04	43. Cassava waste	44. 8	45. 0.49	46. 0.09
47. Wheat bran	48. 7	49. 0.04	50. 0.05	51. Concentrate	52. 39	53. 0.38	54. 0.04
55. Rice bran	56. 18	57. 0.002	58. 0.09	59. Rice bran	60. 24	61. 0.02	62. 0.07
63. Arenga pinnata waste	64. 5	65. 0.37	66. 0.02	67.	68.		
69. Forage/ Concentrate ratio	70.			72.	73.		
	71. 67:33				74. 29:71		

3.2. Consumption of Nutrients (dry matter, Ca, P)

Feed given to beef cattle in upland and lowland area of Jratunselunariver basin was insufficient to meet dry matter requirement of beef cattle (Table 2).

Ca consumption of beef cattle in upland and lowland area had already met the requirement of beef cattle (Table 2). Ca consumption of beef cattle in Jratunseluna river basin area was adequate, while dry matter consumption was less, because Ca content in feedstuff was high enough. The high proportion of feedstuff provision which contains high Ca caused Ca consumption also high. Ca consumption of beef cattle in upland area was different compared to downland area (p<0.05). The difference occurred because the consumption of high Ca-containing materials in lowland area had more proportion and was derived from concentrate feed. Mean while, in upland area, it was derived from a fibrous feed (forage and straw).

P consumption of beef cattle in Jratunseluna river basin, both upland and lowland, had not met the requirement of beef cattle (Table 2). Most feedstuff given to beef cattle had a low P content, then the lack of dry matter consumption will cause P consumption did not meet the requirement of beef cattle.

3.3. Status of Ca and P in Beef Cattle’s Hair

Calcium and P content in beef cattle’s hair in Jratunseluna river basin were presented in Table 3. T-test results showed no difference in the status of the two minerals in beef cattle’s hair between upland and lowland areas of Jratunseluna river basin. Ca content in beef cattle’s hair was in marginal status if the content ranged from 0.1 to 1.85% [9] and P<200 ppm [10]. Thus, the status of Ca and P minerals of beef cattle in upland and lowland of Jratunseluna river basin areas were in defficient to marginal condition.

Ca consumption of beef cattle in both areas were sufficient, but the status of Ca in beef cattle’s hair was in marginal condition. It was suspected that available Ca in feedstuff that can be absorbed bay beef cattle was low. Stated by [5], available Ca in forages feed in tropical regions are low, ranges from 40 to 50%. Feedstuff with low P content and low consumption of P would also certainly affect low status of P mineral in beef cattle (Table 2 and Table 3). The marginal status of Ca and P minerals in

the body of beef cattle would certainly haad an effect on metabolic activity and performance of beef cattle.

Table 2. The Requirement and Consumption of Dry Matter and Mineral of Cattle in Jratunseluna River Basin

75.	76. Upland	77. Lowland
78. Average body weight, kg	79. 361.0	80. 393.1
81. Requirement:	85.	89.
82. Dry matter, kg	86. 8.95	90. 9.13
83. Calcium (Ca), g	87. 17.7	91. 19.91
84. Phosphor (P), g	88. 14.91	92. 17.67
93. Consumption:	97.	101.
94. Dry matter, kg	98. 7.73	102. 8.89
95. Calcium (Ca), g	99. 20.1 ^a	103. 26.1 ^b
96. Phosphor (P), g	100. 4.36	104. 3.60

*) The different superscript in the column above shows the differences ($p < 0,05$)

Table 3. Status of Ca and P Minerals in Beef Cattle's Hair Cattle in Jratunseluna River Basin

105.	106. Upland	107. Lowland
108. Average body weight, kg	109. 361.0	110. 393.1
111. Calcium,%	112. 0.19	114. 0.11
Phosphor, %	113. 0.02	115. 0,01

4. Conclusion

It was concluded that nutrient intake of beef cattle in Jratunseluna river basin was less and mineral status of Ca and P was in marginal condition. Beef cattle in lowland area obtained better feed quality compared to beef cattle in upland area of Jratunseluna river basin.

References

- [1] Departemen Permukiman dan Prasarana Wilayah. 2004. Proyek Induk Pengembangan Wilayah Sungai Jratunseluna. Semarang.
- [2] Jawa Tengah In Figures 2015. BPS – Statistic of Central Java Province. Semarang
- [3] Prawirodiputro, B.R. 2003. Sistem produksi hijauan pakan di lahan kering DAS Jratunseluna. JITV 8(3): 189-195.
- [4] Rosero, O.R., R.E. Tucker, G.E. Mitchell Jr. And G.T. Schelling. 1980. Mineral utilization in sheep fed spring forages of different species, maturity and nitrogen fertility. J. Anim. Sci. **50**:128.

- [5] McDowell, L.R., J.H. Conrad, G.L. Ellis, and J.K. Loosli. 1983. Mineral of Grazing Ruminants in Tropical Region. Departement of Animal Science, Center for Tropical Agriculture, University of Florida. Gainesville.
- [6] Pangestu, E. 1994. Suplementasi Mineral pada Ternak Kambing di Bagian Hulu Daerah Aliran Sungai Serang. Fakultas Pasca Sarjana. Universitas Gadjah Mada. Yogyakarta. (Thesis).
- [7] Kincaid, R. 1988. Macro Elements for Ruminant. In: D.C. Church (Ed.). The Ruminant Animal Digestive Physiology and Nutrition. A Reston Book. Prentice Hall. Englewood Cliffs. New Jersey.
- [8] Underwood, E.J. and N.F. Suttle. 1999. The Mineral Nutrition of Livestock. 3rd Edition. CABI Publishing. New York.
- [9] Puls, R. 1988. Mineral Levels in Animal Health Diagnostic Data. Published by Sherpa International. Clearbook. British Columbia. Canada.
- [10] Combs, D.K. 1987. Hair analysis as an indicator of minerals status of livestock. *J. Anim. Sci.* **65** : 1753.