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Cattle Production Performance in Semi-Intensive and Extensive Farming System from Jembrana District, Bali, Indonesia

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Abstract Farming system in Bali has a significant role for Bali cattle production. This study aim was to identify and compare production performance of Bali cattle between using semi-intensive and using extensive farming systems. The production performance was determined by Birth Weight (BW), Weaning Weight (WW), Weight Gain (WG), and Yearling Weight (YW). The research method used was a survey. Data were analyzed by applying Analysis of Variance (ANOVA) in Nested Design. The result showed that the production performance (WB, WW, WG, and YW) in extensive farming was higher than in semi-intensive farming. Weight average of male Bali cattle was higher than female Bali cattle. Based on Birth Weight (BW), weaning weight (WW), weight gain (WG) and Yearling Weight (YW), production performance of Bali cattle is not only influenced by the farming system and sex, but also by feed consumption and the environment.

Keywords Bali cattle, Farming system, Production

1. Introduction

Bali cattle *(Bos sondaicus)* is a beef cattle native from Indonesia and a domestication species from wild bull (*Bos-bibos banteng)* in 3500 BC. The domestication happens in Bali, so this cattle is called as Bali cattle [1]. Bali cattle has some excellences, such as high quality and productivity of beef; the special pattern of beef color; easily to adapt; high fertility (able to give birth every year); and good digestibility for rich fiber feed.

There are three different farming systems of Bali cattle, intensive; semi-intensive; and extensive. In the intensive farming system, farmers bring and provide water and chopped or cut grass to their Bali cattle in a paddock. It is well known as *cut and carry system*. Bali cattle of semi-intensive farming get their feed by them self from cowherd land in the morning and they are caged in the afternoon. Bali cattle of extensive farming move around freely in cowherd land, have no need extra feed, have the minimum role of farmers and are caged in emergencies time [2]. That different system will influence capability of Bali cattle production whom can be indicated by their birth weight (BW), weaning weight (WW), weight gain (WG), and yearling weight (YW). It is important to study the effect of farming systems toward Bali cattle production.

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2. Materials and Methods

2.1. Location

Bali cattle/calves sample data were gotten from Center of Superior Cattle Farming (BPTU) of Bali cattle Pulukan for semi-intensive farming and people's farming in Negara, Melaya, and Mendoyo subdistrict, Bali, Indonesia for extensive farming.

2.2. Material Research

Sample were 281 Bali cattle that consisted of newborn calves, weaning calves, and one-year calves. This study also needed minimum five years experienced cattle breeders/ farmers as respondents. Locations of the study were determined by purposive sampling to indicate developing Bali cattle farming area.

2.3. Methods

This study used survey method by taking data from calves sample as population representative in semi-intensive farming (Center of superior cattle farming (BPTU) of Bali cattle) and extensive farming (people's farming). BW, WW, WG, and YW were measured in this study to determine the production performance. BW (0 until 3 days after newborn birth) was measured by direct weighing. BW adjusted to male newborn weight by using 1.07 as factor correction [3]. Age of calves data had to be adjusted before WW and YW measurement by *Adjusted Weaning Aged* [4]:

$$Wc = \frac{W \times C}{D} \quad (1)$$

Description: Wc as estimated of calves weight in C (kg); C as age estimated of calves (days); W as calves weight in D (kg); D as weighed age of calves (days)

Daily increasing of the weight was determined by this formula [5]:

$$P = \frac{B_2 - B_1}{Weaning\ age} \quad (2)$$

Description: P as daily increasing the weight after weaning (kg/day); B_1 as weight born (kg); B_2 as weaning weight (kg).

2.4. Data Analysis

Data were analyzed variance analysis (ANOVA) with nested design by using SPSS version 21.

3. Result and Discussion

Survey result from Bali cattle farmers group respondents was showed by Table 1.

Table 1. Total of Bali cattle farmers group respondents in semi-intensive and extensive farming systems

Farming system	Cattle
Semi-intensive	792 cattle
Extensive	168 cattle

Survey showed that extensive farming system let the cattle to get their food by them self. Previous research states that in a particular season, especially after harvest season, farmers always let the cattle graze by them self, but the cattle are caged in rainy and planting season [6]. This extensive farming system farmers group respondents were developed by BPTU of Bali cattle and they play an important role in the provision of calves.

The semi-intensive farming system in BPTU of Bali cattle Pulukan, Jembrana District was a semi-intensive farming system center of Bali cattle. It was also center to evolve plant material eaten by grazing livestock (forage). Bali cattle in the semi-intensive farming system were caged in paddock and farmers supplied the food continually.

3.1. Climate

Local climate of Jembrana District is showed by Table 2.

Table 2. Average of air temperature, humidity, rainfall, and elevation in Jembrana District

Parameter	Average
Air temperature	29 – 32ºC
Humidity	77 - 88 % (2013) 78 – 86 % (2014)
Rainfall	111.0 – 337.0 mm (2013) 107.8 – 378.8 mm(2014)
Elevation	23.65 masl

Source: BMKG, (2013-2014) [7]

3.2. Feed Management

In semi-intensive farming, farmers provided unchopped grass and 50 kg concentrate in every paddock for cattle feed. The forage (grass), such as goosegrass (*Eleusine indica*), nutgrass (*Cyperus rotundus*), buffelgrass (*Cenchrus ciliaris*) dan bahiagrass (*Paspalum notatum*), were gotten from cowherd field. The concentrate consisted of corn, wheat brand, soybean meal, molasse, palm oil, essential amino acid, essential mineral, premix, and vitamin. In rain season, those forage food would be dewy and smelly, so it would be out of stock. To supply their feed in that season, farmers provided elephant grass (*Pennisetum purpureum*) or paddy straw and concentrate. In extensive farming, Bali cattle were fed grasses, legumes plants, and paddy straw by farmers. They got it from shurberry, uncultivated land, and uncultivated paddy field. Bali cattle were given feed as many as 10% of Bali cattle's body weight, or about 30 kg/individual/day that was given in morning and afternoon.

3.3. Bali Cattle Production Performace in Different Farming System

Production performance of Bali cattle is showed by Table 3.

Table 3. Bali cattle production performance in different farming system

Qualification	Farming System			
	Semi-intensive		Extensive	
	Female	Male	Female	Male
N	31	29	20	38
BW (kg)	18.19±0.28[b]	18.34±0.89[b]	17.08±1.07[a]	19.67±1.86[a]
N	31	29	12	11
WW (kg)	87.00±16.07[a]	88.51±18.27[a]	90.48±14.68[a]	98.82±14.76[a]
N	31	29	12	11
WG (kg)	0.30±0.05[a]	0.32±0.06[a]	0.35±0.07[a]	0.38±0.07[a]
N	31	29	10	10
YG (kg)	115.59±8.09[a]	129.19±8.27[b]	141.33±24.27[a]	168.42±16.89[b]

3.3.1. Birth Weight (BW)

Based on statistical analysis, male and female BW in extensive and semi-intensive farming system was not significantly different ($P < 0.01$), but male BW was heavier than female BW. Male WB in extensive farming (19.67 ± 1.86 kg) was significantly higher than in semi-intensive farming (18.34 ± 0.89 kg), but female BW in extensive farming (17.08 ± 1.07 kg) was significantly lower than in semi-intensive farming (18.19 ± 0.28 kg). It showed that sex significantly interacted with the farming system to influence cattle weight ($P < 0.01$) (Table 3).

BW of Bali cattle had a positive correlation with pregnant cattle weight, the heavier pregnant cattle, the heavier newborn cattle. Previous research state that feeding nutritious to pregnant cattle will increase newborn weight by 0.021 kg every 1 kg increasing pregnant cattle weight [8]. Based on BW result, male Bali cattle has superior genetic potential than female Bali cattle [9]. The superior weight of Bali calves criteria is about 15 – 18 kg [10].

3.3.2. Weaning Weight (WW)

Table 3 shows that Bali cattle WW based on farming system and sex was not significantly different. There is also no interaction between sex and farming system to improve their weight. Male cattle WW in extensive and semi-extensive farming system (98.82 ± 14.76 kg and 88.51 ± 18.27 kg) was heavier than female WW (90.48 ± 14.68 kg and 87.00 ± 16.07 kg). Previous study state that male and female cattle growth are not significantly different which is caused by inefficient hormone role in calves [11]. The growth of body tissue in calves is initiated by the development of the brain, central nervous system, bone, muscle, and fat when they have not yet reached puberty.

Previous research stated that growth of calves after weaning period is not longer depend on cow's (parental) milk production, but it depends on the environment factor, especially amount of forage as their food [12]. Budiarto (2014) finds that Bali cattle WW of BPTU Pulukan in 2011 is lower (90.46 kg) than now, but Bali cattle WW observation by Ashari (2013) in NTT is the lowest (85.09 ± 11.91 kg) than the others [6, 13].

3.3.3. Weight Gain (WG)

Table 3 shows that Bali cattle farming systems have significant effect to WG of Bali cattle ($P < 0,01$). Bali cattle WG in the extensive farming system (0.36 kg) was higher than in semi-intensive farming system (0.31 kg). It was possibility caused by cattle feeding in extensive farming had a better quality and was more suitable to raise cattle weight than in semi-intensive farming. Bali cattle in semi-intensive farming do not get additional feed because their feedstock is fulfilled [14]. Ashari (2013) observation shows that Bali cattle WG in NTT (0.338 ± 0,057 kg) was similar to this result, but it is higher than Bali cattle WG of extensive farming in Manokwari from Dominanto (2015) observation (0.214 ± 0.15 kg) [13, 15].

3.3.4. Yearling Weight (YW)

Table 3 shows that YW of Bali calves male in extensive and semi-intensive (168.42 ± 16.89 kg and 129.19 ± 8.27 kg) are significantly higher than YW of Bali calves female in the same farming system (141.33 ± 24.27 kg and 115.91 ± 8.09 kg) ($P < 0.01$). It means that there is an interaction between the farming system and YW ($P < 0.05$). Depison (2010) states that Bali cattle are easily adapted to their environment, so they have high productivity or high production performance [16]. Others research shows that YW of Bali calves of semi-intensive in BPTU Pulukan (113.0 kg) and NTT (male: 125.62 ± 16.56 kg; female: 103.41 ± 12.15.6 kg) are lower than this result [6, 13].

4. Conclusions

Based on Birth Weight (BW), weaning weight (WW), weight gain (WG) and Yearling Weight (YW), production performance of Bali cattle is not only influenced by the farming system and sex, but also by feed consumption and the environment.

REFERENCES

[1] Rollinson, D. H. L., 1984, Bali cattle. In: Evolution of domestic animals. I. L. Mason (Ed), Longman, New York.

[2] Mullik, M. L., and Jelantik, I. G. N., 2009, Strategi peningkatan produktivitas sapi Bali pada sistem pemeliharaan ekstensif di daerah lahan kering: pengalaman Nusa Tenggara Timur, Seminar Nasional Pengembangan Sapi Bali Berkelanjutan dalam Sistem Peternakan Rakyat, 1-15.

[3] USDA. Guidelines for unifrom beef improvement programs. Program Aid 1020. Washington DC, 1981.

[4] Mason, I. L., and Buvanendran, V., Breeding Plans for Ruminant Livestock in the Tropics, FAO, Rome, 1982.

[5] Sudrana, I. P., and Martojo, H., 1994, Pendugaan parameter genetik pada sapi Bali: bobot sapih dan bobot setahun. Scienctific Magazine, Bovine 3(10), 1-5. University of Mataram, Mataram.

[6] A. Budiarto. Analisis sumber bibit sapi bali sebagai dasar perbaikan mutu genetik di pembibitan ternak unggul sapi Bali, Dissertation, Brawijaya University, Malang, 2014.

[7] BMKG. Pelayanan jasa informasi klimatologi priode tahun 2012-2014 di Kabupaten Jembrana. Negara-Bali, 2015.

[8] Hartati, and Dikey, M. D., 2008, Hubungan bobot hidup induk saat melahirkan terhadap pertumbuhan pedet sapi PO di *Foundation Stock.* Seminaar Nasional Teknologi Peternakan dan Veterner, 111-115.

[9] E. Purwantho. Performans produksi dan reproduksi sapi Bali Di Kaki Hunung Rinjani di Pulau Lombok, Thesis, Brawijaya University, Malang, 2012.

[10] A. S. Wibowo. Manajemen pembibitan sapi Bali di Balai

Pemeliharaan Ternak Unggul Sapi Bali, Thesis, Sebelas Maret University, Surakarta, 2012.

[11] Yoga I. M, Sampurna I. P, and Suatha I. K., 2014, Pertumbuhan dimensi tinggi tubuh pedet sapi Bali. Buletin Veteriner Udayana, 6(1), 81-85.

[12] Suranjaya, I. G., Ardika, I. N., and Indrawati, R. R., 2010, Faktor-faktor yang mempengaruhi produktivitas sapi Bali di wilayah binaan proyek pembibitan dan pengembangan sapi Bali di Bali. Veterinary Scientific Magazine, 13(3), ISSN: 0853-8999.

[13] Ashari, M. Analisis performans produksi, efisiensi reproduksi dan kromosom sapi bali dan hasil persilangannya dengan sapi Simmental, Dissertation, Brawijaya University, Malang, 2013.

[14] R. F. Radiastuti. Manajemen pemeliharaan sapi Bali di Balai Pembibitan Ternak Unggul Sapi Bali Kabupaten Jembrana Provinsi Bali, Thesis, Sebelas Maret University, Surakarta, 2012.

[15] Dominanto, G. P., Nasich, M., and Wahyuningsih, S., 2016, Evaluating performance of crossbreed calves in Manokwari, West Papua, Indonesia, Research in Zoology, 6(1), 1-7, doi: 10.5923/j.zoology.20160601.01.

[16] Depison, 2010, Performans anak hasil persilangan induk sapi bali dengan beberapa bangsa pejantan di Kabupaten Batanghari Provinsi Jambi (Bali calf performance hybrid with some of the Bulls in Batangharu District, Jambi Province), Agripet, 10(1), 37-41.