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https://doi.org/10.5109/4629

出版情報：九州大学大学院農学研究院紀要. 50 (1), pp.125-128, 2005-02-01. Faculty of Agriculture, Kyushu University
バージョン：
権利関係：

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J. Fac. Agr., Kyushu Univ., **50** (1), 125–128 (2005)

Performance of Male Bali Cattle Raised in the Marginal Land with Three Strata Forage System in Different Seasons

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(*Received October 30, 2004 and accepted November 11, 2004*)

This study was conducted to evaluate the performance of male Bali Cattle raised in marginal land planted with three strata forage system (TSFS) in different seasons. A–3.2 ha of marginal land was divided into eight plots (each plot was 40 m × 100 m), then four plots were planted with the TSFS and other four plots were planted with native grasses (Control: C). Eight head of male Bali cattle (average body weight 150 kg) grazed continuously in the experimental land (1 cattle/plot). The experiment was carried out for three consecutive years (1992–1995). Dry matter intake (*DMI*), average daily gain (*ADG*), efficiency of feed intake (*EFI*), and rumen NH_3 (*R*–NH_3) of the cattle grazing in the TSFS land were 6.292 kg/head/day, 0.365 kg/head/day, 18.508%, and 25.670 mg/100 ml, respectively. *DMI*, *ADG*, *EFI* and *R*–NH_3 for the C were 3.950 kg/head/day, 0.170 kg/head/day, 23.825%, and 19.025 mg/100 ml, respectively. Comparing between wet and dry seasons showed 5.533 versus 4.708 kg/head/day for *DMI*, 0.288 versus 0.247 kg/head/day for *ADG* and 19.348 versus 23.985% for *EFI*, but *R*–NH_3 was not different (22.162 versus 22.533 mg/100 ml). In conclusion, the performance of Bali male cattle grazing in the marginal land with TSFS system was better than that of cattle raised in the land of native grasses.

INTRODUCTION

Most Bali cattle, the original cattle in Indonesia, are raised traditionally by the farmers using the main feed source of natural grasses and agricultural by–products. In South Sulawesi, 95% of these cattle were raised in the village area (Katoe, 1984). In recent years, the productivity of Bali Cattle has tended to decrease. This is closely related to the availability of forages. The number and the area of the grazing land, the main forage source for the cattle, have continued to decrease due to the increment of land utilization by other fields, such as plantation, industry and so on.

As optimized utilization of the critical/marginal land, the alternative is to plant the marginal/critical land area with three strata forage system (TSFS). The TSFS reduces soil erosion, increases soil fertility and soil organic matter, and improves physical structure of the soil organic matter, and improves physical structure of the soil (Nitis *et al.*, 1989). Also it helps soil recovery, prevents soil destruction and fertility of the soil

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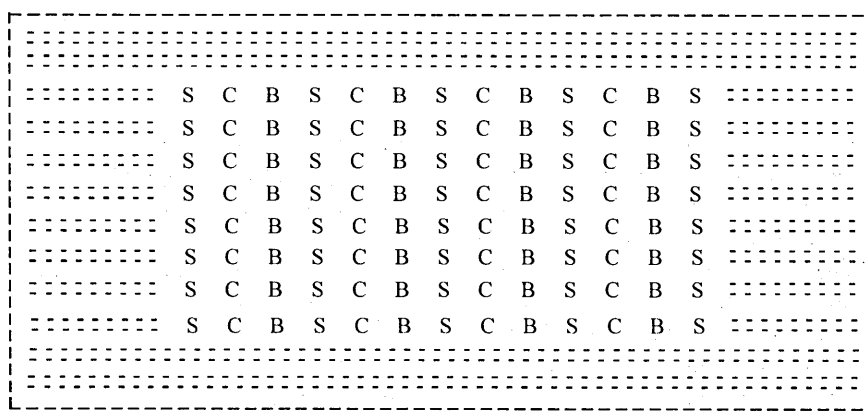
(Soerodjotanojo, 1983; Seta, 1987). In addition, the TSFS makes the forage, in both quantity and quality, available along the year.

The purpose of this study was to evaluate the performance of male Bali Cattle grazing in the marginal land planted with the TSFS in different seasons.

MATERIALS AND METHODS

This research was conducted on a 3.2 ha marginal land. The land was divided into four blocks, then each block was divided into two units, each unit was 40 m × 100 m. Then, one unit in each block was planted with animal feed plants with the TSFS and the other was planted with native grasses (Control: C), therefore, the total of experimental units were 8, four unit for the TSFS and four unit for the C, respectively. The TSFS was arranged as follows. The outset of the unit was planted with fodder trees, *Leucaena leucocephala* and *Gliricidia maculata*, with 0.5 m spacing between those two plants for stratum 3. The inner zone of the unit, five meters from the fodder trees, was planted with buffelgrass (*Cenchrus ciliaris*) and siratro (*Macroptilium atropurpureum*) for stratum 2, and the center of the unit was planted with setaria (*Setaria sphacelata*) and centro (*Centrosema pubescens*) for stratum 1 (Fig. 1).

This research was conducted for three years, and each year was divided into periods, namely the period of dry season and that of wet season. The total of experimental periods were six (P1, P2, P3, P4, P5 and P6). One year following planting of the TSFS, 8 head of male Bali cattle, average body weight 150 kg, grazed on the experimental land (1 cattle/unit). Water was always available at the experimental land, while minerals for



------ Tree legumes (*Leucaena leucocephala* and *Gliricidia maculata*)

- - - - - - - Siratro (*Macroptilium atropurpureum*)

B: Buffelgrass (*Cenchrus ciliaris*)

S: Setaria (*Setaria sphacelata*)

C: Centro (*Centrosema pubescens*)

Fig. 1. A scheme of three strata forage system in each unit of the experimental marginal land.

cattle were supplemented when needed.

The experiment was carried out according to the split plot design. The main plots were the TSFS and the C, and the sub plots were growing periods (P1, P2, P3, P4, P5 and P6). Parameters measured in this experiment were dry matter intake (*DMI*), average daily gain (*ADG*), efficiency of feed intake (*EFI*), and rumen NH_3 (R–NH_3).

The feed intake (*FI*) of grazing animals was determined according to 't Mannetje (1978) and Reksohadiprodjo (1985). *ADG* and *EFI* were calculated as follows.

$$ADG\ (\text{kg/day}) = \frac{\text{Final weight (kg)} - \text{Initial weight (kg)}}{160\ \text{days}}$$

$$EFI\ (\%) = \frac{FI\ (\text{kg})}{ADG\ (\text{kg})} \times 100$$

The GLM procedures of SAS (1985) was used to analyze the experimental data.

RESULTS AND DISCUSSION

Table 1 shows the performances data of the cattle. The analysis of statistics showed

Table 1. Dry matter intake (*DMI*), average daily gain (*ADG*), efficiency of feed intake (*EFI*), and rumen NH_3 (R–NH_3) of the Bali male cattle grazing in the land of three strata forage system (TSFS) and in the land of native grasses (C).

Parameters	Treatments	Periods						
		P1	P2	P3	P4	P5	P6	Mean
DMI (kg/head/day)	TSFS	6.34	3.92	7.28	5.73	7.08	7.40	6.292a
	C	3.60	3.46	3.93	3.47	4.97	4.27	3.950b
			Mean of P1, P3 and P5 5.533a					
			Mean of P2, P4 and P6 4.708b					
ADG (kg/head/day)	TSFS	0.41	0.39	0.40	0.20	0.45	0.34	0.365a
	C	0.18	0.18	0.18	0.21	0.11	0.16	0.170b
			Mean of P1, P3 and P5 0.288a					
			Mean of P2, P4 and P6 0.247b					
EFI (%)	TSFS	15.46	10.05	18.20	28.65	16.93	21.76	18.508a
	C	20.00	19.22	21.83	31.54	23.67	26.69	23.825b
			Mean of P1, P3 and P5 19.348a					
			Mean of P2, P4 and P6 22.985b					
Rumen–NH_3 (mg/100ml)	TSFS	20.14	15.99	25.31	27.09	35.89	29.60	25.670a
	C	13.18	13.18	13.20	22.74	25.25	26.60	19.025b
			Mean of P1, P3 and P5 22.162a					
			Mean of P2, P4 and P6 22.533a					

P1, P3, P5: Periods of wet season.
P2, P4, P6: Periods of dry season.
a, b: Means with different superscripts in the same column for each parameter were significantly different ($P<0.05$).

that *DMI* (kg/head/day), *ADG* (kg/head/day), *EFI* (%) and *R*–NH_3 (mg/100 ml) of the cattle grazing in the TSFS were higher or improved than those of cattle grazing in the C, namely 6.380 versus 3.950 for *DMI*, 0.365 versus 0.170 for *ADG*, 18.508 versus 23.825 for *EFI*, and 25.670 versus 19.025 for *R*–NH_3, respectively.

The improved performance of the cattle raised in the TSFS land was highly related to the better condition of vegetation in the TSFS compared with the C. In addition, forages in the TSFS was a mixed planting of grasses and legumes, therefore, the quality of diets originated from the TSFS land was higher than that from the C. As a consequence, a better performance was shown by the cattle in the TSFS than the cattle in the C.

Analysis also indicated that the performance of cattle in the wet season was better than that of cattle in the dry season; 5.625 versus 4.705 for *DMI* (kg/head/day), 0.305 versus 0.230 for *ADG* (kg/head/day), 19.348 versus 22.985 for *EFI* (%), however, *R*–NH_3 was not different between the TSFS and the C. This phenomenon could be understood because the growth of forages was better in the wet season than in the dry season, resulting in that more amounts of feed with higher quality were available in the wet season compared with the dry season.

In general *ADG* of Bali cattle in the wet season was higher than that in the dry season, but *ADG* of the cattle in the TSFS in dry season was still higher than that in the C in the wet season. This indicates that the TSFS can maintain the availability of forages in both quality and quantity along the year.

CONCLUSIONS

The performance of the Bali male cattle grazing in the TSFS land was higher than that of the cattle raised in the C land not only in the wet season but also in the dry season.

ACKNOWLEDGEMENTS

The author would like to thank the DP4M Depdikbud for funding this research through Hibah Bersaing Project I.

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