STRATEGIES TO IMPROVE BEEF CATTLE PRODUCTIVITY IN NUSA TENGGARA REGION, INDONESIA

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ABSTRACT

Despite its low rainfall (1,000 - 1,500 mm/year) and its long dry season (7-9 months/year) in most parts of the region, Nusa Tenggara is an important cattle production area in Indonesia. Most cattle are raised in an extensive grazing system. Bali cattle account for 85 % of the cattle population on the islands of Timor, Flores, Sumbawa and Lombok, while Sumba is recognized for its pure breed of Ongole cattle. In general, cattle productivity relies largely on the native grassland that subjects to fluctuation due to seasonal changes. During the wet season, cattle can grow at 0.25-0.50 kg/day, while during the dry season the animals can lose as much as 20 % of their live weight due to low quality and low pasture intakes. Some research results showed that Bali cattle had a quite high calving rate, varied from 55 to 85 % per year. Improving the productivity of cattle in Nusa Tenggara region can be achieved by solving the major constraints such as feed availability for both productive and survival measures. This is particularly true to overcome high juvenile mortalities that range from 20 to 45 % per year. Another important factor to be improved is the management practice, which includes strategic feeding for the critical groups of the herds, bull provision, culling unproductive beasts, diseases control and improved raising system to semi-intensive ways, seem to be promising steps to the optimal production. Some of these efforts are briefly described in this paper.

Key words: Nusa Tenggara, Beef cattle, Management, Nutrition, Calving rate, Juvenile mortality, Productivity

INTRODUCTION

Long dry season (7-9 months/year) and low rainfall 1,500 mm/year in most parts of the region characterize the climatic condition of Nusa Tenggara region. About 67 % of the land are classified as land type IV -VI which are suitable for raising livestock on communal grazing land. Nusa Tenggara Timur (NTT) province is an important area for livestock production. Most of the cattle are raised under the extensive grazing system with minimal inputs, resulting low productivity. However, few farmers, have been practicing a semi-intensive system especially in the fattening program based on tree legume forage.

Cattle ownership in NTT is about 2.4 head per household, which are owned by 59% of the total house hold (Tjaong Soka, 1991). A few larger herds owned by the headmen of villages, usually managed by family members (Malessy and Tolihere, 1991). In NTT, livestock is a major component of the farmers' income, contributing some 12 % to the region's income, in which cattle production contributing 40 % of the agriculture sector (Bamualim *et al*, 1991). Before 1990, NTT supplied almost 20% of the demand for slaughter cattle in Jakarta (i.e. about 75.000 head per year) with an addition of some 15.000 breeders were exported annually to other islands. However, the contribution tended to be decreased recently due to the steady cattle production in the last 15 years.

Bali cattle account for 85 % of the total cattle population in NTT, whereas Ongole cattle are raised as a pure breed in Sumba Island. The major advantage claimed for Bali cattle are their outstanding ability to thrive and to conceive under the adverse nutritional

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condition (Copland 1974; Wirdahayati and Bamualim 1990). Bali cattle possess some extremely useful production characteristics i.e. (i) adequate calving rates, varied from 55 to 85 % per year (Devendra *et al*, 1973; Copland 1974; Kirby 1979; Banks 1986; Wirdahayati and Bamualim 1990; Wirdahayati 1994), and (ii) high percentage carcass yield with an average dressing percentages of 51-53 % (Masudana, 1990; Kirby, 1979).

Breeding cows, particularly Bali cows, with the unique pattern of calving, facing severe survival problem both in cows and the newborn calves. Naturally, the peak of calving season for Bali cattle in NTT coincided with the worst season and poorest nutritional condition. The peak of calving season occurred from early to mid dry season. About 41 % of the calf drops occurred from the beginning of April to the end of June, and another 40 % occurred from July to the end of September (Banks, 1986; Wirdahayati and Bamualim, 1990; Wirdahayati, 1994). This phenomenon significantly reducing the condition of cows, particularly during the post-partum period, which lead to the delaying of the onset of post-partum oestrus, prolong the inter-calving interval, hampering the calf survival and the growth of weaner. On the other hand, the local cattle productivity should be significant increased in order to meet the demand for national beef consumption.

At national level, to meet the demand for meat production is crucial. By year 2003, it is estimated that Indonesia will have a shortfall of 346,900 MT of beef (DGLS Statistics, 1997) which is equivalent to 2 million heads of slaughter cattle. The domestic meat production facing boosting demand for meat supply, particularly during the economic crisis, as the nation is not able to import the beef or meat from overseas for some time in the future. Therefore, there is an urgent need to increase domestic beef productivity particularly in the eastern part of Indonesia, the traditionally livestock area for the other parts of the country. The opportunity for improving beef productivity can be obtained through the improvement of management and feeding strategies under the semi-arid and harsh environment condition.

It is necessary to promote ways of introducing tree legumes as a protein source for cattle feed as they are able to strive in harsh environment such as in semi-arid Nusa Tenggara. Therefore, the ACIAR Project has initiated to study the strategies to improve the efficiency of beef cattle production through the improved management and feeding strategies particularly during three month post partum to improve cow condition. The main objective of this study is to develop appropriate feeding practice and management strategies for the lactating Bali and Ongole cows in NTT, during the first three month of post-partum. It is expected that through the improvement of cow condition, milk yield will be increased hence the calf survival and growth rate. Consequently, it will also enhance the reproductive activity of post-partum, shorten the inter-calving interval and increase calf crop per year.

MATERIALS AND METHODS

Duration and Location

The study was conducted for three year period, started from June 1995 until June 1998, conducted at the site of Lili Research Installation (IPPTP-Lili), Kupang, West Timor. This site is located at 100 m above sea level with an average daily temperature range from 23-33^{0}C and annual rainfall of 1,000 - 1,500 mm/year.

Study Design

Animals and facilities

A number of Bali cows and Ongole cows were provided by the IPPTP Lili and cooperative farmers, while another 16 Ongole cows were taken on loan by the project from the DGLS herd at Kabaru, East Sumba. Two Bali and Ongole bulls were provided all the time for mating purposes. A number of facilities and materials were provided for these trials such as: animal housing with individual stalls for surge feeding and calf separators. The lay out of the animal during the trial is shown in Table 1.

Table 1. The number of cows (head) used for the trial during 1995-1997 at Lili, Kupang

Breed	1995		1996		1997	
	SF*	C*	SF	C	SF	C
Bali	11	12	12	15	7	8
Ongole	5	4	5	4	5	6

*SF = surge feeding; C = control

Feed and Feeding

The existing and new established tree legumes (2 ha) at IPPTP Lili and BPTP Naibonat were provided for cut and carry feeding. However, the main supplies for mixed legumes during the trials were purchased from the surrounding area. Native grasses were available during the wet season, while during the dry season animals were fed with rice straw and putak (palm pith) to replace native grasses.

Bali cows. The Bali cows with two bulls' graze in a common area during the day and kept in the yard at night as is practised in NTT. The feed offered to the groups as follows:

a. Basal diets (control group)

- 10 kg native grasses during the wet season (Jan - April). During late dry season (Oct - Dec, 1996 and May - June, 1997 10 kg King grass was offered to replace native grasses.
- 1 kg mix legumes was given to meet the maintenance requirement
- During the dry season (May-Sept, 1996 and from June 1997 - Jan, 1998), the ration was adjusted to the feed available at the time by offering 3 kg fresh rice straw and 5 kg fresh 'putak' (palm pith) to replace 10 kg native grasses.

b. Surge feeding diets

- 5 kg mixed legumes (represent 30 % of the total diet) with the composition of 40:40:20 of *Gliricidia sepium* (gamal) : *Sesbania grandiflora* (turi) : *Leucaena leucocephala* (lamtoro) were given to the cow in the surge feeding group(January to March in 1996).
- Due to the short of leucaena availability, the mixture were then modified to 50:50 for gamal and turi from April to July 1996.
- The mixture were then again changed to turi (Sesbania sp) alone from July to January.
- The modification of the type of diets were undertaken due to: i) the seasonal supply of particular legumes, and ii) declining in herd condition during the severe nutritional stress during 1996 dry season.

For both diets, calves had access to their dams continuously during the first seven days postpartum. Thereafter, they were separated from their dams and allowed to suckle twice a day, until they were weaned at 84 days of age. Then, the weaned calves were grouped as the supplemented and control groups according the group type of their dam. Both groups were allowed to free grazing during the day and given an extra feeding in their pen during the night. The supplemented calves received 2 kg natives grasses, 2 kg tree legumes mixture and 1 kg putak per day, while the control group received only 2 kg native grasses, 1 kg tree legumes mixture and 1 kg putak per day.

Ongole cows. In contrast to the Bali cows, which were grazed during the day and penned at night, the Ongole cows and the Ongole bulls were confined at all time. The exception was during the mating period, when they were released into an adjacent small yard.

The Ongole cows were also grouped as the "Surge feeding" and "Control" groups. The type of feed offered was similar to the feed offered to Bali cows, but the amount of feed and supplements offered were much higher than Bali due to the bigger size of the Ongole.

a. Basal diets (control group)

- 15 kg native grasses during the wet season (Jan - April). During late dry

season (Oct - Dec, 1996 and May - June, 1997. 10 kg King grass was offered to replace native grasses.
- 2.5 kg mix legumes was also given to meet the maintenance requirement
- During the dry season (May-Sept, 1996 and June 1997 - Jan, 1998), the ration was adjusted to the feed available at the time by offering 3 kg fresh rice straw and 5 kg fresh 'putak' (palm pith) to replace 10 kg native grasses in 1995. In 1996 and in 1997 trials the amount of rice straw and putak offered to the Ongole cows were increased to 7.5 kg and 6 kg respectively.

b. Surge feeding diets
- The surge feeding group received 7.5 kg (5 kg more than the control group) mixed legumes (represent 30 % of the total diet) with similar composition and condition of feeding as in Bali cows were applied to the Ongole cows. However, in 1997 trial, the composition of the feed offered was adjusted to meet the requirements of the animals.
- For Ongole calves, the advantage received by the "surge feeding" group was only an extra amount of 1 kg tree legumes mixture added to the basal diet of the both groups which contained 2.5 kg native grasses, 1.5 kg tree legumes mixture and 1 kg putak. However, in 1998 trial, the composition of the feed offered was adjusted to meet the requirements of the animals.

Measurement, recording and data analyses.

The measurement, recording and data analyses for this experiment included:
1. Cows and calves were weighed every 14 days.
2. Milk production of each cow were estimated fortnightly by weigh- suckle - weigh method.
3. Dry matter (DM), crude protein (CP) and metabolized energy (ME) of feed given to

Table 2. The dry matter (DM), crude protein (CP) and metabolism energy (ME) intakes of the surge feeding (SF) and control (C) groups of the Bali and Ongole cattle during the trial at Lili in 1995 - 1997.

Parameter	Surge feeding			Control		
	1995	1996	1997	1995	1996	1997
Bali cows:						
DM (kg/hd/d)	5.76"1.5	4.35±0.75	4.8"0.8	4.04*	3.1±0.3^{ns}	3.25*
ME (MJ/hd/d)	41"6.5	50±10.4	34.6"4.2	28.5"5.3*	22.2±6.3*	24.9*
CP (g/hd/d)	636"52	459±11	408"34	268"17*	292±36*	356"15*
Bali weaners:						
DM wnrs (kg/hd/d)	1.63	134	0.7	1.38 ns	1.07ns	0.79 ns
CP wnrs (g/h/d)	241	175	150.6	229 ns	133*	153.7 ns
ME wnrs (MJ/hd/d)	28.8	29.5	24.0	23.0 ns	16.4*	28.01*
Ongole cows:						
DM int.(kg/hd/d)	-	9.66	9.64±0.3	-	7.66	7.6 ± 1
ME int. (MJ/hd/d)		59.8	60.9±5.6		47.4	48±3.9
CP int. (g/hd/d)	-	-	931±111	-	-	652±126
Ongole weaners:						
DM wnrs (kg/hd/d)	-	-	1.93	-	-	1.6*
CP wnrs (g/hd/d)	-	-	216	-	-	119*
ME (MJ/hd/d)	-	-	14.4	-	-	8*

Table 3. The overall performance and nutrient intakes of Bali and Ongole cows.

Parameter	Bali			Ongole		
	SF	C	Signif.	SF	C	Signif.
Cows						
Calving wt (kg/head)	197.7	191.3	ns	268	259	ns
Condition	2.45	2.4	ns	2.9	2.4	ns
Wt at 3 mo after calving (kg/head)	190.7	181.7	ns	266	221	ns
Milk yield (litre/day)	2.79	2.2	ns	2.9	2.4	ns
DM intake (kg/hd/d)	4.97	3.46	*	9.65	7.63	**
CP intake (g/hd/d)	501	305	*	931	652	*
ME intake (MJ/d)	42	25.2	*	60	47.7	*
Calves						
Birth weight (kg)	11.96	11.93	Ns	21.8	20	ns <.06)
Growth 0-84days (g/hd/d)	191.7	140.3	ns	364	256	*
Weight at 84 days (kg/hd)	32.2	27.1	ns	57.5	40.7	ns
Growth 84-164 days (g/hd/d)	319	188	ns	211	160	ns
Weight at 164 days (kg/hd)	54.3	41	ns	75	58.6	ns
ICI (days)	433	479± 86	Ns	521	667±86	ns
Conception after calving (days)	154±88	201	ns	241	387	ns

the animals calculated based on laboratory analysis.

4. All means for ash parameter was analysed using the ANOVA.

RESULTS

Nutrient intakes

The nutrient intakes of the cattle during the trial were presented in the Table 2. Data in Table 2 showed that there were some missing data for Ongole cattle in 1995 and 1996 due to the late arrival of the cattle from Sumba to join the research at Lili-Kupang. The Ongole cattle started to join the experiment in 1996 or one-year after the Bali cattle (1995).

Productivity

The overall means of Bali and Ongole cattle productivity during the trial were shown in Table 3. Data in Table 3 shows the bodyweights of the cows, milk yield and calf growth from calving to 84 days and the weight of calves from 84 to 168 days of age. It also shows the dry matter (DM), crude protein (CP) and metabolizable energy (ME) intakes of Bali and Ongole cows and calves.

DISCUSSION

Bodyweight of the cows

The effects of the surge feeding on the overall performance of the Bali and Ongole breeds during the trials were presented in Table 3. The advantages of the surge feeding cows over the control cows were evidence in their productive performance. The mean bodyweight of the surge feeding cows during lactating, particularly at three months post calving, both in Bali and Ongole cows were higher than the mean bodyweights of the control cows (190.7 kg vs 181.7 kg for Bali cows and 266 kg vs 221 kg for Ongole cows). However, the differences failed to be significant probably due to the number of samples used in this trial were not large enough, and the data were only based on three observation (three calving records).

Milk yield during the first 3 month of lactation

In Bali cows, the milk yield of the surge feeding group was higher 0.6 litre/day than the control group (2.8 vs. 2.2 litre/day), whereas for the Ongole cows was higher 0.5 litre/day (2.9 vs. 2.4 litre/day). However the difference was not significant. Nevertheless,

the milk yield recorded in this study was higher than the data from the similar study reported by Wirdahayati (1994), who recorded the milk yield in Bali cows during the first six months post calving of only 1.2 litre/day in the supplemented cows and 0.8 litre/day in the control group. However, the milk yield in this study tended to be insufficient for calf growth before weaning, as indicated by the lower growth performed by both Bali and Ongole calves in this trials compared to the reports on growths of Bali and Ongole cattle raised in semi-intensive system (Wirdahayati, 1994).

Calf performance from birth to weaning at 84 days

The growth of the surge feeding calves before weaning at 84 days were also at advantage over the control calves. The means of growth of the surge feeding and the control in Bali calves were 192 and 140 g/d respectively, whereas the Ongole calves grew at 364 and 256 g/d for respective groups. The mean of the calf growth recorded in this trials were lower compared to the average daily gains reported for the Bali calves in CHAPS survey conducted on 11 locations in Nusa Tenggara area (Wirdahayati 1994). It was reported in the survey that the average daily gains of Bali calves at the 1.5-5 months of age ranged from 223 to 246 g/d, while the average daily gains in the Ongole calves ranged from 295 to 438 g/d. Therefore lactating cows in this trial needed higher feed requirement in order to raised their calves with better growth.

Calf bodyweight from 84 to 168 days of age

The means of the growth from weaning (84 day) to 168 days of age were 319 vs. 188 g/d for the surge feeding and the control of Bali calves and 211 vs. 160 g/d for Ongole calves respectively. Data of the average daily gains for calves in this report were lower than the data from the similar study reported by Wirdahayati (1994) mentioned in section 4.3.

Inter-calving interval (ICI)

The main finding of this study showing that the surge feeding given to the lactating cows from calving to 84 days post calving was effective in reducing the inter-calving intervals (ICI). The ICI in the Bali cows that received the surge feeding was reduced by 44 days compared to those without surge feeding (433 vs 479 days). Reducing ICI in the Ongole cows was more pronounced showing 146 days earlier than the mean of the ICI of the control group. This result indicated the potential of the surge feeding during the first three month of lactation to increase the calf crop. This has been the great expectation, as the main concern for the low Ongole reproductive rate reported so far. However, it also failed to show significant different as the number of sample were not large enough as well as limited recording on three observations only.

CONCLUSION

a. The results indicated that the surge feeding treatment improved: cows bodyweight, milk yield, calf growths before and after weaning, and Intercalving-interval.
b. The surge feeding was more effective in reducing the ICI in Ongole cows (521 vs. 667 days) than in Bali cows (433 vs. 479 days), hence produces more calves. Surge feeding shortened the interval from calving to cenception for 47 days in Bali cows and 146 days in the Ongole cows.
c. The research shows that the time of calving played significant influence on the bodyweight change of the dams and the milk production. Therefore it influences the survival both cows and calves. Higher mortality was recorded in the late born calves in 1995.

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