APPLICATION OF SURGE FEEDING FOR IMPROVING THE *POSTPARTUM ANOESTRUS* OF PERANAKAN ONGOLE COWS CALVED IN RAINY SEASON IN DRY LAND OF EAST JAVA

M. Ali Yusran[1], Teguh Purwanto[1], Bambang Suryanto[1], M. Sabrani[2], M. Winugroho[2] and E. Teleni[3]

ABSTRACT

Under village condition, long calving interval is often reported and this is related to prolonged *postpartum anoestrus* (PPA) interval. Surge feeding as a strategic supplementation was applied to shorten the PPA interval of Peranakan Ongole (PO) cows calved in rainy season in dry land areas. Surge feeding is defined as supplementation of legumes mixture (Gliricidia, Calliandra, and Leucena) given to cows (30% of dry matter intake) during the first 2 months *postpartum* (*pp*). In upland areas (Malang), 43 cows were subjected to the treated and 41 cows were used as control, while in low land areas (Probolinggo) 53 cows were treated and 47 cows were as the control animals. Overall, compared to the control, intake of crude protein (CP) was higher when cows were subjected to Surge feeding hence lower live weight (LW) loss after giving birth (3-4% vs. 6-7% LW during the first 2 months *pp*.). Surge feeding *pp* with shrub/tree legumes shortened PPA interval from 106 days down to 55 days (upland) and from 115 days down to 83 days (lowland). It is suggested that Surge feeding should be useful. Farmers' perception of surge feeding *pp* in rainy season were good; But, this program can be applied as long as supported by sustainable shrub/tree legumes establishment program and a cooperativeness amongst farmers for sharing legume leaves production could be created.

Key words: PO cows, *Postpartum anoestrus*, Surge feeding, Shrub/tree legumes, Rainy season

INTRODUCTION

Under smallholder farms condition in East Java, especially in dry land agricultural regions, the lack of crude protein (CP) in the ration of lactating beef breeder cows belong to farmers also occur during rainy season. Crude protein supply to them only around 60% of CP required in the period (Yusran *et al.*, 1998).

Such condition was an important contributor to prolonged *postpartum* anoestrous (PPA) interval of the cows (Church, 1979; Mukasa-Murgewa, 1989). Then, Yusran *et al.* (1998) reported that average of PPA interval of PO cows under smallholder farms condition in dry and agricultural regions in East Java were 104.14±46.43 days and 107.05 29.05 days in upland altitude areas and in lowland altitude areas, respectively.

Surge feeding *postpartum* (*pp*) with shrub/tree legumes as a strategic supplementation should be applied for solving the problem of lack of CP in lactating cows' ration under smallholder farms condition. Cows usually lost weight after calving, but weight lose should be minimized through good feeding to allow them to start cycling again as soon as possible (Mukasa-Murgewa, 1989).

This study was conducted to evaluate application a surge feeding *pp* with shrub/tree legumes (*Gliricidia sepium, Leucaena leucocephala*, and *Calliandra calothyrsus*) for improving PPA interval of PO cows under smallholder farms condition, from more than

[1] IPPTP - Grati, Pasuruan, Indonesia
[2] BPT - Ciawi, Bogor, Indonesia
[3] JCU, Townsville, Australia

100 days to become less than 60 days without restricted suckling.

MATERIALS AND METHODS

Location

On Farm Research method was applied in this study, and it was carried out in selected village research sites which are located in dry land agricultural regions in East Java, either situated in upland altitude areas (600 - 700 m asl.) or in lowland altitude areas (± 4 m asl.).

In each altitude areas were consist of two village research sites; one to act the control village/ control group, either as respondent farmers or their cows as cow samples, and the other to receive the surge feeding treatment (treatment village).

Dadapan village Kecamatan Wajak - Malang has been selected to the treatment village in upland areas, while Patokpicis village in the same kecamatan was selected as the control village. As representative village for the treatment village in lowland areas was Tanjungrejo village Kecamatan Tongas - Probolinggo, and control village was Klampok village in the same kecamatan.

Study Design

The proposed study design, number of cow samples, and number of farmer respondents as the cow owners in this study are illustrated and presented in Table 1.

Procedures

Breed of the cows in this study was Ongole crosses / Peranakan Ongole (PO). Farmers' cows calved on early to middle of rainy season in 1996/1997 in the village research sites were used as cow samples in this study.

In the treatment villages, the selected cow samples received surge feeding treatment for the first 60 days *pp* or until the first behavioral estrus *pp*. The procedures of feed offering in the surge feeding treatment can be shown in Table 2. While in the control villages, the selected cow samples were fed in accordance with habitual daily feed that are conducted by farmer owner (traditionally feed).

Percentage of DM weight of Gliricidia, Leucaena, and Calliandra in the ration (DM basis), respectively, is 60%, 20%, and 20% of DMI of the supplementation (Table 2). The ration as shown in Table 2 are estimated that their Crude Protein (CP) content are 14% (DM basis) or 110 - 115% of recommended CP intake (NRC, 1978 adopted by Church, 1979).

Measurements and Recordings

Cow samples were recorded on:

1. Live weights and body condition (BC) scores monthly during 8 weeks after calving *postpartum*).
2. Occurrence of *oestrus* (the first *postpartum oestrus*) was determined through visual observation daily by farmer and *Ketua kelompok*.

Feed supply and intake were recorded twice weekly for 8 weeks.

Data Analysis

Data were analyzed with description analysis and variance analysis of nested classification.

Table 1. The proposed study design, number of cows samples and of farmer respondents

Altitude Treatment Village	Upland areas		Lowland areas	
	Surge feeding	Control	Surge feeding	Control
	Dadapan	Patokpicis	Tanjungrejo	Klampok
No. cows (heads)	43	41	53	47
No.house-holds (farmers)	41	39	45	36

Table 2. Basal diet and the legume supplementation rate in the surge feeding treatment

Main material of basal diet	DMI ration		% of DMI ration	
	(% LW)	(%)	Basal diet	Supplemented with the shrub/tree legumes*
Elephant grass / Roadside grass	2.5	100	70	30

LW= liveweight, DMI= dry matter intake, *= Gliricidea, Leucaena, and Calliandra

RESULTS AND DISCUSSION

General Description of Selected Village Sites.

Village selection was carried out based on available secondary data on altitude, agroclimate, agroecosystem, the availability of beef breeder cows. The details of the villages selected either as treatment village or control villages are shown in Tables 3.

The villages selected in this study included in dry land crops region, hence all of these villages have dry land agricultural area were more than 75% of agricultural areas on the whole.

Breed of cattle in all of the villages is Ongole Crosses or Peranakan Ongole (PO). It is consistent with the data showed that within the island of Java, approximately 67% of cattle are located in the eastern province. Of this, well over 72% are Ongole Crosses (Komarudin-Ma'sum and Teleni, 1991).

The range of size of cattle enterprises is similar in five selected villages, the mode being 1 to 2 cows per rearer, as shown in Table 3. These data supported an assertion

Table 3. The details of villages selected as treatment village and as control village

	Treatment villages		Control villages	
	Dadapan	Patokpicis	Tanjungrejo	Klampok
Altitude (approximate asl.)	600	4	600	4
Agroclimate				
– Annual rainfall (mm)	2000	1150	2000	1150
– Number of consecutive dry months per year	6	7	6	7
– Month dry months	May-Oct	May-Nov	May-Oct	May-Nov
Agroecosystem				
– Ricefield (ha)	77	40	55	75
– Dry land (ha) (%)	264 (75%)	218 (84%)	448 (89%)	235 (76%)
Cattle reared				
– Breed	PO	PO	PO	PO
– Density*	1.9	2.9	1.7	2.3
Size of cattle enterprises				
– No. rearers surveyed (men)	70	60	53	66
– 1 cow unit (% of them)	82	62	71	68
– 2 cow units (% of them)	14	33	25	29
– 3 cow units (% of them)	4	5	4	8
– > 3 cow units (% of them)	-	-	-	1
– Overall average (CU/rearer)	1.2	1.4	1.3	1.4

Ratio between number of cattle and total area of agriculture (ricefield + dry land).

that beef produced in East Java comes largely from smallholder farms.

Composition of Feedstuff and Nutrients Intake

Dry mater intake/supply, CP percentage and the composition of feedstuff supplied to the cows with and without surge feeding in this study are presented in Table 4. There was no significant difference in DM intake/ supply percentage DM intake/ supply of live weight between surge feeding cows and control cows in both altitudes. While CP content in rations of surge feeding cows is higher significantly (P<.05) than those of control cows in both altitudes. This higher CP in rations is due to existence of the shrub/tree legumes in the ration of surge feeding cows (20 to 29 percent).

Crude protein content in the rations of surge feeding cows is about 12 percent; It is higher than critical limit of CP content in a ration, i.e. 7-8 percent (Thahar and Mahyuddin, 1993). But, that is still lower than CP content expected, namely 14 percent (NRC, 1978 adopted by Church, 1979). This lower CP is due to percentage of weight of the shrub/tree legumes less than 30 percent. Inaccuracy of implementation of surge feeding practice in the field, especially about the legumes weighting, was the main causal factor to the percentage weight of the shrub/tree legumes lower than recommended.

Such occurrence is one of constraints of surge feeding application under smallholder farms in dry land regions of East Java. Besides that, the farmers did not be able to offer basal diet to their lactating cows that consist of Elephant or roadside grasses only. So that, the surge feeding diet is always added by rice or maize straws.

Table 4. Average of DM intake/supply, CP percentage in the ration, and composition of feedstuff were fed to cows with and without surge feeding *pp* in the village research sites in both altitudes

	Up-land area		Low-land areas	
	SF	C	SF	C
No. cows (heads)	42	24	49	43
DM intake/supply (kg/d/cow)	9.19±1.09	7.73±1.56	9.37±1.62	8.43±1.48
% DM int./supp. of liveweight	3.00±0.55	2.95±0.86	2.94±0.74	3.13±0.87
% CP in ration	11.23±1.04[a]	9.42±1.91[b]	12.70±1.25[a]	7.22±0.67[b]
Composition of feedstuff (%)***				
– Legumes :				
– Gliricidia	14	0	16	1
– Leucaena	4	0	10	0
– Calliandra	2	0	0	0
(% of the ration)	20	0	26	1
Non-legumes				
– Elephant grass	28	23	9	10
– Roadside grass	36	45	38	28
– Rice straw (wet)	15	10	8	17
– Rice straw (dry)	0	8	0	28
– Maize straw (wet)	1	14	19	16
(% of the ration)	80	100	74	99

SF= Surge feeding: C= control; *= DM intake; **= DM supply; ***= DM basis
Different superscripts within rows indicate significant differences between means.

Table 5. Average liveweight and BC score on start of observation (0-14 days *pp*), ADG and BC score changes up to 45-60 days *pp* of cows in the two treatment groups in the village research sites (P>.05)

	Up-land villages		Low-land villages	
	SF	Control	SF	Control
LW at start of observation (kg)	302.38±46.68 (n=32)	304.77±41.74 (n=20)	321.24±38.06 (n=42)	294.68±34.17 (n=22)
BC at start of observation	5.30±.43	5.24±.26	5.14±.36	5.75±.28
ADG (kg/d)	-.22±.47	-.34±.46	-.21±.38	-.41±.28
% loss liveweight	3.0	7.2	4.1	6.5
BC score changes	-.10	-.12	-.10	-.11

Liveweight and BC Score Changes

In cattle, the maintenance of both liveweight and BC score during lactation are important for normal ovarian activity (Winugroho and Teleni, 1993). These changes relate to nutrients supply and intake. The effect of surge feeding *pp* on liveweight and BC score changes in this study can be shown in Table 5. Average daily gain *pp* (up to the 60th day *pp*) and the changes in BC of cows amongst variables/ treatments were not difference significantly. This indicated that increasing CP content in ration of cows over 60 days *pp* from 7 percent to 12 percent is not enough yet for maintaining liveweight and BC of PO cows lactation. Nevertheless, the lose of their liveweight, either in surge feeding cows or in control cows, were less than 17% of their liveweight at calving/initial liveweight (Table 5). It means that their cycling may continue (Teleni and Hogan, 1989; Hale, 1975 adopted by Mukasa-Murgewa, 1989).

Postpartum Anoestrus

Although decrease of liveweight over 60th *pp* was not significantly different between surge feeding cows and control cows, but in the *postpartum anoestrus* interval, it has appeared that surge feeding during 60 days *pp* could improve PPA interval of PO cows under smallholder farms condition (Table 6).

Table 6 showed that only average PPA interval of cows received surge feeding in the upland villages were less than 60 days, *viz.* 55 days; However, percentage of number

Table 6. *Postpartum anoestrus* interval of cows in the two treatment groups in village research sites

	Up-land villages		Low-land villages	
	SF	Control	SF	Control
No.of cows (heads)	33	41	53	47
No. detected in estrus by 60 day *pp* (heads/ %)	19 (58%)	10 (24%)	15 (28%)	2 (4%)
No. detected in estrus by 90 day *pp* (heads/ %)	30 (91%)	15 (37%)	24 (45%)	9 (19%)
Av. PPA interval (days)	54.45±30.08^{a}	105.68±39.92^{c}	83.36±31.58^{b}	114.61±30.80^{c}

In the same rows, different superscripts indicate significant differences between means (P<.01).

of the cows which have PPA interval less than 60 days were only 58%. In rainy season, average PPA interval of cows received surge feeding in both altitudes, were shorter significantly (P<.01) than that of the control cows. And also, the percentage of number of the cows which have PPA interval less than 60 days and/or 90 days were higher. These results consistent with the result which have been obtained by Komarudin-Ma'sum *et al.* (1998) which it was conducted under experiment station condition.

Dixon *et al.* (1996), however, reported that with high level supplementation of lactating first-calf cows grazing native pasture in the vegetative stage of growth were no effect on PPA interval. This difference might have been due to the lactating first-calf cows grazing native pasture without supplementation did not suffer from negative nitrogen/ energy balance until below the critical condition score that it could extend PPA interval and lead to silent heat; whereas the control cows in this study suffered from negative nitrogen/energy balance until below that. This is indicated to percentage of CP content in their ration were around 7% (see Table 2). Haresign (1984) cited by Mukasa-Murgewa (1989) stated that negative energy balance is not likely to have much effect on the length of the PPA interval as long as the cow is in good condition at calving and its condition remains above the critical condition score.

Thus, the results indicated that surge feeding *pp* with shrub/tree legumes thoroughly conducted under smallholder farms over rainy season in both altitudes will able to improve the length of PPA interval of PO cows. It is meaning that it can greaten chance of calving within 365 days/ 12 months of previous calving. Dunn and Moss (1992) have suggested that a cow with a PPA interval longer than 80 days has less than 65% chance of calving within 365 days (12 months) of previous calving, while a cow with a PPA interval longer than 40 days but less than 80 days has between 65% - 88% chance of calving within 365 days of previous calving.

But, within surge feeding *pp* treatment, which was conducted in upland villages, will obtain better result than in lowland villages. It might have been due to large part of PO cows in lowland villages are used as draught animal more intensively than those in upland villages. There are positive correlation between the amount of energy required by animals during work and intensity of working (Bakrie and Komarudin-Ma'sum, 1993).

Farmer's Perception

Farmer's perception on surge feeding *pp* with shrub/tree legumes can be stated that it was good. This statement is supported by the results of perception of the farmers surveyed as presented in Table 7.

The reason of farmers rejected the surge feeding *pp* with shrub/tree legumes was difficulties in obtaining the legumes. Nearly all of farmers surveyed who have good perception and motivation for continuing this program have also stated that they can continue this program, provided the legumes are available.

Therefore, this program can be applied as long as supported by sustainable shrub/tree legumes establishment program and cooperativeness amongst farmers for sharing legume leaves production could be created.

Table 7. Farmers surveyed distributions according to their perception on surge feeding *pp*

Village	No. farmers surveyed (men)	Perception		
		Good		Reject (men)
		The program continued (men)	The program not continued (men)	
- Dadapan	41	28 (68%)	8 (20%)	5 (12%)
- Tanjungrejo	45	43 (96%)	2 (4%)	-

In fact, although the surge feeding *pp* with shrub/ tree legumes could improve PPA performance of farmers' cows (Table 6), but nearly all of them have not appreciated its benefit yet. Farmers who wish to continue this program were more determined by improving quality of the diet of their cows.

CONCLUSIONS

Application of surge feeding *pp* with shrub/tree legumes (*Gliricidia sepium, Calliandra colothyrsus*, and *Leucaena leucocephala*) in the rural condition, either in upland or in lowland villages can improve quality of the diet of PO breeder cows.

In smallholder farm condition located in dry land agricultural regions in East Java, surge feeding over the first 60 days *pp* with shrub/tree legumes could shorten PPA interval of PO breeder cows calved in rainy season, that were around 30-50 days, either in the upland or in the lowland altitudes.

Success of this surge feeding *pp* application in the rural condition in East Java is very dependent on the presence of cooperative amongst farmers in sharing shrub/tree legumes on their land as well as on communal and public lands.

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