

## IMPROVEMENT OF REPRODUCTIVE PERFORMANCE OF BRAHMAN CROSS BY HORMONAL TREATMENT AT SMALL FARMS IN EAST JAVA

DICKY M. DIKMAN and MARIYONO

Beef Cattle Research Station, Jl. Pahlawan No. 2, Grati-Pasuruan 67184  
dicman\_tirecs@yahoo.co.id

### ABSTRACT

A study on Brahman cross was conducted in East Java Province to observe their reproductive performance by gonadotropin and prostaglandin hormone. GnRH and prostaglandin (PGF - 2 $\alpha$ ) affect reproductive cycle of cow. The hormones improve reproductive status of cattle and fix time of mate. This study was aimed to improve reproduction of Brahman cross cows through injection of GnRH and PGF - 2 $\alpha$  to increase the pregnancy rate. In this research 60 Brahman cross cows were used (BX). They were maintained in the East Java region in Lamongan, Pasuruan and Ngawi. 60 Brahman cross cows with reproductive problems were chosen. Cows with body score of 5 - 7 were selected, there were 30 cows in Lamongan, 20 cows in Pasuruan and 10 cows in Ngawi. The hormone was given by three methods as follow: (1) Injection of GnRH 2 ml followed by prostaglandin 5 ml after 7 days and mated to a maximum after 3 - 4 days (20 cows); (2) Injection of GnRH 2 ml followed by prostaglandin 5 ml after 7 days continued with GnRH 2 ml after 2 days and mated to a maximum after 3 - 4 days (20 cows); (3) Injection of GnRH 2 ml followed by prostaglandin 5 ml after 7 days continued with GnRH 2 ml after 3 days and mated to a maximum after 3 - 4 days (20 heads). Results showed that effect of all three treatments on level of pregnancy tended to be higher on treatment B (55%) compared to treatment A (25%;  $P < 0.1$ ) but not significantly different with treatment C (40%;  $P > 0,05$ ). In conclusion, all treatments gave similar pregnancy rate, however, treatment B was more economically efficient to improve reproductive performance of Brahman cross as small farms.

**Key words:** GnRH, Prostaglandin, Brahman Cross, Cow

### INTRODUCTION

Decrease in the efficiency of the parent reproduction in beef cattle crosses *Bos indicus* results (Brahman) and *Bos taurus* (Simmental, Limousin, Angus) is maintained on breeder, among others, caused by impaired reproductive organ function as indicated by repeated mating and pregnancy rates are low, resulting in long birth spacing. The results of Beef Cattle Research Station show that Brahman cows are still not able to adapt to the maintenance management in Indonesia so it is necessary to improve the management of marriage and reproduction perkandangan and increasing efficiency through the provision of reproductive hormones and improvement of nutritional supplementation in the treatment of cattle through the parent (Anggraeny *et al.*, 2009). Required of a business that could improve the reproductive efficiency of beef cattle to support self-sufficiency Program Beef and Buffalo (PSDSK) in 2014 as an effort to increase beef

cattle population in order to meet the needs of the national meat. National meat consumption at 1.7 kg/capita/year, equivalent to 1.75 to 2.0 million head of cattle are still experiencing shortages that must be met by imports by 30% (Noor, 2008). This will result in the dependence of the national meat needs longer import.

Gonadotropin Releasing Hormone provision (GnRH) and prostaglandin (PGF-2 $\alpha$ ) to improve reproductive efficiency in beef cattle is one of the appropriate method. PGF-2  $\alpha$  hormones can affect uterine involution, which in turn can accelerate the onset of estrus after birth (Koketsu and Dial, 2002). Patterson *et al.* (2001) states that PGF-2 $\alpha$  can affect the incidence of postpartum ovulation. Provision of GnRH and PGF-2 $\alpha$  can shorten the interval deliveries-the first postpartum estrus and increased the expression of estrus for 60 days after birth (Rasad, 2008). Gonadotropin Releasing Hormone (GnRH) and prostaglandin (PGF-2 $\alpha$ ) can be used as a synchronization of

ovulation/lust or to overcome reproductive problems in cattle ranchers. Gonadotropin and gonadal hormone preparations may improve the pregnancy rate of up to 80% (Barile *et al.*, 2001). Incidence of postpartum anestrus is a cause of infertility and luteal phase shortly after birth (Short *et al.*, 1990). Hafez and Hafez (2000) suggest that administration of GnRH will speed up the first estrus postpartum. The combination of GnRH and PGF-2  $\alpha$  levels of progesterone that may affect the activity can be detected estrus and ovulation accurately. The hormone progesterone plays a role in stimulating the growth and development of the mammary gland in preparation for a food source (milk production) for the child to be born (Manalu and Sumaryadi, 1995).

This study aims to improve the reproductive performance of Brahman Cross cows using the parent reproduction hormone gonadotropin releasing hormone which is commercial (GnRH) and prostaglandin (PGF-2 $\alpha$ ) so as to improve pregnancy and birth rates as well as cattle ranchers can make a profit, which in turn supports self-sufficiency in meat national cattle. The main source of producing hormones related to reproduction (estrogen and progesterone) derived from the ovary. Female animal from birth to the ovaries is equipped with hundreds of thousands of follicles, but during his life only a small percentage of successful ovulated. To maximize the follicle as a biological resource of endogenous hormones can be done by providing a combination of GnRH and prostaglandin in the hope that the optimum ovulation and accompanied by a clear sign of lust. Both of these hormones can also increase the number oocyt produced by the ovaries through an increase in the amount of maturity to be ova so ovulation followed by an increase in the number of corpus luteum. Function of the corpus luteum producing progesterone is as useful to support the survival of the fetus and is a critical point for life after birth. The hormone progesterone also plays a role in stimulating the growth and development of the mammary gland in preparation for a milk production for the child to be born (Manalu and Sumaryadi, 1995).

## MATERIALS AND METHODS

The research was conducted in 2011 using material master number 60 Brahman cross

cows (BX) is maintained in East Java (Kabupaten Lamongan, Pasuruan and Ngawi). The material used is a mother cow with problems include: old not pregnant (more than 150 days after calving), married (more than 3 – 4 times) or not lust more than 120 days after calving. Cows give birth parent who has at least one time and have a Body Condition Score (SKT) stem 5 – 7 by Nicholson and Butterworth (1986). Provision of GnRH and prostaglandin treatment is done by three methods, namely (Hozumi *et al.*, 2001):

1. Injection intra muscular GnRH 2 ml followed by prostaglandin 5 ml after 7 days then mated to a maximum after 3-4 days (20 cows).
2. Injection intra muscular GnRH 2 ml after 7 days prostaglandin 5 ml after two days of GnRH administered 2 ml intra-muscular again later mated to a maximum after 3-4 days (20 fish).
3. Injection intra muscular GnRH 2 ml after 7 days prostaglandin 5 ml after three days of GnRH administered 2 ml intra-muscular again later mated to a maximum after 3-4 days (20 fish).

GnRH used was fertagyl (Intervet International BV) with gonadorelin kompisisi 0.1 mg/ml while the hormone prostaglandin (PGF-2  $\alpha$ ) is lutalyse (Pharmacia-Upjohn Co. The) by composition dinoprost tromethamine 5 mg/ml.

The collection of data obtained using Complete Randomized Design (CRD) with three unidirectional pattern of hormone treatment. The parameters observed include pregnancy rate, percentage of lust and lust expression score (+ = lust calm; ++ = lust with real mucus without sound; +++ = Birahi the vulva swollen, red, warm, climb/ride other cows, restlessness and slimy and sound). Data were analyzed using one way ANOVA.

## RESULTS AND DISCUSSION

### Physiological status identification of Brahman cross (BX) cow

The results of the physiological status identification of BX cow in the Lamongan district were 30 heads, Pasuruan district were 20 heads and Ngawi district were 10 heads, has

performed at the beginning of the study to select the cattle to be used include lactation status, age, parity and body condition score (BCS). Identification is done by visual and keeper records. Identification data are showed in Table 1.

Lactation status indicates that in Lamongan showed higher percentage compared to Pasuruan and Ngawi, the youngest age (I3) at most was in Pasuruan while at least was in Ngawi. The oldest age (I4) at most was in Lamongan while in Pasuruan was none. The third area is predominantly (90%) are first parity but Ngawi had twice parity (10%). Body condition score (BCS) 5 is the highest percentage in Lamongan district than other district. BCS assessment carried out by the range of 1 (poor) – 9 (fat) according to Wagner *et al.* (1988).

#### Reproductive problems identification of Brahman Cross (BX) cows

The results of reproductive identification problems of Brahman Cross (BX) cows was done by conducting interviews and based on existing keeper data of livestock reproduction. Table 2 shows that the problems often encountered in the BX cows were they have

not been pregnant more than 150 days after calving (after birth), repeat breeding (more than 3 – 4 times) and not estrus more than 120 days after calving.

Cow reproduction problems namely: 1). not pregnant after 150 days after calving in Ngawi and Lamongan was the highest equal to 100% compared to Pasuruan only 55%, 2). Repeat breeder (mate more than 3 – 4 times) the highest was in Lamongan and Ngawi equal to 100% compared to Pasuruan only 55% and 3). Not estrus more than 120 days after calving was only found pasuruan equal to 45%.

#### GnRH and prostaglandin (PGF-2 $\alpha$ ) application

GnRH and prostaglandin performed with three treatments including treatments A, B and C. The percentage of number of cows (n), pregnancy, estrus and estrus score after application of hormones listed in Table 3.

Treatments A, B and C respectively used 20 heads BX cows in the Lamongan, Pasuruan and Ngawi district. The highest pregnancy rate obtained in the treatment B was 55% followed by treatment C 40% and treatment A 25%, but the analysis showed no significant

**Table 1.** Percentage of Brahman Cross (BX) cow's physiological status

Physiological status	Research location			Total (%)
	Lamongan (%)	Pasuruan (%)	Ngawi (%)	
Lactation	-	-	-	-
Dry	50	33	17	100
Age				
I <sub>3</sub> (> 3 years)	22	33	5	60
I <sub>4</sub> (> 4 years)	28	-	12	40
Parity				
I (first calving)	50	33	7	90
II (second calving)	-	-	10	10
III (third calving)	-	-	-	-
Body score condition(BCS)				
5	35	17	5	57
6	7	12	7	26
7	7	5	5	17
8	-	-	-	-

**Table 2.** Percentage reproduction problems of Brahman cross (BX) cow

Reproduction problems	Research location		
	Lamongan (%)	Pasuruan (%)	Ngawi (%)
Not pregnant more than 150 day after calving	100	55	100
Repeat breeding (more than 3 – 4 time)	100	55	100
Not estrus more than 120 day after calving	-	45	-

**Table 3.** Pregnancy, estrus and estrus score after application of hormones

Parameter	Treatment		
	A	B	C
n (heads)	20	20	20
Pregnancy (%)	25 <sup>a</sup>	55 <sup>a</sup>	40 <sup>a</sup>
Estrus (%)	70 <sup>a</sup>	75 <sup>a</sup>	70 <sup>a</sup>
Estrus score			
Silent heat (%)	30	25	30
mocus (%)	40	45	65
Warm, red and swollen of vulva (%)	30	45	30

A: Injection of GnRH and PGF-2 $\alpha$ , Intra muscular; B: Injection of GnRH I, PGF-2 $\alpha$  and GnRH II (GnRH II was given 2d after PGF-2 $\alpha$ ), Intra muscular; C: Injection of GnRH I, PGF-2 $\alpha$  and GnRH II (GnRH II was given 3d after PGF-2 $\alpha$ ), Intra muscular; \*: Showed significant differences trend ( $P < 0,1$ ); a: Showed non significant different ( $P > 0,05$ ) difference ( $P > 0.05$ ). Estrus can be observed almost the same for all treatment, there are treatment A = 70%, treatment B = 75% and treatment C = 70%, the analysis also showed no significant difference ( $p > 0.05$ ). Silent estrus expression on treatment A and C showed 30% while treatment B 25%; Estrus sign with mucus the highest result is in treatment C equal to 65% while the lowest result in treatment A equal to 40%; estrus signs such as warm, red color and swollen vulva on treatment A and C showed 30% while treatment B 45%.

### Feeding

Feeding on cattle that have been given hormones include rice straw, rice bran and elephant grass with an average of consecutive giving 15 kg, 2 kg and 20 kg as listed in Table 4.

Feeding in the Lamongan, Pasuruan and Ngawi is relatively the same using rice straw, rice bran (concentrate) and elephant grass (grass field) that every day is consumed by the cattle. Results of analysis of feed that has been done by the Lab. Nutrition Beef Cattle Research Station shows the total dry matter consumed by 9.3 kg/head/day and crude protein of 0.8 kg/head/day.

### Economic analysis

The results of economic analysis showed that the pregnancy success rate in treatment B

is the most efficient of Rp. 281,500 (27.3%) compared with treatment A and treatment C was the least efficient. A treatment will cost at least when compared with treatments B and C will but also the lowest pregnancy percentage. These results only take into account the cost of a hormone that is used not other costs such as the cost of mating injection. Economic analysis of the data as listed in Table 5. Identification of the physiological status of Brahman Cross (BX) status, age, parity and body condition scorecow include lactation (SKT) has done is one way to determine the potential productivity of livestock. Cows that used for the research were under dry conditions or not lactation to support the improvement of reproductive after being given hormones. Hardjosubroto (1994) states that lactation condition can affect beef cattle production and Wattermann *et al.* (2003) states that lactation condition can reduce the

**Table 4.** Average of feed supply and consumption of BX cow

Feed	As fed	Nutrient consumption	
	(kg/head/day)	DM(kg/head/day)	CP (kg/head/day)
Rice straw	15	3.9	0.3
Rice bran	2	1.8	0.1
Elephant grass	20	3.6	0.4
Total		9.3	0.8

**Table 5.** Economic analysis of hormone treatment

Detail	Treatment A	Treatment B	Treatment C
Hormone cost			
GnRH I; 2 cc (IDR)	164,000	164,000	164,000
PGF-2 $\alpha$ ; 5 cc (IDR)	85,000	85,000	85,000
GnRH II; 2 cc (IDR)	-	164,000	164,000
Total cost (IDR)	249,000	413,000	413,000
Pregnancy (%)	25	55	40
Cost to produce 1 calf (IDR)	996,000	751,000	1,032,500
Economic efficiency (IDR)		281,500	
Efficiency (%)		27.3	

intake of nutrients for cow body maintenance and reproductive system so can lead to reproductive disorders. Winugroho and Teleni (1993) suggested that body condition score (BCS) is parameter/guide for determining the adequacy of nutrition and productivity in comparison with body weight (BW). The most critical BCS is  $< 4$  and to support the reproduction is  $> 4$  until  $< 8$ . BCS assessment can be done by touching the spine and ribs observations. Tactile spine is done by rubbing and pressing on the lumbar region of the spine after the last rib and the transverse processus pressed with the thumb to determine the taper the ends while the other four fingers pressing the rib eye meat to feel the thickness of fat under the skin. Thick fat that covers the ends of the transverse processus will thus not visible edges, such as cow condition is good condition (Santosa, 2001) or BCS  $> 6$ . Most of cows had used an average score of 5, once calving and had average productive age ( $I_3$ ) that is expected to support the improvement of reproduction as well.

BX cow reproductive problems are often found in small farmer in Lamongan, Ngawi and Pasuruan include not pregnant more than 150 days after calving, repeat breeding (mating more than 3 – 4 times) and not estrus more than 120 days after calving. Low reproduction performance in Brahman Cross cattle can be caused by differences management between livestock in Australia and in Indonesia. Brahman cross cows in Indonesia mostly from Australia managed extensively on pasture, without a rope nose, live in colonies in large, natural mating, feeding both quantitatively and qualitatively fulfilled. Maintenance of Brahman Cross cows in Indonesia were wearing rope nose, put in individual pen in small groups, not yet fully adapted, feeding the quantity and quality do not meet. Due to differences in the maintenance management causing reproductive disorders characterized by the occurrence of symptom onset did not lust for cows that have not been pregnant or postpartum, estrus period is shorter and the emergence of disorders of the corpus luteum of the ovary such as persistence,

and cystic ovary follicular hypofunction. Vandeplasshe (1982) states that the mother cow that does not lust after birth due to poor food quality, environmental temperature is hot, parasitic infections, reproductive disease, thin body and stress due to breastfeeding.

Provision of GnRH and prostaglandin in this study with treatment B (GnRH I, PGF-2 $\alpha$ ) and GnRH II were given 2 days after PGF-2 $\alpha$ ) obtained the highest pregnancy rate by 55% while the treatment C (GnRH I, PGF2  $\alpha$  and GnRH II are given 3 days after PGF-2 $\alpha$ ) 40% and lowest in treatment A (GnRH and PGF-2 $\alpha$ ) 25%. Administered dose is the same for GnRH 2cc equivalent to 0.2 mg and PGF-2 $\alpha$  5cc equivalent to 25mg. The analysis showed a trend different pregnancy rate significantly ( $P < 0.1$ ) between treatment A with treatment B. Pregnancy was highest in treatment B is 55%, higher than the results of Fricke *et al.* (1998) in lactating dairy cows that showed that administration of GnRH and PGF-2 $\alpha$  can be obtained conception rate/highest pregnancy 47.6%. The results Rasad (2008) suggests the provision of GnRH and PGF-2  $\alpha$  after calving can increase the reproductive activity and improve reproductive performance. Provision of GnRH and prostaglandin in ovulation synchronization method is an appropriate way to repair cow reproduction as a statement Pursley *et al.* (1997). Hafez and Hafez (2000) states GnRH administration may accelerate postpartum estrus as well as Koketsu and Dial (2002) suggestion that provision of PGF-2 $\alpha$  can improve the process of uteri involution and show estrus sign earlier after calving. Patterson *et al.* (2001) suggests giving PGF-2 $\alpha$  to accelerate the onset of ovulation. According Toelihere (1993), conception rates are determined by three factors: male fertility, female fertility and insemination techniques. Mating with artificial insemination (AI) techniques are not appropriate to reduce the pregnancy rate so that the target of 70% can not be achieved. Some factors affecting pregnancy rate by artificial insemination depend on estrus detection, insemination as appropriate, the placement of semen in the right position will obtain a higher pregnancy (Smith, 1982). Pregnancy examinations performed by rectal palpation two months or more after mating as statement Toelihere

(2006) which states that the early diagnosis of pregnancy by rectal palpation can be done 35 days after insemination and accuracy above 95% can be obtained after 60 days of pregnancy.

Lamongan, Pasuruan and Ngawi district included in the lowlands, Zulfardi *et al.* (2000) states lowland conditions with temperatures  $> 30^{\circ}\text{C}$  consumption of dry matter (DM) can be increased 2.7% of body weight, increase 12.5 to 35% when given at night. Middle land conditions with temperature  $24 - 29^{\circ}\text{C}$  for cows 350 – 450 kg body weight will consume grass 30 – 35 kg/head/day and it will be more consumption for high land condition (Kuswandi *et al.*, 2005). Feed that were given such as rice straw, rice bran and elephant grass with an average of consecutive giving 15, 2 and 20 kg as listed in Table 4, indicate the total dry matter consumed by 9.3 kg/head/day and crude protein for 0.8 kg/head/day. Availability of agricultural wastes that can be used as animal feed such as rice straw, corn straw, tubers and beans in 2010 reached 151 million tons of dry forage can be used for 138 million heads of cattle with live weight 250 kg with an estimated delivery 50% of total feed (Bamualim *et al.*, 2007). Improved nutrition of rice straw can be done with fertilize to its utilization as feed can be optimized (Kuswandi *et al.*, 2007). Legume trees such as leucena, gliricidia, kaliandra, sesbania and acacia can be cultivated for forage shortages. So far, farmers only use leucena and gliricidia as cattle feed. Legume production is low so that it is necessary preservation technology to keep by product during harvest as a backup during the dry season (Bamualin *et al.*, 2007). Dried legumes (85%) can be consumed up to 3.7 to 4% while the fresh legumes  $< 2.5\%$  body weight (Kuswandi and Robards, 1999). Utilization of legumes in the third district is still relatively low so that its availability should be endeavored to support the improvement of livestock through improved feed reproduction.

Treatment B reached the highest pregnancy rate of 55% so as to be able to achieve pregnancy 100% will cost IDR 751,000, while the treatment C with pregnancy rate 40% will cost IDR 1,032,500 and lowest in treatment A will cost IDR 996,000, economic analysis shows that the pregnancy success rate of

treatment B is more efficient IDR 281,500 (27.3%) compared to treatment C (Table 5).

### CONCLUSION

From these results, it can be concluded that application of GnRH and prostaglandin for BX cows can increase the pregnancy rate. Highest pregnancy rate achieved in treatment B (GnRH I, PGF-2 $\alpha$  and GnRH II were given 2 days after PGF-2 $\alpha$ ) equal to 55% and treatment C (GnRH I treatment, PGF-2 $\alpha$  and GnRH II are given 3 days after PGF-2 $\alpha$ ) 40% and lowest in treatment A (GnRH and PGF-2 $\alpha$ ) 25%. Treatment B has a value of 27.2% efficiency percentage as compared with treatment A and C. The highest percentage of estrus sign was in the treatment of B equal to 75% while treatment A and C were the same at 70% while the highest of estrus score was on the treatment C with a real mucous without noise by 65%.

### REFERENCES

- Anggraeny, Y.N., U. Umiyasih, D.M. Dikman, Mariyono, A. Rosyid, P.W. Prihandini dan L. Affandhy. 2009. Pembentukan Pejantan Unggul Sapi Potong Pola LEISA dengan Tinggi Badan > 135 cm pada Umur 2 Tahun. Laporan Akhir. Loka Penelitian Sapi Potong.
- Barile, V.L., A. Galasso, E. Marchiori, C. Pacelli, N. Montemurro and A. Borghese, 2001. Effect of PRID treatment on conception rate in Mediterranean buffalo heifers. *Livest. Prod. Sci.* 68(2): 283 – 287.
- Talib, C. dan Y.G. Noor. 2008. Penyediaan daging sapi nasional dalam ketahanan pangan Indonesia. Pros. Seminar Nasional Teknologi Peternakan dan Veteriner. Bogor, 11 – 12 November 2008. Puslitbang Peternakan, Bogor (inpress). hlm. 44 – 51.
- Fricke, P.M., I.J.N. Guenther and M.C. Wiltbank. 1998. Efficacy of decreasing the dose of GnRH used in a protocol for synchronization of ovulation and timed AI in lactating dairy cows. *Theriogenology* 50: 1275 – 1284.
- Hafez, E.S.E. and B. Hafez. 2000. Reproductive Cycle. *In: Reproduction in Farm Animals*. 7<sup>th</sup> Edition. Hafez, E.S.E. and B. Hafez (Eds). Lippincott Williams and Wilkins, New York. pp. 61 – 62.
- Hozumi, T., Herliantien dan D. Zamanti. 2001. Fisiologi dan gangguan reproduksi. The aftercare technical cooperation for strengthening of artificial insemination center project. Japan International Cooperation Agency. pp. 32 – 34.
- Koketsu, Y. and G.D. Dial. 2002. Administration of prostaglandin after farrowing alters the association between lactation length and subsequent litter size in mid-or old-parity sow. *Theriogenology* 57(2): 837 – 843.
- Kuswandi and G.E. Robards. 1999. The efficiency of utilization by growing sheep of rice hull-based rations containing protein meats. *Proc. Australia Society Animal Production XXII*. p. 259.
- Kuswandi, C. Talib, A.R. Siregar dan T. Sugiarti. 2005. Pengaruh Imbangan antara Rumput dan Konsentrat pada Sapi Perah Indonesia Holstein Fase Bunting dan Laktasi. Laporan penelitian. Balai Penelitian Ternak, Ciawi, Bogor.
- Kuswandi, A. Azhari dan B. Haryanto. 2007. Laboratorium Lapang Inovasi Teknologi dengan Pendekatan Sistem Integrasi Tanaman-Ternak. Laporan Penelitian. Puslitbang Peternakan, Bogor.
- Manalu, W. dan M.Y. Sumaryadi. 1995. Hubungan antara konsentrasi progesteron dan estradiol dalam serum induk selama kebuntingan dengan massa fetus pada akhir kebuntingan. Pros. Seminar Nasional Sains dan Teknologi Peternakan, Ciawi, 25 – 26 Januari 1995. Balitnak, Ciawi, Bogor. pp. 57 – 62.
- Nicholson, M.J. and M.N. Butterworth. 1986. A Guide to Condition Scoring of Zebu Cattle. International Livestock Centre for Africa. Addis Ababa. p. 26.
- Patterson, J.L., H.J. Willis, R.N. Kirkwood and G.R. Foxcroft. 2001. Lack of an effect of prostaglandin injection at estrus on set on the time of ovulation and reproductive performance in weaned sow. *Theriogenology* 56(5): 913 – 921.
- Pursley, J.R., M.R. Kosorok and M.C. Wiltbank. 1997. Reproductive management of lactating dairy cows using synchronization of ovulation. *J. Dairy Sci.* 80: 301 – 306.
- Rasad, S.D. 2008. Pengaruh penyuntikan GnRH dan PGF2 $\alpha$  terhadap profil progesteron sapi perah pasca beranak. *Anim. Prod.* 10(1): 16 – 21.

- Santosa, U. 2001. *Tata Laksana Pemeliharaan Ternak Sapi*. Cetakan ke-3. Penerbit Penebar Swadaya. Jakarta.
- Short, R.E., R.A. Bellows, R.B. Staigmiller, J.G. Berardinelli and E.E. Custer. 1990. Physiological mechanisms controlling anestrus and infertility in postpartum beef cattle. *J. Anim. Sci.* 68(3): 799 – 816.
- Smith, R.D., 1982. Factors affecting conception rate. *Proceedings of National Invitational Dairy Cattle Reproduction Workshop*, Cornell University. <http://www.wvu.edu/~Agexten/forglvst/Dairy/dirm10.pdf>.
- Toelihere, M.R. 1993. *Inseminasi Buatan pada Ternak*. Penerbit Angkasa, Bandung.
- Toelihere, M.R. 2006. *Ilmu Kebidanan pada Ternak Sapi dan Kerbau*. UI Press, Jakarta.
- Winugroho, M. dan E. Teleni. 1993. Feeding and breeding strategies. *In: Draught Animal System and Management: an Indonesian Studies*. Teleni, E., R.S.F. Campbell, and D. Hoffmann (Eds.). Australian Centre for International Agricultural Research (ACIAR). Canberra, Australia.
- Wagner, J.J., K.S. Lusby, J.W. Oltjen, J. Rakestraw, R.P. Wettemann and L.E. Walters. 1988. Carcass composition in mature Hereford cows: Estimation and effect on daily metabolizable energy requirement during winter. *J. Anim. Sci.* 66: 603 – 613.
- Wattemann, R.P., C.A. Lents, N.H. Ciccio, F.J. White and I. Rubi. 2003. Nutritional and suckling-mediated anovulation in beef cows. *J. Anim. Sci.* 81(14): E48 – E59.
- Zulbardi, M., Kuswandi, M. Martawidjaya, C. Talib dan D.B. Budiwijono. 2000. Daun *Gliricidia* sebagai sumber protein pada sapi potong. *Pros. Seminar Nasional Peternakan dan Veteriner*, Bogor, 18 – 19 September 2000. Puslitbang Peternakan, Bogor. hlm. 233 – 241.

## DISCUSSION

### Questions:

- 1. 19% gender concordance, what is the factor of the error, 81% gender female?*
- 2. Which one of the methods is the best?*

### Answers:

- 1. Different method. This method is very traditional.*
- 2. We don't know which one is the best, but we want to know which one gets higher result.*