

Conference Paper

Reproductive Performance and Economic Estimates of Pasundan Cattle Induced with Prostaglandins and Hormone Releasing Gonadotropins

E N Setiawati^{1*}, M Y Sumaryadi², D M Saleh² and V Armelia²¹Animal Health Training Center, Cinagara Bogor, West Java, Indonesia²Faculty of Animal Science, Jenderal Soedirman University, Purwokerto, Central Java, Indonesia**ORCID**<https://orcid.org/0000-0002-9235-7175>**Abstract.**

Twenty Pasundan heifers were used in this study to determine the economic estimation of Pasundan cattle induced with prostaglandins and gonadotropin-releasing hormones. The cows were randomly divided into two groups of 10 each. The first group came from breeders who are members of the Rundayan Sawargi Group, Karya Mukti Village, Cibalong District, Garut Regency and the second group of cows came from the Mekar Tani 2 Livestock Group, having their address at Singasari Village, Jonggol District, Bogor Regency. All cows were injected with prostaglandins (PGF₂α, dinoprost tromethamine) with a dose of 5 ml/head intramuscularly 2 (two) times with an interval of 11 days, and on the 9th day was injected with gonadotropin realizing hormone (GnRH, gonadorelin) of 2.5 ml/head intramuscularly. Cows in heat were artificially inseminated 2x with an interval of 6 hours. The variables observed were the percentage of birth rate, calving weight and body weight gain up to 120 days of age, percentage of calf mortality to 120 days of age, profit, and B/C ratio. The data were processed by analysis of variance and used descriptive methods. The results showed that cows in the Garut region had an average calving rate (birth rate) of 90%, birth weight of calves 21.51 ± 0.71 kg, body weight gain 0.60 ± 0.5 kg/head/day, mortality 0%, profit Rp. 26,495,000, - and B / C ratio 1.1. better than the Bogor area with a birth rate of 87.5%. Birth weight 19.95 ± 2.02 kg, body weight gained 0.55 ± 0.5 kg/head/day, mortality 0%, Profit Rp. 12,120,000, -and B / C ratio 0.51. It was concluded that the economic estimation of Pasundan cattle induced with prostaglandins and gonadotropin hormones in the Garut area is better than the Bogor area, with an increase in income of 218.23% per 13 months.

Keywords: pasundan cows, hormone induction, reproductive performance, economic estimation

1. Introduction

Pasundan cattle are local livestock in West Java which have been designated as local Indonesian livestock based on SK Menteri Pertanian Republik Indonesia Nomor1051/Kpts/RI/SR.10/2014. The existence of cow germplasm is the basic capital in

Corresponding Author: E N Setiawati; email: e.niasetiawati@gmail.com

Published: 13 September 2022

Publishing services provided by Knowledge E

© E N Setiawati et al. This article is distributed under the terms of the [Creative Commons Attribution License](#), which permits unrestricted use and redistribution provided that the original author and source are credited.

Selection and Peer-review under the responsibility of the ICASI Conference Committee.

OPEN ACCESS

the formation of superior livestock breeds and needs to be preserved because it is in line with the mandate of Law No.18 of 2009 [1]. The existence of Pasundan cattle is known to be the base of the population of beef cattle that produce calves in West Java, and are able to contribute to meeting the needs of beef, especially the Java region, amounting to 20 percent of 515 thousand head per year [2]. One alternative to increasing Pasundan cattle is through a quantitative approach (population increase) and a qualitative approach (productivity per livestock unit).

Like genetic resources that do not have high economic value, Pasundan cattle continue to decline, both in population and quality. The rate of decline is relatively high each year. The decline was due to several factors, including the social situation and forest conversion. In 2013, the population of Pasundan cattle reached around 50,000 heads, but in the three years until 2016, the number was only around 31,033 heads, meaning the population of Pasundan cattle has decreased by around 22% in three years [2]. On the other hand, the conditions in the field are still There are several problems both from genetic resources, breeding, management, production, and reproductive performance. Related to reproductive performance, there are problems in Pasundan heifers that experience delayed puberty and silent heat, therefore technological development innovations that support the improvement of the comparative superiority of Pasundan cattle are necessary developed.

Lust manipulation techniques have been widely used to overcome silent heat cows (calm heat) and even anesthesia (not in heat), while multiple ovulation techniques are used to take advantage of the abundance of biological resources of follicles as a source of egg cells [3] and hormonal sources to improve performance calves born [4]. Estrus induction applications using PGF2 α are usually carried out in two ways, namely single injection (single injection) and double injection (double injection). The single injection method is usually effective for homogenizing livestock estrus if the estrous cycle is known to have been in the luteal phase with functional CL while the multiple injection method can be applied to both the follicular phase and the luteal phase [5]. The use of GnRH in synchronization protocols has been commonly used in cattle, it is intended to stimulate the development of dominant follicles so that ovulation occurs. GnRH has been used for various purposes, such as shortening the period of post-partum anesthesia, inducing ovulation at the end of the superovulation program, synchronizing the appearance of follicles and ovulation in synchronization programs and scheduled IB programs (fixed time insemination) [6].

Based on these conditions, this study aims to determine the reproductive performance and economic estimation aspects of Pasundan cattle induced by prostaglandin

(PGF2 α) and gonadotropin-releasing hormone (GnRH). The results of the research are expected to provide real support for the government's efforts to empower Pasundan cattle breeders as an entry point for realizing tough, independent, and agribusiness-minded breeders.

2. Materials and Methods

The research used material in the form of 20 Pasundan heifers divided into 2 groups of 10 each. The first group came from breeders belonging to the Rundayan Sawargi Group, Cibalong District, Garut Regency and the second group of cows came from the Mekar Tani 2 Livestock Group, Jonggol District, Bogor Regency. All cows were injected with prostaglandins (PGF2 α , dinoprost tromethamine) at a dose of 5 ml/head intramuscularly 2 (two) times with an interval of 11 days, and on the 9th day was injected with gonadotropin realizing hormone (GnRH, gonadorelin) as much as 2.5 ml/head intramuscularly. Cows in heat are artificially inseminated 2x with an interval of 6 hours. In the third month after insemination, all cows are examined for pregnancy by rectal palpation, and pregnant cows are monitored until birth. The calves born were recorded for sex, body weight, evaluated for body weight gain and mortality until the age of 120 days, and their economic feasibility was analyzed for reporting.

The research method used is experimental, in a pilot application in the field for the implementation of reproductive technology innovation. This research series begins with the delivery of information technology dissemination to breeders as technology users in the field. The data collected were processed with a descriptive and descriptive analysis of reproductive performance including the percentage of birth rates, birth weight of calves and weight gain up to 120 days of age, the percentage of calf mortality until the age of 120 days, and economic estimates including profit and B / C ratio.

3. Results and Discussion

3.1. Reproductive performance

The most realistic assessment of the application of technology is to calculate the birth rate (calving rate). If the results of the application of reproductive technology have not resulted in a child standing next to its mother, then the application of heat synchronization and artificial insemination cannot be said to be successful [7]. The number of births compared to the number of acceptors who were pregnant as a result

of insemination or calving rate (Cr) in the two study sites, synchronized with estrus and ovulation (PGF2 α + GnRH + PGF2 α) is presented in Table 1.

TABLE 1: Calving rate, birth weight, weight gain and mortality.

Reproductive Aspect/Territory	Garut District	Bogor District
Calving Rate (head, %)	9/10 head (90 %)	7/8 head (87.5%)
Birth Weight (Kg)	21.51 \pm 0.71	19.95 \pm 2.02
Weight Gain (kg/head/day)	0.60 \pm 0.5	0.55 \pm 0.5
Mortality (%)	0	0

Based on the results in Table 1, it shows that Pasundan cattle in the Garut region have better reproductive performance than Bogor, including calving rate (90% vs, 87.5%), birth weight of calves (21.51 \pm 0.71 vs 19.95 \pm 2.02), an increase in body weight (0.60 \pm 0.5 vs 0.55 \pm 0.5%), but the percentage of mortality in all locations showed the same value, namely (0%). Numerically, the calving rate (birth rate) in the Garut area was 9 out of 10 pregnant cows, while in the Bogor area 7 out of 8 cows were pregnant. This difference is thought to be influenced by different maintenance, feeding, and environmental management. Changes in land use and changes in forest planting patterns in the population base of Bogor Regency have caused Pasundan cows to lose their carrying capacity for grazing, so that the availability of forage decreases, and causes a negative energy balance, also as a result of relatively hotter temperatures (30.4 degrees Celsius) so there is a lack of water availability and low quality of feed. Hot and humid temperatures affect the body's metabolism, while grass and agricultural waste given to Pasundan cattle in the Bogor area have high crude fiber and are thought to cause low feed efficiency, which will have an impact on decreasing reproductive performance on an ongoing basis. The high birth rate in the Garut region, of course, is inseparable from environmental conditions including nutrition, maintenance management, and climatology (altitude) which are more adequate by the body needs of Pasundan cattle. The conversion of agricultural land to residential, industrial, shopping centers causes the availability of forage to decrease, especially for farms located around cities (urban areas) [8]. Furthermore, the average temperature during research in Bogor Regency is relatively higher than in Garut Regency (30.4 vs 24.8 degrees Celsius), which causes a lack of water availability and low quality of feed which will affect the metabolism of livestock. According to [9] the nutritional feed given before and after giving birth will affect the value of the conception rate. Furthermore, estrus will not occur in conditions of lack of food or estrus can occur but the failure of pregnancy or pregnancy occurs but miscarriage occurs, or pregnancy is safe until the child is born but the child is weak because the mother is malnourished [10].

Based on the results of the analysis of variance, it showed that the synchronization treatment of estrus and ovulation in the two regions was significantly different ($p > 0.05$) on the birth rate. It is suspected that Pasundan cattle in Bogor Regency have relatively negative energy balance (NEB). An imbalance in protein levels will interfere with the secretion of gonadotropin hormones. Ruminants generally need a lot of glucose for fetal body growth and tissue growth such as placenta, udder, and milk production [11].

The mean birth weight of Pasundan calves in the Garut area (21.51 ± 0.71 kg) was higher than the Bogor area (19.95 ± 2.02 kg). Although the birth weight in the Garut area tended to be higher than the Bogor area, there was no significant difference ($P < 0.05$) between the two. The use of GnRH has been shown to increase the secretion of pregnancy hormones, uterine, embryo, and fetal growth, birth weight and weaning weight, growth, and development of mammary glands, and milk production of cows [12]. Furthermore, in addition to increasing endogenous secretion, superovulation was able to increase important metabolites, namely triglycerides, protein, and blood glucose [13].

3.2. Economic estimates of technology application

A review of economic estimates in the application of reproductive technology to Pasundan heifers is very dependent on the reproductive efficiency of each cow. This is because the survival of the calf depends on the success of the mother to produce several healthy calves at the time of weaning in one reproductive cycle, from mating, pregnancy, birth to weaning. The longer the livestock reproduction cycle, the less efficient it is, because it indirectly increases the cost of maintenance and animal feed, while the cost of revenue remains dependent on weaning weight and the price of live weight per kg. This is because the profit function of the livestock business is influenced by several biological properties that will determine the quantity of livestock body weight, such as birth weight, body weight gain, weaning weight, and feed consumption, especially the length of the feeding period [7]. Furthermore, in the modern livestock business, attention to birth weight generally occupies a fairly large portion [14]. The profit function of livestock business is influenced by several biological properties that will determine the quantity of livestock body weight, such as birth weight, body weight gain, weaning weight, and feed consumption, especially the length of the feeding period [15]. The results of the calculation of the economic estimation results from the synchronization of estrus and ovulation in the Garut and Bogor regions are presented in Table 2.

TABLE 2: Total Income, Total Costs, Profits and B / C Ratio.

No	Variable	Garut District	Bogor District
1	Income	Rp 50.495.000	Rp. 36.120.000
2	Total Costs	Rp 24.000.000	Rp. 24.000.000
3	Profit	Rp. 26.495.000	RP. 12.120.000
4	B/C ratio	1.1	0.51

The results in Table 2. show that of the total costs incurred by farmers in the Garut and Bogor regions is the same as Rp. 24,000,000 but income (IDR 50,495,000), profit (IDR 26,495,000) and B / C ratio (1.1) in the Garut area are higher than income (IDR 36,120,000, profit (IDR 12,120,000) and B / C ratio (0.51) for the Bogor region. This shows that the economic estimation of Pasundan cattle induced by prostaglandins and gonadotropin hormones in the Garut area is better than the Bogor area, with an increase in income of, 218.23% per 13 months. The results of this study indicate that the application of synchronization Lust and ovulation ((PGF2 α + GnRH + (PGF2 α)) provide benefits for the cultivation of Pasundan cattle. According to [14] if the B / C ratio is > 0.3, then the cattle business is profitable. Based on the results of these economic estimates, shows the synchronization of estrus and ovulation as well as artificial insemination, and supported by adequate feed management, can produce calves with optimal body weight and high quality of life so that they can deliver Pasundan cattle breeders get optimal benefits.

4. Conclusion

The reproductive performance of Pasundan heifers showed a positive response to the application of estrus synchronization and ovulation. Pasundan heifers in the Garut region have an average calving rate (birth rate) of 90%, birth weight of calves 21.51 \pm 0.71, bodyweight gain 0.60 \pm 0.5 kg/head / day, mortality 0%, better than the Bogor area births 87.5%. birth weight 19.95 \pm 2.02 kg, body weight gain 0.55 \pm 0.5 kg / head / day, mortality 0% ., The economic estimate for Pasundan cattle in the Garut area (profit 26,495,000 and B/C ratio 1.1), is better than the Bogor area (profit Rp. 12,120,000 and B/C ratio 0.51), with an increase in income of, 218.23 % per 13 months.

It is suggested that the application of estrus and ovulation synchronization in Pasundan cattle in Bogor Regency needs to be balanced with adequate feed intake, to increase reproductive performance and optimal economic estimation.

5. Acknowledgement

Thank you to the breeders and the Head of the Rundayan Sawargi Group having his address at Cihurang Village, Karya Mukti Village, Cibalong District, Garut Regency, and Mekar Tani 2 Animal Husbandry Group, having his address at Singasari Village, Jonggol District, Bogor Regency, who have assisted the facilities in conducting research. Thank you also to the Head of the Department of Agriculture and Animal Husbandry of Garut Regency and his staff, Bogor Regency, and his staff who together have helped research activities for the application of synchronization of estrus and ovulation and IB in Pasundan cows.

References

- [1] Utomo B N. 2016. Sapi Katingan Sapi Lokal Kalimantan Tengah Dan Upaya Pelestariannya. *J. Penelit. dan Pengemb. Pertan..* **34** 135.
- [2] Dinas Peternakan Propinsi Jawa Barat 2016. 2016. Laporan Populasi Sapi Potong di Propinsi Jawa Barat Tahun.
- [3] Wahyudi L, Sulistiawati T and Wahyuningsih S. 2013. Tampilan reproduksi sapi perah pada berbagai paritas di Desa Kemiri Kecamatan Jabung Kabupaten Malang. *J. Ternak Trop.* **14** 13–22.
- [4] Spencer T E, Forde N, Dorniak P, Hansen T R, Romero J J and Lonergan P. 2013. Conceptus-derived prostaglandins regulate gene expression in the endometrium prior to pregnancy recognition in ruminants. *Reproduction.* **146** 377–87.
- [5] Nascimento A B, Souza A H, Keskin A, Sartori R and Wiltbank M C. 2014. Lack of complete regression of the Day 5 corpus luteum after one or two doses of PGF2 α in nonlactating Holstein cows. *Theriogenology.* **81** 389–95.
- [6] Sianturi R G, Purwantara B, Supriatna I, Amrozi and Situmorang P. 2012. Optimasi inseminasi buatan pada kerbau lumpur (*Bubalus bubalis*) melalui teknik sinkronisasi estrus dan ovulasi. *J. Ilmu Ternak dan Vet.* **17** 92–9.
- [7] Sumaryadi M Y, Saleh D M, Haryanto B, Herdiansah D, Sudrajat S and Yasin C A. 2010. Kajian Aspek Reproduksi dan Estimasi Ekonomi pada Ternak Sapi yang di Inovasi Teknologi Reproduksi. *J. Agripet.* **10** 1–6.
- [8] Aslimah S. 2014. Produktivitas Karkas Domba Garut Jantan Pada Pemberian Jenis Pakan dan Waktu yang Berbeda. *J. Ilmu Produksi dan Teknol. Has. Peternak.* **2** 251–6.

- [9] Nuryadi and Wahjuningsih S. 2011. Penampilan reproduksi sapi peranakan Ongole dan peranakan Limousin di Kabupaten Malang. *J. Ternak Trop.* **12** 76–81.
- [10] Diskin M G and Kenny D A 2014 Optimising reproductive performance of beef cows and replacement heifers *Animal.* **8** 27–39.
- [11] Piccione G, Messina V, Marafioti S, Casella S, Giannetto C and Fazio F. 2012. Changes of some haematochemical parameters in dairy cows during late gestation, post partum, lactation and dry periods *Vet. ir Zootech.* **58** 59–64.
- [12] Hassan M, Husnain A, Naveed M I, Riaz U and Ahmad N. 2017. Effect of ovsynch versus prostaglandin F2 α protocol on estrus response, ovulation rate, timing of ovulation and pregnancy per artificial insemination in Sahiwal cows *Anim. Sci. J.* **88** 445–50.
- [13] Valdecabres-Torres X, Larrosa-Morales P and Cuervo-Arango J. 2013. The effect of dose and type of cloprostenol on the luteolytic response of dairy cattle during the ovsynch protocol under different oestrous cycle and physiological characteristics. *Reprod. Domest. Anim.* **48** 874–80.
- [14] Rusdiana S, Soeharsono S and Ferasyi T R. 2018. Beef Cattle Business in Dry Land Area Parangloe District Gowa. *Int. J. Trop. Vet. Biomed. Res.* **22** 11–6.
- [15] Wirdahayati R B. 2010. Penerapan Teknologi dalam Upaya Meningkatkan Produktivitas Sapi Potong di Nusa Tenggara Timur *Wartazoa.* **20** 12–20.