



The Estimation of Breeding Value of Saburai Goats at Weaning Weight in Gisting Atas Village, Gisting District, Tanggamus Regency, Lampung Province, Indonesia

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Abstract | Background and Objective: One of the goats developed in Lampung Province is the Saburai goat. Selection is an action to select livestock with good genetic quality. This study aims to determine the genetic potential of male and female Saburai goats that have good genetic quality at weaning based on their estimated breeding value (EBV) and to determine which individuals are eligible to be retained in the population. **Materials and Methods:** This research was conducted in March—May 2021 at Gisting Atas Village, Gisting District, Tanggamus Regency. This study used a survey method using primary and secondary data. Primary data was obtained from interview questionnaires and measuring the weaning weight of goats. Secondary data was obtained from weaning weight data in the recording. The observed variables were birth weight, weaning weight, weaning age, age of the dam at partus, type of birth, and sex. **Results:** The results of this study showed that the average weaning weights of male and female Saburai goats were 16.46 ± 1.1 kg and 16.40 ± 0.98 kg, heritability value was 0.37 ± 0.24 and EBV of weaning weights of male were 16.45 ± 0.40 kg and female Saburai goats 16.39 ± 0.37 kg, respectively. **Conclusion:** There were 5 males with the highest breeding value in Gisting Atas Village, Gisting District, Tanggamus Regency, namely BG8 (17.20 kg); LS9 (17.16 kg); LS8 (17.16 kg); LJ3 (17.09 kg); and BG (17.06 kg). Meanwhile, there were 5 females with the highest breeding value, namely BG5 (17.03 kg); BG6 (16.93 kg); SU4 (16.86 kg); SU5 (16.86 kg); and MR3 (16.84 kg).

Keywords | Estimation, Weaning weight, Heritability, Breeding Value, Saburai Goat, Tanggamus, Lampung.

Received | March 11, 2022; Accepted | May 30, 2022; Published | July 20, 2022

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Citation | Adhianto K, Arif CR, Kurniawati D, Dakhlan A (2022). The estimation of breeding value of saburai goats at weaning weight in gisting atas village, gisting district, tanggamus regency, lampung province, indonesia. Adv. Anim. Vet. Sci. 10(8): 1781-1786.

DOI | <http://dx.doi.org/10.17582/journal.aavs/2022/10.8.1781.1786>

ISSN (Online) | 2307-8316



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INTRODUCTION

The need for meat as a source of animal protein will increase along with the high awareness, population growth, and increasing purchasing power of the people. One of the livestock that can be used for meat as a solution to increase the need for animal protein is goats.

According to Central Bureau of Statistics Indonesian, the

Goat population in Indonesia in 2019 was 18,975,955 heads. Lampung Province as the province with the largest goat population in Sumatra 1,453,529 heads, accounts for 7.6% of the goat population in Indonesia. The number of goat populations in Lampung Province has continued to increase in recent years. According to BPS data, the goat population in Lampung in 2015-2019 was 1,297,872, 1,326,103, 1,360,734, 1,430, 416, and 1,453,529 individuals (Central Bureau of Statistics, 2019).

One of the goats developed in Lampung Province is the Saburai goat. The Saburai goat is a meat type goat resulting from a grading up cross between a male Boer goat and a female Ettawa Grade (EG) goat with a blood composition of 75% Boer goat and 25% EG goat. Saburai goat is a goat designated as a local genetic resource in Lampung Province based on the Decree of the Minister of Agriculture of the Republic of Indonesia Number 359/Kpts/PK.040/6/2015 (Sulastris and Sukur, 2015; Adhianto et al., 2015).

Efforts that can be made for the success of the Saburai goat farming business is to provide superior seeds. One way to produce superior seeds is by selection. Selection is an action to select livestock with good genetic quality, that comes from parents or ancestors. This inherited ability will interact with the influence of environmental factors in which the livestock is raised. Selection is usually carried out on livestock traits that can be measured, one of which is weaning weight. One of selection criterion that can be used is estimated breeding value (EBV) of weaning weight. BV estimation in goats when they reach weaning age can be a reference for breeders to determine which individuals are selected to be maintained in the population.

Gisting District, Tanggamus Regency, is one of the Saburai goat development areas in Lampung Province. One of the villages that is the development of the Saburai goat is Gisting Atas Village. In that village the recording of the Saburai goat is quite good. Based on this, it is necessary to conduct research to determine the estimation BV of weaning weight of Saburai goats in Gisting Atas Village, Gisting District, Tanggamus Regency.

MATERIALS AND METHODS

MATERIALS

The materials used in this study were recordings of 100 Saburai goats consisting of 50 recordings of male Saburai goats and 50 recordings of female Saburai goats at weaning age. The equipment used were stationery, scales for goat kids at weaning, and a camera for documentation.

RESEARCH METHODS

This study used a survey method using primary and secondary data. Research was taken by *purposive sampling* by observing Saburai goats that reached weaning age at the study site. Primary data was obtained by weighing goats that had reached weaning age that had not been recorded in the recording and conducting direct interviews with farmers. Secondary data was obtained from the results of measurements and weighing carried out by farmers on goats that were observed and recorded on a recording.

VARIABLES OBSERVED

Variables observed in this study included the age of doe at the time of partus, birth weight, weaning weight, weaning age, type of birth, and sex.

DATA ANALYSIS

Weaning weight data obtained from recording and weighing directly was corrected for the age of the dam (FKUI), type of birth (FKTL), and sex (FKJK) with the formula according to Hardjosubroto's (1994) recommendation as follows:

$$BST = \left(BL + \frac{BS - BL}{Weaning\ age} \times 90 \right) \times FKTL \times FKUI \times FKJK$$

Description:

- BST = corrected weaning weight
- BL = birth weight
- BS = weaning weight
- FKJK = sex correction factor
- FKTL = birth type correction factor
- FKUI = parent age correction factor

The heritability of weaning weights was estimated using half sib correlation method using the formula as recommended by Hardjosubroto (1994) as follows:

$$h^2 = \frac{4 \sigma_s^2}{\sigma_w^2 + \sigma_s^2}$$

Description:

- = Heritability
- = Variation in sires
- = Variation within sires

Standard error (SE) of heritability value was calculated by the formula:

$$SE(h^2) = 4 \sqrt{\frac{2(1-t)^2 (1+(k-1)t)^2}{k(k-1)(s-1)}}$$

Description:

- SE = standard error
- t = half sib correlation
- k = number of offspring per sire
- s = total number of sire

Heritability value of weaning weight obtained is used to calculate the breeding value (BV). According to Hardjosubroto (1994), to calculate EBV, the following formula is used:

$$NP = h^2 (P - \bar{P}) + \bar{P}$$

Description:

NP= Breeding Value

h2 = Heritability

P = Individual weaning weight

\bar{P} = Average population weaning weight

RESULTS AND DISCUSSION

OVERVIEW OF RESEARCH LOCATIONS

Gisting Atas village is one of the villages in Gisting Sub-district, Tanggamus Regency, where many people keep goats. One of the goats kept by the community in Gisting Atas Village is the Saburai goat. According to the [Central Statistics Agency \(2018\)](#), the goat population in Gisting District in 2018 reached 15,595 heads.

Gisting Atas Village has an area of 4.64 km² and is included in the administrative area of Gisting District which has an area of 32.53 km². Gisting District is located 12 km from Kota Agung which is the capital of Tanggamus Regency and 75 km from Bandar Lampung City which is the capital of Lampung Province. The boundaries of the Gisting sub-district are as follows: in the north it is bordered by Sumberejo sub-district, in the east it is bordered by Gunung Alip sub-district, in the west it is bordered by the East Kota Agung sub-district. The average altitude of Gisting sub-district is ±700 m above sea level with air temperature around 18-28 °C. The average humidity in Gisting District is 61-98%. These conditions support the growth of abundant forage both grasses and legumes. So this area is suitable as a place for the development of Saburai goats.

Most of the residents in Gisting Atas Village work as farmers and ranchers. According to research data, from the results of interviews conducted with members of the Makmur II and Mutiara Tani livestock groups in Gisting Atas Village, it shows that the main profession of members as breeders is 63.16%. Meanwhile, members who work as farmers and raise livestock as a side business are 36.84%. The last education of the members of the livestock group studied was grouped by education level of elementary, junior high, and high school or equivalent, the results were 15.79%, 36.84%, and 47.37%, respectively.

The age of the breeders in the study area were grouped into categories of age 30-40 years, 41-50 years, and more than 51 years, from the results of the grouping the results were 21.05%, 42.10%, and 36.84 %. Farmers in Gisting Atas provide feed 3 times a day, at 06.00 AM, 11.00 AM, and 04.00 PM. The feed used is in the form of forage consisting of odot grass, legumes such as calliandra; gamal; and

lamtoro, as well as agricultural waste such as sweet potato waste; carrot waste; and so forth.

From the results of the study, the Saburai goat cage at the study site used a stage cage with wooden floors. All cages at the study site had individual cages with a head to head form of cage. The roofs of the cages in the Makmur II and Mutiara Tani groups in this study were in the form of monitors (63.16%) and gables (36.84%).

SABURAI GOAT

Weaning weight is a performance that is often used as a selection criterion for goats. Weaning weights need to be corrected first so that there are no other influencing factors, so they can be used as selection criteria. Weaning weight can be used as a criterion in estimating livestock performance and can be used as a selection criterion to predict post-weaning calf growth. Weaning weight is influenced by sex, age of mother, type of birth, and age of weaning ([Hardjosubroto, 1994](#)).

Based on the data ([Table 1](#)), it is known that the average corrected weaning weight for male Saburai goats is 16.46 ± 1.1 kg, which is greater than the average corrected weaning weight for female Saburai goats, which is 16.40 ± 0.98 kg. The average male weaning weight is greater than the female weaning average weight because gender has an influence on weaning weight. According to [Devendra and Burns \(1994\)](#), male bulls are almost always heavier than female calves in the same breed of goat. Weaning weight has a strong correlation with birth weight, according to [Sulastrit et al. \(2019\)](#) goat kid who have a high birth weight are likely to have a high weaning weight as well. [Hardjosubroto \(1994\)](#) stated that birth weight is influenced by differences in hormones that affect fetal growth in the mother's womb. According to [Alfiansyah \(2011\)](#) the androgen hormones contained in the male goat fetal hormonal system work and produce growth processes in all body tissues. This is different from the female fetus. Androgen hormones found in female goat fetuses limit the growth of tube bones in the prenatal phase. This causes the birth weight of males to be higher than that of females and then also to the weight when they reach weaning age.

Table 1: Corrected weaning weight of Saburai goat

Item	Male	Female
Highest corrected weaning weight (kg)	18.72	18.10
Lowest corrected weaning weight (kg)	14.20	13.78
Average corrected weaning weight (kg)	16.46	16 ,40
Standard deviation (kg)	1.1	0.98
Number of observations (tails)	50	50

The results of this study are relatively the same as those of Adhianto et al. (2017) which shows the weaning weight of male Saburai goats in Gisting is 16.22 ± 3.77 kg and Adhianto et al. (2016) which shows the weaning weight of female Saburai goats in Gisting is 16.1 ± 3.4 kg. However, this result is lower than the statement from the Department of Animal Husbandry and Health, Lampung Province (2015) which states that the weaning weights of male and female Saburai goats are 19.67 ± 6.88 kg and 18.56 ± 1.46 kg, respectively. This difference is thought to be due to the influence of environmental factors, especially the feed received by the broodstock at the study site. Saburai goats at the study site were only fed forage. According toutama (2003) weaning weight is influenced by the condition of the mother, the number of children, and the condition of the children born. Weaning weight is a trait that is influenced by the genetic component of the parent (*maternal genetic effect*), namely the influence of genes that affect environmental conditions in the parent which ultimately affects individual performance (Bourdon, 1997).

HERITABILITY VALUE SABURAI GOATS AT WEANING

Knowledge of the magnitude of heritability is important in the development of selection and mating plans to improve livestock quality. This knowledge provides a basis for estimating the magnitude of progress in different breeding programs (Dakhlan and Sulastri, 2002). The value of heritability in the field of livestock breeding has an important role because the value of heritability provides information on the magnitude of the value of a trait passed on by parents to their offspring (Hardjosubroto, 1994).

The heritability value of the weaning weight of Saburai goats in this study was 0.37. This shows that the heritability value of Saburai goat's weaning weight which was analyzed using the step-brother method was included in the high category.

This is in line with the opinion of Hardjosubroto (1994) which states that the heritability value is said to be low if the value is less than 0.10, moderate if the value is between 0.10-0.30, and high if it is more than 0.30-1.00. Gunawan and Noor (2006) argue that heritability categorized as moderate to high can provide an indication that the selection made will be more effective and efficient in improving genetic quality improvement. Based on the estimation results, the selection of prospective parents or determination of suitable goats to be maintained as elders in the population can be done through individual selection.

The heritability of weaning weight for Saburai goat 0.37 means that the difference or diversity in weaning weight for Saburai goat, 37% is caused by genetic factors, while the rest is caused by environmental factors (Hoque et al.,

2002; Kruger et al., 2016).

The heritability value of the weaning weight of the Saburai goat in this study was greater than the heritability value of the Boerawa goat in the study of Pirdania et al. (2014) which is 0.072 ± 0.006 , greater than the research of Beyleto et al. (2010) which is 0.30 ± 0.17 , and lower than research by Nugraha (2007) which is 0.41 ± 0.102 . The difference in the heritability of weaning weight in this study with previous studies is thought to be caused by differences in the number of observations, time, and environment. In addition, the selection of elders made by breeders affects the subsequent individual performance. According to Hardjosubroto (1994) the heritability value of a trait will vary between populations. These variations can be caused by differences in genetic factors (genetic diversity), environmental differences (environmental diversity), methods and the number of data samples used. In addition, it is also influenced by the selection generation time.

The heritability estimation of Saburai goat weight in this study had a low standard error of 0.24. Standard error is said to be low if its value is smaller than the estimated heritability. This result is presumably because in the study the data obtained were corrected in advance for the age of the parent, type of birth, and sex. According to Warwick et al. (1990) the high heritability standard error was due to the absence of data adjustment, sampling errors, the number of individuals in each family group being too varied.

The heritability standard is declared low if the value is smaller than the heritability value obtained. Heritability which has a low standard error indicates that the heritability value is quite reliable. This reliable estimate of heritability when used in calculating livestock breeding formulas has results that are not much different from real conditions in the field (Legates and Warwick, 1990).

BREEDING VALUE

Breeding value (BV) is an assessment of the genetic quality of livestock for a particular trait given relatively on the basis of its position in the population (Hardjosubroto, 1994). The breeding value of the weaning weight of the Saburai goat in this study is presented in Table 2.

Based on the results of the study, the average value of the breeding weight of the male and female Saburai goats was 16.45 ± 0.45 kg and 16.39 ± 0.37 , respectively. kg. This result is thought to be caused by the average weaning weight of Saburai goats in this study, which was 16.46 ± 1.1 kg for males and 16.40 ± 0.98 kg for females, and the heritability value was 0.37 ± 0.24 . According to Hardjosubroto (1994) the magnitude of the breeding value is determined by heritability and the magnitude of the performance or trait

measured by the breeding value.

Table 2: Breeding value weaning weight of Saburai goat

Item	Male	Female
Highest breeding value (kg)	17.20	17.03
Lowest breeding value (kg)	15.60	15.43
Average breeding value (kg)	16.45	16.39
Standard deviation	0.40	0.37
Number of observations (tails)	50	50
Number of samples with BVs above the average (tails)	25	26
Number of samples with above average BV (%)	50	52

The results of this study are lower than those of Pirdania et al. (2014) which shows the average breeding value of Boerawa goats is 25.706±0.205 kg. This difference is thought to be due to differences in the genetic potential of each observed individual, weaning weight, and heritability value of weaning weight from each research result.

The results of the breeding value of 100 heads (50 males and 50 females) of Saburai goats were evaluated, it was obtained that the estimated weaning weight breeding value was above the group average of 50% (25 heads) in male and 52% (26 heads) in female. Saburai goats that have a breeding value above the average need to be maintained, because the higher the breeding value of an animal, the more superior the animal will be and can repeat its superior performance. According to Dakhlan and Sulastrri (2002) individuals with high breeding values will show a high ability to pass on their genetic potential to their offspring and repeat their production. Based on the research results, if it is determined that 10 percent of the male and female Saburai goat population has the highest breeding value, it will produce the 5 best individuals. The results of the selection of 10 percent of the population are presented in Table 3.

Table 3: Selection of male and female Saburai goats based on the breeding value of weaning weight of 10 percent of the population

No	Livestock Code (Male)	BV	Livestock Code (Female)	BV
1	BG8	17,20	BG5	17.03
2	LS9	17.16	BG6	16.93
3	LS8	17.16	SU4	16.86
4	LJ3	17.09	SU5	16.86
5	BG7	17.06	MR3	16.84

The results of this study indicate that the male Saburai goat

with livestock code LS9 has the highest breeding value of 17.20 kg and female Saburai goat with livestock code BG5 has the highest BV value of 17.03 kg. Sulastrri et al. (2019) stated that an excessively high number of adult male goats only adds to the cost of maintenance but does not increase the population like female goats which support population increase through the birth of offspring. Population of adult female goats in livestock business is an important factor related to reproductive performance and prediction of population growth rate in a certain area.

Based on this breeding value, it is expected that the goat kids with the highest breeding value deserves to be maintained for further development as replacement stock because it has an above-average breeding value. This is done so that the Saburai goats at the research site continue to experience increased performance.

CONCLUSION

Based on the results of research and discussion, it can be concluded that heritability value of weaning weight of Saburai goat in Gisting Atas Village is 0.70 (high category). The estimated average value of the weaning weight of male Saburai goats in Gisting Atas Village is 16.45±0.75 kg. The male Saburai goats have the highest breeding values, namely BG8, LS9, LS8, LJ3, and BG7. The estimated breeding value for the weaning weight of female Saburai goats in Gisting Atas Village is 16.40±0.69 kg. The female Saburai goats have the highest breeding values, namely BG5, BG6, SU4, SU5, and MR3.

ACKNOWLEDGEMENTS

The authors are thankful to all livestock group members who facilitated data for this study.

CONFLICT OF INTEREST

The authors have declared that there is no conflict of interest.

NOVELTY STATEMENT

The present study identify male and female Saburai goat that have good quality indicated by high estimated breeding value, that is not identified before.

AUTHORS CONTRIBUTION

All authors are equally sharing.

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