The economic value of beef cattle through AI and natural mating in farmers

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Abstract. The aim of this study was to determine the economic value of beef cattle through Artificial Insemination (AI) with the elite bulls and natural mating in farmers. The study was conducted in Gowa Regency, South Sulawesi Province in 2017, in 2 Sub-districts (Bajeng and Pallangga) and 9 Villages (Pabantengan, Pallangga, Maceni Baji, Ramba, Todotoa, Bajeng City, Marekaya and Paraikatte). The study used a field survey method, by recording data on the development of beef cattle. Mating activity was carried out with AI and natural mating using bulls and semen from Brahman, Ongole, Angus and Bali. All of the female were Bali dams and Bali heifers which ready to mate as many as 119 animals, where 90 dams would be bred through AI, and others 29 dams and heifers through natural mating in each farmer. Primary and secondary data were analysed descriptively, qualitatively, quantitatively, and economically. The results showed that the net profit of farmers who joined AI amounting to IDR. 266,712,000/year, net profits of farmers amounting to IDR.3,292,740/farmer, R/C 1.80. Net profits for farmers participating in natural mating were IDR. 32,027,000/year, the farmer's net profit of IDR. 1,104,379/farmer, R/C 1.27. The income of farmers from AI calf was higher than the income derived from calves from natural mating. The price of female and male calves were influenced by sire breeds, body weight and calf performance. The beef Bali cattle business, which is breeding through AI and natural mating is economically feasible.

1. Introduction

The SIWAB program, concern special effort to accelerate the increase of cattle and buffalo population and quality for getting the Government target of beef self-sufficiency in 2026 [1]. Until now in various regions of Indonesia, the SIWAB program is still ongoing to develop cattle and buffalo with artificial insemination (AI) and natural mating. Through AI, the government can maximize the potential of cattle and buffalo in the country through elite bull quality to produce highly productivity of crossbred and to be able continued producing calves. Through AI and natural mating at least the Government can create independent farmers in the fulfilment of food of animal origin and improve the welfare of farmers. To support the success of the SIWAB Program, the provision of medicines and vaccines can be done to improve animal health [2]. Effort to develop beef cattle farms continue to be pursued, and one of them is to meet the needs of meat and increase the economic value of farmers [3]. The
The consequence of ideal ratio of females and males cause the number of productive cows and heifers would decrease and the impact of the calving rate is also reduced.

Therefore, one of the government policies Made in the form SIWAB program, which has been pursued and is still ongoing in order to maintain basic production stock, beef cattle is quite ideal, to be able to supply meat needs [4]. This is the importance of reviewing the meat self-sufficiency program that has been made through government policy. For the program to run better, the government needs to re-evaluate the results obtain previously. Beef self-sufficiency has been launched seen 2005, and is targeted to be achieved in 2010, but is still did not work expectedly [5]. Ashari et al [6] stated that, in the Ministry of Agriculture’s strategic plan for 2010 – 2014, there were four main targets to be achieved and maintained, one of them was the achievement of sustainable beef self-sufficiency. Atmakusuma et al [7] suggested that could self-sufficiency in meat be realised. The fact is that until now self-sufficiency in meat has become a phenomenon that has not yet been achieved, while most of the local beef supply comes from small farmers [8].

SIWAB is able to overcome various obstacle and problems in the development of beef cattle. Pregnancy targets for cows in small farmers through AI and natural mating can be achieved well. Maintenance of beef cattle in farmers is still a part-time business and has not yet led many to main business, only limited to daily business, and savings. However, the development of beef cattle is quite slow, but the largest population is still filled with small farmers in rural areas. Through AI and natural mating, it is expected that the economic value of farmer increases, then farmers must be encouraged to be able to scale up beef cattle business properly. The Government's expectation is that the SIWAB program cannot fail to meet domestic meat needs. There are two activities that will be as the focus of the government important points, namely artificial insemination and natural mating; that can improve the economic value of the farmers through the birth of calves. Based on the problems mentioned above, comparatively beef cattle in several regions in Indonesia, have local advantages to be developed in Java and outside of Java, such as in NTT, NTB, Bali and Sulawesi [9].

Hopefully, SIWAB program, can improve and increase beef cattle and buffalo populations in the country. In the long run, beef needs do not have to rely on imports, but can be met from the SIWAB program results. The SIWAB program must be responded to, otherwise, the shortage of beef demand in Indonesia will still be imported [10]. Referring to the prediction and strategy of optimizing the implementation of AI and natural mating, in Gowa Regency, South Sulawesi Province, it can be expected holistically the development will increase. The aim of this paper was to determine the economic value of beef cattle through AI with elite bulls and natural mating in farmers.

2. Materials and methods
This study was conducted in Gowa Regency, South Sulawesi, Indonesia in two Sub-districts (Bajeng and Pallangga) and nine Villages (Pabantengan, Pangga, Maceni Beji, Ramba, Todotoa, Bajeng, City, Marekaya and Paraikatte). The study was using a field survey method, by recording data on the development of the number of beef cattle, both Bali cows and Bali heifers that were ready to mate as many as 119 animals, where 90 cows would be bred through AI and others 29 cows and heifers through natural mating. Those cattle mated through the AI were used elite semen from elite sires of Brahman, Angus, Ongole and Bali. Likewise, the Bali cows and heifers mated naturally were using bulls with the same breeds, i.e. Brahman, Angus, Ongole and Bali. Data collected included secondary and primary data. Secondary data were obtained from the field data recording of cows and heifers that were ready for mating both AI and natural mating methods. Primary data were obtained from the Livestock Services Office [11].
2.1. Data analysis
Cost earned for the development of beef cattle of the farmers were calculated for one year and based on the number of cattle raised [12]. Business feasibility, can be seen from the economic value obtained by R/C farmers >1, which means profit, R/C <1 loss and R/C = 1, meaning that beef cattle business is not profitable and not loss. Farmers can consider whether the beef cattle business will continue or not. The cost parameters of beef cattle business in small farmers have been formulated [6]. Analysis of the feasibility of beef cattle business in farmers, the financial economy can be calculated based on business for one year. Financial feasibility can be described the amount of costs incurred for each production cost/year. Analysis of the financial feasibility of beef cattle business can also be done partially, using R/C ratio analysis indicators [13]. In order to determine the profitability of beef cattle business in breeders, can be assessed by R/C [14]. Analyses of data were descriptively, qualitatively, quantitatively, and financially and economically, refers to the data obtained from the number of Bali cattle (cows and heifers) in AI, natural mating, number of calves and calf selling points.

3. Results and discussion

3.1. Beef cattle business and breeders
The results of the field survey show that, Bali cows and Bali heifers when in AI and natural mating have an average age between 2.2-4.6 years, all heifers have not given birth and cows have given birth between 1-2 times. The mating activities that have been carried out show that the results of AI and natural mating in Bali cows and heifers, the time of pregnancy was not as uniform in between 3-6 months, depending on the time of estrous, the timeliness of the AI and the readiness of the inseminator. All of Bali cows and heifers from AI and natural mating are assumed that have one calf at each farmer. The selling value of calves in farmers has ages between 5-8 months and is calculated based on the family of cattle produced by AI and the results of natural mating. The productivity of beef cattle kept by farmers is still below the potential productivity, caused by the limitations of farmers in capital [15]. Each bull or sire is mated at a price of IDR.100.000/mating and an AI of IDR. 100.000/AI. The assumptions for the expenditure of the Bali cows and heifers as many as 119 heads ready for pregnancy through AI and natural mating.

Then each of Bali cows and heifers in AI were 90 heads and the others 29 heads of Bali cows and heifers were followed in naturally mated. The calculation of the cost of Bali's cattle farmers can be seen from the pregnancy and the results of giving birth to each cow. For each Bali cow at AI have 90 calves, with assuming calf mortality was 10% or 9 remaining 81 live calves. The results of calf from natural mating were produced 29 heads, and calf mortality was 24% or as many as 7 remaining with 22 calf survivors, calves deaths caused by abortion, lack of food and drinking water in field, stepping on the mother and bulls and born in a status of weakness. The number of calves died in this study was better than the number of Bali calves died in pasture areas in East Nusa Tenggara [16,17].

3.2. Production cost producing pregnant cows through AI and its income
Investment costs for the purchase of female Bali cattle were 90 cows with an average price of IDR.11,250,000 / head or IDR. 1,012,500,000. The cost to purchase 5 bulls with an average price of IDR. 21,750,000 or IDR. 108,750,000. The cost for making one unit of animal house with the average price of IDR.1,150,000. The cost of devaluation of female Bali cattle is 2%/2 years or IDR. 20,250,000, the cost of devaluation of bulls 5%/5 years or 2,175,000 and cost of animal house devaluation of 10%/year or at IDR.115,000. Total devaluation costs of IDR.22,540,000/year. Variable
costs, inseminator labour costs as much as 159.50 days/year or as much as IDR. 3,271,200, labour costs as much as 163.56 days or IDR. 2,175,000/year, AI costs of 81 individuals as much as IDR. 8,100,000/year, the cost of purchasing medicines is 125,000/ package/year, the cost of purchasing concentrate feed is 2 kg/day x the price is IDR.4,500 x the number of cows and heifers are 90 heads x year amounting to IDR.291,600,000/year, the cost of purchasing corn straw feed as much as 5 kg/day x 90 x price of IDR.100 x year of IDR.3,240,000.

The amount of variable costs is IDR 309,528,000/year. The income, selling value of female calf produced by AI from semen of Brahman, Angus, Ongole, aged 5-8 months/head as many as 21 animals with an average price of IDR.6,780,000, or IDR.142,380,000. The selling value of male calf from AI from semen of Brahman, Angus, Ongole, aged 5-8 months/head is 26 heads with an average price of IDR.7,850,000 or IDR.204,100,000. The selling value of female calf produced by AI from Bali bulls aged 5-8 months/head is 14 heads with an average price of IDR.6,750,000 or IDR.94,500,000. The selling value of male calf produced by AI from Bali bulls aged 5-8 months/head as many as 20 with an average price of IDR.7,890,000 or of IDR.157,800,000. Total gross income from the sale of calves produced by AI amounted to IDR.598,780,000/year.

3.3. Production cost producing pregnant cows through natural mating and its income

Investment costs for the purchase of female Bali cattle are 29 head with an average price of IDR.11,250,000/head or IDR.326,250,000. The cost to purchase 5 bulls with an average price of IDR. 21,750,000 or IDR.108,750,000. The cost for making one unit of animal house is the average price of IDR.1,150,000., The cost of devaluation of Bali cows is 2%/2 years or IDR. 6,525,000 bulls devaluation of 5%/5 years or 2,175,000 and animal house depreciation costs of 10%/ year or IDR 115,000. - Total devaluation costs of IDR.8,815,000/year. Variable costs, inseminator costs as much as 159.50 days/year or as much as IDR.3,271,200 farmer’ costs as much as 163.56 days or IDR. 2,175,000/year, natural mating costs in bulls belonging to cows and heifers as many as 29 heads in the amount of IDR.2,900,000/year, costs for purchasing medicines for IDR.125,000/package/year, the cost of purchasing concentrate feed as much as 2 kg/day x price of IDR.4,500 x number of cows and heifers of 29 cows x years is IDR 93,960,000/year, the cost of purchasing corn straw feed as much as 5 kg/day x 29 x the price of IDR.100, x-year is IDR.5,220,000.

The amount of variable costs is IDR.108,668,000/year. The selling value of female calves was produced through natural mating with Brahman, Angus and Ongole bulls, aged 5-8 months/head of 5 heads with an average price of IDR.6,760,000, or IDR.33,800,000. The selling value of male calves was yielded by natural mating of Brahman, Angus, Ongole, aged 5-8 months/head of 7 heads with an average price of IDR.7,835,000 of IDR.54,845,000. Selling value of female calves was created with natural mating from Bali bulls aged 5-8 months/head of 3 animals with an average price of IDR.5,670,000 or of IDR.17,010,000. The selling value of female calves was got from natural mating from Bali bulls aged 5-8 months/head of 7 heads with average price of IDR.6,265,000 or IDR.43,855,000. Total gross income was derived from the sale of calves from natural mating is IDR.149,510,000/year. The economic value of calves was obtained from AI and natural mating is shown in table 1.
Table 1. Economic value in the calves business resulted from AI and natural mating in farmers.

| Description     | Calves produced by AI (IDR) | Calves produced by Natural mating (IDR) |
|-----------------|-----------------------------|----------------------------------------|
| A. Devaluation  | 22,540,000                  | 8,815000                               |
| B. Variable cost| 309,528,000                 | 108,668,000                            |
| Total (A+B)     | 332,068,000                 | 117,488,000                            |
| C. Gross income | 598,780,000                 | 149,510,000                            |
| D. Net income/year | 266,712,000           | 32,027,000                             |
| E. Net income/farmers | 3,292,740                  | 1,104,379                              |
| F. R/C          | 1.80                        | 1.27                                   |

Table 1 shows that from spending on the business of pregnant cows through AI to farmers, amounting to IDR.332,068,000/year, getting a net profit of IDR.266,712,000/year, obtaining a net profit of IDR.3,292,740/farmer and finding R/C value of 1.80. From every expenditure was earned on the business of pregnant cows and heifers from natural breeding in the farmer is IDR.117,488,000/year, giving a net profit of IDR.32,027,000/year, earning net profit of IDR.1,104,379/farmer, and finding R/C value of 1.27. The income of farmers from AI calf is higher than income from calves from natural mating. The price of female and male calves is influenced by sire breed, body weight and calf performance. Production costs and labor costs can be offset by the number of cattle and calf prices raised by farmers. The Bali beef cattle business, whose breeding is through AI and natural mating, is economically financially feasible.

4. Conclusion
The Government's policy to increase cattle population as a target for meat self-sufficiency in 2026 and to increase the economic value of farmers is expected to be achieved. Arrangement of mating through AI and natural mating in Bali cows and heifers can regulate calf births well, and at the same time can deliver breeders to get optimal benefits. Farmer profit from calf sales from AI results is higher with an R/C value of 1.80 than natural mating results that have an R/C value of 1.27. Higher farmer income from selling AI products from natural mating is due to better quality AI males and more farmer attention. The Bali cattle business, which is breeding through AI and natural mating, is economically feasible.

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