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## Gross Margin Comparison of Bali and Crossbred Cattle in Small Holder Beef Cattle Farming in South Kalimantan, Indonesia

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### ABSTRACT

Crossbred cattle have become more popular for smallholder farmer in Indonesia due to their superior performance compare to local breeds. However, assessment on economic performance of crossbred relative to local breeds, especially Bali cattle, in a smallholder farming is still limited. This study aims to compare gross margins of raising Bali cattle and crossbred cattle in a smallholder farming in South Kalimantan. Data collection methods comprised group discussion and personal interview with farmers that practice cattle breeding or fattening farming production system of either breed. Gross margin analysis showed raising crossbred cattle was more profitable than Bali cattle for both production systems. For breeding, Bali cattle resulted in IDR 413,438/head/month in gross profit compared to IDR 729,750/head/month for crossbred. For fattening, the gross profit for Bali cattle was lower (IDR 468,958/head/month) compared to crossbred (IDR 714,558/head/month). In addition, this study showed for Bali cattle, fattening is more profitable while for crossbred, breeding was more profitable. It is concluded that in the short term, in an intensive production system of smallholder cattle farming, raising crossbred is more profitable than Bali cattle, especially for breeding purpose. However, from a policy perspective, issues associated with crossbreeding in longer term must be considered.

**Keywords:** Bali cattle, Crossbred cattle, Gross margin analysis, Smallholder farming.

### 1. INTRODUCTION

The excellent physical characteristic of exotic breeds, especially *Bos taurus* breeds, has been attracted smallholder cattle farmers to raise those breeds in Indonesia. While artificial insemination is very popular, the crossbreed of those breeds with *Bos indicus* breeds or local breeds become unavoidable. Crossbreeding of Taurine breeds with locals is reported to have improved cattle productivity but it do not affect increasing national cattle population [1]. It was also reported the crossbreeds does not increase farming profits and there is no observable improvement in environmental performance [2].

Bali cattle (*Bos javanicus*) is a local Indonesian cattle, that is well known for its robustness in harsh conditions of tropical environments [3] [4]. Bali cattle populations spread along the Indonesian archipelago, in a varied production systems and are closely related to farmer livelihood and agriculture in the rural area. However, the popularity of exotic breeds has been slowly replaced Bali cattle in smallholder cattle farming in Indonesia. Because of their physical exterior, many smallholder farmers are eager to raise exotic breed or crossbreeds, even though they do not have adequate resources to manage the cattle in achieving its optimal performance.

Therefore, it is important to compare the farming performance of both breeds to evaluate the decision in

choosing the most profitable breeds in a similar environment. Gross margin analysis is a simple and common measure in farm evaluation [5]. This paper will apply a gross margin analysis to compare the profitability of raising crossbred and Bali cattle in smallholder breeding and fattening farms. Results will provide a preliminary assessment for further analysis on cattle breed development for smallholder cattle farming in Indonesia.

## 2. METHODS

### 2.1. Data Collection

This study was conducted through a group discussion and interview which involved farmer group leaders of Tanah Laut District, South Kalimantan Province. Two farmer groups were involved in the discussion, namely Wisma Nugraha and Budi Daya farmer groups. Twenty farmers from both groups were divided into four cattle businesses, namely Bali cattle-breeding, crossbred cattle-breeding, Bali cattle-fattening, and crossbred cattle-fattening. Participants

discussed their cattle business practices to collect information regarding variable and fixed costs, and revenues from selling cattle and manure in each production system.

### 2.2. Data analysis

Data were analysed using gross margin analysis to compare the gross profits of the breeding and fattening of Bali and crossbred cattle.

## 3. RESULTS AND DISCUSSION

### 3.1. Gross margin analysis of breeding business

High demand for exotic breed or crossbred cattle causes their calves to be more expensive than those of local cattle, such as Bali cattle. Our results showed that crossbred cattle produced more profits than Bali cattle for a cattle breeding farming (IDR. 729,750 vs IDR 413,438 per cattle per month). However, breeding crossbred cattle requires more investment than Bali

**Table 1.** Gross margin analysis of breeding business using Bali cattle and crossbred

No.	Items for raising 2 cows	Bali Cattle (12 months)	Crossbred (15 months)
A.	Revenue		
1.	Calves selling	14,000,000;	30,000,000;
2.	Manure selling	1,000,000;	1,200,000;
	Total revenues	15,000,000;	31,200,000;
B.	Variable cost		
1.	Fuel for collecting grass	2,920,000;	3,640,000;
2.	Feed concentrate and supplement	--	1,950,000;
3.	Health care	90,000;	200,000;
4.	Artificial insemination	100,000;	300,000;
5.	Supporting equipment	165,000;	165,000;
6.	Electricity	150,000;	150,000;
7.	Marketing cost	200,000;	200,000;
	Total variable costs	3,625,000;	6,605,000;
C.	Fixed cost		
1.	Pen depreciation	600,000;	650,000;
2.	Equipment depreciation	52,500;	52,500;
3.	Cows depreciation	1,000,000;	2,000,000;
	Total fixed costs	1,652,500;	2,702,500;
D.	Gross profit		
	Revenue-cost	9,922,500;	21,892,500;
	Gross profit per cow	4,961,250;	10,946,250;
	Gross profit per cow per month	413,438;	729,750;

cattle. As shown in Table 1, a farmer has to have more capital for purchasing breeding stocks, feed, health care and higher service fees per conception. In contrast, there is no need for feed concentrate or supplements in raising Bali cattle, and there are lower costs for health care and reproduction.

Breeding crossbred cattle also takes longer to generate revenue. This is because crossbred cattle have longer calving interval. A survey by [6] showed service per conception of crossbred cattle in Tanah Laut District ranges from 1.3 to 1.6 that are higher than service per conception for Bali cattle (1.0-1.3). Thus, the calving interval for Bali cattle was estimated at 12 months and can produce a calf every year. [7] stated that in Bali cattle breeding business, cows produces calves in the first year, and such reproductive performance allows farmers to sell calves every year.

Bali cattle is well known for its adaptability in harsh environments and able to efficiently utilize the low quality of feed resources, such as crops and plantation by-products [8]. Even though Bali cattle is also well known for their good fertility, the production system affects their reproductive performance. Report

of [9] indicated Bali cattle under an intensive production system has better reproductive performance in term of the age at first mating, service per conception, calf weight, age at weaning, and calving interval, compared with either extensive system or semi-intensive system. This is because, under an intensive production system cows normally receive feed concentrate and supplements that fulfil their energy, protein and mineral requirements. This is in agreement with the previous review that Bali cattle breeding performance can be improved by good nutrition and management [10].

In our study, farmers who keep Bali cows did not offer feed concentrate and supplement even though the cows were raised under an intensive system. This might result in lower calves' body growth and weaning weight and finally resulted in cheaper selling price.

In the group discussion, gross margin calculations were based on 2 head of cattle as the average cattle owning by studied farmer groups. This cattle owning number is smaller than national average, even though cattle is the main component of farming system in Tanah Laut District [11]. Business performance could

**Table 2.** Gross margin analysis of fattening business using Bali cattle and crossbred

No.	Items for raising 2 cows	Bali Cattle (12 months)	Crossbred (15 months)
<b>A.</b>	<b>Revenue</b>		
1.	Calves selling	14,000,000;	30,000,000;
2.	Manure selling	1,000,000;	1,200,000;
	Total revenues	15,000,000;	31,200,000;
<b>B.</b>	<b>Variable cost</b>		
1.	Fuel for collecting grass	2,920,000;	3,640,000;
2.	Feed concentrate and supplement	--	1,950,000;
3.	Health care	90,000;	200,000;
4.	Artificial insemination	100,000;	300,000;
5.	Supporting equipment	165,000;	165,000;
6.	Electricity	150,000;	150,000;
7.	Marketing cost	200,000;	200,000;
	Total variable costs	3,625,000;	6,605,000;
<b>C.</b>	<b>Fixed cost</b>		
1.	Pen depreciation	600,000;	650,000;
2.	Equipment depreciation	52,500;	52,500;
3.	Cows depreciation	1,000,000;	2,000,000;
	Total fixed costs	1,652,500;	2,702,500;
<b>D.</b>	<b>Gross profit</b>		
	Revenue-cost	9,922,500;	21,892,500;
	Gross profit per cow	4,961,250;	10,946,250;
	Gross profit per cow per month	413,438;	729,750;

be better if the number of cattle is larger. [7] suggested that Bali cattle breeding business is feasible for smallholder farmer in rural area if farmers raise a minimum of 3 cattle.

### **3.2. Gross margin analysis of fattening business**

Similar to the breeding business, raising crossbred cattle was more profitable than Bali cattle in a fattening business (IDR 714,558 vs IDR 468,958 per cow per month). Exotic cattle and their crossbred have higher averages weight gain and final weight than local cattle breeds, including Bali cattle, Madura cattle or *Bos indicus* crossbreds. A study by [12] showed the crossbreds of Simmental  $\times$  Bali and their backcrosses have a higher yearling weight and post-pubertal growth rate compared to Bali cattle, namely 66.8% heavier than the yearling weight of Bali cattle calves and 69.5% higher in growth rate than Bali cattle. Similar results were also reported for offspring of other local cattle breeds crossed with Limousine or Simmental [13] [14] [15]. Those findings indicated a higher proportion of *Bos taurus* genotypes will result in better physical performance than local breed if the crossbreds are raised under the environment, management and nutrition that fulfil their requirements [12]. This can be a constraint for many farmers in Tanah Laut district, because feed availability is limited in dry season and the feed cost will be increased [11].

However, similar to the breeding business, raising a crossbred for fattening business required more investments than for raising Bali cattle. Our study also found that for keeping crossbred cattle, farmers have to hire additional labour (from outside of their family) while there is no such cash cost for Bali cattle breeding. However, the opportunity cost of family labour should be added in the analysis. Alternatively, the gross profit should be considered as the return to labour.

### **4. CONCLUSION**

In an intensive production system of a smallholder farmer, raising crossbred cattle was more profitable than Bali cattle for both breeding and fattening business. However, success in raising crossbreds required more business investments, better cattle farming management, and a good feed quality supply.

The implication for the cattle industry development in the longer term should also be considered.

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