

# Factors Affecting the Farm-Gate Selling Price of Smallholder Beef Cattle in East Java, Indonesia

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## ABSTRACT

Small-scale beef cattle production in East Java, Indonesia, is mostly undertaken to generate household income to meet current farm-household needs. This research aimed to understand the factors affecting the prices, hence the incomes, received by small-scale cattle producers. The study involved monthly monitoring over 2010-11 with 184 farmer-collaborators in two sites – one in the irrigated lowlands and one in the rainfed uplands. Data were recorded for each of 353 cattle sold during the 2-year period. Cattle were sold in the village to local or district traders. The farm-gate price was regressed on six variables – liveweight, body condition score, cattle breed (local or crossbred), age, reason for selling, and site. The age variable was omitted in the final model to avoid multicollinearity. The estimated equation was significant and provided a good fit of the data ( $R^2 = 0.77$ ). The coefficients for all variables were positive and significant at the 5% level. These results imply efficient transmission of buyer preferences through traders to small-scale producers as expressed in farm-gate prices.

Keywords: farm-gate price, multiple regression, beef cattle, East Java

## INTRODUCTION

More than 90% of beef cattle production in Indonesia is derived from smallholder cattle operations, often with only 2-3 cattle per household. It has been found that, in areas such as Bali and Lombok, smallholder cattle are an important source of cash income (Patrick *et al.*, 2010). East Java accounts for 32% of the national cattle herd as reported by the recent livestock census (Kementan-BPS, 2011). The Ongole Cross (PO), introduced long ago from India by the Dutch, is the dominant breed in East Java, accounting for 34%, and used for breeding and fattening operations. Other breeds are Madura (21%), Bali (3%), and a variety of crosses, primarily between Ongole and Simmental, Limousin, or Brahman, accounting for around 42% (Dinas Peternakan Jawa Timur, 2009).

There is a diversity of small-scale cattle systems in East Java but, as in other provinces, most production is undertaken to generate household income to meet current farm-household needs (Priyanti, *et al.*, 2012). Farmers in the more densely populated lowlands keep cattle in intensive systems and focus on producing and selling calves. In the upland zone, farmers tend to keep cattle longer and sell mature animals. In all areas, however, cattle production is an example of market-oriented farming, with cash income the primary motivation. Draught power and production of manure are secondary considerations. Moreover, small-scale cattle production is generally subject to a low degree of risk and creates employment for various family members, particularly women and children.

Hence the price farmers receive for their cattle is an important determinant of household income and well-being. Mahendri *et al.* (2010) reported that cattle were mostly sold in the village to local traders from different locations (village, sub-district or district) rather than being transported to a marketplace. The selling price is based on a visual assessment of the animal's weight and body condition rather than measured weight. The

animal's age, sex and breed are also taken into account. The aim of this research was to quantify the factors affecting the farm-gate price received by small-scale cattle producers in East Java in order to give guidance to farmers and researchers in modifying the production system.

## MATERIALS AND METHODS

The study was undertaken throughout 2010 and 2011 and involved monthly monitoring with 184 farmer-collaborators in two sites – one in the intensively farmed, fertile, irrigated lowlands, and one in the less-intensive rainfed (and seasonally dry) uplands. Data were recorded for each of 353 cattle sold during the 2-year period, including: liveweight, body condition score (BCS), cattle breed, age, and reasons for selling. The BCS was based on a five-point scale: 1 = very thin; 2 = thin; 3 = moderate; 4 = fat; and 5 = very fat. Cattle were sold in the village to local or district traders so that the selling price was essentially a farm-gate price.

A multiple linear regression model was developed with selling price (in IDR 1,000 = USD 0.1055) as the dependent variable and seven independent variables. Three of these were continuous variables: age (years), liveweight (kg), and BCS (1-5). The remaining four were defined as binary or dummy variables: site (1 = lowland, 0 = upland); breed (1 = crossbred, 0 = local); sex (1 = male, 0 = female); and farmer's reason for sale (1 = cash income, 0 = other). It was hypothesized that price would increase with age, measured liveweight, and BCS, and would be higher for the lowland site, for crossbred cattle, for males, and when farmers were selling routinely for cash rather than because the animal was sick or injured or they had insufficient feed to maintain it. The analysis was conducted using the SPSS program version 14. A first run of the model showed that the age variable was highly correlated with liveweight ( $r=0.75$ ) so the age variable was omitted to avoid the estimation problems associated with multicollinearity (Kaps and Lamberson, 2004).

## RESULTS

The mean values of the model variables are shown in Table 1. The average selling price of cattle was IDR 3,971,600 for an average liveweight of 198 kg and body condition score (BCS) of 2.7 (between thin and moderate). However, these means cover the full spectrum of ages from calves to culled animals so are not very meaningful. Cross-bred cattle accounted for 56% of cattle sold. Surprisingly, 58% of the cattle sold were females; many of these would have been calves from the lowland site. In most cases (72%), the motivation for sale was as a regular source of cash income.

**Table 1** Mean values of variables included in multiple regression (n=353)

Variables	Description	Mean	Standard deviation
Price	Selling price of cattle (IDR '000)	3,971.60	2,457.15
Site	Location where cattle raised (1 = lowland, 0 = upland)	0.55	0.49
Breed	Breed of cattle (1 = crossbred, 0 = local breed)	0.56	0.498
Sex	Sex of cattle (1 = male, 0 = female)	0.42	0.494
Live weight	Live weight of cattle (kg)	198.5	128.4
BCS	Body condition score of cattle (1-5 scale)	2.7	0.5
Reason	Reason for selling cattle (1 = cash, 0 = other)	0.72	0.45

The results of the regression analysis are shown in Table 2. The estimated equation provided a good fit of the data with an adjusted coefficient of determination of 0.77. The F

value was 196, which was significant at the 1% level. The coefficients for all the independent variables were positive and significantly different from zero at the 1% level (or 5% in the case of the site variable).

**Table 2** Results of multiple regression for cattle selling price in East Java

Model	df	Sum of squares	Mean square	F	Significance
Regression	6	1642167407.804	273694567.967	196.034	0.000
Residual	346	483071012.876	1396158.997		
Total	352	2125238420.680			

  

Variables	Coefficients	Standard error	t	P-value
(Constant)	-3204.890	409.126	-7.834	0.000
Site	318.586**	143.981	2.213	0.028
Breed	506.818***	159.813	3.171	0.002
Sex	837.383***	141.812	5.905	0.000
Liveweight	15.695***	0.671	23.395	0.000
BCS	1040.569***	160.409	6.487	0.000
Reason	598.713***	156.630	3.822	0.000

\*\*, \*\*\* significant at 5%, 1% level

## DISCUSSION

The results show that a range of factors affected the selling price of cattle at the farm gate. The buyer's visual assessment of liveweight was sufficiently accurate that measured liveweight was a highly significant variable ( $P < 0.01$ ), with the price increasing by IDR 16,000/kg (USD 1.66). Prices were also significantly higher ( $P < 0.01$ ) for crossbred animals and for animals with a higher BCS. On average, a crossbred animal obtained a price IDR 510,000 (13%) higher than a local (PO) cattle of the same weight. Likewise, an improvement in BCS from say 2.5 to 3.5 increased the price obtained by IDR 1,000,000. This suggests that buyers of young animals were anticipating a higher growth rate, and that buyers of mature animals were expecting a higher dressing percentage or carcass weight from crossbred animals or animals in better condition. Purnomoadi et al. (2008) noted that cattle body condition had a positive correlation with age and body fat ( $r = 0.69$ ,  $P < 0.05$ ).

Mahendri et al. (2010) also reported that crossbred cattle generally obtained a higher price than Ongole cattle (20-30% higher for crossbred calves and up to 50% higher for crossbred adults). Farmers in this study stated that crossbred cattle usually have higher growth rates than local cattle. It is true that the genetic potential of Ongole cattle may enable them to reach a mature liveweight of more than 400 kg (Astuti, 2004); the lower mature liveweights under village conditions are due to insufficient good quality feed, especially during the dry season. However, Lestari et al. (2011) reported that the daily growth rate of Ongole crossbred cattle was higher than pure Ongole cattle being fed the same ration of concentrates and rice straw *ad libitum* (0.78 kg/d vs 0.58 kg/d). This suggests that farmers and traders have correctly identified the better growth response of crossbred cattle and this is reflected in the higher market price for crossbreds.

Male animals obtained significantly higher prices ( $P < 0.01$ ) on average than females (IDR 837,000 or 21%), other things being equal. This also probably reflects the demand for male calves and young bulls with greater potential for fattening, as well as the relative lack of demand for breeders as most herds were self-replacing and not growing. The widespread use of AI implies that not many buyers were looking for bulls for breeding. Farmers also noted that male cattle yield a higher carcass weight than females, affecting the returns to slaughtering.

The reason for selling is harder to interpret as a farmer's decision to sell can be the result of a complex set of factors. However, farmers who sold an animal primarily in order to increase household cash income obtained a significantly higher price ( $P < 0.01$ ) than farmers selling for other reasons, such as to cull an old or injured animal or because of a shortage of resources. In the latter cases, the farmer would have had reduced bargaining power. On average, such "forced sales" reduced the price by IDR 600,000 or 15%.

Finally, the sales in the lowland site obtained significantly higher ( $P < 0.05$ ) prices for the same class of animal than in the upland site – on average IDR 600,000/head or 15%. This presumably reflects the greater intensity of production in the lowlands, meaning traders have less distance to travel and can acquire larger lots, hence have lower marketing costs per animal than in the uplands. This needs to be tested with further data.

### CONCLUSION

It can be concluded that the preferences and requirements of cattle buyers – growers, fatteners, and butchers – for growth potential and carcass quality are effectively transmitted through primary traders (i.e., village collectors) to small-scale cattle producers and expressed in a differential farm-gate price for animals with different attributes. The urgency of the sale and the proximity to markets can also affect the farm-gate price.

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