Growth of Bali bulls fattened with forage tree legumes in Eastern Indonesia: *Leucaena leucocephala* in Sumbawa

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Introduction

The contribution of West Nusa Tenggara Province to domestic beef supply in Indonesia is relatively small, however, beef cattle are very important for the livelihoods of smallholder farmers in the region.

Bali cattle (*Boss javanicus*) are the predominant breed as they are adapted to harsh nutritional conditions, are highly fertile and have low calf mortality (Toelihere 2003). While genetically capable of achieving a growth rate of 0.85 kg/d (Mastika 2003), Panjaitan (2012) identified poor nutrition as a severe limitation to animal growth in traditional village systems. Improving feed quality and supply is vital to increasing growth rates and product quality. Forage tree legumes such as leucaena (*Leucaena leucocephala*) offer the best chance of providing high quality feed to fatten Bali bulls in village systems where leucaena is well-adapted. Indeed, the feeding of leucaena has been practiced for about two decades in Sumbawa district of West Nusa Tenggara although the practice is limited to specific villages, mostly Balinese, even though farmers nearby have similar biophysical conditions and nutritional problems. The objective of this work was to characterize the best practices employed by farmers in Sumbawa that maximize growth rates by feeding leucaena so that their detailed knowledge can be passed onto other villagers in a pilot roll-out program (Kana Hau 2013).

Materials and Methods

The study was conducted from April 2012 to March 2013 in the hamlet of Jatisari in Sumbawa district, which has an annual rainfall of 865 ± 246 mm/year mostly falling between November and May. Bull fattening in Jatisari is based on feeding high leucaena diets in a cut-and carry system to animals tethered in simple sheds (roof, cement floor, feed bunker but no side walls). Farmers' normal management and trading practices resulted in constantly changing numbers of bulls being fattened. Parameters monitored included average daily gain (ADG), feed offered including amount of leucaena in diet and sale weight. All cattle were weighed each month following an overnight curfew on feed and water. Fresh feed offered was determined over 3 consecutive days each month. Bulls were treated with albendazole to control internal parasites prior to being fattened. Deltamethrin was sprayed regularly to control external parasites.

Results and Discussion

In general, farmers had three fattening periods each year. The average fattening period was 127 ± 58 days; the shortest and the longest fattening periods were 37 and 296 days, respectively. The number of bulls purchased and fattened during the wet season was more than twice that of the dry months due to increased feed resources available. The initial weight of bulls varied within and between farmers with an average of 191 ± 41 kg at 18 ± 7 months of age; the lightest and heaviest initial weights were 97 and 277 kg, respectively. Farmers with younger cattle had a longer fattening period. The average sale weight of bulls was 229 ± 27 kg while the lowest and the highest were 188 and 318 kg, respectively. Average sale weight was thus below the accepted standard for slaughtering beef (300 kg). This low sale weight may contribute to the low dressing percentage commonly stated by traders and butchers in the region.

There was no overall pattern of animal sales which was generally based on the need for money, rather than on optimal bull parameters. Increasing sale weight by delaying sale time and extending the fattening period may be an option to not only increase dressing percentage but also obtain premium prices. The ADG over the 11 months was 0.42 ± 0.12 kg/d. The highest average point of 0.61 kg/d was obtained early in the dry season in June while the lowest average point of 0.23 kg/d occurred at the end of the dry season in October (Table 1). However, bulls belonging to the best farmers achieved ADGs of 0.83 kg/d over the 11 month period including ADGs of ≥1 kg/d for May, June and August. As most bulls were under-nourished on arrival, the highest ADGs were achieved in the initial month due to compensatory weight gain. It was not possible to determine the precise amount of feed consumed as dry

Table 1. The average daily gain of 276 Bali bulls fattened on leucaena under a smallholder cut-and-carry system between May 2012 and March 2013 in Sumbawa, Indonesia. (Values listed are cumulative, with the monthly period ending as listed).

Parameter	25 May 2012	25 Jun 2012	25 Jul 2012	25 Aug 2012	25 Sep 2012	25 Oct 2012	28 Nov 2012	23 Dec 2012	23 Jan 2013	23 Feb 2013	23 Mar 2013
Average daily gain	0.56	0.61	0.47	0.40	0.37	0.23	0.25	0.38	0.56	0.41	0.42
(kg/d) (±SE)	±0.09	±0.05	±0.03	±0.06	±0.04	±0.05	±0.02	±0.02	±0.03	±0.03	±0.03
No of bulls	49	55	59	54	55	55	95	134	68	130	136
Average weight bulls purchased (kg)	145	186	182	136	186	156	137	141	128	118	150
Average weight bull sold (kg)	188	237	158	220	242	216	214	184	198	176	206
Average weight gain of best herd (kg/d)	1.4	1.0	0.8	1.1	0.7	0.7	0.5	0.8	0.8	0.6	0.7
No bulls in best	1	3	1	2	3	2	3	3	4	10	3

matter content could not be calculated and refusals varied according to the steminess of the leucaena branches being fed. Nevertheless, the highest amount of fresh feed offered was at the end of the wet season in May while the lowest offered occurred in the dry season between August and October. The average percentage of leucaena in diets over the year was approximately 80% followed by corn straw 13% and native grass 7%. The percentage of leucaena in the diet was highest (100%) between May and July, and lowest (approximately 50%) in October.

The mean average daily gain recorded for all Bali bulls over the measurement period (0.42 kg/d) was almost double that achieved under the traditional system (0.26 kg/d) (Panjaitan 2012). This was similar to other improved feeding systems reported by Mastika (2003) (0.44 kg/d), but well below the potential growth rate of Bali bulls (0.85 kg/d) also reported by Mastika (2003). This was most likely due to an insufficient amount of feed offered, especially during the dry season as the best ADGs (0.56-0.61 kg/d) were recorded in the wetter months of May, June, and January when feed supply and percentage leucaena in diet were highest (close to 100%). Significantly, the best farmers achieved maximum weight gains ≥0.8 kg/d for 6 of the 11 months, approaching the genetic potential of Bali bulls reported by Mastika (2003). Further monitoring is planned to understand the practices of the best farmers.

Conclusions

It is concluded that increasing supply of leucaena, either by planting more leucaena or altering the number of bulls to fit available feed supply, will increase growth rates to near the potential for Bali bulls. This will enable smallholders to more quickly achieve the appropriate sale weight of 300 kg.

Wider adoption of the feeding and management strategies employed by the best farmers of Jatisari provides an excellent opportunity to increase the output of fattened bulls from other smallholders in other regions of West Nusa Tenggara and East Nusa Tenggara. Achieving this potential will require not only a thorough knowledge of leucaena establishment, improved management, housing and hygiene of the bulls, but also an understanding of the barriers to adoption. It will require "an effective outreach strategy to address perceptions, access and regulations that are barriers to implementation of the innovations. The outreach strategy will need to be comprehensive, long term, and involve multiple stakeholders" (Kana Hau 2013).

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