



final report

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Indonesian Feedlot Performance Comparison of Brahman and F1 Senepol Steers

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Abstract

This study was conducted to compare the performance of F1 Senepol x Brahman steers (F1 Senepol) to that of Brahman steers in an Indonesian feedlot. The impetus for the work was to address concerns that crossbred cattle are discriminated against by live export cattle buyers due to a perception that they do not perform as well as Brahmans in Indonesian feedlots. F1 Senepol (n=54) and Brahman (n=32) steers were fed for 121 days in the Elders feedlot near Lampung (Sumatra, Indonesia). The average daily gain over the feeding period was 0.17 kg/day higher in the F1 Senepol steers compared to Brahmans (1.71 vs 1.54 kg/day). As a result the F1 Senepols put on 21.6 kg more weight over the 121 day feeding period. As this study found that that F1 Senepol steers actually performed better than Brahmans in an Indonesian feedlot, the results should allow live export cattle buyers to purchase these types of animals (Brahman crossed with a tropically adapted *Bos taurus* breed) with confidence that Indonesian feedlotters will be happy with their performance.

Executive summary

The aim of this study was to compare the performance of F1 Senepol x Brahman steers (F1 Senepol) and Brahman steers in an Indonesian feedlot as there were concerns that live export cattle buyers discriminate against crossbred steers due to the perception that they do not do as well as Brahmans in Indonesian feedlots. Previous research found that crossbreeding Brahmans with Senepols (a tropically adapted *Bos taurus* breed) produces F1 crossbred animals that have production advantages for north Australian cattle producers and have better meat tenderness than Brahmans^{1,2}. Since F1 Senepol steers were found to perform better than Brahmans on improved pasture in the NT^{1,3}, it was hypothesised that they should perform at least as well, if not better than Brahmans in an Indonesian feedlot. This study was conducted to investigate this hypothesis. If this was to prove to be correct then it should demonstrate to Indonesian feedlotters and live export cattle buyers that the crossbred steers actually offer them production advantages, and in doing so remove the threat of price discrimination that may prevent north Australian cattle producers from adopting crossbreeding.

The Northern Territory Department of Primary Industry and Fisheries (NT DPIF) and Elders Indonesia formed a collaborative partnership in which Elders agreed to purchase Brahman and F1 Senepol steers at the market rate from NT DPIF and allow their performance in the Elders feedlot in Lampung Province (Sumatra, Indonesia) to be studied by a DPIF research officer. These steers had been managed as one mob at Douglas Daly Research Farm (DDRF) NT, since June 2013 shortly after weaning until they were sold to Elders on 27/2/14. The steers (32 Brahmans and 54 F1 Senepols) went through the normal live export process and were inducted into the feedlot on 15/3/14. The steers were fed together in one pen and received the normal feedlot rations and management for 121 days until the final measurements were recorded on 14/7/14. They were then transported to the Elders abattoir at Bogor (south of Jakarta) where they were slaughtered for the supermarket and restaurant market, and slaughter data was collected.

This study found that the F1 Senepol steers outperformed the Brahman steers in the Indonesian feedlot. The overall average average daily gain (ADG) was 0.17 kg/day higher ($P < 0.001$) in F1 Senepol steers compared to Brahmans (1.71 vs 1.54 kg/day). As a result, on average the F1 Senepols put on 21.6 kg more weight over the 121 day feeding period resulting in them having a 25.4 kg higher average final weight (since their average weight at induction was 3.8 kg heavier). The average P8 fat depth of both genotypes was the same even though the F1 Senepol steers were on average 25.4 kg heavier at the end of the feeding period. This indicates that the F1 Senepols will have more value adding potential for feedlotters if they can be fed to heavier weights without becoming over-fat.

The average weight of beef yielded at the abattoir per animal slaughtered was 199.1 kg for the F1 Senepols and 184.2 kg for the Brahmans. The amount of beef yielded per animal was higher for the F1 Senepols due to their heavier carcass weights and higher yields. The meat yield of the F1 Senepol steers was 2.44 % higher as the fat and bone yields made up a smaller proportion of their hot standard carcass weight (HSCW). This suggested that they were lighter boned, since the P8 fat depth measured just prior to slaughter was approximately the same for both genotypes.

In addition to the higher feedlot weight gains and carcass yields, the better meat tenderness of the F1 Senepols previously reported^{1,2} (on average their shear force results were 0.44 kg lower than Brahmans) would enable Indonesian feedlotters to use these steers to supply either the

wet market or the supermarket and restaurant trade. They could feed the animals for the longer periods required for the supermarket and restaurant trade with the knowledge that the meat would be tender.

The most relevant comparison from this study is probably the growth rate (ADG) of the 2 genotypes while in the feedlot, and in this comparison the F1 Senepols had a higher (+0.17 kg/day) average ADG. When evaluating the performance of the F1 Senepol steers in the Indonesian feedlot, the bottom line is probably that Dick Slaney (Elders Indonesia Managing Director) was impressed with them and said that their company would actually pay more for them¹⁰.

These results disprove the perception that crossbred steers do not perform as well as Brahmans in Indonesian feedlots when a tropically adapted *Bos taurus* breed (Senepol) is used in the cross. Therefore cattle buyers should be able to buy these types of cattle for Indonesian feedlots with confidence that their clients will be happy with their performance as the F1 Senepols were found to offer production advantages to Indonesian feedlot owners and their better meat tenderness also gives them confidence in the option of targeting the restaurant market in addition to the wet market.

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1 Background

Most cattle in northern Australia have a high *Bos indicus* (usually Brahman) content as they generally perform better in the harsh tropical environments than *Bos taurus* cattle⁴. However *Bos indicus* cattle are usually regarded as having less tender meat than *Bos taurus* and some studies have shown that there is an almost linear reduction in tenderness as the proportion of *Bos indicus* genes increase^{5,6}. As a result of the perception that they have lower meat quality, Brahman cattle from northern Australia often suffer price discrimination when they are sent to Australian domestic markets. This has not really been a problem in the past as the main market for northern cattle producers has been live export into South East Asia, where demand for Brahman cattle has been strong and the cooking methods used mean that meat tenderness is not really an issue. However it would be advantageous for north Australian producers to be able to produce cattle that are in demand in both the live export and Australian domestic markets so that they have more marketing options and are less vulnerable to live export market fluctuations.

The NT DPIF began a project in 2008 to determine whether crossbreeding with a tropically adapted *Bos taurus* breed with a reputation for good meat quality was an efficient way of quickly increasing the marketing options for north Australian cattle herds with a high Brahman content and reducing their vulnerability to downturns in the live export market. While a number of tropically adapted *Bos taurus* breeds (eg. Tuli, Belmont Red, Senepol) could have been used in this work, the Senepol was chosen because of it was known to have good meat quality^{7,8} and produces offspring that are mostly polled.

Results from this research program have shown that F1 Senepols were; heavier at weaning than Brahmans, grew as well or better than Brahmans on native and improved pasture in the NT, performed as well as Brahmans in a feedlot in Queensland, were on average graded into lower boning groups than Brahmans by MSA carcass assessment, and had more tender meat than Brahmans assessed by shear force testing^{1,2}. In addition, preliminary results appear to show that F1 Senepol steers are leaner at the same weight as Brahmans⁹, which means that they are likely to have more value adding potential for feedlotters (as they can be fed to heavier weights before becoming over-fat). These findings appear to show that F1 Senepol steers would provide production advantages to both north Australian cattle producers and Indonesian feedlotters. However despite this there is a perception that many of the cattle buyers that purchase cattle for Indonesian feedlots discriminate against cattle that are not high grade Brahman due to the perception that they will not perform as well as Brahmans in Indonesian feedlots. Therefore this research was conducted to determine whether this perception was correct or not by comparing the performance of F1 Senepol and Brahman steers in an Indonesian feedlot. It was hoped that if there was scientific evidence showing that these types of cattle perform at least as well as high grade Brahmans in Indonesian feedlots that this would remove the threat of price penalties to north Australian producers considering adopting crossbreeding Brahmans with a tropically adapted *Bos taurus* breed. It is important to determine whether the F1 Senepol suit the Indonesian market and perform well there as it is anticipated that the Indonesian market will continue to be the main market for northern NT cattle for many years to come.

2 Project objectives

This project aimed to determine scientifically whether F1 Senepol x Brahman steers perform as well or better than purebred Brahmans in Indonesian feedlots. If this proved to be the case then the objective from the results is to remove the threat of price penalties to north Australian producers considering adopting crossbreeding Brahmans with tropically adapted *Bos taurus* breeds.

Brahman and F1 Senepol x Brahman steers (that were bred on NT DPIF research stations and have been managed together since weaning) were sent to an Indonesian feedlot where their performance was measured and compared.

Additional details: MLA required that a final report be delivered documenting and comparing the performance of Brahman and F1 Senepol X Brahman steers in an Indonesian feedlot that have been fed for 100 days. Measures reported on include:

- Weights recorded upon arrival and after 100 day feeding period
- Weight gain recorded during the feeding period
- Average daily gain of the two genotypes
- Fat depth before and after the 100 day feeding program
- Morbidity
- Carcase Weights

3 Methodology

A collaborative partnership was formed with Elders Indonesia who agreed to purchase Brahman and F1 Senepol steers from NT DPIF and to allow the department to study their performance in the Elders feedlot in Lampung Province (Sumatra, Indonesia). These steers had been transported to DDRF shortly after weaning and grazed improved Buffel pasture in one mob as part of a cell grazing trial from June 2103 until they were sold to Elders on 27/2/14. The whole mob was weighed on the morning of 26/2/14 and steers were selected for sale if they weighed more than 300 kg (unfasted weight) and thus were approaching the 350 kg Indonesian live export limit. At this time 24% of Brahman steers and 57% of F1 Senepol steers weighed more than 300 kg. As a result 32 Brahman steers and 54 F1 Senepols were sold to Elders for this work. The higher number of F1 Senepol steers sold highlights how the heavier weaning weights and higher post weaning growth leads to a higher proportion of crossbred steers being turned off earlier.

A fasted weight (12 hour curfew with no feed or water) was recorded at DDRF on the evening of 26/2/14 and then the steers that had been selected for sale were placed in a holding paddock overnight with good Buffel pasture before trucking by a commercial transport company to the Berrimah export yards on 27/2/14. The total weight of the steers on arrival at the Berrimah export yards was recorded and an average weight on arrival (313 kg) was calculated from this.

There was a delay while the shipment of cattle was being put together and the steers remained at the Berrimah export yards until 6/3/14 when they left Darwin on the "Gelbrey" (live export boat). After going through the quarantine process in Indonesia and being transported to the Elders feedlot at Lampung, feeding of the steers began in the Lampung feedlot on 12/3/14. The

steers were gradually introduced to the new feedstuffs with a starter ration. The induction weight was recorded on 15/3/14 at which time the average weight of the steers was 310 kg. The wellbeing of each animal was assessed at induction and 5 steers were placed in a “sick pen” for observation and to receive extra care as necessary. Four of these steers only remained there for a short time but one animal remained in the sick pen for most of the feeding period (110 days).

The steers were fed the normal commercial rations for a period of 121 days from induction until a final weight was recorded on 14/7/14. While in the feedlot the steers were managed as per the normal feedlot management. They were fed various levels of starter rations for 3 weeks before receiving the finishing ration. The major ingredients of the ration were Tapioca waste, Tapioca chip, DDGS (distillers dried grains plus solubles), Copra meal, Palm kernel cake, Napier grass and molasses. Feed intake was recorded by the feedlot staff and over the entire feeding period it averaged 13 kg/head/day as fed (or 10.4 kg dry matter/head/day). All the steers (both genotypes) were kept in the same pen while in the feedlot to allow a proper comparison between genotypes. Any steers that appeared sick or lame were taken to the sick pen until they recovered and then returned to the pen with the other steers.

Final weight and P8 fat depth (measured ultrasonically) were recorded on 14/7/14. A NT DPIF research officer (Tim Schatz) travelled to the feedlot to oversee the data recording at induction and at the end of the feeding period. The weighing setup was very good with a Warwick veterinary crush mounted on Trutest weigh beams (see picture 1). Data was recorded electronically via NLIS tags, a NLIS tag reader, Trutest weigh scale indicator and a stock recording computer program.



Picture 1. The crush where data was recorded at the Lampung feedlot

After the final measurements had been recorded the steers were transported to the Elders abattoir at Bogor (about 55km south of Jakarta on the island of Java) for slaughter and boning, with the meat destined for the restaurant and supermarket trade. This had to be done over several days as there were too many animals to slaughter all at once. Also since this work was being conducted during Ramadan there were some significant dates that slaughtering had to be scheduled around. As a result the Brahmans were slaughtered on the 16/7/14 and the F1 Senepols were slaughtered in 2 lots during the following week. Transport from the feedlot to the abattoir took about 12 hours in total as the traffic in Indonesia makes travel slow. The steers were transported on small trucks in loads of about 10 head per truck. They stayed on these trucks during the short (2 hour) ferry ride from Sumatra to Java. After arriving at the abattoir the steers were spelled for 24 hours before slaughter. After slaughtering, hide removal and evisceration, the carcasses were split into 2 sides which were weighed and hung in a chiller over night before boning the next day. Carcase weight and yield data was recorded at the abattoir and supplied for project reporting.

Statistical analysis: Mean initial live weights for breed (Brahman v F1 Senepol) were compared with analysis of variance (ANOVA) models. Final means for average daily gain (kg/d), corrected for initial weight, and P8 fat depth (mm), corrected for final weight, were compared with analysis of covariance (ANCOVA) and reported means adjusted for the covariates. The type I error rate was set at 0.05.

4 Results/discussion

Table 1 shows the average weight of all the steers (both genotypes combined) at key times during the research. These weights can be used to evaluate the weight change of the steers during the transport and feedlotting periods. The data shows that there was a small average weight loss during the export process. The average weight at induction into the feedlot was 2.9 kg less than when the steers arrived at the Berrimah export yards. It should be noted though that there would have been differences in gut fill at the times of measurement as the steers would have been “empty” on arrival at the export yards and would have been “full” at induction as they had been given access to the feedlot starter ration for 3 days (so the weight loss would have been greater if the animals were “empty” on both occasions). It should also be noted that the export process took longer than normal due to delays in putting the shipment together and that this may have adversely affected performance during this period. The steers arrived at the export yards on 27/2/14 and remained there for 8 days until leaving the port of Darwin on 6/3/14. Temperature and humidity were high during the time the animals were in the export yards and 22 mm of rainfall was received. They were introduced to the starter ration at the Lampung feedlot on 12/3/14, the induction weight was recorded on 15/3/14 and the final weight was recorded on 14/7/14. All weights recorded in the feedlot were “full” (ie. not curfewed).

Table 1. The average weight of exported steers (both genotypes) at key times.

Event	Date	Average weight (kg)
Full weight at DDRF after mustering	26/02/2014	327.9
Curfew (12 hours) weight at DDRF	26/02/2014	318.8
Weight on arrival at export depot*	27/02/2014	313.0
Induction weight	15/03/2014	310.1
Final weight	14/07/2014	515.9

*The weight on arrival at the export depot was a total weight of the shipment and so the average weight of each genotype cannot be calculated.

When the induction and final weights are used to evaluate the average performance of all the steers in the feedlot over the 121 days, the average daily gain was 1.70 kg/day. This is comparable to the performance of a similar group of steers that were fed in a feedlot in Queensland the previous year^{6,7}. In that study 25 Brahman and 25 F1 Senepol steers were sent from DDRF to a commercial feedlot near Proston (Qld) and their average ADG over 73 days of feeding from induction was 1.83 kg/day. However these steers lost considerably more weight in transport to the feedlot compared to the ones that were exported to Indonesia, and so their weight gain in the feedlot would have been influenced to a greater degree by recovery of weight loss in transport. The steers sent to the Queensland feedlot were transported a distance of 3,300 km by roadtrain over 5 days with spelling at the Cedar Park export yards, Brunette Downs and Longreach. At induction into the feedlot (after 24 hours access to the starter ration) on average the steers had lost 29.7 kg or 9% of their curfewed weight recorded at DDRF prior to transport. In comparison the steers exported to Indonesia lost 8.7 kg or 3% of their curfewed weight between leaving DDRF and induction into the feedlot. If the curfewed weight at DDRF is used as the starting point for both groups of steers then their performance during the transport and feeding process was quite similar with an overall weight gain of 1.31 kg/day for the steers sent to the Queensland feedlot compared to 1.43 kg/day for the steers sent to the Lampung feedlot.

At induction five steers (three F1 Senepol and two Brahman) were removed from the mob for treatment in the “sick pen” due to lameness (two of these steers were also given treatment for pneumonia). Three of these steers only stayed in the sick pen for a short period before being moved back to the pen with the other animals. One Brahman steer ended up being euthanised on 11/4/14, and one F1 Senepol steer remained in the sick pen for 110 days and so its data was not included in the analysis as it had a much lower overall ADG than the other steers (0.78 kg/day compared to 1.71 kg/day). Also one other Brahman steer was removed from the main pen and euthanised on 6/6/14 due to illness. In summary the data of 30 Brahman steers and 53 F1 Senepol steers was included in the analysis as two of the Brahman steers were euthanised and one F1 Senepol steer remained in the sick pen for most of the feeding period.

Data comparing the performance of the two genotypes of steers in the Lampung feedlot is summarised in Table 2. It shows that both genotypes performed well and that the overall average daily gain (ADG) of the F1 Senepol steers was significantly ($P < 0.001$) higher than the Brahmans (1.71 kg/day vs 1.54 kg/day) and as a result their final weight at the end of the

feeding period was also significantly ($P=0.002$) higher (ie. the F1 Senepols were on average 3.8 kg heavier at induction and put on 21.6 kg more weight over the 121 day feeding period and so their average final weight was 25.4 kg heavier than the Brahmans).

Table 2. The performance of Brahman and F1 Senepol steers in an Indonesian feedlot.

	Brahman	F1 Senepol	Difference (F1 Sen - Brah)
Number of animals (N)	30	53	
Avg. curfew (12 hours) weight at DDRF 26/2/14 (kg)	312.7	322.5	9.8
Avg. P8 fat depth at DDRF 26/2/14 (mm)	2.4	1.6	-0.8
Avg. feedlot induction weight 15/3/14 (kg)	308.5	312.3	3.8
Avg. final weight 14/7/14 (kg)	501.3	526.7	25.4
Avg. final P8 Fat depth 14/7/13 (mm)	10.6	10.5	-0.1
Avg. Overall ADG (kg/day)	1.54	1.71	0.17
Avg. carcass weight – HSCW (kg)*	272.4	283.4	11.0*
Dressing percentage (%)	54.3	53.7	-0.6
Boning room yield (%) **	67.6	70.04	2.44

*Note that the F1 Senepols were slaughtered about a week after the Brahmans and may have put on more weight during this time.

** Boning room yield is the amount of beef yielded divided by the HSCW.

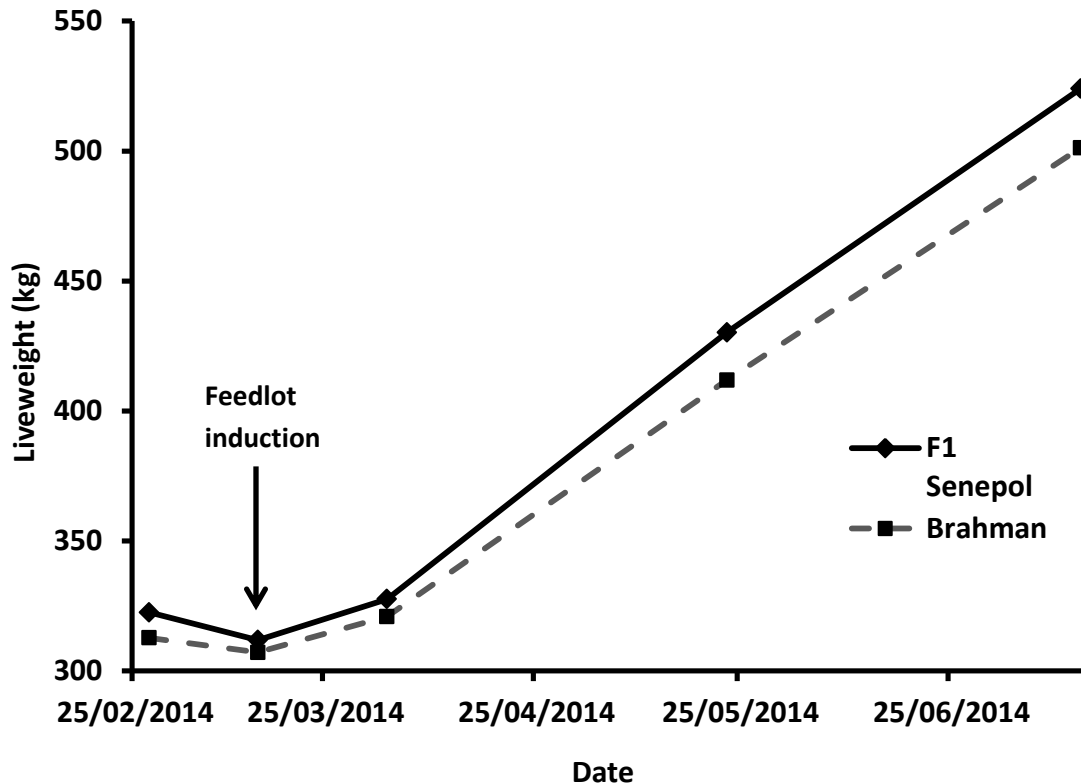


Figure 1. The liveweight (kg) change of F1 Senepol and Brahman steers throughout the export and feedlotting process.

Figure 1 demonstrates graphically how the average liveweight of the steers of each genotype changed over time. The average weight of the F1 Senepols was 9.8 kg heavier at DDRF before the animals left the property. The difference was reduced to 3.8 kg at induction showing that the F1 Senepols lost slightly more weight during the export process. Then during the time in the feedlot the difference between the genotypes increased so that by the end of the feeding period the F1 Senepols were 25.4 kg heavier.

The average P8 fat depth of the F1 Senepol steers was similar (not significantly different) to the Brahmans both times it was measured (ie. at DDRF and at the final data collection). When fat depth was measured at DDRF the average fat depth was 0.8 mm less in the F1 Senepols even though they were on average 9.8 kg heavier. At the final measurement average P8 fat depth was about the same in both genotypes even though the F1 Senepols were on average 25 kg heavier. This indicates that the mature size of the F1 Senepols is slightly larger. The implications of this for Indonesian feedlotters are that they can be fed to heavier weights before becoming over fat.

Since the F1 Senepols were slaughtered about a week after the Brahmans and they may have put on more weight during this time, the final weight at the feedlot on 14/7/14 is the best comparison of the final weight of the genotypes. If carcass weights are to be compared then they should be calculated from this weight using the dressing percentage which was calculated at the abattoir rather than using the actual carcass weights measured in the abattoir on different dates. When this is done the average hot standard carcass weight (HSCW) for the Brahmans is

272.4 kg and it is 282.8 for the F1 Senepols. It should be noted though that the F1 Senepol steer that did not grow well due to spending 110 days in the sick pen is included in the calculation of dressing percentage for the F1 Senepols (and if it is excluded the dressing percentage would likely be slightly higher).

While the dressing percentage of the Brahmans (54.3 %) was slightly higher (0.6%) than the F1 Senepols (53.7%), the more economically important figure is the boning room yield, which is the amount of beef yielded as a percentage of the HSCW. The Boning room yield was higher (+2.44%) for the F1 Senepols (70.04%) than the Brahmans (67.6%). The reason that the yield was higher for the F1 Senepol steers was likely that they were finer boned as they had a smaller proportion of their weight in “fat and bones yield” (from abattoir data).

The average amount of beef yielded per animal slaughtered was calculated to be 184.2 kg for the Brahmans and 199.1 kg from the F1 Senepols. The amount of beef yielded per animal is higher for the F1 Senepols due to their heavier carcass weights and higher boning room yields. When the average amount of beef yielded per animal exported is calculated it is 199.1 kg for the F1 Senepols and 172.6 kg for the Brahmans. The Brahman figure per animal exported is lower than the figure per animal slaughtered as 2 Brahman steers were euthanised in the feedlot and not slaughtered. However this figure is probably misleading as it is likely that the higher mortality rate of Brahmans in this study was just due to chance as Brahmans are generally considered to be one of the breeds with the best stress tolerance in tropical climates. The most relevant comparison from this study is probably the growth rate (ADG) of the 2 genotypes while in the feedlot, and in this comparison the F1 Senepols had a higher (+0.17 kg/day) average ADG. When evaluating the performance of the F1 Senepol steers in the Indonesian feedlot, the bottom line is probably that Dick Slaney (Elders Indonesia Managing Director) was impressed with them and said that their company would actually pay more for them¹⁰.

5 Conclusion

This study found that F1 Senepol steers performed better than Brahman steers in an Indonesian feedlot. The overall ADG was 0.17 kg/day higher in F1 Senepol steers compared to Brahmans (1.71 vs 1.54 kg/day). As a result the F1 Senepols put on 21.6 kg more weight over the 121 day feeding period. The study also found that growth of steers in this Indonesian feedlot was very good and is similar to the growth achieved in Australian feedlots.

The aim of this work was to find out whether F1 Senepols perform as well as Brahmans in Indonesian feedlots since there were concerns that cattle buyers discriminate against crossbred steers as they believe they do not perform as well there. These results show that this is not the case when a tropically adapted *Bos taurus* breed (Senepol) is used in the cross. Therefore cattle buyers should be able to buy these types of cattle for Indonesian feedlots with confidence that their clients will be happy with their performance as the F1 Senepols were found to offer production advantages to Indonesian feedlot owners as well as Australian cattle producers. Their better meat tenderness also gives Indonesian feedlot owners confidence in the option of targeting the restaurant market in addition to the wet market.

6 Acknowledgement

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8 Appendix (Photos)

Photos of the cattle at various times are shown below.



Photo 1. The F1 Senepol and Brahman steers at DDRF before trucking to the Berrimah export yards



Photo 2. The steers being loaded at DDRF for transport to the Berrimah export yards



Photo 3. The steers at induction into the feedlot near Lampung, Indonesia



Photo 4. The steers feeding in their pen on the day after induction into the feedlot



Photos 5 to 8. Steers in the Lampung feedlot on the day of the final measurements



Photo 9. One of the Brahman steers on the day of the final measurements



Photo 10. P8 fat depth being measured ultrasonically at the final data recording



Photo 11. Tim Schatz (NT DPIF) with Lampung feedlot staff (Misni – Feedlot Headstockman, and Anas – IT, traceability and safety officer)