FutureBeef

Crossbreeding for more profit with tropically adapted Bos taurus

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Darwin

A joint initiative of:

Queensland Government | Northern Territory Government | Department of Agriculture and Food | mla MEAT & LIVESTOCK AUSTRALIA

Would you like to get an extra $100 for every steer that you sell?

Obviously this "controversial" question is intended to get your attention, but it may not be as far fetched as it sounds, so keep listening…….

Outline of presentation

There will be 3 sections with breaks after each section for questions:

1) **Compare the pre and post weaning growth of Brahmans and F1 Senepol x Brahmans (F1 Senepol) in the Top End of the NT.**

Questions

2) **Compare the feedlot growth (Qld) and results of meat quality testing on Brahman and F1 Senepol steers.**

Questions

3) **Compare the performance of Brahman and F1 Senepol steers in a feedlot in Indonesia.**

Questions

Background: DPIF Senepol crossbreeding project

-**Aim: To determine whether Senepol bulls can be used for crossbreeding with Brahman cows to increase the marketing options for NT cattle producers (ie. produce progeny that have better meat quality but still perform well under NT conditions).**

We began the project in 2008 in response to the threat we saw for north Australian producers with high grade Brahman cattle only having 1 market – live export.

If something went wrong with the market – Brahman cattle sent to domestic markets in southern Australia would be penalised due to perceptions of poor meat quality

The idea was to find a way for north Australian producers to produce cattle that did well in our environment and would be in demand in both the live export and Australian domestic markets – ie. have more marketing options due to better meat quality

Wanted to find a way for northern producers with Brahman herds to be able to very quickly (1 generation) start producing animals that were more in demand in southern Australian markets.

Basically means increasing the *Bos taurus* content by as much as possible, as quickly as possible…… but still having animals that can cope with our environment and do at least as well as Brahmans.

The quickest way to increase *Bos taurus* genes is to use a pure *Bos taurus* bull…….

……..BUT in the past these have been "terminal sires"

So the obvious solution was to try a tropically adapted *Bos taurus* breed

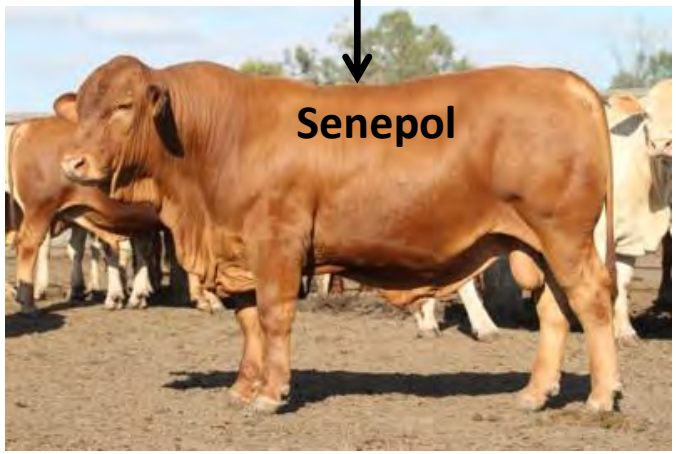
Could have used any tropically adapted *Bos taurus* breed (eg. Tuli, Belmont , Bonsmara). – we chose Senepol due to polledness, meat quality traits, and they were more "popular" at the time.

Breed origin: The Senepol is a stabilised 2 breed composite (N'Dama x Red Poll) that was developed on the island of St Croix in the Caribbean, in the early 1900's. Then selected for performance in the tropical environment

N'Dama
(an adapted *Bos taurus* breed from Senegal).

Red Poll
(a British *Bos taurus* breed)

X



It is important to understand that this presentation is not an advertisement for one breed. While all the results are from the Senepol crossbreeding project, it is likely that similar results could be obtained from other tropically adapted *Bos taurus* breeds or Composites.

1. Compare the pre and post weaning growth of Brahmans and F1 Senepols in the Top End of the NT.

Management:

Calves were bred from Brahman cows at VRRS ("Kidman Springs") and Manbulloo (both Brahman and Senepol bulls were used at both properties).

After weaning **- males to DDRF for growth studies on improved (Buffel) pasture.**
- females studied on native pasture at VRRS, Manbulloo and KRS.

In all studies the 2 genotypes were run together (same paddock, same management).

Weaning weight

Heavier weaning weights are a typical result of crossbreeding due to hybrid vigour.

At VRRS the F1 Senepol cross calves were an average of 23 kg heavier at weaning than Brahman calves over 4 years. (Average of 19 kg heavier at Manbulloo).

Table 1. Average weaning weights (kg) of calves weaned at VRRS at the first weaning round *(the number of animal is in brackets).*

	2010	2011	2012	2013
Brahman	178 *(137)*	184 *(123)*	200 *(176)*	203 *(292)*
F1 Senepol	196 *(38)*	204 *(143)*	230 *(193)*	225 *(222)*
Difference (F1 Sen - Brah)	*18 kg*	*20 kg*	*30 kg*	*22 kg*

Average = 23 kg

Steer post weaning growth on improved (Buffel) pasture

4 year groups of male calves were transported to DDRF where their growth was studied for about a year after weaning (from 6 mo. to 18 mo.).
They grazed together in one mob (part of a cell grazing trial).

Average growth (kg) from June to March (4 year groups of steers)

	Brahman	F1 Senepol	Difference (F1 Sen - Brah)
2010-11 ***(287 days)***	**118.4** (n= 74)	**129.2** (n= 31)	**10.8**
2011-12 ***(254 days)***	**94.8** (n= 45)	**107.8** (n= 56)	**13.0**
2012-13 ***(245 days)***	**90.9** (n=117)	**100.6** (n= 98)	**9.7**
2013-14 ***(210 days)***	**82.6** (n=103)	**98.1** (n=112)	**15.5**

Avg diff = 12.3 kg (+ F1 Sen)

Summary: Steer growth

(33 kg @$2.70/kg = $89)

4 year groups of steers. Each year the F1 Senepols:

- have been about 21 kg heavier at weaning
- have grown about 12 kg more over the post weaning year
- as a result have been about 33 kg heavier at 18 mo.

F1 Senepols tend to be slightly leaner (~1 mm) at the same weight (lower average P8 fat).

Heifer performance on native pasture (VRRS, Manbulloo and KRS)

Maiden heifers (joined at 2 yo)

Heavier weaning weights (+26 kg) and higher growth result in F1 Senepols usually being about 35 kg heavier at maiden joining as 2 year olds

- Pregnancy rates were on average 10% higher in F1 Senepols

The performance of females as they get older is continuing to be studied around Katherine (KRS, Manbulloo and Kumbidgee).

Early indications are that F1 Senepols are performing at least as well as Brahmans as first calf heifers. More results in coming years (low numbers at this stage).

Horn status of F1 Senepol calves

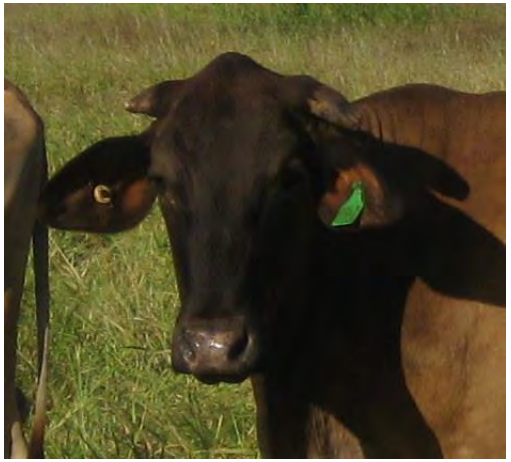
	Polled	Scurred	Horned
Female	70%	27%	3%
Male	53%	43%	4%

The scur gene is sex linked (dominant in males, recessive in females) so the proportion of polled animals is higher in females than males.

Few animals had horns (<5%). **The scurs don't seem to grow much more than 5-10 cm.**

1 y.o scurred steer

2.5 y.o heifers



3 y.o heifer with large scurs

Words of caution when considering a crossbreeding program:

- **There is a big difference between using tropically adapted *Bos taurus* bulls and British (or European) *Bos taurus* bulls …….. they are "terminal sires" in the north**

- **Worthwhile vaccinating "southern" bulls for tick fever** (while Senepols have quite good tick resistance, they are as susceptible to tick fever as British breeds and so it is worthwhile ensuring that they have been vaccinated for tick fever)

- **Recommend buying bulls that have been semen tested (before transport)**

- **Bulls may need time (months) to adapt after transport to a new environment**

- **Likely to be dominance relationships when adding introduced bulls to paddocks with established bulls**

- **Like any breed there is variation within the Senepol breed -** good and bad animals/lines


Questions?

2) A comparison of the growth and meat tenderness of Brahman and F1 Senepol x Brahman steers.

Do the crossbred animals really have more tender meat?

This study used steers weaned in 2012 that went into a cell grazing trial at DDRF

F1 Senepols (n=96) were on average 28 kg heavier than the Brahmans (n=116) when they arrived at DDRF and grew an average of 10 kg more (101 vs 91 kg) between 17 July 2012 and 19 March 2013 , and so were 38 kg heavier by 19/3/13.

On 19/3/13 those animals approaching the 350 kg live export limit were sold. 54% of the F1 Senepols were sold at this time compared to 16% of the Brahmans. The animals for the feedlot and meat quality research were selected from what was left (in July).

In mid July 2013, 25 steers of each genotype were sent to Smithfield feedlot (Proston, Qld).

A total distance of 3,300 km over 5 days - including stops for spelling at Brunette Downs (NT) and Longreach (Qld)

At the Smithfield feedlot the steers were fed the commercial ration in the same pen for 73 days.

No significant difference in weight gain

Average ADG (over 73 days from induction): F1 Sen = 1.84, Brah = 1.82 kg/day (NS)

The animals were slaughtered at Dinmore abattoir (JBS) on 30/9/13.

- **The carcases were hung overnight and MSA assessment was done the following morning.**
- **Carcases were boned out on 1/10/13 and a whole striploin was collected from each animal for meat quality studies at UNE. The striploins were individually cryovacced, boxed, chilled over night and then sent to the UNE meat science lab.**

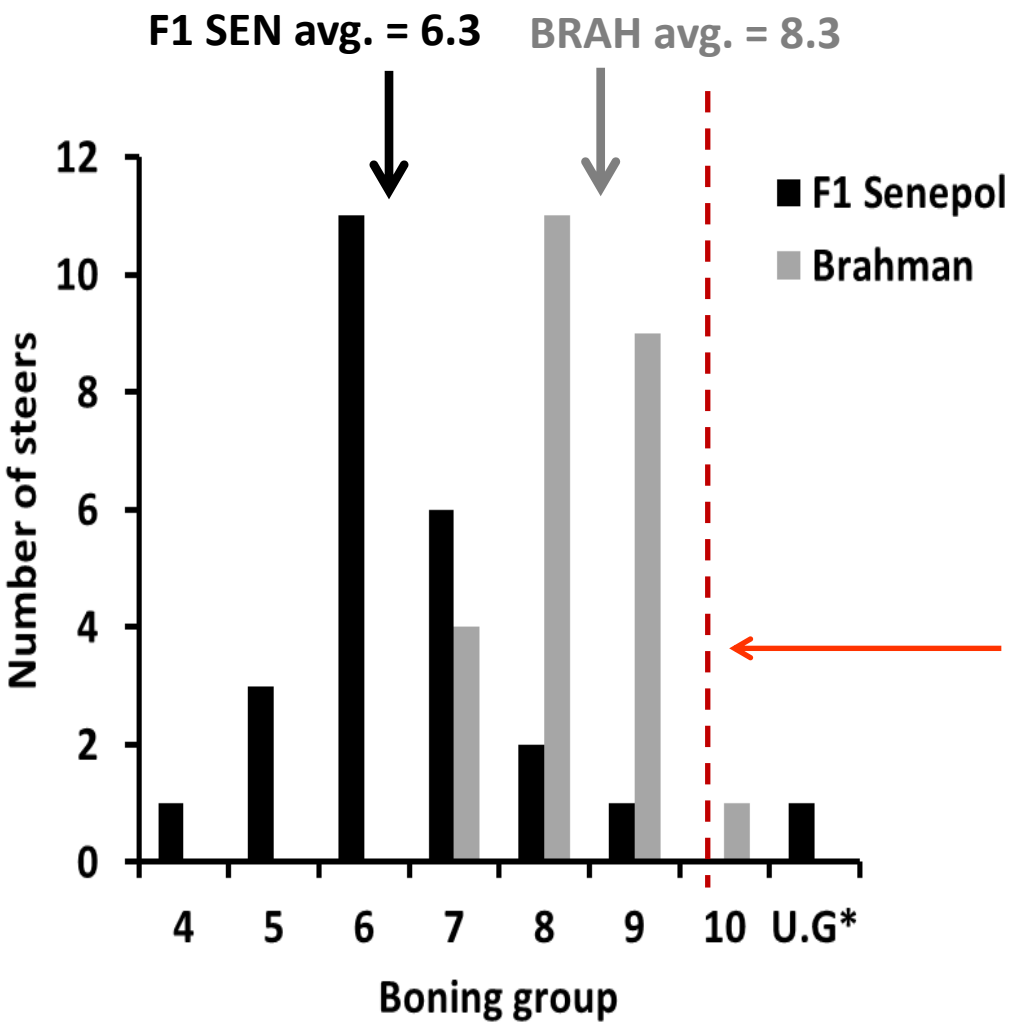
Meatworks data (from MSA grading and kill sheets)

(P < 0.0001)

	HSCW (kg)	Boning Group	Hump Ht (mm)	EMA	OSS	Meat Colour	Fat Colour	P8 Fat (mm)	Price /kg received	Body value (ex GST)	18/7/13 (kg) (FL	10/09/13 (kg) (54
Brahman	236.7	8.3	137.6	64.8	128.4	2.1	0.8	9.5	$3.55	$846.62	314.0	424.2
F1 Senepol	239.1	6.3	87.6	68.4	130.8	2.3	0.8	8.6	$3.57	$860.10	317.0	434.3

MSA carcase grading : Boning groups

Figure 1. The number of steers in each MSA boning group. (*U.G. = ungraded).



A lower boning group number is better (ie. more cuts can be used for MSA)

JBS pays MSA rates for boning groups <10

Much of the difference between breeds in boning group (from MSA grading) was due to hump height

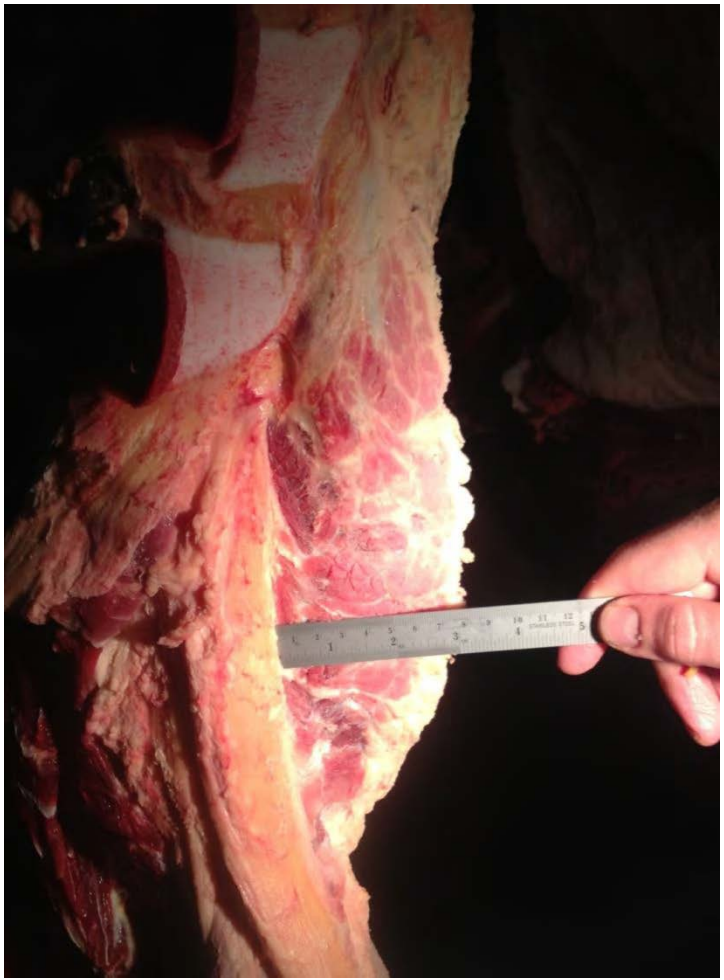
(MSA grading system – high hump height associated with tough beef)

Brahman

Avg hump height = 138 mm

F1 Senepol

Avg hump height = 88 mm



At the UNE Meat Science lab (Armidale NSW): the samples were aged for 14 days and then shearforce and other meat quality tests were performed.

The **F1 Senepol meat was significantly more tender** (P<0.01) than the Brahmans. On average their shear force results were **0.44 kg lower**.
(People notice differences of about 0.5 kg when tasting meat).

	F1 Senepol	Brahman
Shear force (kg)	**3.43**	**3.86**

- Meat from **both genotypes tested well** ie. had average **shear force values < 4 kg** (which is considered to be tender).
- **Shear force values for the Brahmans in this study are quite low in comparison to values that have been found from other Brahmans -**
Polkinghorne (unpublished): *average shear force = 5.5 kg (range 2.53 to 16.88 kg): of 1298 Brahman striploin samples*
The young age at slaughter (est. 21.5 mo.) may have been the reason.

Conclusions of feedlot and meat tenderness studies

Both genotypes	**- grew well in the feedlot**	**: Avg ADG = 1.83 kg/day**
	- graded well	**: Most in boning group < 10**
	- tested well for tenderness	**: Shearforce < 4 kg**

Results indicate that **Brahman cattle with good meat quality can be produced** by production systems that give good growth rates and minimize age at slaughter. However this may not be possible on many extensive properties in northern Australia where growth rates are low. In these situations crossbreeding may be required to improve meat quality.

Advantages of the F1 Senepols

Graded better (average 2 boning groups lower) – mostly due to lower hump height
Significantly more tender meat

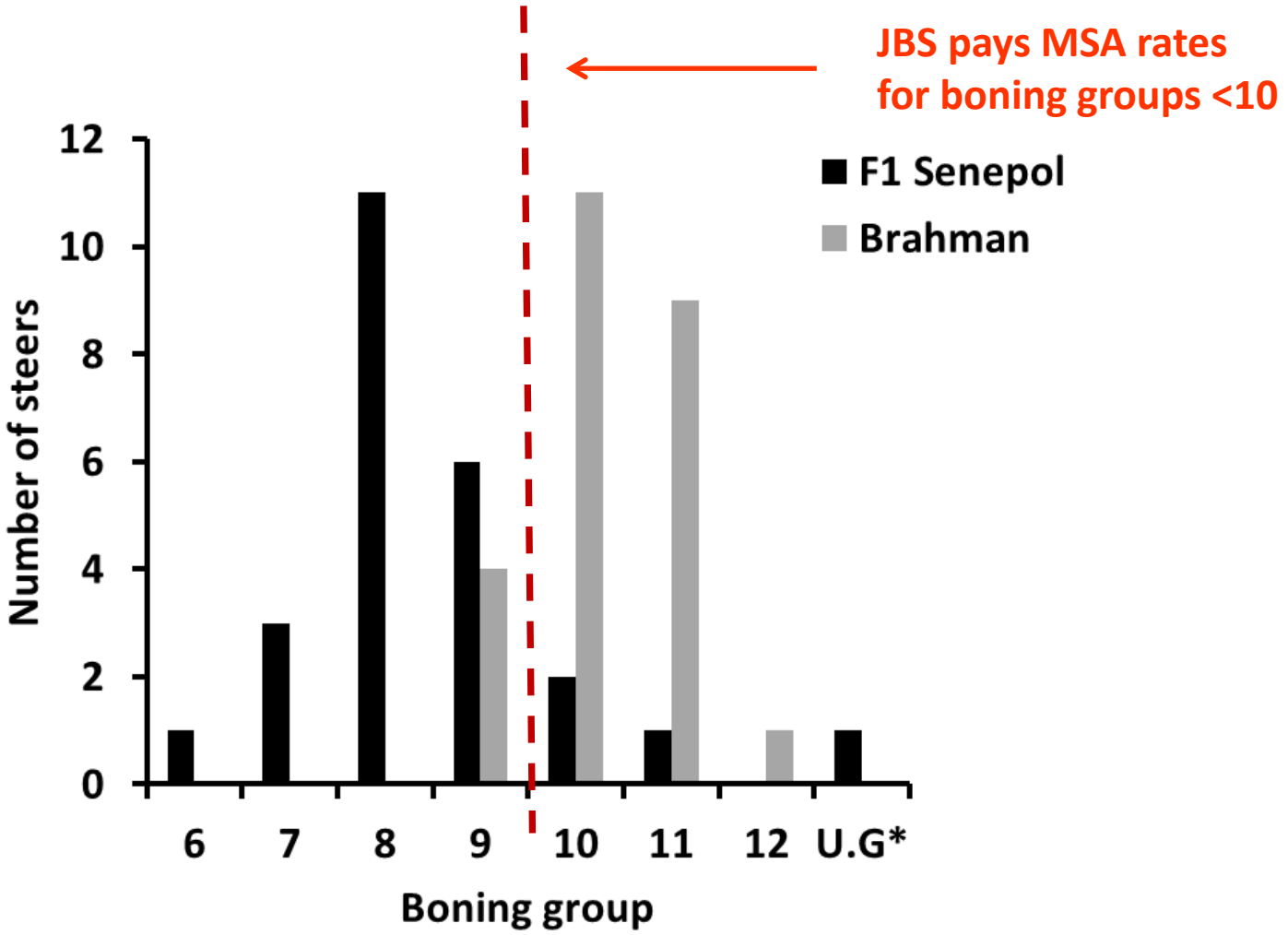
Therefore they have "more margin for error": if all the steers had not grown so well:

- **were fed for a shorter time in the feedlot,**
- **had a worse season while grazing pasture,**
- **grazed native pasture instead of improved pasture post weaning (etc.)**

then more of the F1 SEN would be likely to be graded below boning group 10 than the BRAH and have meat with a shear force < 4.

Figure 2. The hypothetical number of steers in each MSA boning group.

If these factors that reduce weight for age were to occur, then more of the F1 Senepols would still grade MSA …….



Conclusion

Crossbreeding with a tropically adapted *Bos taurus* breed such as the Senepol appears to be a good way for northern beef producers to produce cattle that:

- have improved meat quality

- perform as well as Brahmans in the NT environment.

- have more marketing options as they suit both the Indonesian live export and Australian domestic markets

Questions?

The assistance of MLA in funding this aspect of the work is gratefully acknowledged.

3. Indonesian feedlot comparison

mla
MEAT & LIVESTOCK AUSTRALIA

Northern Territory Government

The Indonesian live export market has been the main destination for young north Australian cattle for many years.

We hope and anticipate that this mutually beneficial trade will continue to remain strong, so it is important that Indonesian feedlotters are happy with the cattle produced in northern Australia.

Despite the production and meat quality advantages of tropically adapted *Bos taurus* crosses, some northern cattle producers are reluctant to embrace crossbreeding as 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 won't perform as well as Brahmans in Indonesian feedlots.

So we did a study to find out whether this perception was true or not.

The aim of the study was to compare the performance of F1 Senepol x Brahman steers (F1 Senepol) and Brahman steers in an Indonesian feedlot.

NT DPIF formed a collaboration with Elders Indonesia – who agreed to buy our Brahman and F1 Senepol steers and allow us to study their performance in their feedlot at Lampung province (Sumatra).

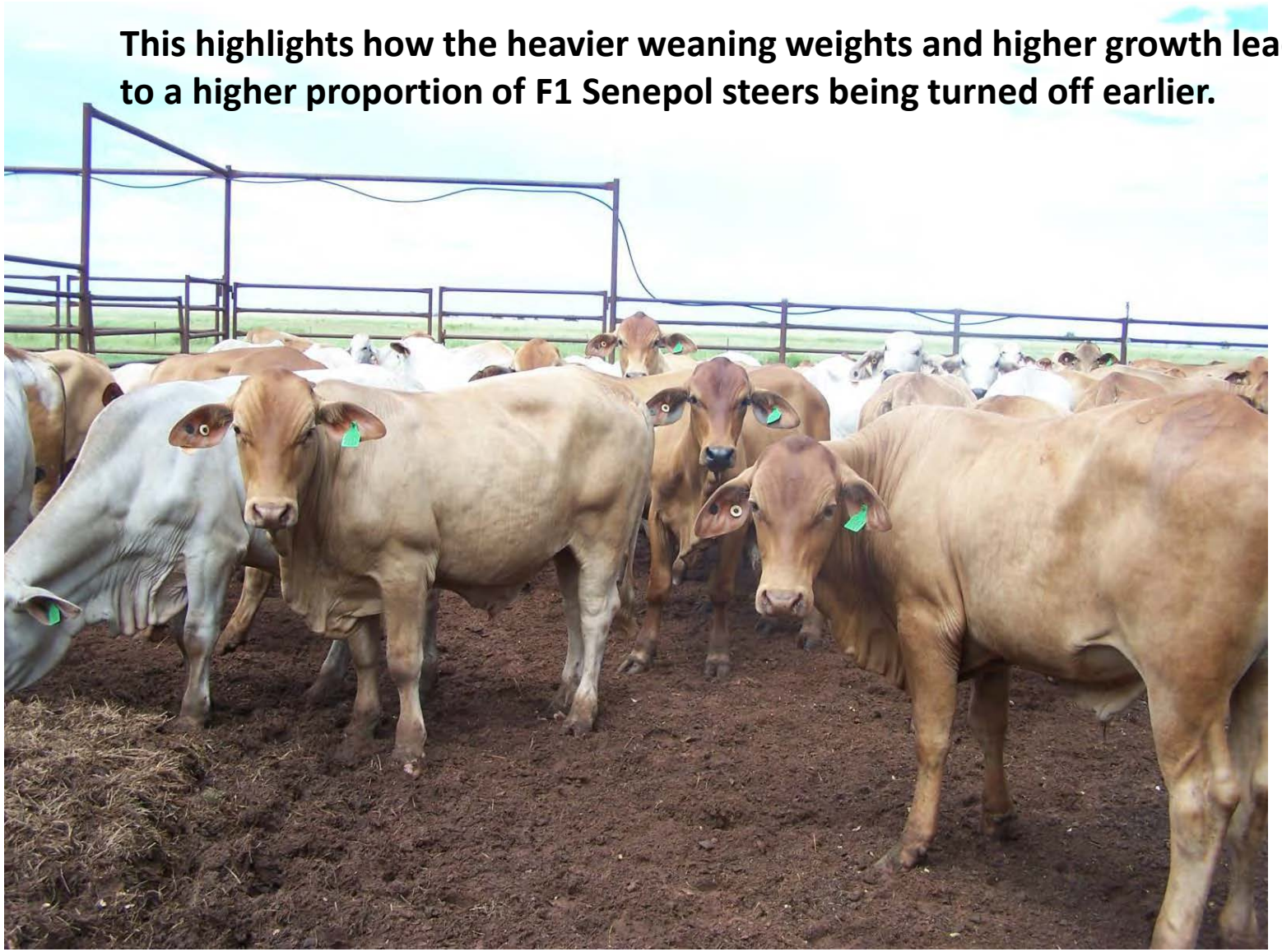
We gratefully acknowledge their excellent cooperation and assistance

The steers used were Brahman and F1 Senepol steers that had been grazing (improved Buffel pasture) together in a cell grazing trial at Douglas Daly Research Farm (DDRF) since weaning in 2013 .

On 26 Feb 2014 all the steers at DDRF were weighed and those >300 kg were selected to be sold for the feedlot study.

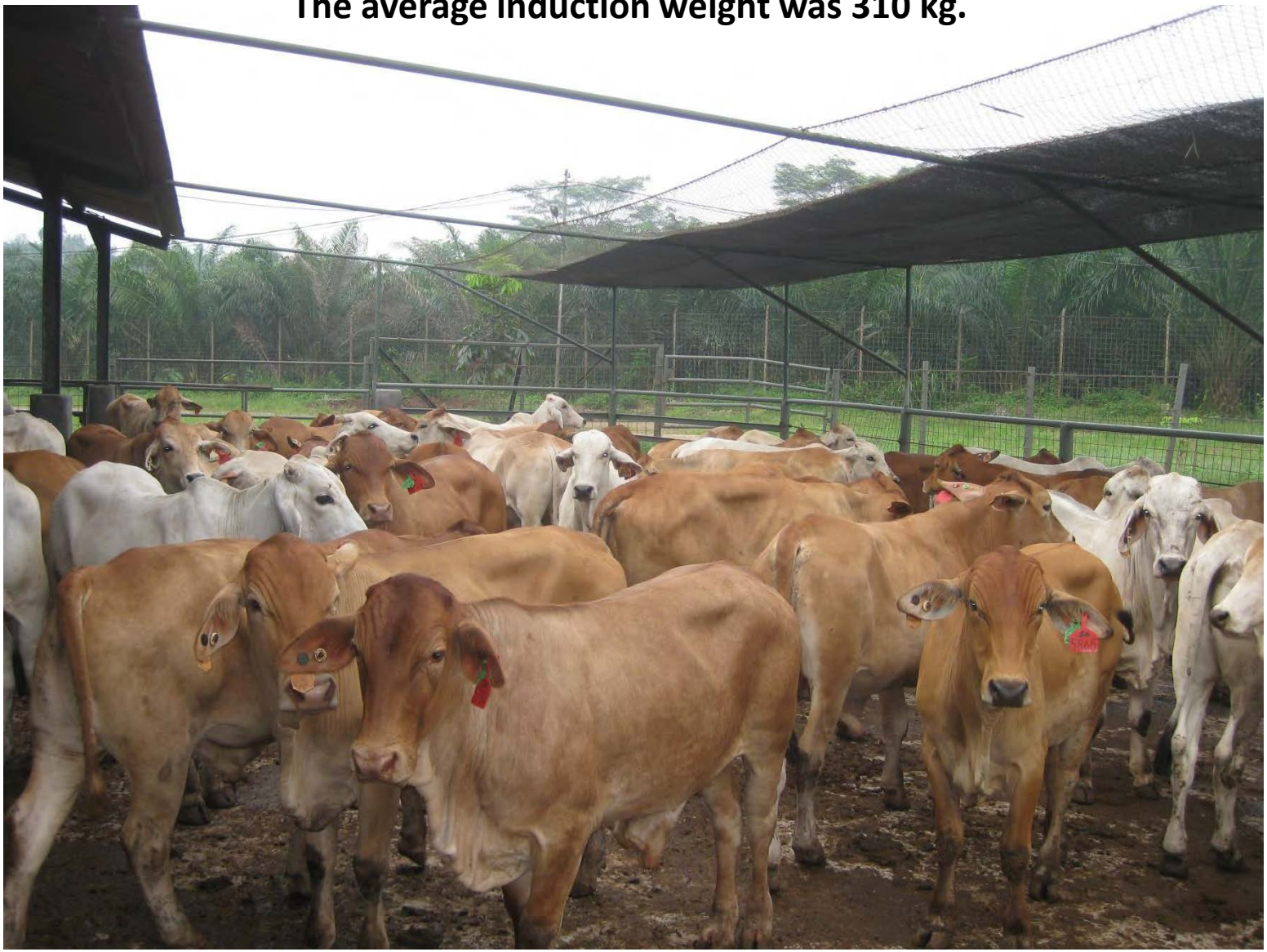
24% of Brahman steers and 57% of F1 Senepol steers weighed >300 kg.

This highlights how the heavier weaning weights and higher growth leads to a higher proportion of F1 Senepol steers being turned off earlier.



54 F1 Senepol and 32 Brahman steers were exported through the normal live export process and were inducted into the Elders Lampung feedlot on 15/3/14.

The average induction weight was 310 kg.



The steers were managed as per normal feedlot management and fed the commercial rations for 121 days (starter ration for 3 weeks and then finishing ration).

Ration - major ingredients : Tapioca waste, Tapioca chip, DDGS (distillers dried grains plus soluables), Copra meal, Palm kernel cake, Napier grass and molasses.

Weight and fat depth was measured at induction and at the end of the feeding period on 14/7/14.

Feedlot performance comparison

	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. carcase 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

- ADG of F1 Senepols was significantly ($P<0.001$) higher (1.71 kg/day vs 1.54 kg/day).
- As a result their final weight was also significantly ($P=0.002$) higher (+25.4 kg).

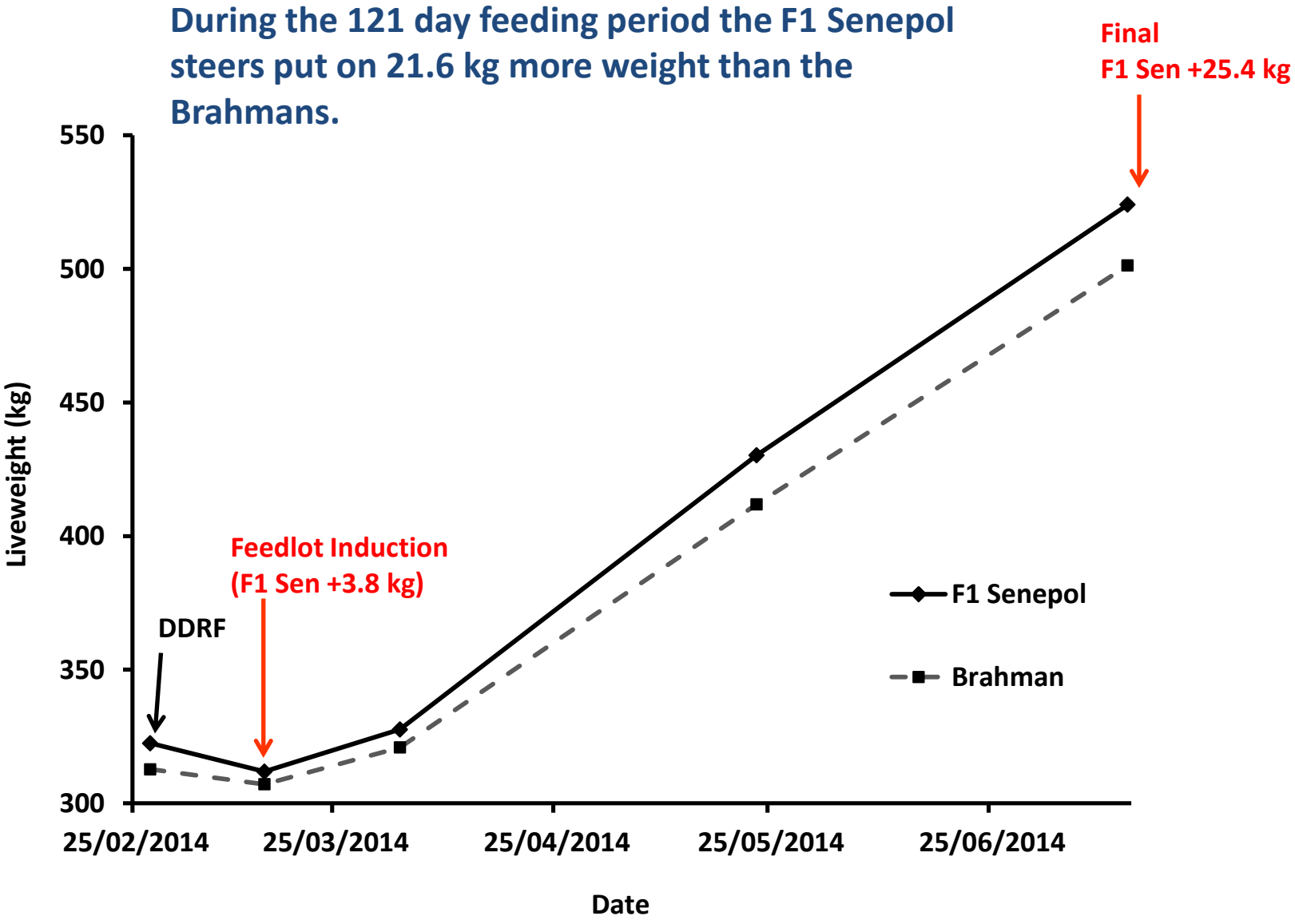


Figure: The liveweight (kg) change of F1 Senepol and Brahman steers throughout the export and feedlotting process.

Final 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.

Examples of the finished steers

The steers were slaughtered at the Elders abattoir at Bogor and boned out for the restaurant market.

Boning room yield was 2.44 % higher for the F1 Senepols.

Photo from: theaustralian.com.au

Conclusion: F1 Senepol steers performed better than Brahmans.

They - put on more weight in the feedlot (+21 kg)
- had higher average ADG in the feedlot (+0.17 kg/day)
- were heavier at slaughter (+25 kg)
- had higher average HSCW (+11 kg)
- had the same average P8 fat depth even though they were heavier
- had higher boning room yield (+ 2.44 %)

The Indonesian feedlot operators were very happy with them.
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.
Their better meat tenderness also gives Indonesian feedlotters confidence in the option of targeting the restaurant market in addition to the wet market.

F1 Senepols were found to offer production advantages to Indonesian feedlotters as well as Australian cattle producers.

Dick Slaney Elders Indonesia:

- **“Would I pay more for these F1 Senepol x Brahman cattle? ... You bet.”**

- **“Did my buyers want those steers? ... You bet”.**

“You can quote me on that”

Photo from: beefcentral.com

So what about the extra $100 per steer?

Extra weight at sale at 18 months of age = 33 kg x $2.70/kg = $89.10

Premium (for adapted *B.taurus* crossbred) = 330 kg @ $0.05/kg = $16.50

Total = $105.60

Questions?

Acknowledgements:

- Funding for the Senepol crossbreeding project from NT Government - DPIF
- Funding for meat quality studies and Indonesian feedlot comparison from Meat and Livestock Australia (MLA)
- Dick Slaney, Jason Hatchett and Elders Indonesia for their excellent cooperation and assistance in conducting the Indonesian feedlot study.
- Support of the Katherine Pastoral Industry Advisory Committee (KPIAC)
- DPIF staff at VRRS, KRS and DDRF research stations.
- Dr Mark Hearnden (DPIF) for help with statistical analysis

Crossbreeding options for subsequent generations

Depends on your environment and how complicated you want to get with your breeding system.

There are lots of options but the basic principles are:

- **the harsher your environment the higher *Bos indicus* content should be and the more important it is that the *Bos taurus* breeds that you use in crossbreeding are tropically adapted.**

- **The more breeds that you have in a crossbreed or composite the higher the level of hybrid vigour that is retained**

- **Rotational crosses maintain more hybrid vigour than stabilised composites.**

Crossbreeding options for subsequent generations

$44.55 plus any premium for *Bos taurus* content

Stick with just Brahman and Senepol content

- Stabilised composite of 50% Brahman x 50% Senepol – retains 50% HV
- 2 Breed rotational cross (alternate between Brahman & Senepol bulls – 67% HV

$59.70 plus any premium

Introduce another breed (increases level of hybrid vigour retained).

How you do it depends on how harsh your environment is. If hard country then use more Brahman content and the other *Bos taurus* content should probably be tropically adapted.

Options:

- **50% Brahman x 50% other tropical *Bos taurus* breed** (eg. Belmont, Bonsmara) retains 62.5% HV when stabilised as a composite (1/2 Bra ¼ Sen ¼ Bonsmara).
- **Established 2 breed composite** eg. Brangus, Charbray, Droughtmaster. Good numbers for sale and have been selected for traits.
- **Other tropically adapted *Bos taurus* breed** (eg. Belmont, Bonsmara, Tuli) then use a 3 breed rotational cross. Retains 86% HV but can be hard to manage.

Introduce several other breeds eg. use Composite bulls

Maximises hybrid vigour.

Make sure the Composite has enough tropical adaption for your environment

2 Breed rotational cross

Reasonably simple system that retains a good amount of HV

Retains 67% of the hybrid vigour: eg. 22 kg extra weight gain (=$59.40) plus any premium for *Bos taurus* content.

F1 females: 50 % Brahman x 50% Senepol

↓ X Brahman bull

F2 Females 75% Brahman x 25% Senepol

↓ X Senepol bull

F3 Females 37.5% Brahman x 62.5% Senepol

↓ X Brahman bull

F4 Females 68.75% Brahman x 31.25% Senepol

↓ X Senepol bull

F5 Females 34.4% Brahman x 65.6% Senepol

Can allocate females to mating groups based on type

Stabilises at around 65% of 1 breed and 35% of the other depending on the sire

End up with 2 herds/mating groups (Brahman bulls and Senepol bulls)