

Breeding beef cattle to suit the environment and meet market specifications - A case study from northern Australia.

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Northern Territory : Background

- Is a “state” in the north of Australia.
- The climate in the north similar to much of Vietnam (hot and humid). Further south it is much more arid.
- Average annual rainfall ranges from 1,800 mm in the north to 150 mm in the south.
- The population density is very low: only 0.2 people/km² in the NT compared to 300 people/km² in Vietnam

	Area (km ²)	Population	People/km ²	No. of cattle
Vietnam	331,690	99,000,000	298.5	6.4 million
Northern Territory	1,349,130	254,000	0.2	2 million

The NT cattle industry is characterised by large scale, low cost operations in a harsh environment (heat, ticks, seasonal low nutrition int the dry season etc.).

Due to low stocking rates and economies of scale, NT cattle stations (farms) are very large eg. area = 4,000 km² (990,000 acres), herd size = 11,000 cattle, number of staff = 10 people.



Picture: Loading 16 triple road trains at Helen Springs (about 2,500 cows)

Cattle production in the NT is mostly based on grazing native pasture with minimal infrastructure improvements other than water troughs and fences. Cattle are often only handled twice a year.



We try to breed cattle that survive well and are productive in our environment, are low maintenance, and meet market requirements.

Most cattle in the north target the South East Asian live export market (mainly Indonesia and Vietnam). Cattle need to be able to cope with a hot, humid environment with parasites (ticks, buffalo flies and worms).

Therefore most cattle in the north have a high *Bos indicus* (Brahman) content as they cope better with stressful environments and have better walking ability than *Bos taurus* cattle.



Today I will be talking about how we try to breed cattle that are suited to our environment and meet the specifications for the live export market to Indonesia.

The same principles apply to breeding cattle that perform well in the Vietnam environment and meet the Vietnam market specifications.



The NT Department has conducted several breeding programs to develop cattle suited for the live export market. One program involved crossbreeding Brahman cows with F1 Charolais x Brahman bulls to produce cattle that were $\frac{1}{4}$ Charolais and $\frac{3}{4}$ Brahman. And then criss-cross mating to stabilise the *Bos indicus* and Euro breed content.

European *Bos taurus* breeds (eg. Charolais, Simmental, Limousin) – have high growth, large mature size, and lean carcasses with high yield. But have lower stress resistance than Brahman.

Charolais



Limousin



Cross breeding European breeds with Brahman produces animals that still have good stress resistance (and so perform well in our environment), but have higher growth, yield and value adding potential than Brahman.

Value adding potential = they can be fed to heavier weights in feedlots before they become fat. ie. feed is not wasted in putting on fat instead of muscle.



Picture: An Australian bred Brahman x Charolais cross steer in an Indonesian feedlot.

NT Senepol crossbreeding project

In 2008 the NT Department evaluated the cattle industry threats and saw that northern NT producers were very reliant on one market (live export), and were susceptible if there was ever a problem in that market. If NT Brahman cattle had to be sent to domestic markets in southern Australia then they would be penalised (get lower prices) due to perceptions of having tough meat. So we looked for ways to breed cattle with more marketing options (accepted in both the live export and Australian domestic markets).



Aim: To determine whether crossbreeding Senepol bulls with Brahman cows produces progeny that:

- have better meat quality (tenderness) than Brahmans**
- perform well under NT conditions**
- are suited to both the live export and Australian domestic markets**

Bos taurus cattle are known to have more tender meat than Brahman cattle, so the easiest way to improve the meat tenderness of NT cattle is to crossbreed with *Bos taurus* bulls.

However this had been tried in the past and the *Bos taurus* bulls usually died before producing many calves as the conditions were too stressful for them..... they were terminal sires (*cattle breeding joke*).



In more recent times tropically adapted *Bos taurus* breeds have been imported to Australia and so we decided to try crossbreeding with one of them. We could have used any tropically adapted *Bos taurus* breed (eg. Tuli, Belmont Red, Bonsmara). We chose Senepol due to polledness, meat quality traits, and they were more “popular” at the time.

We mated Senepol and Brahman bulls to Brahman cows at NT DITT research stations for 4 years to produce 4 year groups of F1 Senepol x Brahman and Brahman calves.



Then we compared the performance of the 4 year groups of offspring:

- Performance of steers growing on pasture**
- Performance of steers in an Indonesian feedlot**
- Meat quality studies**
- Performance of females retained for breeding**

Brief summary of crossbreeding project results

Steer performance grazing improved pasture in the NT



Each year the F1 Senepol steers:

- were about 21 kg heavier at weaning
- grew about 12 kg more over the post weaning year
- as a result were **about 33 kg heavier at 18 mo.** when sold for live export

33 kg extra growth @\$3.05/kg = \$100.65



Meat quality studies

25 Brahman and 25 F1 Senepol steers were transported to the Smithfield feedlot (Proston, Qld). Fed for 73 days. Then slaughtered and Met Standards Australia (MSA) assessment done and samples sent to UNE meat science lab for meat quality testing.



MSA assessment: On average the F1 Senepol carcasses were graded 2 boning groups better (mostly due to lower hump height)

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

Our research found that F1 Senepol x Brahman steers provide a number of production advantages compared to Brahmans (heavier weaning weights, higher growth, leaner at the same weight, more tender meat etc.).

Despite this, some cattle producers are reluctant to adopt 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 studied the performance of F1 Senepol and Brahman steers in an Indonesian feedlot to find out if the perception is right.



We collaborated with Elders Indonesia – they agreed to buy our Brahman and F1 Senepol steers and allow us to study their performance in their feedlot at Lampung province (Sumatra).

**Sent 34 Brahman and 54 F1 Senepol steers that weighed 300-350 kg.
The steers were managed as per normal feedlot management and fed the commercial rations for 121 days.**



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

Results:



- F1 Senepols:**
- Had significantly higher ADG: **1.71 vs 1.54 kg/day**
 - Put on significantly more weight in the feedlot (**+21 kg**)
 - Had the same average P8 fat depth even though they were heavier (**10.5mm**), so can be fed to heavier weights.
 - Had higher boning room yield (**+ 2.44 %**)

Conclusion: F1 Senepol steers actually performed better than Brahmans.

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 the option of targeting the restaurant market in addition to the wet market.

Heifer performance on native pasture

Maiden heifers (first mated at 2 y.o) – 4 year groups

- Heavier weaning weights (+26 kg) and higher growth result in F1 Senepols heifers being about **35 kg heavier** at maiden joining as 2 year olds
- Pregnancy rates were on average **19% higher** in F1 Senepols



The performance of mature females was studied until the oldest year group was 9.5 y.o

Summary: the breeds performed similarly.

- **Annual weaning rates for the breeds were similar (F1 Senepol 59%, Brahman 57%)**
- **Mean annual female liveweight production (change in female liveweight plus weight of calf weaned) was similar.**
- **There were no significant differences between breeds in cumulative mortality or calf loss rates.**



Overall Summary: the work showed that crossbreeding with a tropically adapted *Bos taurus* breed gave production advantages for both:

- **Cattle breeders (Australia or Vietnam):** *Heavier weaning weights, higher growth, heavier at turnoff (\$100/steer), higher pregnancy rates etc.*
- **Feedlotters (Indonesia or Vietnam):** *Higher feedlot growth, more value adding potential, better carcass yield, more tender meat gives option to target restaurant trade*



Important: This work is not about proving that one breed is better than another. It was a demonstration of the benefits that are available through crossbreeding from hybrid vigour (increased growth and fertility) and combining the desirable characteristics of different breeds (eg. stress resistance of Brahman and meat tenderness and polledness of Senepol).



Important considerations for crossbreeding – In Australia and Vietnam.

1. Consider the breed characteristics and choose a combination that is suitable for your environment and market.

We want the breeding cows to be low maintenance and perform well.....

- In areas where there are cattle ticks you should have a genotype that has good tick resistance and can cope with the heat eg. at least 50% *Bos indicus*.

- Consider using tropically adapted *Bos Taurus* breeds (eg. *Senepol*, *Belmont Red*, *Bonsmara*) instead of British breeds (eg. *Angus*, *Shorthorn* etc.).

2. Composite breeds combine traits from several breeds and reduce the loss of hybrid vigour after the F1 generation.

A good genotype for Vietnam might be:

50% *Bos indicus* (for heat tolerance and tick resistance traits)


25% tropically adapted *Bos taurus* (for meat quality and fertility traits)

25% Euro *Bos taurus* (for growth, lean carcass and high value adding potential)

Important considerations for crossbreeding – In Australia and Vietnam.

3. Choose good animals for your breeding programs:

- There is almost as much variation within breeds as there is between breeds.
 - There are good and bad animals in all breeds – make sure that you use good ones.
- When selecting bulls or semen for breeding, you can use objective data (Estimated Breeding Values - EBVs) to identify good ones.

October 2023 Brahman BREEDPLAN																		
	Gestation Length (days)	Birth Wt. (kg)	200 Day Wt (kg)	400 Day Wt (kg)	600 Day Wt (kg)	Mat Cow Wt (kg)	Milk (kg)	Scrotal Size (cm)	Days to Calving (days)	Carcase Wt (kg)	Eye Muscle Area (sq.cm)	Rib Fat (mm)	Rump Fat (mm)	Retail Beef Yield (%)	IMF (%)	Percent Normal Sperm (%)	Flight Time (secs)	Shear Force (kgs)
EBV	-0.3	+0.2	+9	+19	+29	+26	-2	+4.7	-27.0	+14	-1.1	+1.5	+2.0	-0.2	+0.2	+7.9	-0.08	+0.41
<u>Accuracy</u>	38%	72%	71%	74%	78%	71%	53%	73%	51%	61%	50%	50%	60%	38%	44%	58%	65%	54%
Breed Avg. EBVs for 2021 Born Calves Click for Percentiles																		
EBV	-0.4	+2.5	+19	+27	+38	+43	-2	+0.9	-2.0	+22	+3.0	-0.3	-0.5	+0.7	-0.1	+0.6	+0.01	+0.01

Traits Analysed: BWT,200WT,400WT,600WT,SS,PNS,FLT,Genomics

SELECTION INDEX VALUES		
Market Target	Index Value	Breed Average
Central Production Index (\$)	+\$ 75	+\$ 26
Live Export Index (\$)	+\$ 103	+\$ 28

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