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Evaluation of the economic cost-benefit of spaying associated with female turnoff options for northern Australia

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Abstract

An evaluation of the cost benefits of spaying females in Northern Australia was undertaken to better understand why and if spaying still has a place as a management tool, what (if any) are the financial benefits and how much resources should be directed at methods of controlling pregnancy in the future. The study demonstrated positive cost benefits in the majority of properties (5/6) studied. It highlighted the constraints and issues in targeting suitable markets for females in northern Australia. An analysis of the results revealed that any increases in Gross Margin/Adult Equivalent (GM/AE) were dependent on the percentage increase in the net value of the females sold in relation to the lowered turnoff. An equation was developed that quantified this relationship. The results enabled a more in depth examination of common cull cow policies, demonstrated the role of value adding to the female sales and highlighted the need to expand our thinking in ways to improve profitability in the northern beef herds.

Executive Summary

Industry needs to be constantly reviewing current husbandry procedures to ensure they are relevant and in the best interests of the well being of the livestock and the cattle industry in general. Most procedures can be justified on improved animal well being, improved cattle control and improved worker safety. The justification for spaying is less obvious but it may actually increase breeder cow survival on stations – this was not examined in this project. The aim of this project was to determine the actual cost benefit of the technique and to establish whether or not it still has a role in the northern beef industry on economic grounds.

Spaying cull females does not improve liveweight gain per se, but it does have welfare benefits, through reduction in mortalities due to inability to carry a pregnancy or raise a calf in old cows, it also enables fattening by avoiding the demands of pregnancy and lactation, and if systems to better control bulls were able to be devised, then the technique would not be required.

In extensive herds in northern Australia, bull control still poses major problems - especially in herds that continuously mate, those that are exposed to flooding, those that can't obtain 100% musters, and those that can't justify expenditure on infrastructure and maintenance to control stock by securing the watering points eg in desert country.

This project analysed the net economic benefit of spaying of surplus heifers and cull cows for six properties in six different northern beef producing regions in Australia, and quantified the net economic benefit of the practice.

The production parameters, herd structure, current market prices and variable costs were modelled in the Bcowplus program for six breeding properties, as well as for a company enterprise having turnoff options to a fattening/backgrounding depot in central Highlands of Queensland.

The modelling demonstrated a net benefit ranging from $35.05 - $306.93/spayed animal on five of the six properties and a net cost of - $219.27 (cull for age cows only) on one property The negative results found in the Alice Springs study may be due to the lower cull for age of the cows and better market options for British breeds into South Australia. In addition, the management strategy for the Alice Springs property was very difficult to fit the Bcowplus model.

The best data, and perhaps therefore the most reliable result, came from the multi-property company enterprise, where our informant seemed equally well informed on both sides of the question, i.e. management and market outcomes with or without the inclusion of spaying.

Spaying cull cows and retaining them in the herd to fatten changes the structure of the herd. Less breeders can be run, less weaners are produced and the number of cattle turned off decreases, while the value per head of older female turnoff is increased. Spaying heifers and selling them does not change the structure of the herd, unless it also entails keeping heifers to an older age, as these animals are sold either as cull entire heifers or cull spayed heifers. Spaying heifers is a marketing issue and not a modelling issue. Properties in the study identified premiums for spayed heifers in the live export trade and at feedlots.

An analysis of all the results demonstrated a relationship between the improvement in the net value of the female sales from spaying versus the decreased number of stock turned off. If the percentage improvement in net value of the female sales is greater than the percentage difference in total turnoff by more than 2. 654, then spaying females would appear to have a positive cost benefit for the enterprise.

$$\% \text{ Change \$GM/AE} = \frac{(\% \text{ Diff Value of female sales} / \% \text{ Diff in total sales}) - 2.45)}{68.27.}$$

($r^2 = 0.98$, SE = 0.5124)

Alternative markets for non-spayed surplus heifers and cull cows were investigated and the associated logistical constraints in supplying these markets were discussed. The key profit drivers including weaning rates, mortality rates and growth rates were examined for each of the properties in the study. Guidelines were developed to help producers to identify ways to improve the overall net value of their female turnoff.

The role that spaying may have in decreasing mortality rates in breeders was not modelled as there was no hard data available. Similarly the impact on feedlot performance and animal well being during transport as a result of the better condition of cull for age cows was not explored. The impact of decreasing breeder mortality was explored in the Key Profit Driver analysis and was found to make a very significant contribution to improved station returns by increasing the actual numbers of females sold.

A market analysis was undertaken to examine the options for female turnoff in northern Australia. There are very limited opportunities for stations to sell stock through a saleyard system in the N.T. and Western Australia. Saleyards do exist in Queensland but frequency of sales is not high in those saleyards located in the extensive regions. Apart from the limited “on farm” sales for which there was no data, the most popular markets are the live export trade through the ports of Broome, Darwin and to a lesser extent Townsville. This trade requires an animal to be greater than 260 – 290 Kgs live weight for heifers and preferably not pregnant. Premiums are paid for spayed heifers. The minimum weight for cows to these markets is 340 Kgs.

No export abattoirs are currently operating in northern Australia. The closest export abattoirs are in the south west corner of Western Australia, the south of South Australia and the coast of Queensland. While there are no minimum weights for these markets, the price on offer for cows that dress less than 160 Kgs (or about 310 kg live weight) is very low. The high Brahman content of the northern herd and the extended dry each year make it difficult for producers to target the local trade with cull heifers. Putting a value on the practice of spaying, now allows properties to examine the returns on extra capital invested or needed to improve bull control and it even allows the role of local anaesthesia and analgesics in the procedure to be costed in.

The modelling and subsequent Key Profit Driver analysis demonstrated a significant impact on being able to value add the female turnoff. It also demonstrated other windows of opportunity that may be available to some properties with good weaning rates.

The outcomes of this project recommend continued support of initiatives to develop alternate methods of desexing females. It further highlights the need not to focus entirely on male markets and male turnoff as females contribute almost 50% of the total net income from some properties – especially those that sell steers at 18 months of age.

Contents

1 Background.

1.1 Management and marketing options

The management and marketing options for large extensively operated beef cattle stations in northern Australia are very different to those experienced in regions south of the tropics. The differences are complex and can be attributed to seasonal, nutritional, geographical, managerial and breed differences.

1.1.1 Season

The dry tropics and sub tropical regions of northern Australia are dominated by a strongly seasonal, highly variable rainfall pattern. Average yearly rainfall totals decrease progressively with distance from the northern coast. The 'wet' or growing season occurs each year from late spring to early autumn with little or no rain from autumn through to late spring – the 'dry' season. The soils are generally of low fertility and low water holding capacity.

1.1.2 Nutrition

Beef production is based entirely on native pastures. The most common species are the spear grasses (Heteropgon sps), kangaroo grass (Themeda australis), golden beard grass (Chrysopogon fallax), wild sorghum (Sorghum plumosom), the blue grasses (Dicanthium sps and bothriochloa sps), spinifex sps and mitchell grass (Astrebla sps) and flinders grass (Iseilema sps) on the black soil plains. In addition, pangola (Digitaria decumbens) and para grass (Brachiaria mutica) grow on the subcoastal plains. There are relatively no dominant legume species and the establishment of leucaena is not widely adopted to date. "Drought" as it is known in southern Australia in terms of a lack of dry matter production seldom occurs in the dry tropics. However, 'energy' and 'protein' droughts occur every year in the northern beef producing areas due to the extended nature of the dry season and poor quality of the native pastures. Fogs and heavy dews within 200 kms of the coastline cause further deterioration of the dry standing pastures. The nutrient value of the pastures is somewhat higher in the lower rainfall regions because of a lower dilution effects of nutrients in the shorter pastures. The nutritional picture is further exacerbated by acutely low soil phosphorus levels in most of the dry tropics of northern Australia. Animals generally grow and increase body weight during the wet and early dry seasons and then maintain and lose weight as the dry progresses. Weaning rates around 70% are generally achievable with dry season supplementation and early weaning. Weaning weights vary from 150 kgs – 210 kgs at 6 – 9 months and growth rates in young cattle (post weaning) range from 80 – 140Kgs per annum, G. Bortolussi et al, (2005).

1.1.3 Geography

The landscape is generally fairly flat but escarpment country, hills and ridges are commonly encountered. Large river systems drain into the Timor sea and Gulf of Carpentaria and the landscape is generally covered with trees and shrubs except for the open black soil flats and open plains of the southern Victoria River Region and the Barkly Tableland. Generally speaking, mustering costs are high in the northern areas due to the vegetation cover and numerous surface waters. Further south, the mustering costs decrease but the cost of providing water now becomes a major operational cost. Stocking rates are much lower than those found in southern beef producing regions and end of season fires can cause feed shortages prior to the onset of the wet season. The cost of infrastructure such as paddocks and yards also limits the intensification that is common in southern beef producing regions.

1.1.4 Management

While cattle control and mustering efficiency have improved greatly over the last two decades, the extensive nature of the operations and the damage done by flood waters in some regions to fencing and infrastructure makes it almost impossible to control bulls and manage the breeding herd. Most places achieve two rounds of mustering a year but even this only provides opportunity to sort out and redraft stock twice a year. Controlled mating, as practised in intensive beef producing areas is usually not an option in the majority of the breeder herds due to the difficulty in movement of stock over the 'wet'. Hundreds of herd bulls would have to be moved many kilometres over unsealed internal station roads. More importantly, the large percentage of 'wet' and 'empty' cows that would emanate from a tight joining practice make it unsustainable on most properties. Some properties practice restricted joining and remove bulls at the time of the regular muster. The majority of properties still employ 'year round' mating and manage 'out of season' calving by early weaning techniques.

1.1.5 Breed

The dominant genotype of the breeder cow in northern Australia is the Brahman. Euro infusion is being utilised but mainly as terminal sires. The Brahman cow is able to survive the harsh environment of northern Australia better than most other breeds. In addition, they generally are easier to muster as they tend to form into mobs and they can travel longer distances to yards. However, brahmans are not suited quite as well to the domestic trade and options for selling stores to southern regions and to feedlots are limited. Most of the production is directed at the live export market into south east Asia.

1.1.6 Markets

While there is a healthy live export trade for steers and non pregnant females into south east Asia, problems still exist with sale of pregnant and aged females in northern Australia. There is currently no export abattoir operating away from the east coast and welfare issues exist with movement to sale of animals in low condition over long distances. In addition to the distances involved with land transport, there are specific market issues with regards volume and saleyard capacity. The numbers of females involved from any one of these large properties in northern Australia could be thousands of head per movement. The logistics of placing large numbers of females at various saleyards around the state on different days of the week is not practical. The sale yard system in southern Queensland may not handle a large influx of cull cows as stores. Markets would be inundated with cracker cows and prices would most likely drop. In addition, most saleyards (except Roma) routinely only sell 2,000 – 4,000 twice monthly. Therefore , large numbers of these 'cull for age' cows from the north west of the country that aren't suitable for slaughter (body weight <340 Kgs,) are extremely difficult to market. Furthermore, breeder cattle with *Bos indicus* content are not generally accepted by industry in the more southern parts of the country. Currently, most of the 'northern' cull cows are sold overseas or die of old age on property. Pregnancy status is a welfare issue during live export and also in feedlots in south east Asia. At the moment, live export prices are relatively buoyant, however a decline in prices would have a far greater impact on female turnoff than male turnoff as the price differential greatly favours the male market – average difference in C/Kg live weight is around 50 cents.

1.1.7 The BTEC campaign

BTEC paved the way for dramatic changes in the northern beef producing regions of Australia over the past two decades. Firstly it freed the north of two endemic diseases that restricted market access for stock raised in these regions. Secondly, it ensured infrastructure and management that allowed for better stock management. Finally, it removed feral shorthorn bulls and allowed for the

rapid transition to Brahman cattle in the north. These measures paved the way for a vibrant live export market. The average age of turnoff of male cattle also decreased. Better management of stock was possible as older 'rogue' cattle were almost entirely eliminated . The improved returns have allowed better supplementation and management practices to be adopted. These changes, together with an increased *Bos indicus* content in the herd have brought about marked reductions in the mortality rates in breeders from 15%+ p.a. - G. Niethe (1996) to around 4%. This has had a dramatic effect on the number of females being sold both as cull heifers and 'cull for age' cows. National turnoff figures indicate that over 1 million head more females are now being turned off stations in Australia compared to the turn off in the period 1982-91 (G. Niethe, unpublished). Most of this improvement would have occurred in northern regions. Female sales are now an important part of station revenue and in some instances are almost 50% to total net returns.

1.1.8 Closure of export abattoirs

Unfortunately, the improvement in the economic performance of the beef industry in the north has not been accompanied by similar changes in the meat processing sector. Closure of all export abattoirs operating in northern Australia has occurred over the same time span as export bullocks and feral bulls disappeared from the regions. The closest outlets for manufacturing beef processed 'on shore' is currently the east coast of Queensland, the south of South Australia and the south west corner of Western Australia. This scenario has presented potential problems for the sale of stock not suitable for the live export trade. Changing animal welfare standards for long distance road haulage of stock will pose even further challenges for the sale of this class of animal. Methods to improve the suitability of stock eligible for transport and market are therefore the logical progression required to ensure ongoing returns for all the product marketed from remote northern beef producing regions of Australia. Ensuring cull females can be presented as a marketable and viable product depends entirely on the ability to keep these animals from becoming pregnant. Pregnancy and the ensuing lactating prevents breeders in northern Australia from achieving target body condition required for turnoff.

1.1.9 The role of Spaying

Surgical spaying is often used to control female pregnancies in extensive beef production enterprises where bull and heifer control is difficult . This project aims to examine the role of spaying in improving marketing options for both cull cows and cull heifers. The primary role of desexing a cull female animal is to improve her marketability. Inability to control bulls in a very extensive and sometimes hostile environment and thus prevent unwanted pregnancies is the primary reason for utilising a technique which is not necessary in intensive and well controlled environments in the south. Spayed females do not perform any better than their non pregnant entire counterparts, M. Jeffery (1997) Spaying can cause a temporary set back in growth rates, however, a spayed heifer which has been implanted with a hormonal growth promotant will outperform her entire counterpart, Rupp (1995). In addition, there is a requirement to ensure cull heifers destined for the live export trade are "non pregnant" at the time of sale. Pregnancy testing and use of drugs such as prostaglandins can help ensure this requirement is met but there are animal welfare issues with regards aborting pregnant heifers and the drugs do not routinely work on animals greater than three months pregnant. Therefore the sale of all heifers greater than 3 months pregnant can be problematic. Ovarioectomy is the only current method available to industry to ensure that cull females are 'non pregnant' at the time of sale and that all the animals destined for sale can actually travel or be marketed.

1.1.10 Cull for Age Cows

The dilemma with aged cows is that they have been selected for fertility over the whole of their lifetime.. However, after they have weaned their calf, they invariably reconceive or they become too

old to reproduce and gain weight – without adequate management these animals can end up dying in the paddock. At the time of weaning, these 'wet' cull for age cows weigh in the range of 280 – 340 kgs depending on the type of country on which they are running. A beast that does not dress a minimum of 160 kgs at the meatworks does not even cover the freight costs. There is a massive discounting of prices at the abattoirs for carcases under 160 Kgs.- see AMH market Spec Dec 2006, Appendix 1.

1.1.11 Stock control

On properties with good stock control, the bulls can be removed allowing cull cows to be fattened and sold to abattoirs. However, the large amount of surface waters, the inability to maintain fences over the 'wet' and the damage from flooded streams almost invariably means that it is impossible to maintain adequate stock security to ensure this will happen in a large percentage of country in northern Australia. Other properties lack sufficient internal subdivisions to provide a 'safe' paddock in the first instance. Spaying 'cull for age' cows allows them to be domiciled with the rest of the breeding cows and eventually to be sold as 'fats' the following year at the normal round of muster. In the low carrying capacity regions (such as the arid zone) the capital cost and associated ongoing maintenance costs of fences determine the amount of infrastructure that can be economically sustained on a property. If cattle can be mustered and controlled on waters, then the need to superimpose internal subdivisions for additional control has to be seriously questioned if disease issues are non present.

This photo highlights 2 critical aspects of beef production in the Arid Zone:-

Traps offer excellent cattle control.

Paucity of feed to hold cattle for any length of time.

1.1.12 Cull heifers:

The same problems of security and infrastructure apply to cull heifers as apply to 'cull for age' cows. At the time of selection they are invariably below their critical mating weight and consequently not a saleable item for the live trade. The minimum weight for heifers for the boat trade is 260 kgs. Consequently, they have to be retained over the wet in a separate secure paddock if one exists. Both their body weight and condition increase over the wet and if bulls manage to get into the paddock, a percentage of these animals will conceive – albeit usually at the wrong time. As pregnant heifers, they now may be ineligible for the boat trade and yet they are surplus to requirements as replacement breeders. Abortion can be induced with prostaglandins but this is unreliable once the pregnancy exceeds 90 days and there are animal welfare issues with such procedures. Markets are usually restricted for such classes of animals so they are sold at a reduced price or retained in the herd where they become sub-optimum performers. Spaying at the time of heifer selection allows these animals to be run with the replacement heifers and marketed the following season either as guaranteed "non pregnant" heifers to the boat trade or to feedlots down south. Most properties in the study marketed spayed heifers along with the non pregnant heifers. Alternately, spayed heifers could be kept an additional year and sold as fat heifers to the export abattoirs on the coast. Either way, spaying 'value adds' cull heifers and allows several marketing options to be exploited. Producers who sell spayed heifers receive a premium price as they can guarantee that they will not calve on the boat or in the feedlot.

1.2 Project Objectives

1.2.1 Objectives

By 31 December 2006,

1. Completed the analysis for six property case studies in the various northern beef producing regions and quantified for each property:
    - the net economic benefit of spaying of surplus heifers and cull cows;
    - the net economic benefit of alternative markets for non-spayed surplus heifers and cull cows, and associated logistical constraints in supplying these alternative markets;
    - the key profit drivers including weaning rates, mortality rates and growth rates;

2. Developed guidelines that help producers to identify the most productive and profitable breeding females to retain in their herd and which ones to cull and/or desex.

3. Developed simple tools/models that assist producers to decide when to spay surplus females

2 Methodoloy

2.1.1 Bcowplus

Because no two properties are identical and no two seasons the same, the only valid approach to deriving the cost benefit of spaying is to use a tried and proven static computer simulation model and to evaluate various scenarios and options once the production parameters that drive the beef enterprise in the study are validated. The prototype of Bcowplus was originally developed in 1988 by W. Holmes and has undergone various modifications and improvements over the last 18 years. The software is widely used by the Department of Primary Industries and Fisheries extension team in evaluation of projects and training courses for beef producers throughout northern Australia and

is the basis for cost benefit analysis of all live stock production research proposals (including the Beef CRCIII) for the Department. Furthermore, the package has won several awards at "The Australian" Sydney Royal Easter Show Farm Software Competition. Bcowplus uses existing liveweights, growth rates, reproduction and mortality rates, turnoff policy and variable costs to model a stable state representation of the herd and match it to existing stocking rates..

The model has been developed especially for breeding properties in northern Australia and is able to encapsulate the majority of different scenarios that exist on most places. These include the average timing of calving, the timing of sales, the various cull rates of breeder groups up to 10 years of age, the bull joining percentage, the weaning percentage and the mortality rates of the breeders. One of the strengths of the model is the ability to validate accurate production parameters (such as weaning percentages and mortality rates) as provided by the station management with what is actually occurring with regards stock turnoff numbers. This fine tuning of the inputs has two purposes. Bcowplus is able to validate accurately the vital production parameters that exist on the property using uniform and established formula, and then compare the various scenarios with the confidence that all the basic assumptions are correct. The variable costs of beef production are inserted and gross margins are generated for the analyses. Finally, as gross margin analyses are price dependent, a sensitivity analysis can then be ultimately produced for each option at various input costs and varying market prices on offer. Because the outputs of this project will be available to the wider industry and because financial data is treated on a confidential basis, this approach provides the essential information required for decision making without the need to divulge the overall profit and loss situation for the various properties involved.

2.1.2 Pilot Study

A pilot study was initially undertaken on two well managed company properties in the gulf region of Queensland and the Barkly tableland region of the Northern Territory where accurate herd numbers, sales figures and growth rates were available. The company uses the data for annual herd projections and budgeting and a complete bang tail muster is completed every third year to ensure their numbers are correct. All stock are routinely bangtailed at muster every year and it was easy to see on a paddock inspection the high efficiency of mustering. The actual numbers of all the various classes of stock, production projections and sales data were inserted in Bcowplus and the model was adjusted to accommodate the older age of cows that are currently being turned off. The company currently transfers cull heifers and 'cull for age' cows to a fattening property further south. The cull heifers are spayed and enter a feedlot after backgrounding while the old cows are allowed to calve out and are sold when fat. This current management strategy is utilising valuable fattening country that would be better suited to fattening/backgrounding younger and more valuable stock so it is planned to spay and retain the 'cull for age' on their gulf breeding places. Once the whole beef system was completely understood and the model was mirroring the actual situation on the ground three basic analyses were performed:- (1) model the status quo as it currently exists i.e. bulls removed from the 'cull for age' group at the end of the second round muster, 30% fat cows sold at the first round muster the following year and the balance of cows transferred off the property at an agreed value. (2) sell all the cull for age cows for the best price on offer at the first muster after the bulls have been removed (this includes the 30% fat cows) and sell the balance at the second round muster. (3) Same as option (1) but spay the remaining cows after the 30% fat cows have been sold and retain on the property of origin. Sell these fat spayed cows at the first muster in the next year. The final outcome is really a comparison between options (2) and (3). Option (2) involves an increase in the actual size of the breeder herd and more weaners produced at the expense of poor returns for the cull cows versus option (3) which offers a much better price for the cull females at the expense of less weaners. The results were communicated back to management to see if firstly they were in line with their own gross margin estimates for the two properties and secondly, the results seemed logical and plausible.

2.1.3 Extension of pilot study to four other regions

Once the methodology for the pilot was established and verified then data was obtained from four other stations in northern Australia representing four distinct geographical regions. A similar validation process was undertaken on each of the properties and the sensitivity analyses prepared for the various options. Stations were chosen in the Alice Springs district, the Victoria River Downs region, The Kimberley and the Pilbara. Separate station reports have been written for each of these studies.

2.1.4 Limitations of the model

It should be noted that while Bcowplus is an excellent spreadsheet model on which to examine each of the stations in question, invariably, none of the stations exactly fitted the model. In some cases cull for age cows were older than 10 years and Bcowplus does not extend past 10 years of age. In other cases, spayed cows were being sold with calves at foot and again, while Bcowplus assumed spaying pre-empted calving, though these extra calves could still be accounted for. In the case of heifers, most stations spayed the cull heifers which were the tail of the mob i.e. approximately 100 kgs lighter in body weight than the replacement heifers. This was not a problem with Bcowplus, but it did create some complexity with average prices and adult equivalents. Modelling was still fine, but it did complicate the sensitivity analyses.

3 Results and Discussion

3.1 Results

3.1.1 The seven regions

In all, seven properties were visited and modelled in the study. The properties were chosen primarily to obtain a good spread across the northern cattle industry and on the basis of their willingness to provide data. Secondly the comprehensiveness of the data that they collect and had available for analysis was also considered. Properties were selected from each of the major regions in northern Australia – namely the Pilbara, the Kimberley, the Victoria River District (VRD), the Barkly Tableland, Alice Springs and the North West Queensland Gulf region (NWQG) (representing six regions in northern Australia). The Barkly and NWQG properties were owned by the same company and had fattening depots where stock were transferred for fattening. To obtain a further clarification of the opportunities to maximise the returns of cull female options on these two properties, the fattening property located on the central highlands region in Queensland was also visited. Bcowplus was used to model the management options on all the breeding properties but the analysis on the fattening depot was undertaken with the Destock and Bullocks programs. These programs were also developed by W. Holmes. A detailed report of each property is included in the appendices numbered 2 – 8 of this report. The following is a summary of each visit:-

3.1.2 The Pilbara Study

The bulk of the breeder herd is run in a large unfenced area where stock have access to the desert. Stock control is very good in the dry season as waters can be controlled along the river. Bulls are continuously mated and cattle are worked through portable yards. Cull cows are spayed and released back into the breeder herd while replacement heifers and steers along with sale cattle are trucked back to the station complex for sale or processing. Basically all cull females (including cull for age) are spayed and sold the following year. The modelling here examined the impact of spaying cull cows and holding them for an additional 12 months versus selling them at the time of muster. Mothering up could pose problems if all cull cows were to be theoretically sold at the time

of muster. The additional costs and time constraints of mothering up cull cows with baby calves has not been included in the analysis. See appendix 2 for detailed report.

3.1.3 The Kimberley Study

This property has a mixture of river country and red country. The red country is fenced and controlled mating is practiced. The river country is less secure and is used for fattening. Neighbouring scrub bulls create problems along the Fitzroy River over the wet. Cull heifers and cull cows are spayed and put on the river country for fattening. The modelling on this place examined the improved price differential for the spayed heifers only. Spayed cull cows are included in both scenarios. See Appendix 3 for detailed report.

3.1.4 The VRD study

This property spays cull heifers and cull cows (mainly cull for age) that don't meet market specifications i.e. min 160 kg dressed weight at time of muster. The spaying of the heifers was included in both scenarios as the station receives a 5 cents/kg live premium for spayed heifers and this did not require modelling. The scenarios examined on this property were simply the spayed cow options. The modelling involved spaying cull for age cows and keeping them for an additional year versus selling them immediately at the time of muster. See Appendix 4 for details.

3.1.5 Alice Springs Study

This property spays all cull heifers and off types as part of their routine management. It also has a fattening property in South Australia which can be utilised for turning off store cattle. IN 2006, the station was in drought and so was the property in South Australia. The modelling of this operation was extremely difficult because it was hard to derive a normal year in a region in which there is so much variation and droughts are a common occurrence. Spaying cull heifers provides the station with turnoff options and cash flow and decreases the risk associated with a larger breeding herd. The modelling on Bcowplus does not include risk minimisation. Therefore the modelling here really only explored the options of spaying the cull for age cows and keeping them an additional 12 months versus selling them at the time of muster. However, the analysis was further complicated by the fact that some of these spayed/webbed cows actually produce calves. In the final analsysis, the total numbers of spayed cfa cows involved was only minimal (305) and although the spaying came out as being unprofitable, no attempt was made to model the practice of not spaying the majority of cull females involved – some 1,120 including cull heifers. – see Appendix 5 for detailed report.

3.1.6 Barkly Tableland

This breeder property on the Barkly Tableland is a company owned property along with the one in the North West Gulf of Queensland. This property utilises spaying as a tool to value add to their cull heifers. It also spays cull for age cows. However, the current practice was to send all cull females to the fattening depot on the Central Highlands and to actually do the spaying after the transfers had occurred. The company however feels that it may be more advantageous to spay the cull for age cows at the property of origin and retain them until sale. Therefore the scenarios analysed in this study was simply the cost benefit of spaying cull for age cows and keeping them an additional year on the breeder block or selling the cull for age cows immediately at the time of muster. The profitability of spaying cull heifers was not explored in this scenario. A full analysis of the fattening block was undertaken however to examine the economics of spaying for the company as a whole. – See Appendix 6 for detailed report.

3.1.7 North West Gulf Queensland (NWGQ)

The comments and analysis for this property are similar to the Barkly Tableland property. – See Appendix 7 for detailed report.

3.1.8 Central Highlands fattening Depot:-

This property receives steers, cull heifer and cull for age cows from the breeder blocks on the Barkly Tableland and North West Queensland. All of the spaying (heifers and cows) is carried out after the stock arrive. Consequently Bcowplus could not be used to model this property as it is a backgrounding /fattening enterprise. Nevertheless if was felt that a full detailed appraisal should be undertaken to provide a more complete picture for the company overall. Two models, Bullocks and Destock were used to compare the options of fattening the various classes of stock that were currently utilised ie cull for age cows, cull heifers and steers. See Appendix 8 for detailed report.

3.1.9 Summary of Findings on Breeder properties:

Table 1. Summary of GM analysis on 6 breeding properties in Northern Australia that spay.

Property	Total AE	GM (Spay)	GM (No Spay)	Total Spayed	Cost Benefit	Av Female
Pilbara	17000	$2,852,789	$2,806,456	1145	$40.47	$313.91
Kimberley	8000	$1,358,550	$1,335,604	483	$47.51	$404.16
VRD	18000	$3,010,630	$2,982,868	792	$35.05	$467.05
Barkly	32000	$4,691,133	$4,462,276	781	$293.03	$444.53
NW QLD Gulf	28000	$3,859,596	$3,642,597	707	$306.93	$431.24
Alice Springs*	10400	$1,893,212	$1,960,088	305	-$219.27	$463.38

(* = Some spaying occurs in the no spay option as well. The negative benefit modelled in the Alice Springs enterprise reflects a price differential of only $125 between spayed and unspayed cows, the high weaning percentage of 80% and the relative small number (305) involved in the actual analysis.)

The cost benefit in Table 1 refers to the added value of each spayed animal. “Total spayed” in Table 1 refers only to those additional animals spayed in the spay option. A more detailed summary information sheet is provided in Appendix 9.

3.1.10 The fattening/backgrounding operation:-

Summary of results of the Fattening Operation analysis:- The result indicates that feed on this fattening block would be better used for other classes of stock returning higher GM/AE/yr, with steers growing and fattening to Jap Ox showing $315, and heifers growing out to feedlot entry showing an overall average of $270, compared with old cows at $180. This is before allowing for the problems of cows getting back in calf to straying neighbours’ bulls.

These outcomes come from a transfer price of $1.30/kg for the breeders. If these cows are not transferred to the central highlands, the price available back on the breeder properties in the gulf and on the Barkly Tablelands is assumed to be $0.65 for the saleable portion, and nil for a 10% rejection – effectively about $0.60/kg for the lot. If the calculations of GM/AE on cull cows at the fattening block are repeated for a transfer price of $0.60/kg the outcomes are very different . The GM for cull cows on a weighted average for the various classes (empty, pregnant and cow and calf) moved is $311.20. – See further discussion Appendix 8.

3.1.11 The impact on the company operations:-

Summary of the effect of spaying cull cows for the company:- If, as determined by comparisons of fattening/backgrounding options on the fattening property on the central highlands, the “true” value (based on opportunity cost) of old cows is $0.60/kg (roughly equivalent to $0.65 with 10% rejection as used in the spay versus no spay comparisons on breeder properties), the benefit to the pastoral company of the spaying option is calculated at $423,000/yr. These benefits are calculated on the assumption spaying does not increase overall numbers (AE) carried.

The modelling indicates 1,550 cows/yr are spayed, indicating a benefit of approximately $270 per cow spayed, or $7/AE carried on the two properties.

3.1.12 Average value of female sales versus total sales:-

On the modelling performed using all the input data and the prices as provided by management at the time, there was an economic benefit detected on five of the six properties for spaying the cull cows. It would appear that spaying ensures that the animals desexed can actually improve their sale value and in doing so increase the average value for all females sold.

Table 2: Summary of the Percentage change in Net female sales and total turnoff:-

	Pilbara		Kimberley		VRD		Barkly		NW QLD Gulf		Alice Springs	
	Spay	No Spay	Spay	No Spay	Spay	No Spay	Spay	No Spay	Spay	No Spay	Spay	No Spay
Female sales	2999	3239	1414	1492	2784	2903	6223	6354	5634	5757	1768	1861
Male sales	3298	3519	1550	1627	3058	3176	7198	7325	6518	6637	2041	2135
Total Turnoff	6297	6758	2964	3119	5842	6079	13421	13679	12152	12394	3809	3996
Av female price.	$375	$299	$450	$389	$546	$491	$459	$408	$445	$394	$517	$502
GM/AE	$168	$165	$170	$167	$167	$166	$147	$139	$138	$130	$182	$188
% Change in GM/AE	1.65%		1.72%		0.94%		5.13%		5.96%		-3.41%	
A = % Diff in Av female price	25.26%		15.71%		11.13%		12.46%		13.17%		3.01%	
B = % Difference in total turnoff no's.	6.82%		4.97%		3.90%		1.89%		1.95%		4.68%	
A/B	**3.70**		**3.16**		**2.86**		**6.61**		**6.75**		**0.64**	

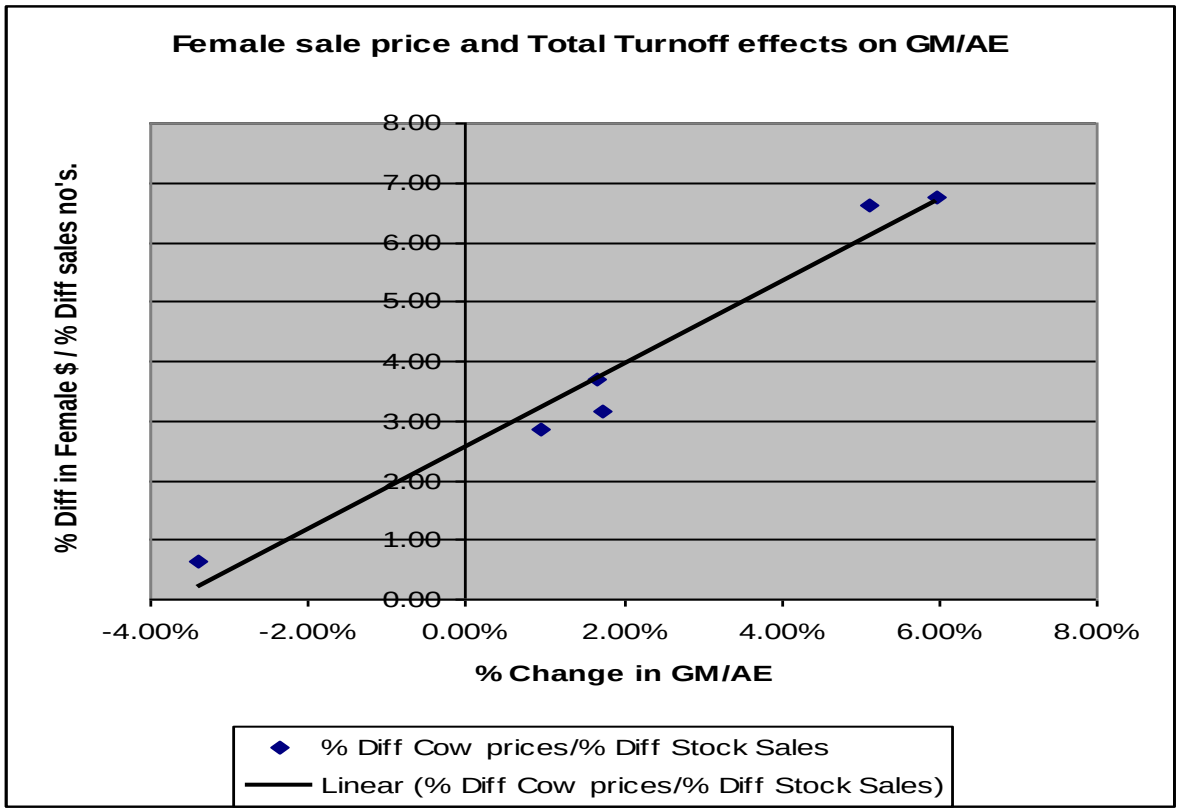
The results indicated that the change in Gross Margin /AE is correlated with the change in average sale price of the female turnoff in relation to change in the total numbers of stock turned off. This relationship was able to described in a mathematical equation.

$$\text{\% Change \$GM/AE} = \frac{\text{(\% Diff Value of female sales/ \% Diff in total sales) - 2.45}}{\text{68.27.}}$$

($r^2 = 0.98$, SE = 0.5124)

In other words, for the strategy of spaying to be cost effective, the overall differential in sale price of the female turnoff has to increase by at least 2.45 times the corresponding change in overall stock numbers.

Graph 1: % Difference in Net female Sales/ % Diff in total turnoff Versus % change in Gross margin.



Spaying females and keeping them an additional year alters the structure of the breeding herd. When comparisons are done at exactly the same stocking rate, then it can be seen that in the "No Spay' option, more breeding females are able to be carried on the property and this then increases the total turnoff. Logically then, the "spay' option seeks to improve the gross margin by increasing the value of the female sales. The 'non spay' option increases the Gross Margin by increasing the numbers sold. From Table 2, it can be seen that in the Alice Springs study, the improvement in the average price of female sales was not sufficient to counter the effect of decreased number of sales on gross margin. One possible reason for the Alice Springs outcome is that breeders are culled at eight years of age and are therefore more valuable as potential breeder cow replacements. In addition, the options of selling British Breed breeders into southern states greatly increases the markets for these cull cows. The additional prices received for spayed cows was not sufficient to compensate for the unusually high price being paid for cull for age cows being purchased as replacement breeders. These findings highlight the fact that the price structures do vary and the economics of spaying changes from year to year and between stations. It emphasises the fact that general recommendations are not possible and that each station needs to undertake its own economic assessment.

Spaying Heifers

The option of spaying heifers was not modelled as it was seen as more of a marketing issue than a modelling issue. In all cases, the decision to sell cull heifers has already been made. The main difference is that properties that spay heifers select their replacements and make marketing decisions on the cull animals a year earlier. These animals would not be retained on the station 12 months later whether they were spayed or not and therefore the herd structure does not change. It is possible that some properties may find inter property sales for yearling heifers as replacements but these opportunities are fairly rare in regions devoted entirely to breeding store stock. These cull animals are usually <270 kgs live weight the year following weaning and there are virtually no reasonable markets for them. The VRD property and the Kimberley property obtain a premium for their spayed heifers and these values were included in the analysis for both spay and non spay options.

3.2 Markets and Prices:

3.2.1 Market options in northern Australia:-

The importance of the live export industry to northern Australia can not be over stated. The marketing options available to most producers in the far north west of the continent are limited to this avenue of turnoff. There are four main factors that need to be understood:-

- There are no export abattoirs currently operating in the north. They are all situated in southern states or along the coast of Qld.
- There are no regular store sales in the study regions except Alice Springs where one or two sales occur each year.
- The *Bos indicus* breeds of cattle produced in the north are generally not favoured in southern markets.
- The distances to store markets is generally two to three times greater than the distance to the nearest live export port.

In addition to the those factors discussed above, the following needs to be considered:-

- There are virtually no markets for females <270 Kgs at abattoirs or live export.
- The return on cull cows less that 320 Kgs live weight on property currently do not cover freight costs.
- The environment and breed of stock produced in the north is generally not conducive to a vealer/local trade market.
- There are no large cities/towns in the north which would create enough demand for a local trade market.

3.2.2 The live export markets:-

The successful marketing of all animals involves two aspects: Meeting the market specifications; and achieving the best possible price. Table 3 provides a summary of the specifications for Live export females from Darwin while Appendix 10 provides a more detailed indication of prices and specifications in Dec 2006.

Table 3: Summary of the Weight Specifications for the Female trade to S.E. Asia.

Destination	Sex	Description	Weight Range
Philipines	Heifer	Light	290 – 330 Kgs
Malaysia	Heifer	Light	280 – 360 Kgs
Malaysia	Heifer	Heavy	360 Kgs +
Indonesia	Heifer	Light	260 – 360 Kgs
Indonesia	Heifer	Heavy	340 Kgs +
Export	Cow		350 Kgs +

3.2.3 Export abattoirs in Australia:-

Diagram 1: an example of an AMH weight and grade sheet detailing prices at the Dinmore abattoirs in December 2006.

Below are prices we could offer you, to kill on a weight and grade basis at **Dinmore**, prior to **10/12/2006**

Grade	Fat	Teeth	Shape	+420	+400	+340	+320	+300	+280	+260	+240	+220	+200	+180	+160	+150	+130	+110	-110
Grass Fed Jap Heifer																			
I1	7-22	0-4	A-C	2.85	3.40	3.40	3.40	3.40											
I8	23-32	0-4	A-C	2.85	3.35	3.35	3.35	3.35											
J1	7-22	0-6	A-C	2.85	3.35	3.35	3.35	3.35											
J8	23-32	0-6	A-C	2.85	3.30	3.30	3.30	3.30											
B1	7-22	0-6	A-C						3.30										
B8	23-32	0-6	A-C						3.25										
Grass Trade Yearling Heifer																			
YH	5-12	0-2	A-C				3.55	3.50	3.45	3.40	3.15	2.95	2.75	2.45					
Y6	13-17	0-2	A-C				3.53	3.48	3.43	3.38	3.13	2.93	2.73	2.43					
Y7	18-22	0-2	A-C				3.50	3.45	3.40	3.35	3.10	2.90	2.70	2.40					
Y8	23-32	0-2	A-C				3.45	3.40	3.35	3.30	3.05	2.85	2.65	2.35					
Grass Trade Heifer																			
TH	5-12	3-4	A-C						3.40	3.35	3.10	2.90	2.70	2.40					
T6	13-17	3-4	A-C						3.38	3.33	3.08	2.88	2.68	2.38					
T7	18-22	3-4	A-C						3.35	3.30	3.05	2.85	2.65	2.35					
T8	23-32	3-4	A-C						3.30	3.25	3.00	2.80	2.60	2.30					
Cow																			
L/M/M9	3-12	8	A-D	2.85	3.00	3.00	3.00	3.00	2.95	2.90	2.80	2.70	2.50	2.15	1.80	0.45	0.30	0.20	0.10
N	13-22	8	A-D	2.85	2.95	2.95	2.95	2.95	2.90	2.85	2.75	2.65	2.45	2.10	1.75	0.40	0.30	0.20	0.10
O	23-32	8	A-D	2.85	2.90	2.90	2.90	2.90	2.85	2.80	2.70	2.60	2.40	2.05	1.70	0.35	0.30	0.20	0.10
P	0-32	8	A-E	2.85	2.85	2.85	2.85	2.85	2.80	2.75	2.65	2.55	2.35	2.00	1.65	0.30	0.30	0.20	0.10
Heifer																			
D1	3-22	0-7	A-D	2.85	3.15	3.15	3.15	3.15	3.10	3.00	2.75	2.65	2.45	2.15	1.80	0.45	0.30	0.20	0.10
D8	23-32	0-7	A-D	2.85	3.10	3.10	3.10	3.10	3.05	2.95	2.70	2.65	2.40	2.10	1.75	0.40	0.30	0.20	0.10
F1	0-32	0-7	A-E	2.85	3.00	3.00	3.00	3.00	2.95	2.85	2.60	2.55	2.30	2.00	1.65	0.30	0.30	0.20	0.10
Bull																			
Q	0-32	0-8	A-D	2.70	2.65	2.60	2.50	2.45	2.35	2.20	2.15	2.05	1.90	1.75	1.50	0.15	0.10	0.10	0.10
R	0-32	0-8	A-E	2.60	2.55	2.50	2.40	2.35	2.25	2.10	2.05	1.95	1.80	1.65	1.40	0.15	0.10	0.10	0.10

invariably the heavier heifers are usually kept as replacements and the lighter heifers are the ones that are culled.

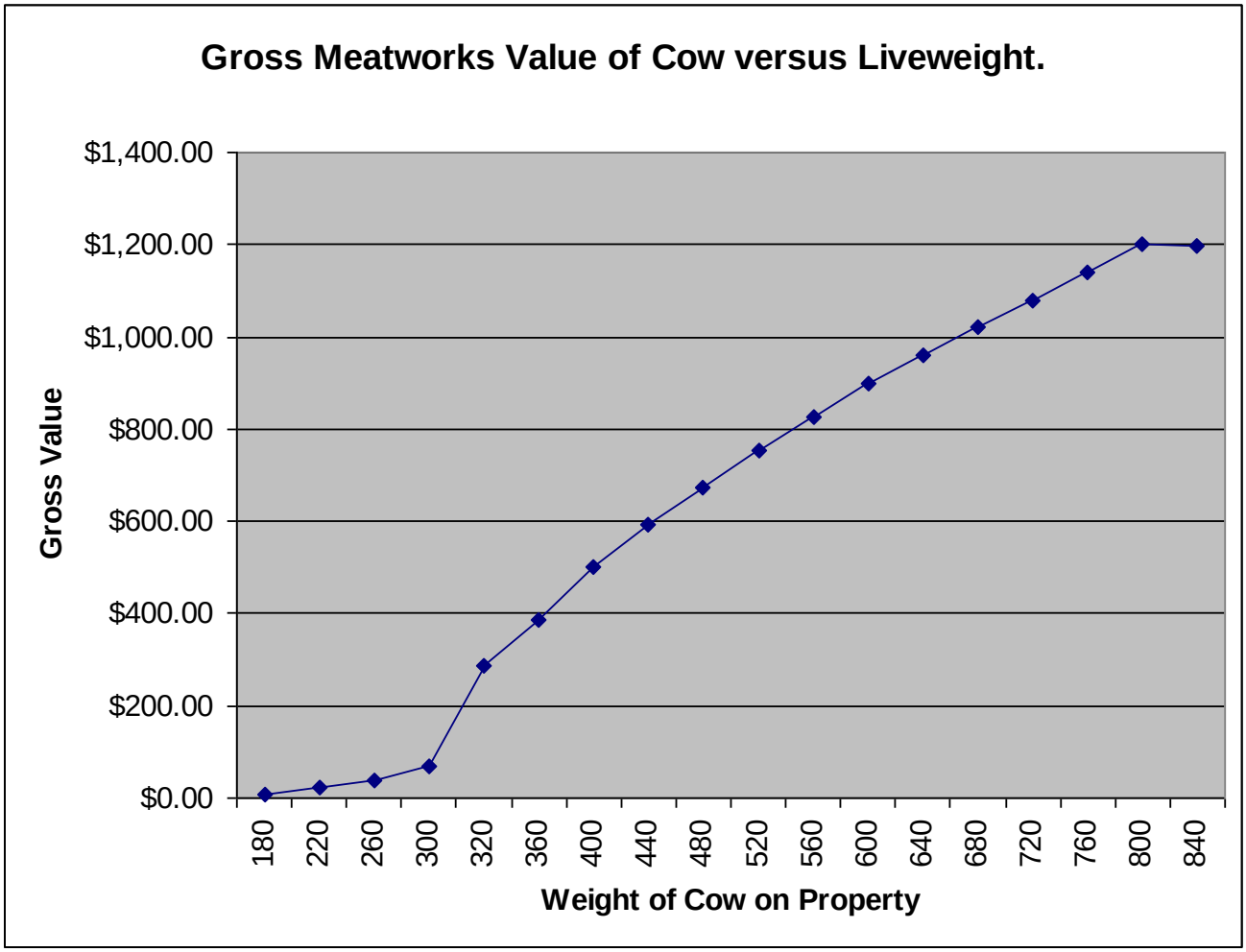
Similarly with the cow descriptions, it can be seen that prices for stock less than160 kgs decrease dramatically. The absolute minimum weight of a cow in the paddock would have to be 322 kgs. With regards the culling of aged cows that have just weaned a calf, it is highly probable that a large percentage will not weigh the 322 kgs (live weight) at abattoirs or the 340 kgs (minimum) for the live export trade. Actual weights were not obtained in this study but the photos below give an indication.

Typical cows sent to Central Highlands for fattening – no weights available.

Breeders in the VRD after rearing a weaner. Again no weights available but would struggle to average 340 kgs live weight.

3.2.4 Impact of liveweight on price received:-

Graph 2: The relationship between body weight and cow price at an export abattoirs.



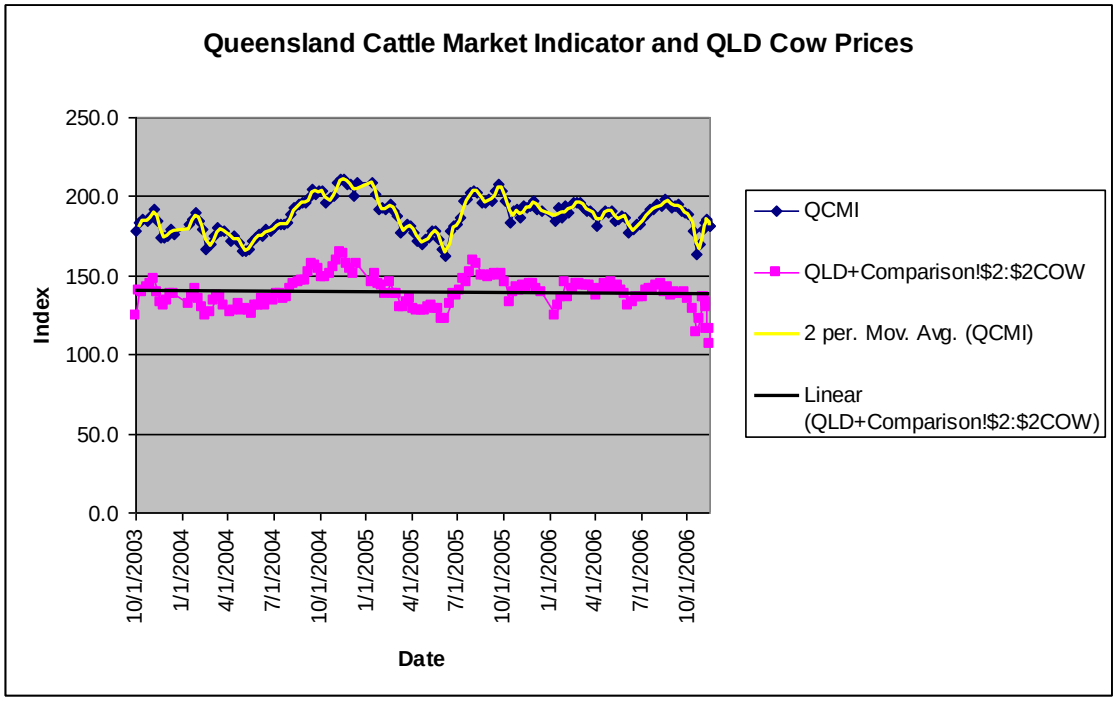
3.2.5 Cow prices in Queensland:-

Cow prices over the past three years were analysed to gain an indication of trends and variability.. They were also compared with the Queensland Cattle Market Indicator (QCMI) to better understand how female prices affect the overall indicator. The relationship is as follows:-

QCMI = Qld Cow Price X 0.97 + 52.6448 (r^2 = 0.87, SE = r.41, n=158)

(The Queensland Cow price which is based on the abattoir value of a D3 cow weighing 420-500 kgs liveweight.)

Graph 3 ; The QCMI versus the QLD Cow Price.



In summary then, there is a close relationship between the Qld Cow price and the QCMI and the trend line would appear to indicate a fairly stable market over the period from 2003 to 2006 inclusive.

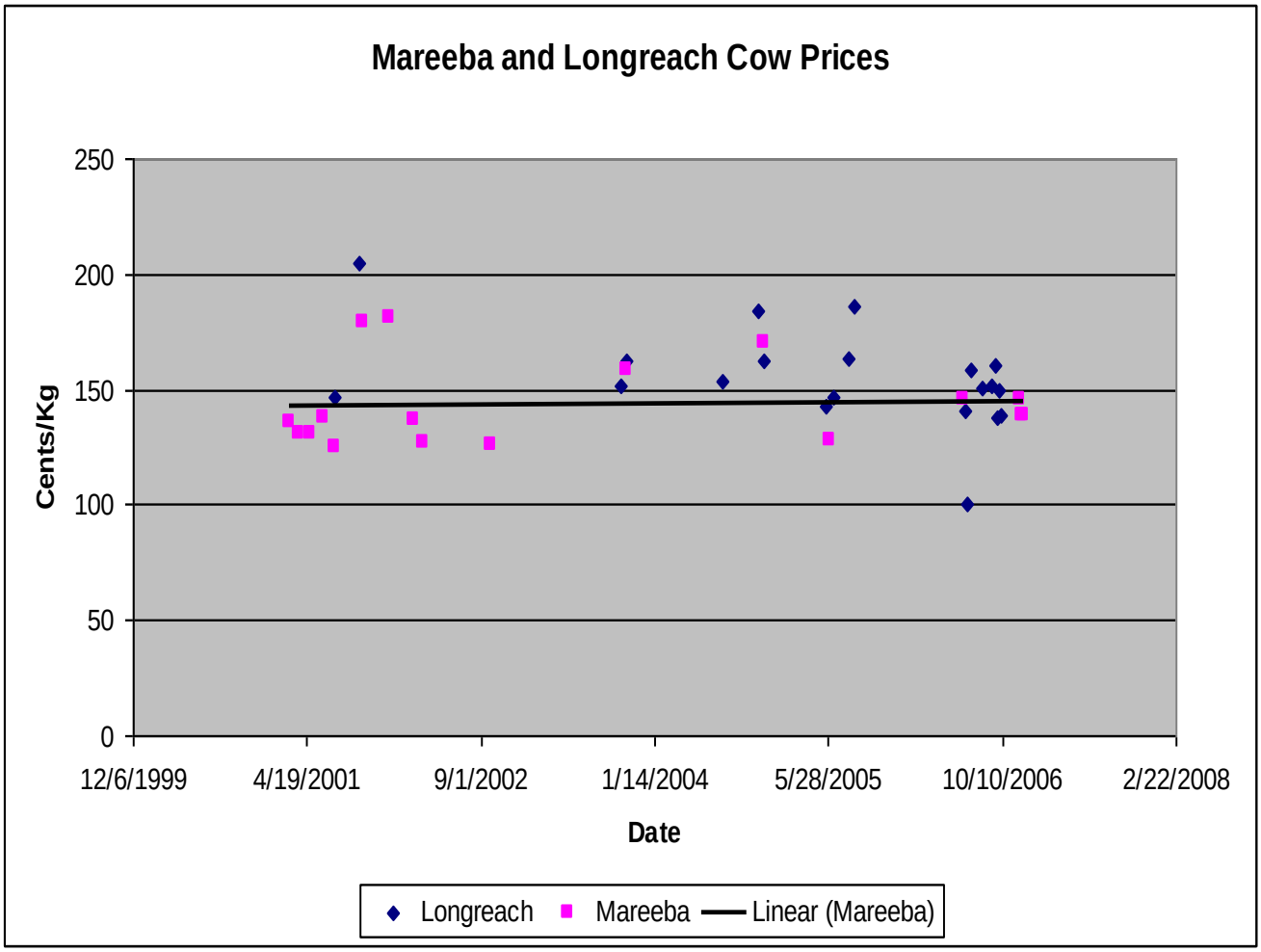
3.2.6 Queensland Saleyard prices and the Qld Cow Price:-

The trend in female prices was further examined by analysis of the saleyard reports from Mareeba and Longreach (NLRS) against the Queensland Cow Mareeba and Longreach are the two northern saleyards monitored regularly by the National Livestock Reporting Service (NLRS). Store sales in both these regions are not frequent occurrences. The variation in prices as seen on the graph in Graph 4. is reflected in the regression analysis below.:-

The Longreach Saleyard Price = $\frac{(\text{QLD Cow price} - 99.4)}{0.27}$ ($r^2 = 0.64$, SE = 6.33, n=18)

The Mareeba Saleyard Price = $\frac{(\text{QLD Cow price} + 28.76)}{1.07}$ ($r^2 = 0.83$, SE = 10.98, n = 7)

Graph 4: The Mareeba and Longreach store sales 1999 – 2006.

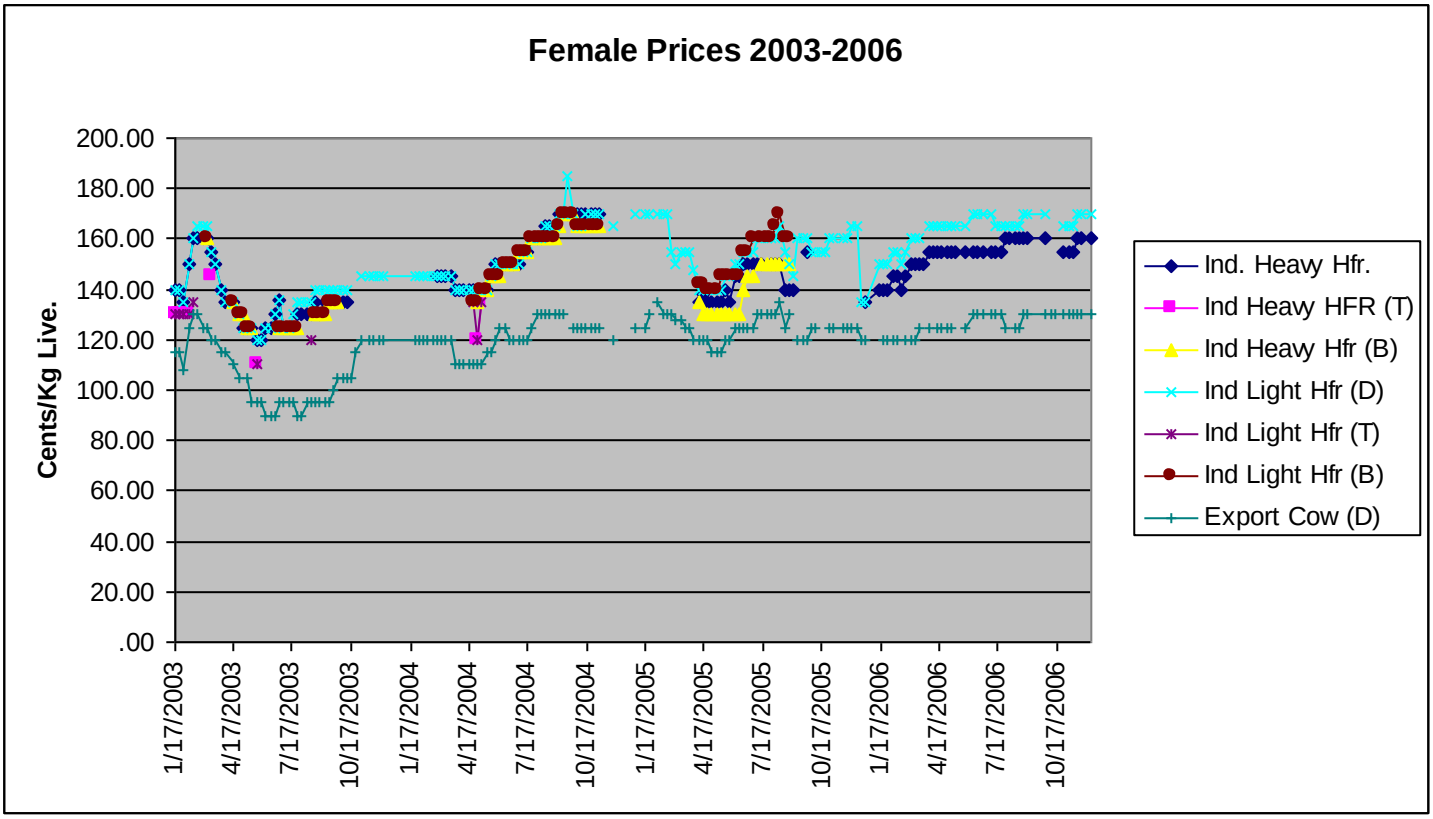


In summary, the graph demonstrates a wide variation in prices between years for prices of cows at the two northern sale yards however the long term trend line tends to suggest that prices have been relatively constant over the six year period from 1999 to 2006. The graph also highlights the frequency of store sale effects in these areas.

3.2.7 The live export market:

The export prices are an extremely important market for the producers in the N.T. and Western Australia. Graph 5 illustrates there has been fairly close alignment of prices between all three major export ports – Darwin (D), Broome (B) and Townsville (T) although Townsville is only a minor player.

Graph 5 – Prices received for females at 3 export terminals in northern Australia 2003-2006.

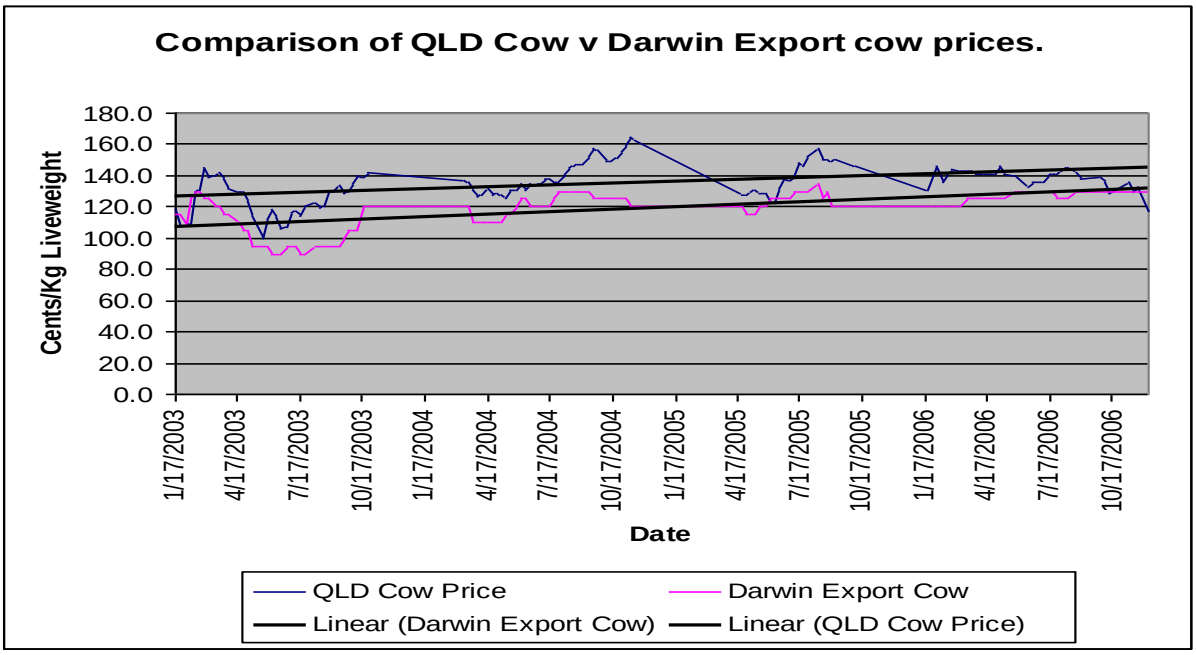


3.2.8 The live export market for cows versus the Qld Cow price.

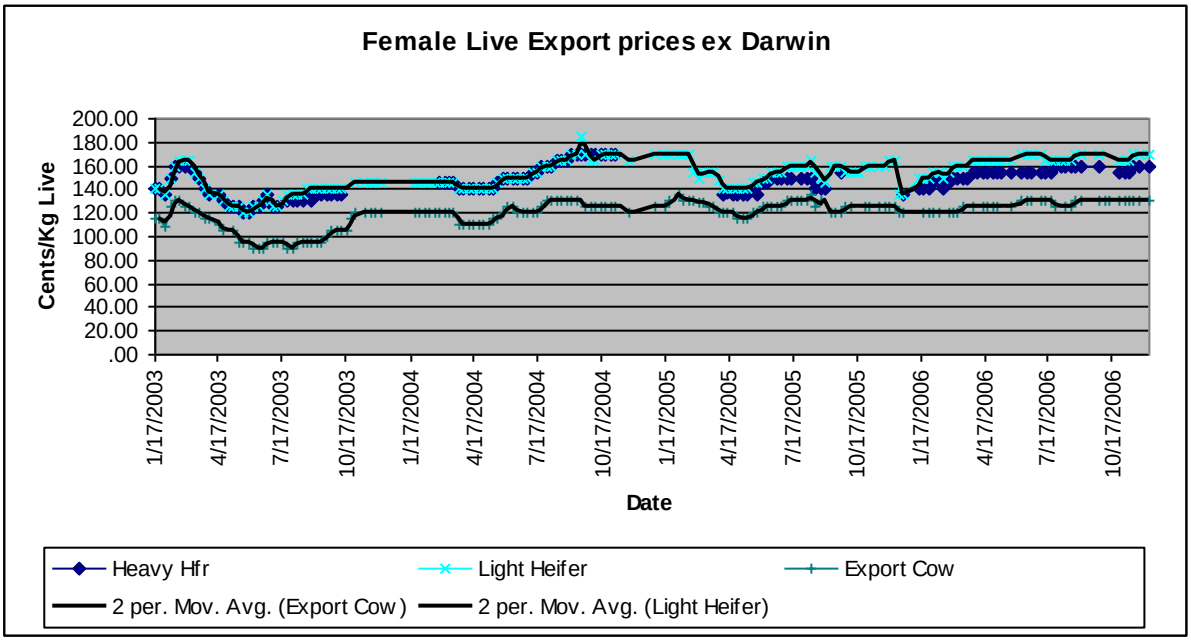
As Darwin is the major port for live export in the north, a comparison was done of the live export prices received for cows in Darwin and the Queensland Cow Price. Again, the graph reveals that the two indices are roughly aligned and fluctuate during the year. The average Qld Cow price over the 3 year period was $1.35/Kg compared to a an average price for cows of $1.18/Kg in Darwin.

QLD Cow Price = Darwin Export Cow Price x 0.661 + 56.774 (r^2 = 0.64, SE = 9.54, n= 126)

Graph 6: The relationship between the live export market (Darwin) and the QLD cow indicator.



Graph 7 : The relationship between export heifer prices and export cow prices.



Light Heifer Price (D) = 0.99 x Export Cow Price (D) + 34.26 (r^2 = 0.86, SE = 7.15, n= 130)

The average Light Heifer Price (2003-2006) = \$1.51/Kg and the average Export Cow Price (2003-2006) = \$1.18/Kg.

In summary then, the 2 main drivers for cull cow prices in northern Australia are the Queensland Cow Price indicator and Darwin Live Export price. These two indicators are relatively closely correlated with an r^2 value of 0.64. Although there are fluctuations within and between years, the overall trends have been for a fairly steady market over the past 4 years in the period 2003 – 2006.

3.2.9 Other comparative data:-

Finally, the female prices used in the modelling and the analysis of markets over the last 4 years in northern Australia, was compared to data used in the most recent study available for the north. Prices form the Smart Manager Project – J, Kernot (NAP3.107) was examined and compared with the average cow prices obtained in this analysis. The Smart Manager project ran for several years, involved 182 properties and 17 QDPI staff who analysed properties over a wide area in north Queensland. The project ran from 1998 to 2002 and the most recent data has been used here. The average cow price towards the end of the project ranged from $394 (Hughenden) to $499 (Atherton Tableland). The GM/AE ranged from $132 (Mt. Garnet) to $192 (Hughenden). The results achieved in this study, although not directly comparable because it was performed over a different time span and on different regions, range from $375.04 (Pilbara) to $526.75 (Alice) for average cull female prices. The GM/AE ranged from $137.84 (NWQG) to $182.04 (Alice Springs).

Table 4: Average Cow prices and GM's from Smart manager project 1998-2002.

	Combined Lakeland Downs Nov-01	Comb Mt Garnet Basalt & Red Earth & Mt Surprise Nov-01	Combined Atherton Tableland May-02	Hughenden 2002	Charters Towers 2002
Average female sale price*	$484	$459	$499	$394	$420
Gross Margin/AE*	$152	$132	$141	$192	$156

Table 5: Average Cow prices and GM's from this study.

	Pilbara	**Kimberley**	**VRD**	**Barkly**	**NW QLD Gulf**	**Alice Springs**
Average Female Price	$375.04	$449.91	$546.12	$459.30	$445.46	$516.75
GM/AE	$167.81	$169.82	$167.26	$146.60	$137.84	$182.04

3.3 The sensitivity analysis;

3.3.1 The role of the sensitivity analysis:

The big problem with all modelling exercises is not so much getting the station operations and management plan to mimic the model but to accurately predict the "what ifs". The validation of the data is relatively easy for the existing management practice, which in these studies were the "spay" options. All places visited were already using the spaying option and the weights and prices of the desexed females were known. However, trying to predict a yearly average weight and price for classes of stock that are not routinely sold or weighed is open for some error e.g. suppose the average weight of the cull for age cow is 350 kgs on property after she has reared a big weaner, what impact does the tail have on the average sale price if they don't meet the specifications. It has already been shown that the weight / price relationship for both heifers and females is not a linear relationship and that there are quite heavy penalties for cows that come under the specifications. In

the absence of hard data on weights and grades (including bruising and downers etc) , the best way to address this issue is to perform a sensitivity analysis.

3.3.2 The summary of the sensitivity analysis:

A sensitivity analysis was performed at 10% and 20% increases in cull female prices where applicable and a breakeven cull female price was developed for each study. In the Kimberley study, it should be noted that the comparisons were on heifer culls and not cull for age females as these older animals were spayed in both scenarios and the $384.60 is only a hypothetical price.

Table 6: Summary of the sensitivity analysis performed on all 6 breeding properties.

	Pilbara		**Kimberley**		**VRD**	
	Spay	*No Spay*	*Spay*	*No Spay*	*Spayed*	*No Spay*
GM per adult equivalent	**$167.81**	**$165.09**	**$169.82**	**$166.95**	**$167.26**	**$165.71**
Av female Sale Price	***$375.04***	***$299.42***	***$449.91***	***$388.84***	*$546.12*	***$491.41***
Sensitivity Analysis on CFA Price.	**GM/AE**	**GM/AE**	**GM/AE**	**GM/AE**	**GM/AE**	**GM/AE**
CFA Price of entire cows modelled	**$259.00**		**$356.00**	***	**$428.00**	
10% Increase in CFA Price	**$284.90**	**$166.79**	**$391.60**	**$170.52**	**$470.00**	
20% Increase in CFA Price	**$310.80**	**$168.49**				
Breakeven Price for CFA Cows	**$301.00**	**$167.85**	**$384.60**	**$169.82**	**$468.00**	**$161.50**
Average Female Price @ Breakeven	***$313.91***		***$404.22***		*$501.14*	

(*** In the Kimberley Study the spaying scenario is on cull heifers)

	Barkly		**NW QLD**		**ASPS**	
	Spay	*No Spay*	*Spayed*	*No Spay*	*Spay*	*No Spay*
GM per adult equivalent	**$146.60**	**$139.45**	**$137.84**	**Spay**	**$182.04**	**$188.46**
Av female Sale Price	***$459.30***	***$408.40***	***$445.61***	***$393.61***	***$516.75***	***$501.67***
Sensitivity Analysis on CFA Price.	**GM/AE**	**GM/AE**	**GM/AE**	**GM/AE**	**GM/AE**	**GM/AE**
CFA Price of entire cows modelled	**$325.00**		**$335.00**		**$375.00**	
10% Increase in CFA Price	**$365.00**	**$140.68**	**$368.50**	**$131.38**		
20% Increase in CFA Price	**$390.00**	**$141.61**	**$402.00**	**$132.68**		
Breakeven Price for CFA Cows	**$525.00**	**$146.66**	**$535.00**	**$137.83**	**$272.00**	**$182.04**
Average Female Price @ Breakeven	***$444.71***		***$431.24***		***$466.55***	

To explain the table above, the breakeven price in the Pilbara would have had to have been $301,/head for a non spayed cull for age cow to equal the spay scenario GM of $167.85/AE.

3.4 Key Profit Drivers for the 6 breeder properties in the study;

3.4.1 The Key Profit Driver analysis:

It is apparent from the sensitivity analysis and the earlier discussion that the strategy of spaying is all about value adding and improving the average price of the female turnoff in relation to the overall decrease in total turnoff. However other factors such as mortality rates, weaning rates and growth rates affect both the number and value of the turnoff. Part of objective one was, after having collected the data, to then perform a Key Profit Driver analysis for each of the properties. After all of the data had been inputted into Bcowplus for each of the 6 breeding properties and after it had been verified by management, it was a relatively easy task to then take Bcowplus files and look at 1% point changes in each of the main production parameters i.e.

- Weaning rates
- Breeder cow mortality rates.
- Growth Rates in male turnoff cattle.

Table 7: Summary of findings from Key profit driver analysis.

KEY PERFORMANCE INDICATOR ANALYSIS OF 6 BREEDER PROPERTIES IN STUDY
(Breeder Cow mortality, Weaning Percentage and Male Steer Price altered by 1 percenatge point)

	Normal Operation.	**1% Decrease Breeder mort.**	**1% Increase Weaning**	**1% Increase Male turnoff**
Alice Springs	**$182.18**	$182.95	$182.73	$183.27
Percent change to original GM		*0.42%*	*0.30%*	*0.60%*
Relativity compared to Growth Rate		0.7	0.5	1.0
Barkly Tableland	**$146.60**	$149.38	$147.93	$147.48
Percent change to original GM		*1.90%*	*0.91%*	*0.60%*
Relativity compared to Growth Rate		3.2	1.5	1.0
Victoria River Downs	**$167.26**	$169.08	$168.32	$168.21
Percent change to original GM		*1.09%*	*0.63%*	*0.57%*
Relativity compared to Growth Rate		1.9	1.1	1.0
Kimberley	**$169.82**	$171.46	$171.40	$171.01
Percent change to original GM		*0.97%*	*0.93%*	*0.70%*
Relativity compared to Growth Rate		1.4	1.3	1.0
Pilbara	**$167.81**	$169.40	$169.15	$168.92
Percent change to original GM		*0.95%*	*0.80%*	*0.66%*
Relativity compared to Growth Rate		1.4	1.2	1
North West Queensland	**$137.84**	$140.51	$139.00	$139.14
Percent change to original GM		*1.94%*	*0.84%*	*0.94%*
Relativity compared to Growth Rate		2.1	0.9	1.0

Use of the Key Profit Driver analysis:

The Key Profit driver analysis on its own is of little value unless accompanied by a detailed analysis of the room for improvement in the various areas studied. If the enterprise is performing at maximum in all three areas then a Key Profit Driver analysis needs to then include a detailed costing to achieve the 1% improvement for each of the options. A summary of the starting production parameters for each of the six stations is included in table 8. In the case of male growth rates, the average price was increased 1% as price and weight are closely correlated.

Table 8: Summary of base indicators used in the profit driver analysis for the 6 properties.

	Pilbara	**Kimberley**	**VRD**	**Barkly**	**NWQG**	**Alice Sps**
Weaning %	80.00%	65.73%	76.06%	75.57%	75.57%	82.76%
Breeder Mortality	3.28%	2.67%	3.24%	4.00%	4.00%	4.00%
Average Male price	$575.48	$549.45	$549.13	$391.00	$357.00	$555.34

(Weaning % = no of weaners per breeder unit retained)

3.4.2 Improved live weight gain:

It is clear from the data provided in Table 8 that all properties in the study are operating at or above the regional averages. Cattle prices can be quite variable and of the three main parameters examined, the average male price is the one where most variation and improvement is likely to occur. Having said that however, it is growth rate and not prices that is being addressed in this KPI analysis. Even with increases in prices, if stations are already vigorously targeting market specifications, then stations owners may be limited in their efforts to make additional gains in an environment where there are not many alternatives. When it comes specifically to growth rates, then achieving gains will be slow and depend on genetic improvement, pasture management and maximising the benefits of the seasons.

The strategy of spaying cull females does not increase turnoff (but can improve weight and value of turnoff) and this was demonstrated in the modelling. Spaying generally decreases the reproductive index. However, it can be argued that spaying will improve liveweight gain in male cattle. If the number of out of season calves can be reduced, then theoretically the average weight of the weaners will improve. Finally, spaying does have real potential to reduce breeder cow mortality rates especially if the older cull cows can be prevented from getting back in calf and or dying. The impact that spaying may have on liveweight gain or cow survival was not included in the modelling as no data was available.

3.4.3 Cow survival versus female reproduction:

The modelling the NWQG herd (using the current prices available for stock) suggests a benefit for spaying. It would appear that spaying allows a property to 'value – add' their female turnoff and improve market options. In addition, it should allow management an opportunity to reduce female mortality rates by identifying those animals that are most likely to die depending on the time of season, age, pregnancy status and condition score. As stated above, there was no data available to assess the impact of spaying on decreasing female mortality rates, but a sensitivity analysis on the current management strategies employed on NWQG (scenario 1) shows the likely gains that may be able to be achieved by either decreasing female mortality rates or increasing weaning percentage.

Table 9: Comparison of mortality rates v weaning rates in the NWQG property.

	Scenario 1	1% Mortality	95% weaning
Female Mortality rate	4%	1%	4%
Weaners/Cows Kept.	75.57%	75.53%	95%
% female sales	46.45%	50%	47.45%
Turnoff/total herd .	34.18%	37.96%	41.67%
Gross Margin	$3.803M	$4.682M	$4.689M

One suspects that the mortality rates of 4% validated on the northern Barkly Tablelands and gulf regions of Queensland will actually be higher in the harsher less well managed environments in the far north. It would appear that substantial gains should be possible in northern Australia if mortality rates at least equivalent to those obtained in more intensive beef breeder systems in the south can be achieved. As the two major endemic diseases (botulism and boophilus microplus) that affect breeders in the north can be effectively controlled by vaccination and genetics, nutritional management now seems to be the major limiting factor effecting both weaning rates and mortality rates. A breeder cow mortality rate of 1% should be achievable if tools to identify the most 'at risk' animals can be developed. Spaying may be a valuable tool in managing 'at risk ' females. On the other hand, achieving weaning percentages of 95% in northern beef producing herds where lactational anoestrous poses massive challenges in *Bos indicus* cattle, is not economically feasible.

3.4.4 Value adding the female sales – other cull options:

Female turnoff is an extremely important part of the revenue generated by breeding properties. In the NWQG property for example, it was actually 51.8%. Therefore a further analysis was performed on the NWQG property to look at further means to add value to the average price of the females. The current strategy utilised on the property of culling fat cows provided a sound basis by which to compare alternate strategies of culling females. Routinely 600 weaner heifers (the tail) are sent each year to the fattening block as they are <150Kgs and it is thought they grow out better on the Central Highlands. This practice has been included in all scenarios. Now in the Max Cull option, 80% of the heifers are kept as replacement breeders and maximum culling occurs in the breeder herd prior to reaching cull for age. In the Min Cull option, only 60% of heifers are kept as replacements and minor culling occurs in the breeder herd until culled for age. Everything else has been kept the same. The modelling shows a $219,427 difference between the Max Cull (+$86,734) and Min Cull options (-$129,693). The difference is almost entirely due to the differential in prices of the cull heifers versus the cull cows. The economics of selling more heifers (and older cfa cows) versus fewer heifers (and younger cfa cows) will vary with relative prices of heifers versus older cows. The message is NOT necessarily to sell more heifers, but for each enterprise to routinely perform the analyses (in Bcowplus) as price relativities of the various categories change.

Currently apart from spaying heifers, there is little extra that can be done to value add to heifers in practical terms. The cull cows are a different issue. In this scenario they are the younger cull cows not the aged cows. Conceivably they could be all the fat dry cows irrespective of pregnancy status. It is highly probable that most of the fat cows will be pregnant. Brown et al (1994) reported 60% pregnancy rates in dry cows CS 4, and 85% pregnancy rates in dry cows CS 5 in a 4 year study in the gulf in Brahman cows. Many properties usually retain the fat pregnant dry cows to produce a weaner the following year. Alternatively some cows pregnancy tested in calf (if weaning numbers are adequate) could be sold to a possible store market . The important issues here is the difference in net returns and the impact that the sale of a breeder at her maximum value has on increasing the

average female price. The impact of decreasing the age of cull cows and selling them when they are a more valuable commodity was also found in the Smart Manager study (J. Kernot)

Table 10: Minimum cull and maximum cull strategies compared to current NWQG policy on cull cows.

	Current Strategy	**Spay Max Cull**	**Spay Min Cull**
Total adult equivalents	28000	28000	28000
Total cattle carried	36477	36697	36157
Weaner heifers retained	6110	6091	6154
Total breeders mated	20407	21033	19637
Total breeders mated & kept	17766	17760	17851
Total calves weaned	13579	13521	13674
Weaners/total cows mated ..	66.54%	64.28%	69.63%
Wnrs/cows mated and kept	76.43%	76.13%	76.60%
Overall breeder deaths	4.00%	4.00%	4.00%
Female sales/total sales %	46.37%	46.30%	46.46%
Total cows and heifers sold	5634	5597	5696
Maximum cow culling age	11	11	11
Heifer joining age	2	2	2
Weaner heifer sale & spay	10.00%	9.89%	9.98%
One yr old heifer sales % .	27.40%	19.50%	39.30%
Two yr old heifer sales % ...	20.00%	20.00%	20.00%
Total steers & bullocks sold	6518	6490	6563
Max bullock turnoff age	1	1	1
Average female price	**$445.46**	**$468.66**	**$411.47**
Average steer/bullock price	$357.00	$357.00	$357.00
Net cattle sales	$4,836,714	$4,939,807	$4,686,673
Gross margin for herd	$3,859,596	$3,946,330	$3,729,903
GM per adult equivalent	$137.84	$140.94	$133.21
Difference in Gross Income		**$86,734**	**($129,693)**

Discussion

3.4.5 General discussion:

In southern beef producing areas, there is little need for spaying females as bulls can be controlled, there are markets for light weight heifers and cull cows and the breeds of cattle are suitable for the domestic markets. However, the situation for properties in northern Australia is completely different. Firstly there are still issues with bull control especially over the wet seasons where maintenance of fences is difficult. This is evidenced by the relatively small number of large properties that have been able to successfully implement restricted joining practices. Furthermore, in the light carrying capacity regions such as the arid zone, the economics of construction and maintenance of fences is not able to be justified when cattle can be mustered by controlling the waters. Lack of holding paddocks and inadequate feed around yards further exacerbates the problems of assembling mobs of sale cattle and mothering up cows with baby calves should a producer wish to sell cull breeders. Unless specific inter property sales are able to be negotiated, then there are virtually no suitable markets available for heifers <260 kgs and cows <340 Kgs liveweight. This is further exemplified by the complete lack of saleyards in the Pilbara, the Kimberley, the N.T. and in north west Queensland. Opportunities do exist for breeding properties in Queensland to target sale yards at Longreach, Mareeba, Charters Towers and the like but the cost of transport becomes a major consideration for properties further out west.

The problem of surplus females in northern Australia (if one could call it a problem) is that it did not exist to any great extent in previous years as cull heifers and cows were a luxury. Improved genotypes, improved supplementation and early weaning has changed the face of the northern beef industry. However, the change in genotype has posed other issues. There is a reluctance of producers in southern areas to embrace *Bos indicus* genotypes as they are disadvantaged in the meat trade. The challenge for northern producers therefore is not only accessing markets but to value add to the products they produce. The live export trade requires a heifer >260 kgs and preferably non pregnant. Similarly, the live export trade for cull cows requires a cow >340 kgs while the absolute minimum for the slaughter trade to the coastal abattoirs would appear to be also >340 kgs on farm.

Unfortunately, the category of heifer to be culled i.e. non replacement, is usually <260kgs live weight after the first wet season, necessitating that they be kept for an additional wet season prior to sale. Spaying is really not an issue for those places selecting replacement heifers on pregnancy status after the second wet season, if the percentage of heifers required as replacements is large and the conception rate low. However, pregnancy in cull heifers becomes a big issue for properties that have an abundance of heifer replacements and need to make decisions about joining prior to the mating period. These heifers will be sold after the second wet season as they are surplus to requirements and consequently this is not a modelling exercise but a marketing strategy. They will not affect the herd structure or number of weaners produced but they will attract a premium price if they can meet the market specifications.

In contrast to the heifer scenario, the cull for age of cows is somewhat different. On some places studied, there were still cows in the herd at 14 years of age, albeit low numbers. These cows destined to be spayed have been selected on their reproductive performance over their life span, so there is a high probability that if the weaners are removed (say at the first muster), then they will be either early pregnant or conceive soon after weaning and therefore be in a low condition again the following year. Spaying or webbing (depending on the pregnancy status of the old cow) allows

these animals to sold the following year. Without the strategy of spaying these old cows in a continuously mated breeder herd, they either eventually die or get sold at a very reduced price.

The modelling exercise on all six properties illustrated conclusively, that spaying provides the opportunity to increase the average price of the entire female turnoff . The subsequent analysis on the six case studies was able to demonstrate that there is a definite relationship between the increased average price of the entire females sold and the decreased number of stock sold as the retention of spayed cows in the herd lowers the overall number of weaners produced. An equation was developed that shows a close relationship between the increased average value of female sales versus the difference in total turnoff.

$$\% \text{ Change \$GM/AE} = \frac{(\% \text{ Diff Value of female sales} / \% \text{ Diff in total sales} - 2.45)}{68.27.}$$

($r^2 = 0.98$, SE = 0.5124)

Put simply, if the practice of spaying cull cows decreases the total turnoff by 1%, then the increased average value of the female turnoff must be at least greater than 2.45% to justify the practice and if it is considerably higher than this, then spaying is certainly an option that will increase net station returns. In the arid areas, the option may still be worthwhile considering as it will decrease risk during drought.

3.4.6 Should I consider spaying?

The best way to assess whether or not to spay is to do a Bcowplus evaluation of the existing breeder system and then assess all the options after doing careful market research. The options should be all examined at the same stocking rate and this is expressed in Adult Equivalents (AEs). However a rough indication as to whether or not there may be a net benefit can be undertaken quickly on a the back of an envelope. The following is an example:-

1. The current total turnoff is 1,000.
2. the average price for females last year was $400.
3. The current weaning percentage is 70%.
4. The number of cull cows to be spayed is 100.
5. Suppose that spayed cows will increase the average of the females sold by $50/head.

Step 1. Multiply the number of cows to be spayed by the branding% and divide by 1.5. This then provides a approximate calculation of the decrease in turnoff numbers. In this example:-

$$\frac{(100 \text{ X } .7)}{1.5} = 47 \text{ head.}$$

(1.5 is an AE factor that considers additional feed requirements of weaners and cows. 100 spayed cows will not eat as much feed as 100 cows and 70 weaners and the factor of 1.5 is a crude adjustment figure to accommodate the different categories of stock)

Step 2. The reduction in turnoff then is 47/1000 = 4.7%

Step 3. The estimated increase in average value of female sales = $50/$400 = 12.5%

Step 4.. 12.5 / 4.7 = 2.6595.

Step 5. Using the formula above as follows:- (2.6595 - 2.45) / 68.27 = 0.003%

Therefore in the above scenario, it would appear that spaying would perhaps give a very small positive return. However, if the spaying were to increase the average value of females sold by $100/head, then there is a very good indication that there would be a net benefit and that a full appraisal on Bcowplus is warranted. See Calculator Appendix 11 – also available as spreadsheet model.

3.4.7 Female turnoff.

The impact of spaying cull for age females as a tool to decrease breeder cow mortality rates and increase the actual numbers of females sold has not been modelled in this study as there is no hard data available on the impact of spaying on cow survival. However if the percentage of females being turned off annually is <45% in a stable herd (ie not in a destock or herd build up phase), then there certainly could be a case to examine this aspect of the enterprise as well.

1. Suppose the total yearly turnoff is 1,000 head.
2. And that the total number of females (cull heifers and cull cows) being sold each year is 400 head, then the % female turnoff is 40%.

If the female mortality rate can be reduced to say 4% from ?%, then the total turnoff should not be 1,000 but around 1,135 head ie there are potentially around 135 extra female sales that are not occurring each year. Identifying and spaying these 'at risk' animals may be one technique that can be used to improve the total turnoff. Other techniques include reducing the age of culling females, supplementation, vaccination for botulism and early weaning.

3.5 Success in Achieving Objectives:

3.5.1 Objective 1:

Complete the analysis for six property case studies in the various northern beef producing regions and quantified for each property:

- the net economic benefit of spaying of surplus heifers and cull cows;
- the net economic benefit of alternative markets for non-spayed surplus heifers and cull cows, and associated logistical constraints in supplying these alternative markets;
- the key profit drivers including weaning rates, mortality rates and growth rates;

Seven separate case studies on breeding properties has been completed and the results analysed. An additional fattening block has also been studied to look at a company structure that is vertically integrated and has alternate strategies available to spaying. Market alternatives for non spayed heifers were examined and the constraints and problems of selling heifers <260 Kgs was explored. The net economic benefit of spaying heifers is basically the premium that is available in the market place because these heifers can be guaranteed non pregnant. The key profit drivers of weaning rates, mortality rates and growth rates has been produced for each of the six main breeder regions in the study.

3.5.2 Objective 2:

Developed guidelines that help producers to identify the most productive and profitable breeding females to retain in their herd and which ones to cull and/or desex.

The concept of value adding to increase the average value of the total female was introduced and explored in depth. Supply of spayed heifers to the live export trade attracts a premium and needs little further explanation. As for the mature breeder cow, the importance of selling females when they are at their highest value to increase the overall average female value was also modelled. If weaning rates are high enough to ensure adequate replacements, then the advantages of selling females when they are at their highest net value whether as fat empty females to abattoirs, fat pregnant females to abattoirs or the store market or spayed females was shown to have a big impact on net station returns. Aged cows present a problem for all stations and the net benefit of spaying these animals to improve the net average value of the female turnoff was demonstrated. The key message here is that if a breeder reaches her maximum value, sell her if there are adequate pregnant replacements.

3.5.3 Objective 3:

Developed simple tools/models that assist producers to decide when to spay surplus females

An equation was developed and the relationship between the increased average price of sale females versus the decreased turnoff numbers was derived. This formula needs further testing but the principles are basically correct and should provide a guide as to when spaying is beneficial to the overall net returns to the station. – See Calculator Appendix 11

4 Impact on Meat and Livestock Industry – now & in five years time

4.1.1 The impact now:

The Impact on the Meat and Livestock Industry now is debatable. Spaying is still not widely practiced or adopted. The reason could be related to animal welfare concerns or to lack of evidence or profit analyses to demonstrate the impact of the practice. Many producers are probably still coming to grips with more pressing issues such as supplementation, early weaning and health considerations. Those producers (and it is highly probably that the innovators were selected in this project) that have made the hard yards in cattle management now look at these options to improve profitability. Nevertheless, the animal welfare considerations are certainly a large issue for the community and alternate methods to surgical spaying need to be developed. Alternatively the practice could be performed as an act of veterinary science. This project should allow producers to accurately assess if additional costs that may be imposed on industry of anaesthesia, analgesia or alternative chemical neutering options are warranted.

4.1.2 The impact in five years time.

The impact in five years time will be dependent on markets. Assuming that the live export trade continues to flourish and that both cows and heifers can be exported overseas, then increasing the value of female sales has the potential to be the single biggest profit driver for stations in northern Australia. It would appear that improving the net worth of the female sales has 2-3 times the impact on profitability as does increasing weaning percentages. Once weaning percentages are adequate to ensure sufficient females are available to enter the breeding herd and if these reproductive rates can be maintained, then the emphasis needs to focus on value adding female sales and increasing the number of females sold by reducing mortality rates.

5 Conclusions and Recommendations

5.1 Conclusions and Recommendations.

5.1.1 Conclusions.

This project set out to establish the cost benefits of spaying for northern beef herds. The strategy of permanently sterilising females is not necessary per se, nor does it increase live weight gains (except for heifers in feedlots on HGPs) if animals can be practically prevented form becoming pregnant. The key then is bull control. In continuously mated herds, in herds with no need for massive infrastructure for cattle control and in areas where security will always be a problem, then there is no alternative at present. Consequently, spaying is the only proven strategy that can cost effectively prevent females from becoming pregnant. It offers significant improvements in farm profitability if the average value of the total females sold can be increased with respect to the decrease in total turnoff that arises from running slightly less breeders in the herd. In herds where the average price of mature females exceeds the average price of cull heifers and the weaning rates are sufficient to supply pregnant replacement heifers, then strategies of selling more females out of the breeder herd and lowering the cull for age of the breeder unit can be useful in improving overall net returns. The sale of fat empty cows and fat pregnant cows to abattoirs are the best options at the moment to capitalise on this strategy but if markets are available for pregnancy tested 'in calf' breeders then these need to pursued. Before considering spaying as a means to increase net returns, a full profit analysis of the existing herd is strongly recommended prior to making any changes to the current operations of a station. However, in the arid zones, spaying may offer other benefits such as decreasing the risk in drought as the number of breeders can be reduced. It would appear that the stations participating in this study are operating at or above the district means for most production indices but the findings have application for all enterprises.

5.1.2 Recommendations:

This study has highlighted the variation in modelling outputs for northern Australian beef breeding enterprises over the years. Most seem to find weaning rates and growth rates in steers as the most important issues for northern producers. While improvements in reproductive efficiency will always improve the net returns to the station, there is a limit to what is achievable and other factors such as net value of females sold and survival rates of breeders have been overlooked. The very fact that a strategy that prevents pregnancy, and decreases total stock turnoff can actually increase net returns further supports this argument. This does not mean that efforts to improve reproductive performance should not be pursued but it does suggest that there are other areas previously not targeted that may need further work. These are as follows:-

(i) Ongoing support for research to find non surgical alternatives to desexing females. This would address welfare issues and make the practice more widely adopted.

(ii) Instigate a workshop or forum for all researchers, consultants and extension officers who provide economic advice to the industry in an effort to gain some consistency in provision of recommendations to producers, researchers and funding organisations.

(iii) Support initiatives to value add female sales. Collect data on weights of cull females to enable an accurate situation analysis of the extent of the issues.

(iv) Encourage producers to analyse their own herd situations to determine most profitable turnoff strategies for females as well as for male

(v) Encourage research into causes and prevention of deaths in breeders in northern Australia and practical ways to identify 'at risk' animals. Even a 1% decrease offers substantial financial returns. If health and nutrition are well managed, there are no real reasons (apart from dystocia) why levels enjoyed in southern regions can't be obtained in the north.

(vi) Further investigations into the role of spaying as a means to decrease breeder mortalities in northern Australia.

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7 Appendices

7.1 Appendix 1: Example of a Feedback sheet from AMH.

Below are prices we could offer you, to kill on a weight and grade basis at **Dinmore**, prior to **10/12/2006**.

Grade	Fat	Teeth	Shape	+420	+400	+340	+320	+300	+280	+260	+240	+220	+200	+180	+160	+150	+130	+110	-110
Grass Fed Jap Heifer																			
I1	7-22	0-4	A-C	2.85	3.40	3.40	3.40	3.40											
I8	23-32	0-4	A-C	2.85	3.35	3.35	3.35	3.35											
J1	7-22	0-6	A-C	2.85	3.35	3.35	3.35	3.35											
J8	23-32	0-6	A-C	2.85	3.30	3.30	3.30	3.30											
B1	7-22	0-6	A-C						3.30										
B8	23-32	0-6	A-C						3.25										
Grass Trade Yearling Heifer																			
YH	5-12	0-2	A-C				3.55	3.50	3.45	3.40	3.15	2.95	2.75	2.45					
Y6	13-17	0-2	A-C				3.53	3.48	3.43	3.38	3.13	2.93	2.73	2.43					
Y7	18-22	0-2	A-C				3.50	3.45	3.40	3.35	3.10	2.90	2.70	2.40					
Y8	23-32	0-2	A-C				3.45	3.40	3.35	3.30	3.05	2.85	2.65	2.35					
Grass Trade Heifer																			
TH	5-12	3-4	A-C						3.40	3.35	3.10	2.90	2.70	2.40					
T6	13-17	3-4	A-C						3.38	3.33	3.08	2.88	2.68	2.38					
T7	18-22	3-4	A-C						3.35	3.30	3.05	2.85	2.65	2.35					
T8	23-32	3-4	A-C						3.30	3.25	3.00	2.80	2.60	2.30					
Cow																			
L/M/M9	3-12	8	A-D	2.85	3.00	3.00	3.00	3.00	2.95	2.90	2.80	2.70	2.50	2.15	1.80	0.45	0.30	0.20	0.10
N	13-22	8	A-D	2.85	2.95	2.95	2.95	2.95	2.90	2.85	2.75	2.65	2.45	2.10	1.75	0.40	0.30	0.20	0.10
O	23-32	8	A-D	2.85	2.90	2.90	2.90	2.90	2.85	2.80	2.70	2.60	2.40	2.05	1.70	0.35	0.30	0.20	0.10
P	0-32	8	A-E	2.85	2.85	2.85	2.85	2.85	2.80	2.75	2.65	2.55	2.35	2.00	1.65	0.30	0.30	0.20	0.10
Heifer																			
D1	3-22	0-7	A-D	2.85	3.15	3.15	3.15	3.15	3.10	3.00	2.75	2.65	2.45	2.15	1.80	0.45	0.30	0.20	0.10
D8	23-32	0-7	A-D	2.85	3.10	3.10	3.10	3.10	3.05	2.95	2.70	2.65	2.40	2.10	1.75	0.40	0.30	0.20	0.10
F1	0-32	0-7	A-E	2.85	3.00	3.00	3.00	3.00	2.95	2.85	2.60	2.55	2.30	2.00	1.65	0.30	0.30	0.20	0.10
Bull																			
Q	0-32	0-8	A-D	2.70	2.65	2.60	2.50	2.45	2.35	2.20	2.15	2.05	1.90	1.75	1.50	0.15	0.10	0.10	0.10
R	0-32	0-8	A-E	2.60	2.55	2.50	2.40	2.35	2.25	2.10	2.05	1.95	1.80	1.65	1.40	0.15	0.10	0.10	0.10

7.2 Appendix 2: Pilbara Case Study.

Pilbara property Study:- November 27th, 2006

Bill Holmes (DPI&F) & Geoff Niethe (MLA).

Property Description:

The property area is 1,605 square miles (410,780 ha) with a carrying capacity of approximately 17,000 adult equivalents. The Oakover River flows through the property which is predominately red spinfex country with large river flats along the entire length of the property. There is approximately 50,000 hectares of fenced country providing 20 small paddocks for managing stock. The paddocks contain approximately 3,000 heifers and young breeders along with sale steers.

The property is well watered with over 130 watering points – 33 mills, 13 solar driven bores and 17 dams. The remainder of the watering points being permanent waterholes along the river and its tributaries. The property is very well improved with monitoring of controlled watering points via telemetry at the station office using VHF radio transmission. The remainder of the property is basically one large paddock which runs into the Great Sandy Desert. Various mountain ranges run parallel to the river on either side.

It is a family operated property. The head stockman runs a stock camp of 6 persons during the season and performs all of the spaying using the Willis technique. The bulk of the breeding herd runs in the large unpaddocked areas along the river. Choppers are used for mustering and a fixed wing plane is available for monitoring and surveillance.

Cattle Management:

Cattle on hand at the time of the visit (November 2006) were approximately 8,350 breeders plus weaners and 3,300 steers.

The herd is predominantly a drought master infused herd with some shorthorn content on the outskirts of the property. The breeding cows are identified with NLIS devices and all cattle are recorded on “Stockbook”. Both boluses and tags are used. One round of mustering is done annually. The muster usually starts in April and portable yards are used in conjunction with some permanent races and drafting facilities. The stock camp usually muster on a Monday and cattle are drafted 3 ways – wet cows with calves at foot are released. Cull cows, bulls and mickeys are sent to sale and weaners are returned to the main processing yard at the station. Here the weaners are branded under cover in a very modern complex which boasts a hydraulic crush, concrete floors, closed in races and a watering system to lay the dust and cool the yards. Controlled mating is not practiced in the unfenced areas as is not practical. The mustering of the breeders is usually completed by the end of August. For convenience, the calving peak was defined to be December to January with half the calves born each side of the peak. Bulls are used at 4%. Replacement bulls are purchased as yearlings in March from Queensland for an average price of $2,000 (landed) and grown out on the property for 12 months prior to being used in the herd. The majority of the herd bulls are used for 5-6 matings

Heifers to be joined are put to the bull in March at about 330 kgs in weight. The property is involved in the heifer management trails being conducted by the West Australian agriculture Department. The theory is to get the heifers calving at the right time of the year to improve their long term

productivity in the herd. The average weaning rate is 80%, although this is boosted by the bush cattle that are not mustered every year.

Supplement:

Some supplement blocks are provided during the dry (mainly to weaners) and about $30,000 worth of hay is purchased each year for use during the muster and while stock are held in the yards. The supplement is modelled at $10.00/weaner and nil for all other females and bulls.

Vaccines etc:

- Eartags for weaners @ $4.60/head.

Steer turnoff:

The majority of steers are sold usually around July to the live export trade. 18 month old steers average about 360 kgs while the tails that are held over and sold the following year at 30 months of age average around 400 Kgs.

Heifer policy:

Approximately 42% of all weaner heifers are kept as replacement heifers. Of the cull heifers, 75% of these are sold as yearlings and the remaining 25% are sold as 2 YO heifers. The majority of these heifers find their way into the sale yards at Geraldton.
The yearling heifers which average about 200 kgs will return about $280/head while the 2 year old heifer culls (the lighter ones from the year before) usually average about $280 kgs and return $350/head at the farm gate. Any heifers that are spayed average 400 kgs at the time of sale.

Current Cull-for Age Policy:

Approximately 2% of breeders are culled each year from each age group on type, condition and defects such as “bottle teats” etc. These are usually spayed in the portable yards and returned to the unpaddocked areas. ‘Culling for age” occurs at 8 years of age. The old cows are spayed and returned to the unpaddocked areas as well and mustered the following year for sale. The spayed cows average $473 (net) twelve months later when mustered.

Branding & Deaths:

- Branding 80% across the board
- Deaths 3% in all breeder females.
- Deaths 4% in maiden heifers.
- Death 3.5% in 1st calf heifers.
- Deaths 1.5% in dry cattle

Bulls:

Bulls are purchased from Queensland as yearlings at an average price of $2,000. They acclimatise for 12 months prior to joining. The commercial breeders are joined at 4% bulls and bulls usually work for 5 years. There is some wastage of bulls with prolapse of the prepuce. Cull herd bulls are usually sold at about 700Kgs for about $1,20Kg live.

Selling details:-

Sales occur continuously throughout the mustering period.

- Transaction Levy $5.00.
- Commission 3%.

The average trucking costs to Port Hedland are 7cents/Kg and 18-20cents/Kg to Midland in the south. Steers this year averaged $1.70/Kg while *Bos indicus* type cows averaged $1.10/kg. The shorthorn types averaged $0.90/Kg.

Comparison of the two scenarios for selling surplus/cull females.

In developing the two scenarios available to management, the owner's astute judgement of markets and prices on offer at the time were used. A sensitivity analysis has also been done to address any price variations which may have been present, The alternative strategy of not spaying and placing cull females in a 'safe' paddock does not really exist on this property. The best fattening country ie suitable for fattening, is located along the river flats. Stocking rates are light and dry animals can make best use of the wide open spaces. However, as there are no boundary fences out into the desert and ranges, it is impossible to achieve 100% musters under normal economic restraints. Most of the spayed females are mustered 12 months later and sold at $473/head average.

The river runs the full length of the property – about 100 miles. Most of the breeders run in one large open paddock and stocking rates are relatively low.

Scenario 1 - No spaying at all – culls sold to best available market.

In this scenario, the cull breeders are sold at the time of time of muster. 50% are sold the first year and the remainder the year after. The modelling shows that more breeders would be able to be retained on the property and additional weaners are available each year. However the value of the cull cows drops to $259 (average) compared to that of a fat spayed female ($473).

Scenario 2 – Cull for age with spaying*:*

The modelling undertaken here was basically that which is occurring presently on the property and described above. The cull aged cows are all spayed and placed in the unpaddocked area until fattened and sold 12 months later. The average price received for these animals is calculated to be $473.00/head.

Modelling Results:

The 27/11/2006 round of modelling indicates the following gross margins (GM), assuming a culling (or spaying) age of 8 yrs, and a herd of 17,000 AE:

1. No spaying – sell cull females for best possible price GM $2,806M/yr
2. Spay cull heifers and light weight cull cows – GM $2.853 M/yr

This suggests that the spaying strategy is an effective strategy for the alternate policy of sending cull females directly to sale ie a cost benefit of approximately $47,000 on the 1181 cull females that were spayed or $39.80/head.

The cost benefits of additional fencing in light carrying capacity country has not been proven. Utilisation of this type of country with minimal capital infrastructure (apart from waters and roads) and the main expenditure focussed in one area seems to be the best option to maximise profitability.

In a 'one muster/year" management system in light carrying country there are real problems removing cull wet cows from the herd as 'mothering up" is both costly and time consuming. This additional cost has not be factored into the modelling.

	With Spaying	***Without Spaying***
Total adult equivalents	17000	17000
Total cattle carried	19044	19038
Weaner heifers retained	3342	3565
Total breeders mated	8354	9759
Total breeders mated & kept	8354	8913
Total calves weaned	6683	7130
Weaners/total cows mated ..	80.00%	73.06%
Wnrs/cows mated and kept	80.00%	80.00%
Overall breeder deaths	3.28%	3.25%

Female sales/total sales %	47.62%	47.93%
Total cows and heifers sold	2999	3239
Maximum cow culling age	11	10
Heifer joining age	2	2
Weaner heifer sale & spay	0.00%	0.00%
One yr old heifer sales % .	44.65%	46.20%
Two yr old heifer sales % ...	13.00%	19.00%
One yr old heifer spay %	0.00%	0.00%
Two yr old heifer spay %	0.00%	0.00%
Total steers & bullocks sold	3298	3519
Max bullock turnoff age	2	2
Average female price	$375.04	$299.42
Average steer/bullock price	$575.48	$575.48
Capital value of herd	$6,978,799	$6,857,070
Imputed interest on herd val.	$697,880	$685,707
Net cattle sales	$3,022,679	$2,995,043
Direct costs excluding bulls	$97,573	$104,102
Bull replacement	$72,317	$84,484
Gross margin for herd	$2,852,789	$2,806,456
GM after imputed interest ...	$2,154,909	$2,120,749
GM per adult equivalent	$167.81	$165.09
GM/AE after interest	$126.76	$124.75

7.3 Appendix 3: Kimberley Case Study.

Kimberley property study:- November 24-25, 2006.

Bill Holmes (DPI&F), Geoff Niethe (MLA) & Michael Jeffery

Property Description:

The property area is 860 square miles (220,000 ha) with a carrying capacity of approximately 11,000 head. It has frontage on Fitzroy and River. The property is approximately 75% Pindan land system (red soils) and 25% black soil country and river frontage which floods on average about every 4 years. Cattle are routinely moved off the black soil flats over the wet to reduce stock losses from flooding. This has the added advantage of providing a wet season spell to the black soil country.

Water holes in the Fitzroy River aren't accessible to stock as the riparian area of the river is fenced. The property is watered by 32 bores and 11 dams together with water holes in the creeks which feed into the Fitzroy river. The property is fenced into 30 paddocks.

This owner operated enterprise employs on permanent staff member who supervises the waters and maintains the roads and improvements. Helicopters are used sparingly when required to put a mob together and then the cattle are worked with horses.

Cattle Management:

Cattle on hand at the time of the visit (November 2006) were 6,180 breeders of all ages, 3,200 weaners and calves and approximately 1,400 steers.

The owners prefer Droughtmaster cattle as they maintain it allows more flexibility in marketing – either export trade or southern markets. Controlled mating is practiced with bulls going out in December and removed on the first round of mustering which usually runs from April through to June. A second round of mustering is done in September to October. Branding numbers are based on the calendar year. For convenience, calving peak was defined to be December to January with half the calves born each side of the peak and just about everything born by March. Bulls are used at 3%. Replacement stud bulls are purchased in Queensland for an average price of $3,000 (landed). The herd bulls are bred on the property and used for 5-6 matings (assume 20% of bulls are replaced each year, covering age and breakdown). Heifers to be joined are put to the bull in December.

Branding is in two rounds – April/May/June and September/October. Not all calves are weaned at the first round – some are carried over to the second round but all are removed at the second round because of the ability to control mate. Weaners get some pellets and hay during the education process before being turned out.

Supplement:

About 40 tonne of loose mix supplement is fed out each year during the dry season. An additional 400 large round bales of hay are purchased for use when cattle are being processed through the yards. The supplement is modelled at $4.75/weaner and $5.60/hd for all other females and bulls.

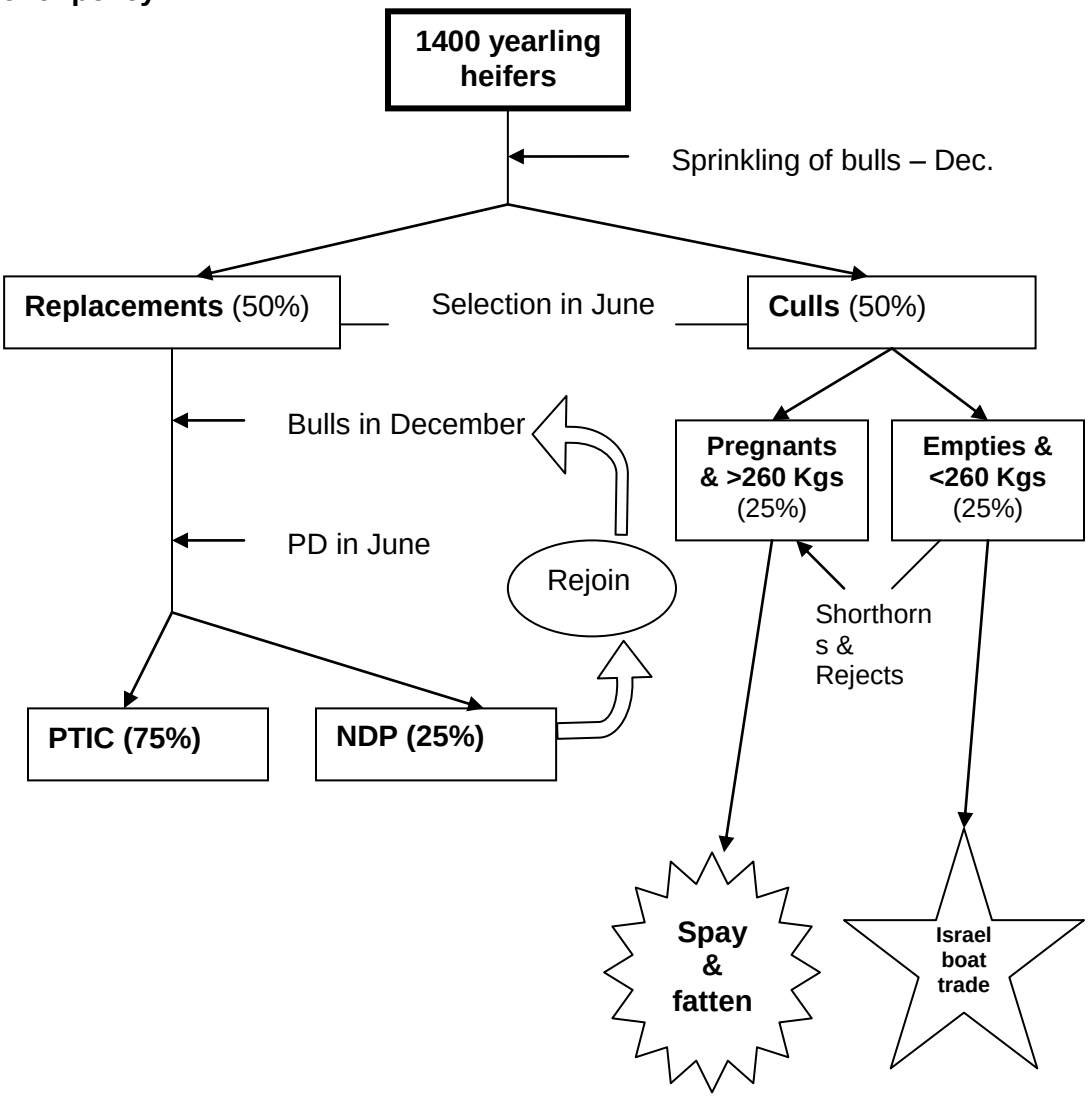
Vaccines etc:

- Botulism C&D @ $1.00/hd/yr for all breeders and bulls.
- Vibrio for bulls @ $2.00.
- 5/1 vacccine for weaners @ $0.40/head.
- Eartags for weaners @ $0.95/head.

Steer turnoff:

The majority of steers are sold usually around July to the live export trade at average weight 346 Kgs.

Heifer policy:



The heifer policy is quite complex and is best explained in the flow diagram above. A sprinkling of bulls are run with the yearling heifers in December and those that are above their critical mating weight conceive. However selection of replacement heifers does not occur until June the following year. About 50% of the heifers are kept as potential breeders and are selected on type and conformation. The remaining 50% or culls are drafted two ways. The empty heifers and lighter types are sold to the Israeli trade – the requirement being for an animal <260 Kgs in body weight. The shorthorn rejects and heavier heifers and those that are pregnant are then spayed/webbed and fattened on the property. Pregnant heifers can not be transported by ship. Heifer spaying is performed by a contractor in the cooler months.

Current Cull-for Age Policy:

Approximately 8% of breeders are culled each year from each age group on type, condition and defects such as “bottle teats” etc.. Culling for age starts at 8 years of age. About 22% are culled in the first year and it usually takes about 2 years (ie age 10) before an opportunity arises to have culled all old cows. Occasionally “inter property” sales for “cull for age” cows can be arranged depending on the demand for such animals. In the past, the price received is usually the boat price at the time but as the transaction occurs on property there is an additional saving from not paying freight on these sales.

Branding & Deaths:

- Branding 65% across the board
- Deaths 3% in all breeder females.
- Death 2% in heifer & steer weaners
- Deaths 1% in dry cattle

Bulls:

The property has its own small stud and bulls for the stud are purchased from Queensland at an average price of $3,000. The commercial breeders are joined at 3% bulls and bulls usually work for 5 years. There is some wastage of bulls with prolapse of the prepuce. Cull herd bulls are usually sold at about 700 Kgs. for about $1.20/Kg liveweight.

Selling details:-

Surplus heifers are usually sold in August at about 320 Kgs. and replacement heifers that fail to get pregnant are about 395 Kgs. The average weight of the breeders at sale is about 428 Kgs (on farm) while fat cows and spayed cows average around 460 kgs. The paddock weights of the sale steers averages 380 Kgs. Approximately 30 cull herd bulls are sold each year. The selling costs include:-

- Dipping - $1.60/head.
- Transaction Levy $5.00.
- Commission 3%.
- Transit Insurance $2.16.
- Freight is around $1.15/deck/Km and the distance to Broome is 415 Kms.

Loading rates are approximately as follows:-

- Steers 28/Deck.
- Cows 22-24/deck.
- Heifers 32/deck.
- Spayed cows and fats 22/deck.
- Bulls 18/deck.

Comparison of the two scenarios for selling surplus/cull females.

In developing the two scenarios available to management, the price derived by the owner at the time were used in the modelling. A sensitivity analysis was then undertaken to explore the amount of elasticity in the outcomes. The alternative strategy of placing cull females in a ‘safe’ paddock does not really exist on this property – like so many other places in the Kimberley. The best fattening country, i.e. suitable for fattening, is located on the black soil plains along the Fitzroy River. This

area is difficult to achieve 100% musters and the security along the river is not good enough to keep neighbouring scrub bulls out. The river flats can be six feet under water during big floods in the Fitzroy River.

Typical "longtail" scrub bulls seen in the Kimberley region.

Scenario 1 - No spaying at all – culls sold to best available market.

In this scenario, the cull heifers are sold at the time of selection. The modelling shows that more breeders would be able to be retained on the property and additional weaners are available each year. However the yearling heifers previously spayed must be sold at discount. Therefore sales now become 25% @ $1.55 x 295 kg + 25% @ $1.10 x 295 kg. The cows previously spayed now sold immediately at the following weights and prices:-

- 8 yr olds: 22% @ $1.20 x 380 kg + 8% @ $0.85 x 360 kg
- 9 yr olds: 37% @ $1.20 x 380 kg + 13% @ $0.85 x 360 kg
- 10 yrs old: 67% @ $1.20 x 380 kg + 33% @ $0.85 x 360 kg

Scenario 2 – Cow and heifer culling with spaying:

The modelling undertaken here was basically that which is occurring presently on the property and described above. The cull heifers and light weight cull for age cows are all spayed and placed in the river paddock until fattened and sold 12 months later. The average price received for these animals is calculated to be $466.00/head.

Modelling Results:

The 25/11/2006 round of modelling indicates the following gross margins (GM), assuming a culling (or spaying) age of 8 yrs, and a herd of 8,000 AE:

3. No spaying – sell cull females for best possible price GM $1.336 m/yr
4. Spay cull heifers and light weight cull cows – GM $1.359 m/yr

Modelling indicates a benefit from the culling policy based on spaying, versus the alternative, of approx $23,000 per year for the property, or $48/head spayed (480 head), or nearly $3/AE carried (8,000). The modelling does not incorporate the ability to better utilise the finishing capabilities of the flood plains and the savings and convenience for management to be able to maintain restricted joining practices in the breeder herd.

This spayed heifer on the river country will be sold in August next year.

Spay Aged	**Sell @ Culling & Some Heifers**	**Without Spay**
Total adult equivalents	8000	8000
Total cattle carried	9059	9127
Weaner heifers retained	1586	1664
Total breeders mated	4860	5492
Total breeders mated & kept	4860	5101
Total calves weaned	3172	3329
Weaners/total cows mated ..	65.26%	60.61%
Wnrs/cows mated and kept	65.26%	65.26%
Overall breeder deaths	2.67%	2.67%
Female sales/total sales %	47.71%	47.84%
Total cows and heifers sold	1414	1492
Maximum cow culling age	11	11
Heifer joining age	1	1
Weaner heifer sale & spay	0.00%	0.00%
One yr old heifer sales % .	24.89%	48.89%
Two yr old heifer sales % ...	0.00%	0.00%
One yr old heifer spay %	24.00%	0.00%
Two yr old heifer spay %	0.00%	0.00%

Total steers & bullocks sold	1550	1627
Max bullock turnoff age	2	2
Average female price	$449.91	$388.84
Average steer/bullock price	$549.45	$549.45
Capital value of herd	$3,701,928	$3,673,265
Imputed interest on herd val.	$370,193	$367,326
Net cattle sales	$1,488,241	$1,474,238
Direct costs excluding bulls	$62,208	$62,379
Bull replacement	$67,483	$76,255
Gross margin for herd	$1,358,550	$1,335,604
GM after imputed interest ...	$988,358	$968,278
GM per adult equivalent	$169.82	$166.95
GM/AE after interest	$123.54	$121.03

7.4 Appendix 4: VRD Case Study.

Victoria River Downs property Study:-November 23rd, 2006.

Bill Holmes (DPI&F), Geoff Niethe (MLA)

Property Description:

This property is located in the Victoria River. It is 920 square miles (230,000 ha) with a carrying capacity of approximately 18,000 adult equivalents. The Victoria River flows through the property which is predominately a mix of the Wavehill land system – basalt strewn black soil plains with granite intrusions. The property is subdivided into approximately 25 paddocks. There are 9 bores about 100 meters in depth and 50 permanent water holes – 10 located in the Victoria River. However, the riparian area of the river is largely excluded from routine cattle grazing.

Cattle Management:

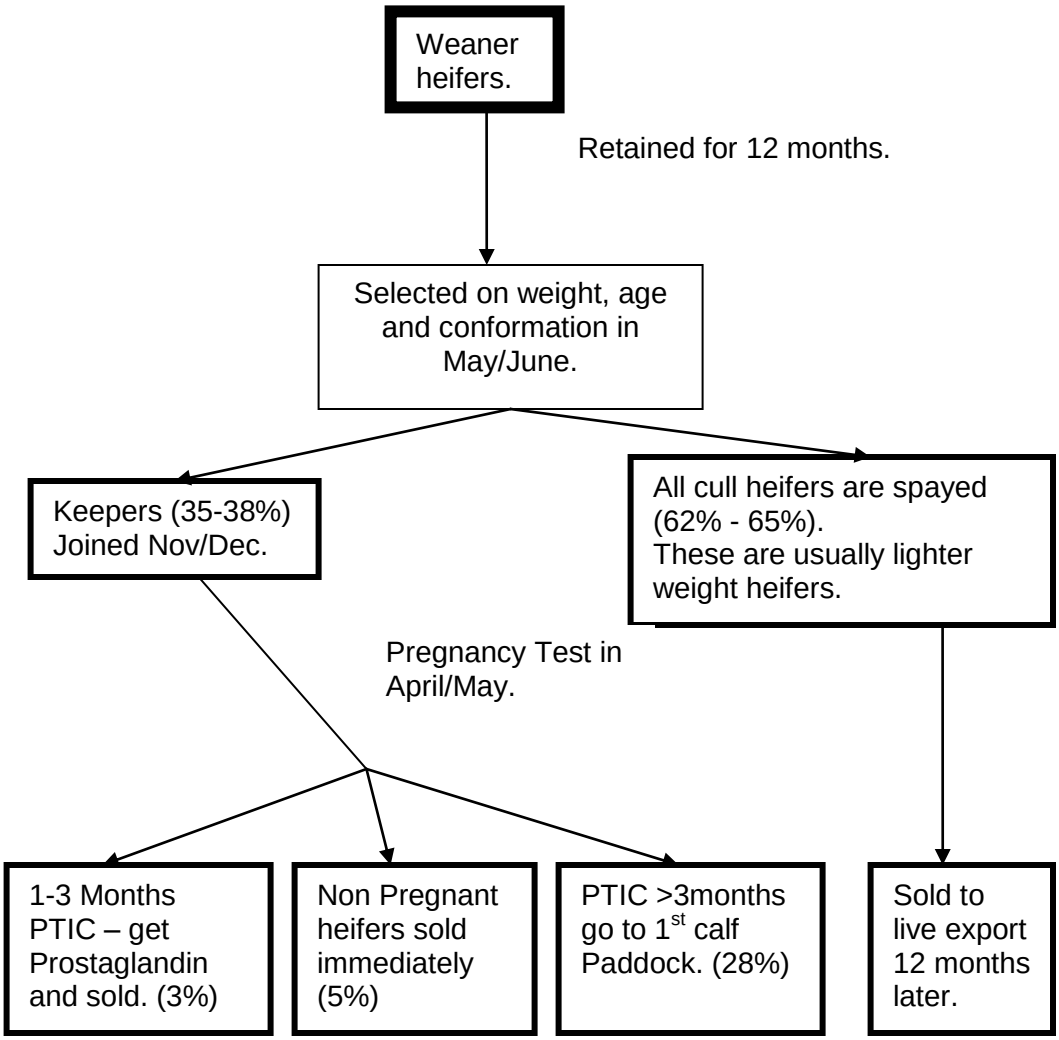
Cattle on hand at the time of the report (November 2006) were approximately 22,220 head.

The herd is high grade Brahman herd. Breeders remain in their breeder groups for their entire life and the breeders are continuously mated. Bulls are put in with the breeders at 2 years of age and are started to be culled at 8 years of age. Culling for age of the breeders starts at 10 years of age. Two rounds of muster are done a year and calves are weaned down to 150 Kgs. The average weight of the weaners is 220 Kgs on the first round and 180 Kgs in the second round. 60% of calves are conceived in response to the wet season, 30% conceive in response to the 1st round of muster and 10% conceive as a result of the second round muster. Calves that are born late are branded and removed from the herd at the 1st round the following year. The annual conception rate is running at around 90% and there are about 10% losses of calves between pregnancy diagnosis and weaning. Approximately 2% (1%-5%) of breeders are culled each year. If they are dry at the 1st

round they are pregnancy diagnosed and culled if found empty. Cows with bottle teats, physical defects and attitude problems are also culled. The property is adequate in phosphorus and no supplement is provided to the breeders. Weaners, 1st calf heifers and some 2nd calf heifers receive supplement in the form of blocks. The average adult mature weight of the cows is 420 Kgs (on property) and are usually sold in July. The spayed cows average 500Kgs on property at the time of sale – 70% are sold in April/May while the balance are turned off in August/September. Maiden heifers are approximately 2 years of age when joined to bulls in November/December. All replacement heifers and dry cows are pregnancy tested annually.

The steer portion of the herd is basically divided into 3 groups – early, mid and late steers. 50% of the steers are sold at 18 months of age at 320 Kgs (average weight) and the tails are carried over until the following year and sold at approximately 360Kgs.

Heifer policy:



The spaying policy on heifers (both pre and post puberty) was adopted 5 years ago. The advantages and reasons why spaying was adopted by management are as follows:-

- Quality assurance that the females presented for sale are indeed empty.
- No calving in feedlots or on board the ship.
- The property is able to command a 5cents/Kg premium because of their guaranteed product.
- Females that abort or calve in feedlots are inefficient to feed.
- Muslims prefer not to slaughter 'in calf' females.
- No market for heifers <270 kgs in the Top End.

The reasons given by management for spaying 'cull for age' cows is as follows:-

- No market for aged cows – full stop.

- Pre spaying – it was difficult to get females out of the herd. The river systems and annual floods during the wet make bull security very difficult.
- Best markets were for fat cows in the live export trade.
- The only markets for cracker cows (CFA) is Queensland and South Australia.

Supplement:

Supplement blocks are provided during the dry (mainly to weaners and young breeders) The following costings have been used for the various classes of stock:-

- Weaners - $6.00/head.
- Joiners - $11.00/head.
- 1st Calf heifers - $6.00/head.
- Some 2nd calf heifers - $11.00/head.

Vaccines etc:

- Botulism - $1.20/dose. – Singvac to all breeders.
- 5/1 vaccine to weaners - $0.65/head.
- Management eartags - $0.65/head.
- Mustering costs – vary between $6.00 - $12.00/ head.

Stock prices:

Prices fluctuate yearly but the average price received in 2006 are as follows:-

- Steers - $1.85/Kg. (landed at the wharf in Darwin)
- Heifers - $1.75/kg (landed at the wharf in Darwin)
- Bulls - $1.30/Kg (at Darwin)
- Older Cows - $1.25/Kg (at Darwin)
- Spayed Cows - $1.25/Kg (at Darwin)

It costs about 10 cents/Kg to transport the stock to Darwin.

Branding & Deaths:

- Conception rates around 90% across the board
- Losses between pregnancy testing and weaning about 10%.
- Deaths 3% in weaners.
- Deaths 1% in yearlings.
- Death 4% in 2YO – 3YO heifers.
- Deaths 3% in cows and 1-2% in steers.

Bulls:

Bulls are joined at 4% in the replacement heifers and 3% in the breeders.

Comparison of the two scenarios for selling surplus/cull females.

In developing the various scenarios for utilising spaying on this property, the focus is to look at the cull for age cows. Basically, the cull heifers are spayed in all scenarios examined. The sale of cull, light weight heifers at the point of the decision is not really a modelling issue but one of marketing and exploring alternate markets. There are very few opportunities to sell cull Brahman heifers <260 Kgs in these regions on a regular basis as stores or replacement. The sale of the cull heifers at sale weight >270Kgs does not affect the herd structure of the breeder herds.

Scenario 1 - No spaying at all of cull cows – culls sold to best available market.

In this scenario, the cull breeders are sold at the time of time of muster. 50% are sold the first year and the remainder the year after. The modelling shows that more breeders would be able to be retained on the property and additional weaners are available each year. The value of the cull cows were priced as follows:-

- 8YO - $462.00
- 9YO - $450.00
- 10YO - $428.00
- 11YO - $405.00

Scenario 2 – Cull for age cows with spaying:

The modelling undertaken here was basically that which is occurring presently on the property. The cull cows and the cull aged cows are all spayed and placed in a paddock until fattened and sold 12 months later. The average price received for these animals is calculated to be $625.00/head.

Modelling Results:

The 2/311/2006 round of modelling indicates the following gross margins (GM), assuming a culling (or spaying) age of 8 yrs, and a herd of 18,000 AE:

1. No spaying – sell cull females for best possible price - GM$2.983M/yr
2. Spay all cull for age cows and fatten for 12 months – GM $3.011M/yr

There would appear to be a positive cost benefit of $28,000 for the enterprise to spay the 792 cull cows prior to sale. This equates to an increased benefit of $35.05 per cow for cull females from the Victoria River District at the current markets that applied in that region at the time of the study.

The breeder cows above in Condition score <2 would be <350 Kgs and their sale value would be much less than the $405 - $462 used for cull unspayed cows in the Bcowplus model.

NB:- One of the real benefits of removing these breeder cows of low body condition is the subsequent increase in their survival rates. The expected increase in probability of survival of low conditioned breeder cows has not been considered in the modelling.

	Old Cows	Spay
	Unspayed	Option
Total adult equivalents	18000	18000
Total cattle carried	20771	20805
Weaner heifers retained	3299	3177
Total breeders mated	8676	8341
Total breeders mated & kept	8200	7896
Total calves weaned	6599	6354
Weaners/total cows mated ..	76.06%	76.18%
Wnrs/cows mated and kept	80.47%	80.47%

Overall breeder deaths	3.24%	3.24%
Female sales/total sales %	47.75%	47.65%
Total cows and heifers sold	2903	2784
Maximum cow culling age	10	11
Heifer joining age	2	2
Weaner heifer sale & spay	0.01%	0.01%
One yr old heifer sales % .	0.00%	0.00%
Two yr old heifer sales % ...	10.00%	10.00%
One yr old heifer spay %	0.00%	0.00%
Two yr old heifer spay %	28.07%	28.07%
Total steers & bullocks sold	3176	3058
Max bullock turnoff age	2	2
Average female price	$491.41	$546.12
Average steer/bullock price	$549.13	$549.13
Capital value of herd	$8,765,688	$8,789,014
Imputed interest on herd val.	$876,569	$878,901
Net cattle sales	$3,175,478	$3,204,303
Direct costs excluding bulls	$130,126	$133,604
Bull replacement	$62,483	$60,069
Gross margin for herd	$2,982,868	$3,010,630
GM after imputed interest ...	$2,106,300	$2,131,729
GM per adult equivalent	$165.71	$167.26
GM/AE after interest	$117.02	$118.43

7.5 Appendix 5: Alice Springs Case Study.

Alice Springs Study: Sep 25-26, 200.

Geoff Niethe MLA) and John Hagan.

Property Description:

The private cattle company consists of two properties in the southern Alice Springs district, two properties in the south east of south Australia and some leased country on a neighbouring station.

It is a family owned and operated business, currently employing eight full time staff and approximately four contract staff periodically throughout the year. The N.T. properties are run predominantly as breeding blocks, with the flexibility to finish stock if the season allows. The South Australian properties are also run with a degree of flexibility depending on the seasons in the N.T. The main management objective is to send steers down south at around 300-350 Kgs liveweight and to take them to feedlot entry weights down there however in dry years (like being currently experienced) weaners are sent down at 100-150 Kgs to take pressure off the stocking rates. For the purposes of this study, only the NT enterprise will be incorporated into the analyses and average

numbers used to develop the herd projections. The Alice Springs district is subject to drought one year in four on average therefore it is impossible to project an average herd structure that would apply in any particular season. Normal inter-company transfers to the South Australian properties will be valued as on normal property sale rates. The three separate leases involved in the NT operation will be amalgamated as if they were all one property to facilitate the modelling.

The total area of land in the N.T. leases is 5,283 km^2. and the carrying capacity is rated at approximately 2.5 AE/km^2. The annual rainfall in the region is around 200mm but the variability is extremely high. The Finke River country is a real mixture of softer desert country in the Finke River basin featuring longitudinal dunefields, sparse shrub lands of desert cassia and desert grevillea over open grasslands of kerosene grass, oatgrass, native saltbush and forbes. Buffel grass has established in the sandy flats adjoining the river systems. Patches of mulga and hard Spinifex are also distributed throughout. The south west Alice Springs block is predominantly mulga and spinifex country with no defined drainage system over any of the property.

The property is watered by 49 watering points. The bores are fairly shallow and the quality of the water is good. Water is reticulated to various watering systems by polypipe. While the south western lease (1,640 Km2) is fenced into 10 paddocks, there are no internal paddocks on the main run (2,960 Km2) due to the poor return from capital invested, and operational costs to maintain paddocks in such light carrying country. Such practices as controlled mating and heifer segregation can not be justified and even management procedures such as holding cattle around yards during muster and mothering up of calves are extremely difficult. These are the realities of running cattle in the extremes of the arid zone of Australia.

Cattle Management:
Mating is year-round. The branding number is based on the calendar year. For convenience, calving peak was defined on the basis of the brand number. There are two main calving drops – spring (60%) and autumn (40%). The breeding herd is predominantly Hereford on Lilla Creek and Hereford/Angus cross on the other two leases. 30 contract Hereford and Angus bulls are purchased each year on Breedplan figures at a value of $3,500 each. Bulls are run at approximately 4% of the breeding herd and used for 5 years before culling. For modelling
purposes calves are estimated to be 150 kg at 5 months of age and 175 kg average at weaning.

Spayed Heifer (centre) saleable item in drought Typical desert country - low stocking rates
Heifers are yard weaned and worked at approximately 150 Kgs (min). 20% are culled at weaning and spayed if the season permits otherwise they are shipped to South Australia. The remainder are distributed throughout the herd and approximately 80% will calve at 2 years of age. The remaining

20% are spayed and or sent south. There are 20% of these heifers that fail to get in calf the second time round and these are spayed as well.

Branding is in two rounds – first round starts end of March – April, and the second round starts late September/October. Not all calves are weaned at the first round – some are carried over to the second round and some second round calves are carried over to the first round next year. Weaners are not routinely supplemented.

T after 2 years no rain.

Supplement:

Supplement blocks are used on the mulga country only and the cost of supplementation has been averaged over the entire breeding herd for ease of modelling. The same applies to botulism vaccine which is utilised on the mulga lease.

- Botulism C&D @ $1.00/hd/yr for every beast, every year on Mt. Ebenezer only – again this was averaged out over the entire herd.
- NLIS and Allflex tags @ $4.00/head

Steer turnoff:

Steers are weaned and spread throughout the herd in normal years. They are then moved south the following year at around 300-350 Kgs of weights. In drought years however, the steers are trucked straight off . This year has been extremely dry in South Australia as well and this has hampered management decisions at all levels.

Heifer turnoff:

In normal seasons, all spayed heifers are retained on the property until they reach exit weight of 500 Kgs (average) at about 3.5 years of age. In dry seasons however, these animals are transferred as entire animals for backgrounding and fattening.

Current and future cull-for-age policy:

Management to date of cull for age (c.f.a.) cows is as follows:-

- approximately 500 replacement heifers are kept from a 2,500 cow herd each year.
- breeders are cast for age at 7 YO.
- All cast for age cows spayed and retained for additional year on the property or sold as cow and calf unit.
- Management believe that spaying the cast for age cows (plus 50% weaners) provides them with an additional 25% premium over simply selling cast for age calves with weaners at foot.

Branding & Deaths:

- Branding 80% across the board
- Deaths 4% in all females and steer weaners
- Deaths 2% in dry cattle

Bulls: Bulls are purchased on contract according to their guaranteed EBV's for $3,500 at 2 years of age and kept for 5 years. They are joined at 3.5% - 4% (modelled at 3.5%). The average sale weight of the bulls is 750 kg.

Scenario 1 – Cow culling with spaying and run for an additional 12 months prior to sale.

All cull for age cows are spayed and run on the property for an additional 12 months prior to sale. Some of these cows will have calved and the sale price of $650/unit reflects the addition of the extra calves (50%) in the overall sale. ($500/spayed cow + $250/weaner)

This scenario is run at 3.5% bulls to make the outputs of the model comparable as far as bull costs are concerned. The extra spayed cows on the property for an additional 12 months means that the overall breeder herd will be reduced.

Scenario 2: Cow culling without spaying with 50% calves at foot – average price of $500/cow

Sale of the cast for age cows are sold on property with 50% calves at foot – presumably too young to wean. The weaning percentage for this age group is adjusted down to 30% in their final year as the older weaners (30%) will be kept on property. The cows that have had their weaners removed together with the cull for age cows with calves at foot (50%) are averaged out at $500/cow. ($375/cow + $250/weaner)

This effectively means that there will be more room to run additional breeders at younger ages as the spayed cows would not be run on the property for an additional 12 months.

The bull percentage has been adjusted down to make the total AE work out in the model.

Modelling Results:

Provisional results i.e. assuming 10390 AE for all scenarios, are:

1. Spay all cast for age cows and sell 12 months later with 50% calves at foot. GM $1.532 M/yr
2. Sell all cast for age cows with 50% calves at foot in the year that they are culled plus retaining the older weaners (30%) in the herd GM $1.616 M/yr

The spaying of cull heifers and young cull cows (1,425 in all) is considered a normal practice in both scenarios and has not been modelled in this run. Consequently only the 325 'cull for age' cows have been analysed and it is apparent from the modelling that the additional $125/head able to be obtained from the spaying did not compensate for the additional 219 head of weaners that would have been produced had the spaying not been performed. What is not apparent from the modelling is the increased market options available in dry times when fat spayed cows are available for sale.

	Spay	**No Spay**
Total adult equivalents	**10400**	**10400**
Total cattle carried	**11584**	**11735**
Weaner heifers retained	**1936**	**2176**
Total breeders mated	**5026**	**5245**
Total breeders mated & kept	**5026**	**5245**
Total calves weaned	**4159**	**4352**
Weaners/total cows mated ..	**82.76%**	**82.98%**
Wnrs/cows mated and kept	**82.76%**	**82.98%**
Overall breeder deaths	**4.00%**	**4.00%**
Female sales/total sales %	**46.42%**	**46.56%**
Total cows and heifers sold	**1768**	**1861**
Maximum cow culling age	**8**	**8**
Heifer joining age	**1**	**1**
Weaner heifer sale & spay	**6.89%**	**0.02%**
One yr old heifer sales % .	**0.00%**	**0.00%**
Two yr old heifer sales % ...	**0.00%**	**0.00%**
One yr old heifer spay %	**40.00%**	**40.00%**
Two yr old heifer spay %	**25.00%**	**25.00%**
Total steers & bullocks sold	**2041**	**2135**
Max bullock turnoff age	**1**	**1**
Average female price	**$516.75**	**$501.67**
Average steer/bullock price	**$554.64**	**$554.64**
Capital value of herd	**$4,362,886**	**$4,319,403**
Imputed interest on herd val.	**$436,289**	**$431,940**
Net cattle sales	**$2,045,595**	**$2,117,884**
Direct costs excluding bulls	**$76,888**	**$79,008**
Bull replacement	**$75,495**	**$78,788**

Gross margin for herd	**$1,893,212**	**$1,960,088**
GM after imputed interest ...	**$1,456,924**	**$1,528,148**
GM per adult equivalent	**$182.04**	**$188.46**
GM/AE after interest	**$140.09**	**$146.93**

7.6 Appendix 6: Barkly Tableland Case Study.

Barkly Tableland Study, June 26-27

Bill Holmes (DPI&F), Geoff Niethe (MLA), Rodd Dyer (MLA

Property Description:

The property area is 3,869 square miles (1,002,200 ha) with a carrying capacity of 40,000 head. The property is located at the top of the Barkly Tableland in the Northern Territory.

The station contains a mixture of Pollyarra, Wonarah, Creswell and Mitchiebo land systems as described below:-

'PY' Pollyarra Land System: Discontinuous strip of gently undulating, sparsely timbered country with lateritic soils extending from Newcastle Waters to the Queensland border. The Pollyarra land system carries predominantly Eucalyptus dichromophloia woodland and Eucalyptus brevifolia woodland.

C' Creswell Land System: Discontinuous areas of very gentle undulating to nearly flat black-soil grasslands. The soils are northern heavy grey Pedocals. Typical vegetation Eulalia fulva – Dichantium fecundum grasslands.

'WH' Wonarah Land System: Gently undulating country with deep lateritic soil and low scrubby vegetation. The main vegetation is Eucalyptus brevifolia od Eucalyptus (low mallees)

'MB' Mitchiebo Land System: A single area north of Alexandria homestead of undulating to low hilly country with leached soils and woodland or shrub woodland vegetation.
The property is approximately 40% open downs country – the rainfall varies between 500mm to 625 mm. p.a. About 800 square kilomteres in the north east corner of the property is not being used for grazing at present.

The property is watered by 85 bores, plus a number of dams in watercourses around the property.

The property is fenced into 24 major paddocks and numerous holding paddocks. There are thirty – four sets of yards.

The workforce is 18 during the working season, down to a couple during the wet, plus a contractor for weaner tailing (two rounds at 4 months total).

Cattle Management:

Cattle on hand at the time of the visit (June 2006) were 5,403 No.5 heifers, 3,086 No. 5 steers (for transfer to fattening depot), 100 No. 4 steers, and 19,000 No. 3 cows and older.

Mating is year-round. The branding number is based on the calendar year. For convenience, calving peak was defined on the basis of the brand number. Calving peak is taken to be in April, with half the calves born each side of the peak and just about everything born by October. Bulls are used at 3% to 4% (modelled at 4%), Brahmans and Charbrays. Bulls are bought at age two years (budget $3,000) and used for 5-6 matings (assume 20% of bulls are replaced each year, covering age and breakdown). For modelling purposes calves are estimated to be 150 kg at 5 months of age and 220 kg (paddock weight) at 12 months of age.

Heifers to be joined are put to the bull in January.

Branding is in two rounds – first round starts end of March – July, and the second round starts late August/September - October. Not all calves are weaned at the first round – some are carried over to the second round and some second round calves are carried over to the first round next year. Weaners are not routinely supplemented but mainly are fed by being tailed out. Contractor tails out with dogs.

Fat Brahman cows on the Barkly Tableland.

Supplement:
Loose lick cost is $300,000 total for the year and all of this goes to the breeders. It is fed out in 1 tonne fertilizer bags – cement has been added to the mix so it hardens as cattle lick it and supplementation extends into the wet season. This is modelled at $0/weaner and $16/hd for all other females and bulls.

Vaccines etc:

- Botulism C&D @ $0.61/hd/yr for every beast, every year.
- Vibrio for bulls @ $3.49
- Dectamax for weaners @ $1.32
- NLIS and Allflex tags @ $4.00/head
- Compudose for steer weaners @ $6/hd

Steer turnoff:

Weaned on site, then transferred to backgrounding properties the following year usually at around 230 kg curfew weight (20 kg heavier than sister Gulf property) and 15 mths of age. There are 2 main shipments of steers. Half go at the end of April and the other half go at the end of August.

Heifer turnoff:

Normally maiden heifers are selected in late July and approximately 1,600 culls are sent to the fattening block at about 230 kg curfew weight (20 kg heavier than the sister Gulf property). The remaining 3,500 – 4,000 are joined in November. They are pregnancy tested around August the following year and an 80% conception rate is usually achieved. The live weight is around 380 kg. Assume empty heifers average 280 kg curfew weight (20 kg heavier than the sister Gulf property) and they are transferred to the bullock depot where they are spayed.

Current and future cull-for-age policy:

Management to date of cull for age (c.f.a.) cows is as follows:-

- Remove bulls at second round muster.
- Take out anything killable and send to meatworks (30%) at 1st round muster following year.
- Wean everything and send balance (70%) to fattening - 20% of the total to still have calves down there.
- Depending on stranger bulls, these cows are turned off over the next couple of years when they are fat.

Age cull is currently undertaken at 12 or 14 years but this will come back to 10 in future once the breeding herd is stabilised. Modelling is based on 10 yrs. In 2006, the **bulls were taken out of the aged culls in the previous year (2005) and the fats will be sold early in July 2006 (approximately 30**. In previous years they have been sent to Charters Towers where they were fattened and sold but turnoff has taken several years if neighbouring bulls got in. This year, of the 351 c.f.a. cows in Sherwin Paddock, approximately 210 will be spayed and kept on the property – the balance will be sold as fats. In addition, 1,223 No 4 cows (12 year old) ex Benmarra Paddock, will be spayed and put in Bush Paddock. Next year, approximately 700 No.5's (South Horse) and 900 No.6's (Puzzle Creek) will be spayed and put into Bush Paddock.

Branding & Deaths:

- Branding 72% across the board
- Deaths 4% in all females and steer weaners
- Deaths 2% in dry cattle

Bulls:

Bulls are purchased at 2 years of age and kept for 5-6 years. They are joined at 3.5% - 4% (modelled at 4%). The average sale weight of the bulls is 800 kg (modelled paddock weight is 800 kg and sale weight 700 kg the same as for the Gulf station) and they are usually culled at the second round of muster.

Scenario 1 – Cow culling without spaying, oldest group for fattening:

Maiden heifers are culled at the pregnancy test in August – assume 20% empties (transferred). Assume no culls the following year, then 10% per year for ages 4 -7 (interview indicated 5 – 7 with current 12 -14 yr age culling), 15% at 8, 20% at 9 and complete age cull at 10.

First calf heifers are modelled as 20% sold on preg test (i.e. after mating), with 85% weaning from the remaining pregnant cows (= 68% of heifers mated).

Older cows are modelled with fat sales of 10% from 5, 6, 7 & 8 yr old cows, 15% from 9 yr olds and 20% from 10 yr olds.

The average yearly weaning rate for all cows joined is modelled at 72%.

Modelling indicates about 1,200 cows reaching 10 yrs, of which 30% can be sold fat to works (420 kg @ $1.60 less $55 costs), and 70% transferred for fattening (330 kg @ $1.30, all costs paid on the delivery end). Overall net price is $483/hd.

Scenario 2: Cow culling without spaying, oldest group sent to works:

The herd is in a state of flux and the ideal breeder herd numbers have not been achieved, so current numbers do not necessarily represent what would be the stable state numbers. Due to dry years in the Charters Towers region, the steer crop has been held on the Barkly Tableland longer than desired thus preventing the breeder herd from being increased. This year (2006) there will be around 1,400 head of cull for age cows to sell, ranging in age from 12 - 14 years, and next year 1,600 head at 11 and 12 years old. Modelling is based on selling culls at 10 years of age from a stabilised herd and indicates cull for age sales of about half this number.

The eventual herd will look something like this:-

- Company estimates 19,500 females each year to be joined (including maiden heifers). Modelling indicates 23,000 before sales, 20,000 after sales
- 14,000 weaners produced per yr (modelling indicates 15,000).
- Weaning rate 72% of females joined.
- Spayed cull for age females put into an 800 Sq.Km Bush paddock in the north east corner of the property and sold when fat. (carrying capacity approximately 1,800 head).

- Approximately 3,000 fifteen – eighteen month cull heifers along with another 800 pregnancy tested empty heifers aged twenty seven – thirty months old to the fattening depot each year for spaying. Modelling indicates 1,800 and 900.

Modelling indicates about 1,200 cows reaching 10 yrs, of which 30% can be sold fat to works (420 kg @ $1.60 less $55 costs), 7% are rejected from sale at no value, and 63% are sold locally (370 kg @ $0.65 less $5 costs). Overall net price (including those at zero value) is $352/hd.

Scenario 3 - Cow culling with spaying:

The only change is to the oldest group of cows.

The 70% of cows formerly transferred for fattening are spayed in two rounds, leaving those heavily in calf to calve out before being spayed. Approx half the pregnancies are lost, leaving a quarter of the 70% to wean calves. All spayed cows are sold (420 kg @ $1.60/kg less $55 costs).

Spaying cost is $5/hd and death rate for spayed cows is 4% for the year. Spayed cows are assumed sold at the same weights as normal fat cows.

For industry relevance, the analysis would be based on retention of spayed cows requiring a corresponding reduction in the rest of the herd to maintain the same stocking rate (AE).

In this particular instance, the station has unused country unsuitable for breeders but OK for spayed cows, and will be making a new paddock for the spays, with a carrying capacity of approx 1,800 hd. From a company standpoint therefore, retention of spayed cows will not require reducing the rest of the herd.

Modelling Results:

Provisional results, without allowing for the impact of the extra paddock on carrying capacity, i.e. assuming 32,000 AE for all scenarios, are:

3. Sell fat cows (30%) and transferred for fatteing – GM $4.643 m/yr
4. Sell fat cows (30%) and stores (63%) on station – GM $4.462 m/yr
   As above but cows non-meatworks cows 30 kg lighter – GM $4.448 m/yr
5. Sell fat cows (30%), spay other 70% for sale the following year, adjust herd to accommodate spays at same overall stocking rate – GM $4.691 m/yr
6. As above but running spays on new country – GM $4.807 m/yr

This suggests that the spaying strategy is an effective replacement for the former policy of sending aged cows for finishing. Relative to selling the non-meatworks portion of the old cows on the property, the modelled gain from spaying is $229,000/yr, or $243,000/yr if non-meatworks cows are 30 kg lighter. The additional gain (modelled) from running spays in a new paddock is $116,000/yr.

The combined benefit to Barkly and Gulf breeding stations relative to selling old cows off the properties, is modelled at $446,000/yr ($473,000 if non-meatworks cows are lighter) over a total herd of 60,000 AE. Total cows spayed on both places in this modelling exercise are 1,550/yr, representing a gain (GM) of approx $30/cow spayed.

This paddock in the north east of the property is expensive to muster and would be ideal for spayed cows.

Overall Effect on Company:

In this instance, the new paddock has been deemed unsuitable for any other class of cattle other than spayed cows so it is almost certain that there will be a significant impact from spaying and retaining cfa cows on property.

The receiving station stands to gain from the change by releasing feed formerly used to calve out and finish old cows, using this feed for (possibly) more profitable steers and cull heifers. For this reason, the analysis will not be complete until we know the relative profitability to the fattening block of cleaning up old cows for sale versus fattening steers and spayed heifers. Combining the breeding and fattening properties, the overall impacts will get us closer to measuring the industry impact of spaying old cows.

Heifer Spaying:

We have not considered the role of spaying in heifer turnoff. In the present context it was not an issue as the spaying of heifers occurred after the transfer. In a whole-of-company (or industry) context however it is an integral part of the spaying story.

	Old Cows to Fattening	Old Cows Sold	Old Cows Spayed
Total adult equivalents	32000	32000	32000
Total cattle carried	40451	40451	40286
Weaner heifers retained	6870	6870	6748
Total breeders mated	22838	22838	22537
Total breeders mated & kept	20196	20196	19621
Total calves weaned	15261	15261	14996
Weaners/total cows mated ..	66.82%	66.82%	66.54%
Wnrs/cows mated and kept	75.57%	75.57%	76.43%
Overall breeder deaths	4.00%	4.00%	4.00%
Female sales/total sales %	46.45%	46.45%	46.37%
Total cows and heifers sold	6354	6354	6223
Maximum cow culling age	10	10	11
Heifer joining age	2	2	2
Weaner heifer sale & spay	9.96%	9.96%	10.00%
One yr old heifer sales % .	26.60%	26.60%	27.40%
Two yr old heifer sales % ...	20.00%	20.00%	20.00%
Total steers & bullocks sold	7325	7325	7198
Max bullock turnoff age	1	1	1
Average female price	$436.86	$408.40	$459.30
Average steer/bullock price	$391.00	$391.00	$391.00
Capital value of herd	$18,687,033	$18,687,033	$18,724,066
Imputed interest on herd val.	$1,868,703	$1,868,703	$1,872,407
Net cattle sales	$5,640,086	$5,459,246	$5,672,575
Direct costs excluding bulls	$573,819	$573,819	$563,870
Bull replacement	$423,152	$423,152	$417,572
Gross margin for herd	$4,643,116	$4,462,276	$4,691,133
GM after imputed interest ...	$2,774,413	$2,593,572	$2,818,727
GM per adult equivalent	$145.10	$139.45	$146.60
GM/AE after interest	$86.70	$81.05	$88.09

7.7 Appendix 7: NWQG Case Study.

North West Queensland Study, June 24-26, 2006

Bill Holmes (DPI&F), Geoff Niethe (MLA)

Property Description:

Property area is 800 square miles (205,000 ha) with a carrying capacity of 30,000 head. The property is bounded by the Leichardt and Albert Rivers. Property is all black soil country with Mitchell & Flinders grass, some flooded country with coolibah, the rest open with whitewood. There are no unusable areas.

Property is watered by 7 flowing bores, though two are slow flowing, so are pumped from 200 feet (60 metres). There are about 30 dams plus natural waterholes.

Property is fenced into 16 major paddocks and two bigger holding paddocks plus other small holing paddocks. There are five sets of yards.

Workforce is 12 at the busy time (March to October), down to a couple during the wet, plus contractor for weaner tailing (two rounds at 4 months total) and a grader contractor (with own grader) for a month each year.

Cattle Management:

Cattle on hand at the time of the visit (June 2006) were 5,075 #5 heifers, 3,086 #4 cows, and 16,517 cows #3 and older.

Mating is year-round. Branding number is based on the calendar year. For convenience, calving peak was defined on the basis of the brand number. Calving peak is taken to be in May, with half the calves born each side of the peak and just about everything born by October. Bulls are used at 3% to 4%, Brahmans and Charbrays. Bulls are bought at age two years (budget $3,000) and used for 5-6 matings (assume 20% of bulls are replaced each year, covering age and breakdown).

Heifers to be joined are put to the bull in January.

Branding is in two rounds – April/May/June and September/October. Not all calves are weaned at the first round – some are carried over to the second round and some second round calves are carried over to the first round next year. Weaners get some lick and a little bit of hay, but mainly are fed by being tailed out. Contractor tails out with dogs.

Supplement:

Lick cost is $300,000 - $400,000 total for the year, approx one third to weaners and heifers, and two thirds to joiners and cows. This is modelled at $10.50/weaner and $14/hd for all other females and bulls, as the weaners get molasses as well for 4-5 weeks.

Breeders

Heifers.

Vaccines etc:

- Botulism C&D @ $0.61/hd/yr for every beast, every year.
- Vibrio for bulls @ $3.29
- Vectamax for weaners @ $1.32

- Compudose for steer weaners @ $6/hd

Steer turnoff:

Weaned on the property, then transferred to a fattening property south of Charters Towers at 180 - 220 kg (model average 210) after the weaning process has been completed.

Heifer turnoff:

About 600 smaller weaner heifers (No. 6 in 2006) of an average weight of 120 kg, are transferred to fattening block immediately after round one and two of weaning i.e. drafts of 300 each round (total 10% of available weaner heifers). This year (2006) they will go in June and more will go in October, but the median month is June. However, the majority of the cull heifers (12 months older) are normally drafted in late July/August and transferred for finsihing. This year (2006) about 1500 – 1600 No.5 cull heifers will be transferred to the fattening block at curfew/paddock weight of 200-220Kgs.

All heifer spaying is done at the fattening block.

Current Cull-for Age Policy:

Cull for age cows have also been routinely transferred for fattening at the end of the second round muster. They are calved out over the wet and ensuing next dry season and sold as fat cows. However, unplanned pregnancies from neighbouring bulls has meant that it is taking up to three years to remove these older breeders from the herd once they reach the fattening block. It is felt that this delayed turn-off of the cull for age cows is taking up valuable space and is less profitable than fattening other “grower” cattle. The proposal is to fatten and sell these aged cows at the breeding block and to send only the young stock south for fattening.

For modelling purposes three scenarios will be compared: Cull cows transferred for fattening, cull cows sold immediately, and cull cows spayed and fattened for twelve months.

Branding & Deaths:

- Branding 72% across the board
- Deaths 4% in all females and steer weaners
- Deaths 2% in dry cattle

Bulls:

Buy 170 bulls/yr and sell 130. Modelling is based on 4% bull rate, 4% bull deaths and purchases of 20% of total bull herd each year. This produces purchases of 160 and sales of 130 each year (does not affect comparisons of strategies).

Scenario 1 - Cow culling without spaying, oldest group transferred for fattening.:

Replacement two-year old heifers are pregnancy tested and 20% empty culls are transferred for fattening. Fat dry cows are sold to meatworks from age 5 onwards - 10% of ages 5 to 8, 15% of age 9, and 20% of age 10. All fat cows are assumed sold after mating (i.e. cows are included in the bull calculation), in April.

First calf heifers, following removal of 20% empties, are assumed to wean 85% from the remaining pregnant cows (= 68% of the original number mated).

Age cull is currently at 10 or 11 years but will come back to 10 in future. Modelling assumes culling at 10 (spays will be sold at 11). Age culls are taken away from the bulls at the second round (though some bulls get back in), and fat cows are sent away the following year in April.

- Take out anything killable and send to meatworks (30%) (420 kg @ $1.60 less $5 levy & $40 freight)
- Wean everything – expect 20% of the total to have calves. For modelling, shift these calves back on to the next oldest group.
- Send the 70% non-killable for fattening (330 kg @ $1.30 – The fattening depot pays transport) – expect 30% of the original number (43% of cows shipped) either to go down with small calves born over the wet (20%) or to calve out down there (10%).

Overall value of 10 yr old cows is net $483.

Scenario 2 - Cow culling without spaying, oldest group sold to meatworks:

Process will be:

- Take out anything killable and send to meatworks (30%) (420 kg @ $1.60 less $5 levy & $40 freight)
- Wean everything – expect 20% of the total to have calves. For modelling, shift these calves back on to the next oldest group.
- The 70% non-killable formerly sent to the fattening depot are now sold on site to meatworks in April. Of these 10% (i.e 7% of the original number) are allowed as buyer rejects, too risky to truck, and are written off (shot). The rest (63% of original) are valued at 340 kg @ $0.65 less transaction levy $5 = $235.

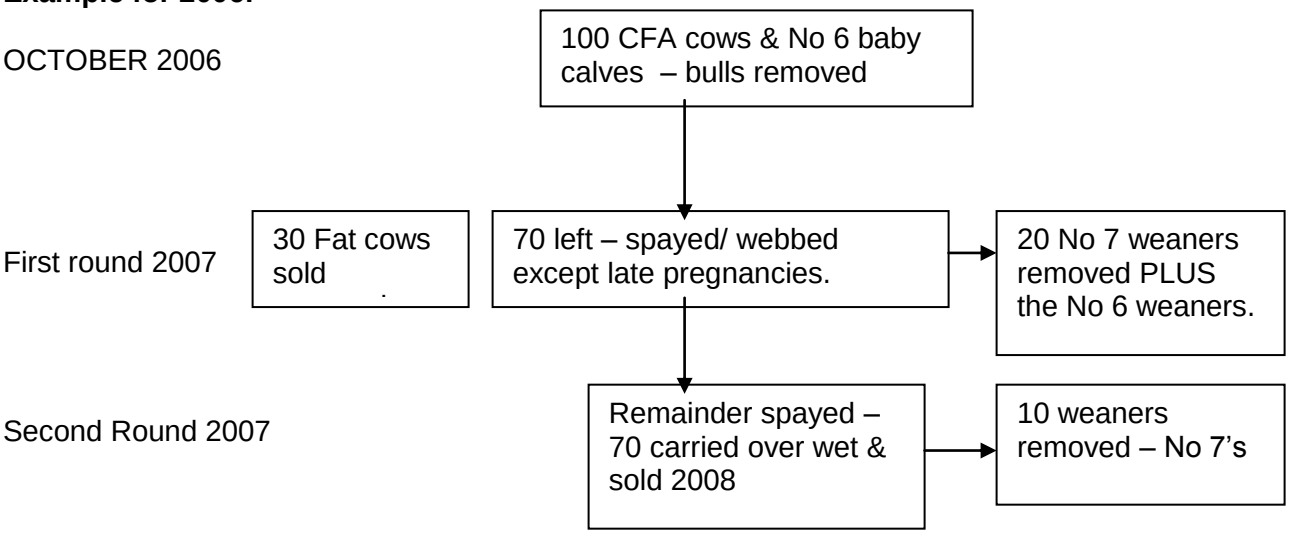
Overall value for 10 yr old cows (including the 7% with nil value) is net $328.

Scenario 3 - Cow culling with spaying:

Process will be:

- Take out anything killable and send to meatworks (30%) (420 kg @ $1.60 less $5 levy & $40 freight)
- Wean everything – expect 20% of the total to have calves. For modelling, shift these calves back on to the next oldest group.
- The 70% non-killable formerly sent to fattening depot are now spayed in two rounds, leaving those heavily in calf to calve out before being spayed. Approx half the pregnancies are lost, leaving 15% of the original number (21.5% of the 70%) to wean calves. For modelling, these calves are added to the year-before group (along with the 20% weaned at spaying).

Example for 2006:



Values for 10 yr old cows is net $627, spayed or unspayed.

Modelling is based bulls out at second round (Sept/Oct), selling fats the following April, and spays the April after that.

Spaying cost is $5/hd and death rate for spayed cows is 4% for the year.

Spayed cows are assumed sold at the same weight as normal fat cows (420 kg curfew weight). The first non-spay scenario assumed old cows were sent to fattening depot at 330 kg (curfew), so the spayed weights require a gain for the year of 90 kg.

Heifer Spaying:

We have not considered the role of spaying in heifer turnoff. In the present context it was not an issue since as cull heifers were transferred to the bullock depot where they were then spayed. Spaying heifers was considered necessary to avoid the risk of their falling pregnant to straying bulls from neighbouring properties.

Modelling Notes:

In **AECalc** weights are as far as possible paddock weights.

Curfew weights used in **Prices** are approx 8% less.

In **AECalc,** weaner heifer turnoff month is not specified, so defaults to the rating boundary, May, rather than July (indicated in interview). This is because AECalc will not accept a July weaner turnoff for a May rating boundary. The error will be small (total AE underestimated by about 15).

Paddock weights\curfew weights are assumed thus:

- Weaners 130/120
- Yearling heifers 220/200
- Yearling steers 230/210

- Two yr old empty heifers 280/260
- Mature cows unspayed 430/395 – sale wt based on 30% @ 330, 70% at 420 (combines all ages 3 yrs plus)
- Mature cows spayed - fat cows & spays 460/420
- Bulls 800/700

Median sale months in **AECalc** are shown thus:

- Weaner heifers - #6 in 2006 – May (constrained by model limitations)
- Yearling heifers - #5 in 2006 – August
- Two year old heifers after preg test - #4 in 2006 – August
- Mature cows – May (actual is April – constrained by model limitations)
- Spayed cows – May (actual is April – constrained by model limitations)
- Yearling steers - #5 in 2006 - June

The error from showing cows sold a month later than actual will be a total overestimate of about 190 AE (completely insignificant against 28,000 AE).
In **Bcowplus**, cow culling age was taken to be 10 yrs. Actual culling age is currently 11, but with the intention of coming back to 10. Using 10 yr culling age allows the spayed cows to be run out one year to sale at 11 yrs (the oldest sale age allowable in **Bcowplus***).*

The model assumes cows are sold before calving, whereas with continuous mating, some cows will calve out pre-sale. In the non-spaying scenarios this was about 20% of cull-for-age cows calving out at 10 yrs. Since this could not be modelled as calves from 10 yr old cows, the calves were shifted to the 9 yr old group (19% of a slightly larger number), making the nominal weaning % for 9 yr olds 72% (actual) + 19% (shifted from 10 yr olds) = 91% (see calculations in the Notes section in the **Bcowplus** files).

In the spaying scenario there were even more calves, since the spayed cows (which would otherwise have calved after sale or after transfer for fattening) also have some calves. These extra calves comprised 20% before spaying (as for non-spaying) plus another 15% after spaying, total 35%. These were attributed to the 9 yr old cows to ensure their inclusion, being expressed as 33% of the slightly larger number of 9 yr old cows mated and retained, making the nominal weaning % for 9 yr olds 72% (actual) plus 33% (shifted from 10 yr olds) = 105% (see calculations in the Notes section in the **Bcowplus** files).

The 07/07/2006 round of modelling indicates the following gross margins (GM), assuming a culling (or spaying) age of 10 yrs, and a herd of 28,000 AE:

5. Sell fat cows (30%) and transfer balance for fattening – GM $3.803 m/yr
6. Sell fat cows and stores –GM $3.630 m/yr
7. Sell fat cows, spay other 70% for sale following year - GM - $3.860 m/yr

This suggests that the spaying strategy is an effective replacement for the former policy of transferring aged cows for finishing. Relative to selling the non-meatworks portion of the old cows on the property, the modelled gain from spaying is $230,000/yr .

The combined benefit to the station, relative to selling old cows off the 2 breeding properties, is modelled at $423,000 over a total herd of 60,000 AE. Total cows spayed on both places in this modelling exercise are 1,550/yr, representing a gain (GM) of approx $270/cow spayed, or $7 per total AE carried.

Overall Effect on Company:

The impact of management change on north west Queensland property will not tell the whole story, and indeed the change may still be worth making even if the station was worse off. The receiving station stands to gain from the change by releasing feed formerly used to calve out and finish old cows, using this feed for more profitable steers and cull heifers. We calculated that for these cull cows to be worth finishing at the fattening depot (before allowing for disruptions from straying bulls), their transfer price would need to be equivalent to the sale prices used for the “sell on station” scenario, i.e. approx $0.65/kg with 10% rejection, or $0.60/kg across the board (see report on Charters Towers fattening block visit.)

The calculated gain from spaying versus selling on property at $0.65/kg (with 10% rejection) therefore also covers the benefit to the fattening depot of not tying up feed finishing old cows.

Heifer Spaying:

We have not considered the role of spaying in heifer turnoff. In the present context it was not an issue for either the Barkly Tableland or the gulf property since the spaying of heifers occurred after transfer. Here it was deemed necessary to spay heifers to avoid the risk of their falling pregnant to straying bulls from neighbouring properties.

Modelling Results:

	Old Cows to fattening	Old Cows Sold	Old Cows Spayed
Total adult equivalents	28000	28000	28000
Total cattle carried	36650	36650	36477
Weaner heifers retained	6225	6225	6110
Total breeders mated	20693	20693	20407
Total breeders mated & kept	18298	18298	17766
Total calves weaned	13827	13827	13579
Weaners/total cows mated ..	66.82%	66.82%	66.54%
Wnrs/cows mated and kept	75.57%	75.57%	76.43%
Overall breeder deaths	4.00% 4.00%	4.00%	
Female sales/total sales %	46.45%	46.45%	46.37%
Total cows and heifers sold	5757	5757	5634
Maximum cow culling age	10	10	11
Heifer joining age	2	2	2
Weaner heifer sale & spay	9.96%	9.96%	10.00%
One yr old heifer sales % .	26.60%	26.60%	27.40%
Two yr old heifer sales % ...	20.00%	20.00%	20.00%
Total steers & bullocks sold	6637	6637	6518
Max bullock turnoff age	1	1	1
Average female price	$421.41	$393.61	$445.46
Average steer/bullock price	$357.00	$357.00	$357.00
Capital value of herd	$16,336,491	$16,336,491	$16,378,243
Imputed interest on herd val.	$1,633,649	$1,633,649	$1,637,824
Net cattle sales	$4,795,558	$4,635,503	$4,836,714
Direct costs excluding bulls	$610,835	$610,835	$600,327
Bull replacement	$382,071	$382,071	$376,790
Gross margin for herd	$3,802,652	$3,642,597	$3,859,596
GM after imputed interest ...	$2,169,003	$2,008,948	$2,221,772
GM per adult equivalent	$135.81	$130.09	$137.84
GM/AE after interest	$77.46	$71.75	$79.35

Appendix 8: Central Highlands (Qld) Case Study.

Central Highlands Fattening Study August 3, 2006

Bill Holmes (DPI&F), Geoff Niethe (MLA)

Property Description:

Property area is 96,000 acres (38,400 ha) of which 80% is cleared and sown to Buffel grass. Original vegetation comprises brigalow, softwood scrub, Reid River box, bendee, gidgea, and some lancewood ridges.

Safe carrying capacity is approx 9,000 head (8,000 if including old cows), but can temporarily rise to as much a 12,000 for a short period during the wet.

Property is fenced into 26 main paddocks with dams and open waterholes on natural waters. Property has two sets of yards.

Staff – no information collected.

Typical landscape from the highest hill on the property..

Purpose of Visit:

The company breeding properties on the Barkly Tableland and the in north west Gulf country of Queensland have already been visited and estimates made of herd profitability with and without access to finishing cull cows on this property. These estimates were compared with spaying and finishing cull cows on the northern properties. The argument was advanced that the benefits of spaying and finishing on the home properties understated the total benefits, since the fattening block

also benefited by freeing up feed for steers and cull heifers, which were presumed to be more profitable than cull cows.

The purpose of this visit was to assess the comparative profitability of the various classes of cattle – steers, heifers and cull cows – that could be finished here. Profitability is compared as gross margin (GM) per adult equivalent (AE).

GM is a measure of profit before taking out the fixed costs, which are presumed to be the same regardless of the type of animal carried. Differences in GM will reflect exactly the differences in net profit. The AE is a measure of feed consumed, so selecting cattle to be finished on the basis of GM/AE will ensure maximum profit for the amount of feed available.

Production System & Cattle Management:

This central highlands fattening block is used for backgrounding and fattening cattle from other company properties. In the past, there have been some purchased cattle fattened on the property. Conversely, during drought (years) steers had to be held back on the breeding properties as there was no feed for them.

Classes of cattle transferred in are:

- Cull weaner heifers (600/yr) from the gulf, transferring at 120 kg (curfew weight at place of origin). These are held 12 months then spayed and grown for another 12 months to feedlot weight (345 kg).

  Total time on property is 24 months. Transfer price is $1.50/kg ($180) plus freight ($42.60). Lick cost for two yrs is assumed to be $4.80. Sale price as per company budgets is $560 on property after all costs ($3.25/kg dressed or $1.62 live). For weaner heifers growing from 120 kg to 345 kg over two years, estimated GM/AE/year is $327.62.

- Yearling heifers (3,000/yr) from the gulf and the Barkly, transferred July/August at 200 kg curfew weight at departure. Transfer price is $1.50/kg ($300) plus freight ($52.10), and subsequent lick cost $4.80. Time on property was estimated on the assumption of spaying Feb/March (7 months after arrival), then sold or transferred 12 months later at feedlot entry weight of 345 kg (total 19 months). In subsequent discussions this was reduced to a total of 14 months from arrival to exit.

  Assuming actual total time on property of 14 months and sale price the same as for the first class, estimated GM/AE/year for yearling heifers growing from 200 kg to 345 kg is $264.65.

- Empty two year olds from the gulf and the Barkly, transferred at 260 kg at $1.50 plus freight ($58.62) and lick cost ($2.40), to be transferred to feedlot after 12 months at 380 kg and $650 net ($3.42/kg dressed or $1.71 live).

  Estimated GM/AE/year for empty two yr old heifers growing from 260 kg to 380 kg over 12 months is $274.18.

Weighted average GM/AE for all heifer classes grown out is about $270/AE/yr, for about 60% of the carrying capacity of the property.

- Weaner steers from the gulf and the Barkly transferred at 190 kg at $1.70/kg ($323) plus transport ($52.10) and lick $4.80 for two years. Time on property is two years to achieve Jap Ox weight of 550 kg and price of $900 net ($2.98/kg dressed or $1.64 live).

  Estimated GM/AE/year for weaner steers fattening to Jap Ox is $315.08.

Overall weighted average GM/AE for this central highlands property, assuming 60% heifers and 40% steers at the above GMs would be about $290/AE/yr.

A weighted average GM/AE for heifers and steers from the gulf and the Barkly.

These calculations were performed in the “Bullocks” program. The following calculations on breeders are performed in the “Destock” program. See screen dumps of summary sections of both sets of calculations.

- Breeders are culled from gulf and the Barkly, at ages in excess of 10 years, though the plan is to reduce culling age to 10. Fat cows (30%) are removed and sent to meatworks. Another 20% transfer down with small calves, 10% calve out after arrival, and 40% arrive empty and stay empty. This assumes that neighbours bulls do not get in, which they do, and which upsets the calculations as presented.

Photos of the ‘cull for age’ cows transferred for fattening.

The three transferred groups are started at the same weight (330 kg) and price ($1.30/kg = $429) plus freight ($78.16), but lick cost is varied according to time on property ($2.40, $3.60 or $4.80/hd). Time taken to finish depends on getting the weaners off each group but varied from 12 to 22 months for the cows. Weaners are valued off at age six months, weight 170 kg and price $1.85/kg (equivalent to the landed cost of weaners from the Gulf and the Barkly Tablelands. Calculated GM/AE in Destock are $112.74, $302.64 and $203.98, but these should not be considered individually since a uniform starting weight for cows is used (assumed correct as an average but not for the groups individually). If starting weights appropriate for pregnancy and lactation status (though still averaging 330 kg) were used, the GM/AE for the groups would be more nearly equal. Overall GM for the cull cows will not be affected by how the 330 kg average is spread across the groups.

Overall GM/AE/year for cull cows is $180.03, based on 40/70 dry and empty ($112.74), 20/70 arriving with calves ($302.62) and 10/70 calving after arrival ($203.98).

This result from the breeders indicates that feed on this fattening block would be better used for other classes of stock returning higher GM/AE/yr, with steers growing and fattening to Jap Ox showing $315, and heifers growing out to feedlot entry showing an overall average of $270, compared with old cows at $180. This is before allowing for the problems of cows getting back in calf to straying neighbours' bulls.

These breeder results come from a transfer price of $1.30/kg. If these cows are not transferred to the central highlands, the price available back on the breeder properties in the gulf and on the Barkly Tablelalnds is assumed to be $0.65 for the saleable portion, and nil for a 10% rejection – effectively about $0.60/kg for the lot. If the calculations of GM/AE on cull cows at the fattening block are repeated for a transfer price of $0.60/kg the outcomes are very different – GM for cull cows $216.66, $490.40 and $330.95, or $311.20 weighted average.

If this fattening block has the option of taking on more steers instead of these old cows, then for the cows to be worth taking they need to be priced ex property of origin at about $0.60/kg (equivalent to $0.65 with 10% rejection).

This legitimises the comparison of the spaying option on the breeder properties in the gulf and on the Barkly Tableland with sale-on-property of old cull cows at $0.65 with 10% rejection, or $0.60 without the rejection. Comparing on this basis effectively takes into account the benefit of not inflicting these old cows on the fattening depot.

The two paragraphs above provide the additional information and insight that was required from the central highlands visit to ensure that the analysis of the spaying option on both the north west Queensland gulf property and the Barkly Tableland property gives a true picture of whole-of-company impact.

BULLOCKS - [BULLOCKS.BWB]

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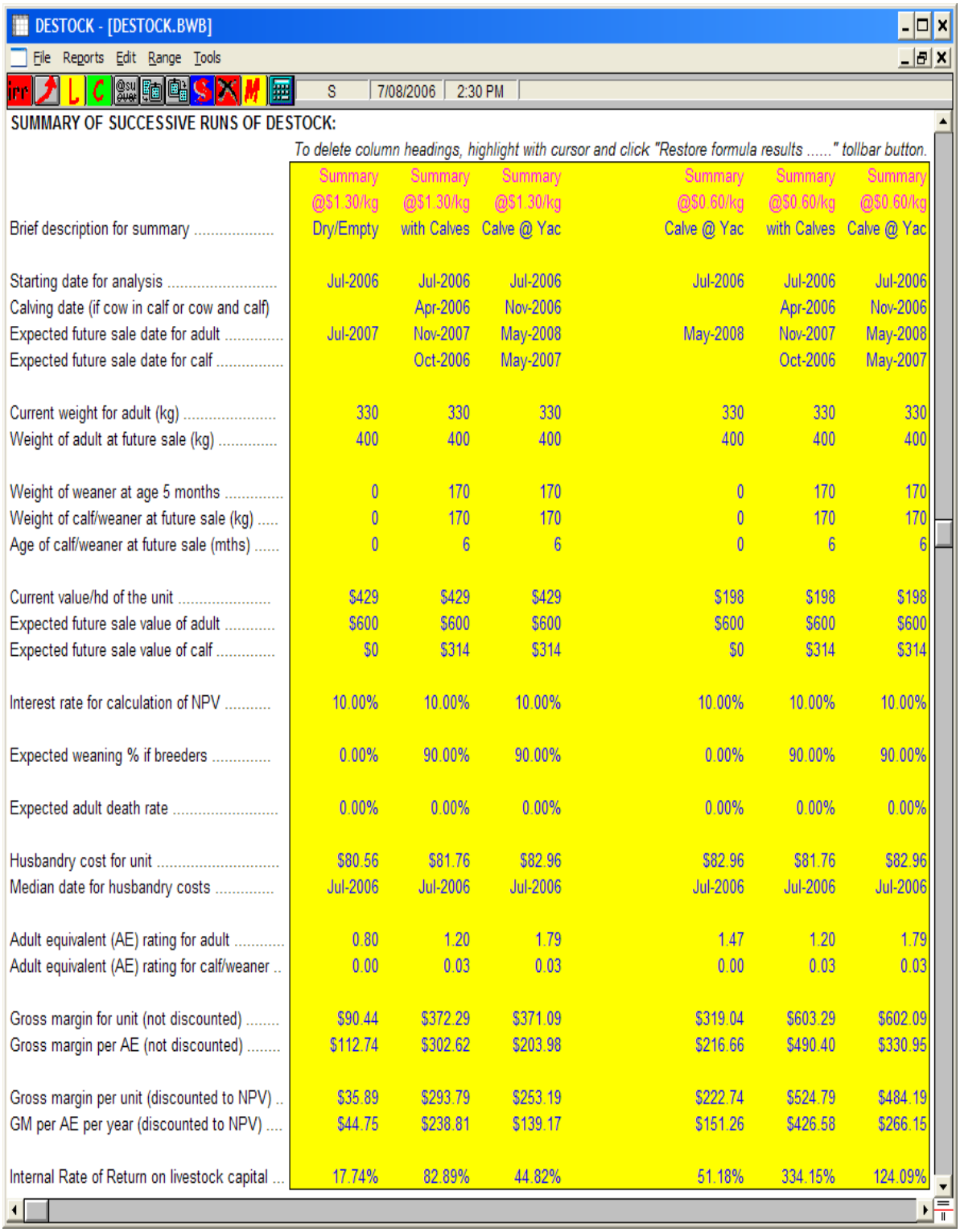
SUMMARIES OF SUCCESSIVE RUNS OF BULLOCKS:

	Weaner Heifers	Yearling Heifers	Empty Heifers	Wnr Strs to Jap Ox
Purchase weight (paddock)	120	200	260	190
Purchase weight (traded)	120	200	260	190
Purchase price/kg landed	$1.50	$1.50	$1.50	$1.70
Purchase price/hd landed	$180	$300	$390	$323
Sale weight live (paddock)	345	345	380	550
Sale weight live (traded)	345	345	380	550
Sale weight dressed	172	172	190	302
Dressing %	50%	50%	50%	55%
Sale price/kg live	$1.62	$1.62	$1.71	$1.64
Sale price/kg dressed	$3.25	$3.25	$3.42	$2.98
Sale price/hd net	$561	$561	$650	$901
Average weight for AE calcn	232	272	320	370
AE standard (kg)	455	455	455	455
Calculated AE rating	1.02	0.75	0.70	1.63
Start date	01-Jul-2006	01-Jul-2006	01-Jul-2006	01-Jul-2006
End date	30-Jun-2008	30-Sep-200	30-Jun-2007	30-Jun-2008
Days on forage	730	456	364	730
Average daily gain (paddock wt)	0.31	0.32	0.33	0.49
Mortality %	1.00%	1.00%	1.00%	1.00%
Variable cost/hd	$47.40	$57.00	$61.00	$57.00
Interest rate	10.00%	10.00%	10.00%	10.00%
Sensitivity increment - sale price	$0.10	$0.10	$0.10	$0.10
Sensitivity increment - buy price	$0.10	$0.10	$0.10	$0.10
Gross margin/beast purchased	$327.62	$198.02	$192.30	$512.44
Gross margin per AE/yr	$320.57	$264.65	$274.18	$315.08
Gross margin per AE/mth	$26.71	$22.05	$22.85	$26.26
GM/AE/yr after interest	$244.01	$188.51	$196.38	$236.84
GM/AE/mth after interest	$20.33	$15.71	$16.37	$19.74
Return on investment % per yr .	41.87%	34.76%	35.24%	40.27%

Worksheet / Explanations



DESTOCK - [DESTOCK.BWB]

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SUMMARY OF SUCCESSIVE RUNS OF DESTOCK:

To delete column headings, highlight with cursor and click "Restore formula results ....." tollbar button.

Brief description for summary	Summary @$1.30/kg Dry/Empty	Summary @$1.30/kg with Calves	Summary @$1.30/kg Calve @ Yac	Summary @$0.60/kg Calve @ Yac	Summary @$0.60/kg with Calves	Summary @$0.60/kg Calve @ Yac
Starting date for analysis	Jul-2006	Jul-2006	Jul-2006	Jul-2006	Jul-2006	Jul-2006
Calving date (if cow in calf or cow and calf)		Apr-2006	Nov-2006		Apr-2006	Nov-2006
Expected future sale date for adult	Jul-2007	Nov-2007	May-2008	May-2008	Nov-2007	May-2008
Expected future sale date for calf		Oct-2006	May-2007		Oct-2006	May-2007
Current weight for adult (kg)	330	330	330	330	330	330
Weight of adult at future sale (kg)	400	400	400	400	400	400
Weight of weaner at age 5 months	0	170	170	0	170	170
Weight of calf/weaner at future sale (kg)	0	170	170	0	170	170
Age of calf/weaner at future sale (mths)	0	6	6	0	6	6
Current value/hd of the unit	$429	$429	$429	$198	$198	$198
Expected future sale value of adult	$600	$600	$600	$600	$600	$600
Expected future sale value of calf	$0	$314	$314	$0	$314	$314
Interest rate for calculation of NPV	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%
Expected weaning % if breeders	0.00%	90.00%	90.00%	0.00%	90.00%	90.00%
Expected adult death rate	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Husbandry cost for unit	$80.56	$81.76	$82.96	$82.96	$81.76	$82.96
Median date for husbandry costs	Jul-2006	Jul-2006	Jul-2006	Jul-2006	Jul-2006	Jul-2006
Adult equivalent (AE) rating for adult	0.80	1.20	1.79	1.47	1.20	1.79
Adult equivalent (AE) rating for calf/weaner ..	0.00	0.03	0.03	0.00	0.03	0.03
Gross margin for unit (not discounted)	$90.44	$372.29	$371.09	$319.04	$603.29	$602.09
Gross margin per AE (not discounted)	$112.74	$302.62	$203.98	$216.66	$490.40	$330.95
Gross margin per unit (discounted to NPV) ..	$35.89	$293.79	$253.19	$222.74	$524.79	$484.19
GM per AE per year (discounted to NPV)	$44.75	$238.81	$139.17	$151.26	$426.58	$266.15
Internal Rate of Return on livestock capital ...	17.74%	82.89%	44.82%	51.18%	334.15%	124.09%

Modelling Results from the two breeder places.:

The 07/07/2006 round of modelling indicates the following gross margins (GM), assuming a culling (or spaying) age of 10 yrs, and a combined herd of 60,000 AE:

8. Sell fat cows (30%) and stores at $0.65/kg, with 10% rejection, and average store cow weight of 340 kg - GM $8.078 m/yr

9. Sell fat cows, spay other 70% for sale following year - GM - $8.551 m/yr

10. Benefit from spaying option = $0.423 m/yr.

If, as determined by comparisons of fattening/backgrounding options on the fattening property on the central highlands, the “true” value (based on opportunity cost) of old cows is $0.60/kg (roughly equivalent to $0.65 with 10% rejection as used in the spay versus no spay comparisons on breeder properties), the benefit to pastoral company of the spaying option is calculated at $423,000/yr. These benefits are calculated on the assumption spaying does not increase overall numbers (AE) carried.

The modelling indicates 1,550 cows/yr are spayed, indicating a benefit of approximately $270 per cow spayed, or $7/AE carried on the two properties.

Wider Implications:

The magnitude of these benefits suggests that other options requiring infrastructure might also be profitable if spaying is not acceptable, such as more secure areas to hold empty but non-spayed cows. We did not investigate other options such as a more aggressive policy of removing fat cows at an earlier age to reduce the numbers of problem cull cows. Earlier culling as cows come in fat may be possible at the branding rate used in this modelling (72%), though it would mean reduced opportunities for heifer culling, and it does run the risk of selling pregnant cows and keeping the empties. Reduced heifer culling in favour of selling more aged and middle-aged cows will be financially advantageous while the value of fat cows substantially exceeds the value of heifers, but it will be subject to some concerns about the need to cull heifers for herd improvement.

Other options may include marketing cows to cross-breeders, or sale of PTIC cows. An obstacle to the wider adoption of terminal sire cross-breeding for hybrid vigour has been that a self contained unit typically has about two thirds of the herd tied up in breeding the mothers for the cross-breds. Development of supply chains for Brahman or predominantly Brahman cows for cross-breeders may both facilitate the wider adoption of cross-breeding and help solve the cull cow problem. This option would certainly require selling age culls younger than 12-14 years.

The issue of spaying heifers has not been addressed, however it would be difficult to imagine a backgrounding operation requiring non-pregnant heifers, surrounded by properties with bulls. The question of balance in sales of surplus females does however impinge on this question, since the option of reducing heifer sales to accommodate increased sales of fat cows earlier in their lives would reduce the numbers of heifers having to be dealt with, and in the case of this fattening property might open the way for the fattening of greater numbers of more profitable steers.

7.8 Appendix 9: Summary Sheet of 6 Bcowplus studies

	Pilbara		Kimberley		VRD		Barkly		NW QLD Gulf		Alice Springs	
	With Spaying	Without Spaying	Spay Aged & Some Heif	Sell @ Cullin Without Spay	Old Cows Spayed	Old Cows Unspayed	Old Cows Spayed	Old Cows Sold	Old Cows Spayed	Old Cows Sold	Spay	No Spay
Total adult equivalents	17000	17000	8000	8000	18000	18000	32000	32000	28000	28000	10400	10400
Total cattle carried	19044	19038	9059	9127	20805	20771	40286	40451	36477	36650	11584	11735
Weaner heifers retained	3342	3565	1586	1664	3177	3299	6748	6870	6110	6225	1936	2176
Total breeders mated	8354	9759	4860	5492	8341	8676	22537	22838	20407	20693	5026	5245
Total breeders mated & kept	8354	8913	4860	5101	7896	8200	19621	20196	17766	18298	5026	5245
Total calves weaned	6683	7130	3172	3329	6354	6599	14996	15261	13579	13827	4159	4352
Weaners/total cows mated ..	80.00%	73.06%	65.26%	60.61%	76.18%	76.06%	66.54%	66.82%	66.54%	66.82%	82.76%	82.98%
Wnrs/cows mated and kept	80.00%	80.00%	65.26%	65.26%	80.47%	80.47%	76.43%	75.57%	76.43%	75.57%	82.76%	82.98%
Overall breeder deaths	3.28%	3.25%	2.67%	2.67%	3.24%	3.24%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%
Female sales/total sales %	47.62%	47.93%	47.71%	47.84%	47.65%	47.75%	46.37%	46.45%	46.37%	46.45%	46.42%	46.56%
$$ Female sales as % of turnoff	37.21%		42.76%		47.52%		50.39%		51.89%		44.66%	
Total cows and heifers sold	2999	3239	1414	1492	2784	2903	6223	6354	5634	5757	1768	1861
Maximum cow culling age	11	10	11	11	11	10	11	10	11	10	8	8
Heifer joining age	2	2	1	1	2	2	2	2	2	2	1	1
Weaner heifer sale & spay	0.00%	0.00%	0.00%	0.00%	0.01%	0.01%	10.00%	9.96%	10.00%	9.96%	6.89%	0.02%
One yr old heifer sales % .	44.65%	46.20%	24.89%	48.89%	0.00%	0.00%	27.40%	26.60%	27.40%	26.60%	0.00%	0.00%
Two yr old heifer sales % ...	13.00%	19.00%	0.00%	0.00%	10.00%	10.00%	20.00%	20.00%	20.00%	20.00%	0.00%	0.00%
One yr old heifer spay %	0.00%	0.00%	24.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	40.00%	40.00%
Two yr old heifer spay %	0.00%	0.00%	0.00%	0.00%	28.07%	28.07%	0.00%	0.00%	0.00%	0.00%	25.00%	25.00%
Total steers & bullocks sold	3298	3519	1550	1627	3058	3176	7198	7325	6518	6637	2041	2135
Max bullock turnoff age	2	2	2	2	2	2	1	1	1	1	1	1
Average female price	$375.04	$299.42	$449.91	$388.84	$546.12	$491.41	$459.30	$408.40	$445.46	$393.61	$516.75	$501.67
Average steer/bullock price	$575.48	$575.48	$549.45	$549.45	$549.13	$549.13	$391.00	$391.00	$357.00	$357.00	$554.64	$554.64
Capital value of herd	$6,978,799	$6,857,070	$3,701,928	$3,673,265	$8,789,014	$8,765,688	$18,724,066	$18,687,033	$16,378,243	$16,336,491	$4,362,886	$4,319,403
Imputed interest on herd val.	$697,880	$685,707	$370,193	$367,326	$878,901	$876,569	$1,872,407	$1,868,703	$1,637,824	$1,633,649	$436,289	$431,940
Net cattle sales	$3,022,679	$2,995,043	$1,488,241	$1,474,238	$3,204,303	$3,175,478	$5,672,575	$5,459,246	$4,836,714	$4,635,503	$2,045,595	$2,117,884
Direct costs excluding bulls	$97,573	$104,102	$62,208	$62,379	$133,604	$130,126	$563,870	$573,819	$600,327	$610,835	$76,888	$79,008
Bull replacement	$72,317	$84,484	$67,483	$76,255	$60,069	$62,483	$417,572	$423,152	$376,790	$382,071	$75,495	$78,788
Gross margin for herd	$2,852,789	$2,806,456	$1,358,550	$1,335,604	$3,010,630	$2,982,868	$4,691,133	$4,462,276	$3,859,596	$3,642,597	$1,893,212	$1,960,088
GM after imputed interest ...	$2,154,909	$2,120,749	$988,358	$968,278	$2,131,729	$2,106,300	$2,818,727	$2,593,572	$2,221,772	$2,008,948	$1,456,924	$1,528,148
GM per adult equivalent	$167.81	$165.09	$169.82	$166.95	$167.26	$165.71	$146.60	$139.45	$137.84	$130.09	$182.04	$188.46
GM/AE after interest	$126.76	$124.75	$123.54	$121.03	$118.43	$117.02	$81.05	$86.70	$79.35	$71.75	$140.09	$146.93

7.9 Appendix 10: Livestock Market Information ex Landmark.

Livestock Market Information

Live Export Indicators - Indicative Prices Quoted

Week ending Sunday 24th December 2006

LANDMARK				Broome	Darwin	Fremantle	Port Hedland	Geraldton
Philippine	Heifer	Light	290-330	-	-	-	-	-
Philippine	Steer	Light	--	-	-	-	-	-
Malaysian	Steer	Light	280 - 380	-	-	-	-	-
Malaysian	Steer	Heavy	320 - 420	-	-	-	-	-
Malaysian	Heifer	Light	280 - 360	-	-	-	-	-
Malaysian	Heifer	Heavy	360 +	-	-	-	-	-
Nth African	Steer	Heavy	360 -500	-	-	-	-	-
Sth African	Steer	Heavy	360 -500	-	-	-	-	-
Indonesian	Steer	Light	280 - 330	-	$1.85	-	-	$1.60
Indonesian	Steer	Heavy	380 - 450	-	$1.75	-	-	$1.45
Indonesian	Heifer	Light	260 - 360	-	$1.70	-	-	$1.45
Indonesian	Heifer	Heavy	340 +	-	$1.60	-	-	$1.30
Export Cows	Female	-	350 +	-	$1.30	-	-	$1.00
Export Bulls	Bulls	Heavy	-	-	$1.35	-	-	$1.20
Export Bulls	Bulls	Light	<250kgs	-	-	-	-	-
Israel	Bulls	Euro X	150 - 250	-	-	-	-	-
Israel	Bulls	Pastoral	150-250	-	-	-	-	-

7.10 Appendix 11: Calculator:-

SPAY FEMALE CALCULATOR:-

Insert all appropriate data in the white boxes
(NB: Fill all the white boxes with "0" where there are no numbers, wt. or $/Kg)

Expected total annual turnoff prior to spaying		**3**
Expected weaning percentage for herd		**4**

Expected female sales of all categories prior to spaying:-

	Number		*Wt. in Kgs*		*$/Kg Lwt*		
Weaner heifers sales		Head @		Av Weight		@ Cents/Kg live	
Cull heifer sales		Head @		Av Weight		@ Cents/Kg live	
Cull Cow sales		Head @		Av Weight		@ Cents/Kg live	
Cull for Age cows		Head @		Av Weight		@ Cents/Kg live	
Total Females Sold **(A.)**							**(B)**

Average Female price ---------- (B/A) **1**

Expected female sales of all categories after spaying

Expected female price of spayed females:-

	Number		*Wt. in Kgs*		*$/Kg Lwt*		Total $
Cull heifers		Head @		Av Weight		@ Cents/Kg live	
Cull Cows **(G)**		Head @		Av Weight		@ Cents/Kg live	
Spayed female sales **(C.)**							**(D)**

Expected female sales of entire females after spaying:-

	Number		*Wt. in Kgs*		*$/Kg Lwt*		Total $
Weaner heifers sales		Head @		Av Weight		@ Cents/Kg live	
Cull heifer sales		Head @		Av Weight		@ Cents/Kg live	
Cull Cow sales		Head @		Av Weight		@ Cents/Kg live	
Cull for Age cows		Head @		Av Weight		@ Cents/Kg live	
Entire female sales **(E)**							**(F)**

Total Female Sold **(C + E)** (NB: This total should equal the total for the non spay option (A))

Average Price of females if spaying option implemented ---------- (D+F)/(C+E) **2**

Expected Increase in average price of females sold with spaying option	**(2-1)**	**5**
Percentage increase in average price of females	**(5 / 1)**	**6**
Projected decrease in turn off after spaying of cull cows	***(G x 4)*** */ 1.5*	**7**
Percentage decrease in total turnoff	**(7 / 3)**	**8**
Projected Change in Gross Margin/Adult Equivalent	**(6 / 8)**	

ReadMe

This simple spreadsheet model was developed to provide beef breeders with a approximation as to whether spaying cull females may be an option that they could consider in an attempt to improve the profitability of their enterprise. It has been developed from the outcomes of an MLA funded project on "The cost benefits of spaying." In this study which was undertaken using the Bill Holmes spreadsheet model, BreedcowPlus, a close relationship between the extra value that spayed animals had on the average price of the total females sold and the decreased total sales that ensued from running less breeding cows in the herd was established. This was reflected in a change in the Gross margins/ Adult Equivalent. All comparisons were done at exactly the same carrying capacity in total adult equivalents for the enterprise.

The calculator is limited in its capability due to the simplicity of its structure. It assumes that the animals to be spayed are sold 12 months later and if cull heifers aren't spayed, they too would be sold 12 months later without having produced a weaner. If the results from the calculator demonstrate a positive change in the GM/AE, then users are strongly urged to do a detailed analysis using BreedcowPlus on their herd prior to implementing any changes in their cull cow policy. This can be undertaken by enrolling in a BreedcowPlus course or utilizing the services of an extension officer or consultant that is familiar with the package. By modeling the breeder herd on BreedcowPlus the GM/AE can be examined before and after spaying and if there is an increase in the GM/AE with the spaying scenario, then this would suggest that spaying would be a cost effective way of improving farm profitability.

Using the Calculator:

The cells where input is required into the calculator are in white. The data to inputted into the calculator should be a best estimate of what is expected from the property or actual data from the previous year. The only production index used in the calculator is weaning percent.

Total Turnoff = the total number of stock sold during the financial year. This includes all males, bulls, cows, heifers and weaners.

Weaning % = The number of weaners produced from the number of eligible breeding animals retained in the herd.

Female sales incorporates the relevant data on <u>all</u> the females sold during a year. There are spaces for weaner heifer sales right up to cull for age cows. If a particular category has not been sold eg weaner heifers, then "0" should still be inserted in each of the white input cells at "number", "weight" and "price/Kg". In setting up the calculator, the total number of females sold should be the same in each scenario as explained in the calculator. The reduction in total turnoff is derived from the total number of breeder cows to be spayed. An adjustment for adult equivalents is used to accommodate the additional feed requirements of the lactating cow.

GENERAL DISCLAIMER: **The MLA and authors of this program have taken all reasonable steps to ensure the accuracy of the outputs of this program within the context of available knowledge at the time. They are not responsible for any problems, damages or losses caused either directly or indirectly through the use of the program. The program should only be used to provide an indication to pursue the spay scenario in more detail using BreedcowPlus or some other such suitable model.**

7.11 Appendix : Location of properties visited in Spay project