UTILIZING ARTIFICIAL INSEMINATION IN COMMERCIAL BEEF HERDS UNDER EXTENSIVE CONDITIONS

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INTRODUCTION

Four years experience in using artificial insemination (AI) as a management aid in an extensive commercial beef herd has convinced me that the benefits are considerable. For example, in an owner-operated situation the cost of producing a calf using AI can be noticeably less than one resulting from natural mating. Secondly, expenses involved in a one-off crossbreeding experiment are significantly reduced. Thirdly, there is a marked quietening effect on range cattle through repetitive handling. Fourthly, there are the obvious advantages in venereal disease control. Lastly, and in my opinion the most significant, there is the ability to breed one's own genetically superior replacement bulls. As an interesting supplement I have collected detailed data on every cow inseminated since undertaking my first program. From the resulting computer data-base, trends have developed showing the effects of various factors, e.g. temperament, condition etc., on conception rates. These are described in this paper.

BACKGROUND

The property to which the following information and data applies is "Goonderoo", midway between Emerald and Springsure in the Central Highlands of Queensland. It consists of 5,500 hectares of basically duplex soils in the 625 mm rainfall zone. It is a cattle breeding property turning off store steers and heifers at approximately 16 to 20 months of age. Apart from a handful of studs, AI in this area has been generally regarded as a time-consuming exercise with little or no benefit to commercial herds. However, since my initial project four years ago, two friends have completed programs and others have shown interest. Others who have experimented but not continued with AI have made the mistake of not following up the program with performance evaluation or comparison.

PRACTICALITY OF A PROGRAM

I commonly hear doubts expressed about the practicality of setting up an AI program in an extensive situation. I didn't have the luxury of looking over my neighbour's fence because there was almost no commercial AI carried out in this area. However, I encountered no serious problems, although in subsequent years I have made various modifications. I had constructed 40 steel yard panels with which I designed a simple set of yards with a covered crush section, a tap delivering a clean water supply beside the crush and an old fridge at arms length from the operating position, in which I stored all inseminating equipment. I was able to utilize electric fencing to construct a long, narrow 35 hectare paddock with scattered trees that funnelled to the yards to facilitate easy mustering.

PROCEDURE

I enrolled in a five day AI course at a very affordable cost. With this experience, coupled with an excellent Inseminator Training Manual, I had the confidence to undertake a program. I bought the

necessary inseminating equipment from the AB Centre in Rockhampton along with the straws which were freighted out to me when I was ready to commence the program. I selected 30 maiden heifers aged approximately 22 months and weighing around 350 kg. I also included 12 dry cows of various ages. I ear-tagged the group with plastic tags displaying large, clear numbers. Prior to the program I found it helpful as a beginner to run the inseminating gun with an attached clean sheath through the cervix of each cow to boost my confidence. This also allowed me to detect any obvious abnormalities as well as familiarised the cows with the new yards and the procedure involved. I carried out the heat detection early morning and late evening on foot observing the cattle in groups and only yarding when there were cows to inseminate. As the group contained 50% Brahman blood I had to be particular with the early and late situation due to their tendency to "bull" for as little as ten or twelve hours. The only aid to heat detecting was the use of tail paint. This was NOT used as confirmation of heat - only as a possible indication. Those inseminated were restrained only by a rail placed behind them in the crush. This was to avoid any fighting associated with a head bail. Three weeks after the completion of the program a cover-up bull was introduced and five weeks later all cows were pregnancy tested. The reason for this time span was that it eliminates any confusion. At that time those that conceived were obviously positive at 8 weeks and over, while those in calf to the bull were still showing no signs at 5 weeks. I have used prostaglandin on occasions but only to speed up the program.

ADVANTAGES OF AI IN A COMMERCIAL SITUATION

Superior genetics for less cost

I have calculated that in my situation I am able to put an AI calf on the ground more cheaply than a naturally produced one. I am able to purchase semen from high quality bulls for $10 per straw so have used that figure in my calculations. For the natural mating figures I have used $3000.00 as I find I am able to buy adequate bulls for that sum. I am assuming that I will use that bull for four seasons at 3% (3 per 100 cows). These figures are typical for this area. I also assume that 80% of his cows will produce live calves and that he will return $800 when slaughtered. The cost of each calf is calculated at $20.75 (see Table 1). This figure is extremely conservative as a proportion of bulls die or break down, there is the two-way cartage of the bull as well as management costs including natural feed, supplementary feeding in dry times and structural damage resulting from bulls fighting.

Table 1. Costs of production of a live calf from natural mating on "Goonderoo" in 1991 (excluding interest on capital, maintenance and labour)

Cost of bull ($)	3,000
Return at slaughter ($)	800
Net cost ($)	2,200
No. of cows mated at 3%	33 per year
No. of seasons	4
Total no. of cows mated	132
No. of calves at 80% conception	106
Cost per calf ($)	20.75

For the calculation of costs of the AI calf I have used my own example from November 1991. My costs included the purchase of 100 straws, hire of the cylinder for one month, rail freight of the cylinder and the

purchase of 100 sheaths and 100 gloves. Costs of other inseminating equipment when calculated over its life are negligible per insemination. Under fairly adverse conditions and with limited experience, my success rate has been close to 60%. Using these figures, the calculated cost per calf is $18.80 (Table 2). I find that one person can handle 100 cows without employing labour and when liquid nitrogen becomes available in the area there will be a considerable saving by investing in my own cylinder. Incidentally, the bull concerned had a market value in excess of $30,000.

Table 2. Costs of production of a live calf from AI on "Goonderoo" in 1991 (excluding labour)

Cost of 100 straws at $10 each	($)	1,000
Cost of freight on cylinder	($)	15
Hire of cylinder for 1 month	($)	85
Cost of 100 sheaths	($)	10
Cost of 100 disposable gloves	($)	24
Total cost	($)	1,129
No. of calves at 60%		60
Cost per calf	($)	18.80

I must emphasise that this was a single person operation and I haven't included a figure for labour costs. Another criticism of the above figures might be that I made no allowance for the cost of prostaglandin in a synchronized program. These figures relate only to my own situation and I synchronize only a small proportion of the cows. Allowing for the fact that in a 10 day synchronized program a maximum of 75% of the group are injected and the drug costs $4.50 a shot, this could add $3.38 to each insemination. However, as mentioned earlier, the maintenance costs of a bull are so conservative that I am convinced that the AI calf would still be a cheaper proposition.

Crossbreeding for hybrid vigour and breed experimentation

There has been an upsurge of interest in crossbreeding for both of these reasons. Costs involved in a one-off crossbreeding situation are considerably reduced by the use of AI. To demonstrate my point I will once again use my own situation. Four years ago I was interested to experiment with a Limousine bull crossed over my Braford cows. I purchased 15 Limousin straws for the experiment but after evaluating the resulting calves, decided the cross wasn't suitable for my situation. The cost of the project using the above figures was $282. Had I purchased a reasonable Limousin bull for the experiment and then sold him after one season, my loss would have been considerable. Two way freight alone would have cost me in the vicinity of $282. Imagine the convenience of the AI system if I were to decide to trial six different European breeds over 100 of my Braford heifers. A telephone call to the Rockhampton AB Centre resulting in a consignment by rail of a cylinder containing the straws of six breeds in six separate buckets. The alternative would be to travel around the State buying six separate bulls at an exorbitant cost and then having to dispose of some or all after the trial. There is another distinct advantage of AI in the above situation which I think is generally overlooked. When comparing the performance of the offspring, the task is simplified by the fact that, particularly with a synchronized program, the calves will all be of a similar age.

Temperament

In this area, as in all the extensive cattle areas, temperament is a problem due to lack of consistent handling. The related costs in terms of reduced store prices, bruising, extra labour etc. are well documented. As I inseminate all of my maiden heifers each year there will come a time when all breeders in the herd will have been through a program. As I tend to concentrate on natural heat, my program covers about three weeks of repetitive contact, drafting etc. My herd has become so quiet that I am now able to single-handedly muster the property on a horse with the assistance of one dog, bearing in mind that 80% of the country is scrub and forest. Quiet cows raise quiet calves and my store steers attract a premium due to their good temperament.

Disease control

In some circles a myth exists which suggests that venereal disease causes little economic loss in the drier extensive areas. There has been a significant increase in vibriosis and trichomoniasis in this area over the last decade and local vets consider the problem is a serious one. The advantage of AI in the control of these diseases is obvious.

Breeding replacement bulls

The use of AI in breeding replacement bulls was largely covered earlier. Expanding on the topic, I have found an often ignored advantage. I purchased straws from 3 Braford bulls. They had contrasting characteristics in terms of eye pigmentation and hooding, bone, muscle, pizzle soundness etc. During insemination I was able to assess each cow as she came up the crush in terms of these qualities. If cow A stood up well as a prospective producer of a good bull but lacked in eye pigmentation I chose the straw from the bull with the strongest pigmentation.

There are considerable advantages in home-bred replacement bulls : being able to monitor performance; having direct control over their handling and hence temperament; preventing the introduction of disease; and significantly the fact that bulls raised together as calves present the owner with vastly reduced problems of bull fighting.

Terminal sires

A side benefit of breeding my replacement bulls is that due to their genetic superiority, the 95% or so male calves that are castrated perform better than my naturally-bred calves, e.g. in March 1992, I sold a consignment of 17 month old store steers in forward condition. The average weight was 367 kg but the AI steers averaged 386 kg. This raises the point of the advantage of using AI bulls as terminal sires. Based on the above weights, the AI bulls I use must be genetically superior to the live bulls I have been buying.

DATA RECORDING AND EVALUATION

As I found little data relating to AI in extensive commercial herds I decided to compile detailed information on every cow I inseminated over the proceeding years. I was interested to find out what effect various identifiable factors had on conception rates. On a personal computer I set up a database into which I entered the information (see Table 3).

Table 3. An excerpt from the 1991 database

COW NO.	SIRE	DATE	TIME	CONC	OP	COND	TEMP	PG	ACT
416	MC	NOV25	AM	Y	3	4	5	N	20D
104	CP	NOV25	PM	Y	4	3	4	N	4Y
121	TT	NOV26	PM	N	3	2	2	Y	3N

The abbreviations COW NO., SIRE, DATE, TIME are apparent; CONC indicates whether or not she conceived; OP refers to the degree of difficulty of the AI (1 = impossible to penetrate cervix, 5 = easy AI); COND is a condition score of the cow (1 = lean, 5 = fat); TEMP refers to her temperament (1 = very fractious, 5 = extremely docile); PG indicates whether or not she was injected with prostaglandin; ACT refers to bulling activity (1 = little activity, 5 = much activity over extended periods; OD applies when the cow was inseminated on detection, not 12 hours later as is the norm; Y indicates a cow was seen standing 12 hours previously and was still permitting mounting at time of AI and N means she was not allowing mounting at AI but was 12 hours previously. The database also has columns for pre-program and post-program weights and gestation period but for reasons of space they are not included here.

Table 4 shows the trends that have developed within the above data over a period of four years. It should be noted that at this stage the sample totals 221 animals so a larger sample would permit more definite conclusions.

Table 4. Factors affecting conception rates to AI

Temperament	% Pregnant	Condition	% Pregnant
Poor (1-2)	38	Poor (1-2)	31
Average (3)	63	Average (3)	51
Good (4-5)	62	Good (4-5)	68
Ease of operation		**Activity**	
Easy (1-2)	54	Non-active	60
Average (3)	60	Average	69
Difficult (4-5)	62	Very active	60
Cervix only (1)	53		
Time of AI		**Synchronized**	
AM	58	Yes	59
PM	60	No	59
AI on detection	67		
Standing on AI	53		
Not standing	58		

It is important to be aware of the four year average conception rate to undertand the significance of the above data. Although my overall rate is 67% for all the cows inseminated, a considerable number were reinseminated on their next cycle when they were seen to have returned to heat. The conception rate PER INSEMINATION has been 59%. This realistic figure must be used as the comparison for the above data. Cows that were reinseminated were entered a second time with a different tag number.

TRENDS IN FACTORS AFFECTING CONCEPTION

I would like to point out trends that appear significant. Score 1 and 2 temperament cows (poor temperament) have a noticeably reduced conception rate. Poor condition leads to poor conception rates, good condition to good conception rates. The sample of score 5 (fat) is too small to draw conclusions and has been grouped with score 4. In the ease of operation category it is interesting to note that the score 1's entered separately under cervix (cervix only) have only a 6% reduction in conception rates. Bulling activity appears to have little bearing on conception rates but interestingly, those inseminated early (OD - immediately after detection) seem to have a significantly better chance of success. Of particular interest is the fact that there are exactly the same results for those synchronised with prostaglandin as those that were not.

It has been suggested by Dennis Boothby of Wacol AB Centre that pre-program and post-program weights of participating cows be recorded as conception rates are more likely determined by the degree to which the cow is gaining or losing weight during the program rather than by her condition score. My database has been adjusted to accommodate this information and weights obtained from the last program have been entered, but as the sample was small I thought the results too inconclusive to document.