futurebeef

Department of **Agriculture, Fisheries and Forestry**

CQ BEEF

Better Economic and Environmental Futures

Issue 15 AUG 2012

Bundaleer legume trial results

Joe O'Reagain
Grazing Land Management Officer
Fitzroy Basin Association
07 4992 5417

Arcadia Valley beef producers Matthew and Maryellen Peart have achieved some interesting results from a legume establishment trial on their property *Bundaleer*. The Pearts have been trialing a range of legume establishment techniques in their buffel grass pastures and have also been exploring the use of animal impact to assist in seedling recruitment. Through collaboration with the Department of Agriculture, Fisheries and Forestry (DAFF) and the Fitzroy Basin Association (FBA) they have initiated a three-year trial program, partly funded by Meat and Livestock Australia (MLA).

Background

Matthew and Maryellen are active members of the Rolleston Beef Group and they, like many other producers within the region, are concerned about the maintenance of pasture productivity for the long term viability of their family operation. Many central Queensland producers have observed declines in the vigor and overall productivity of their buffel grass pastures during the last decade. DAFF Future Beef extension officer Peggy Rohan, who has worked closely with the Rolleston Beef Group, says that buffel grass run-down is leading to declining pasture yields and liveweight gains, and impacting on grazing productivity and profitability.

According to DAFF pasture agronomist Stuart Buck, the primary cause of pasture run-down is nitrogen tie-up in soil organic matter making nitrogen unavailable for plant growth. There are broadly three methods of addressing the problem: 1. mechanical disturbance of the soil, such as blade ploughing, 2. the addition of fertiliser and 3. the introduction of legumes to the pasture as an input source of nitrogen. "In central Queensland fertiliser is generally not an economical option to address run-down and traditional methods of stimulating pasture growth such as blade ploughing are expensive and unsustainable as the costs are high relative to the returns and the soil is effectively being 'mined' of nitrogen with each renovation. For these reasons, legumes offer the only real, long-term solution," said Stuart.

The Pearts wanted to find lower cost establishment methods to maximise the potential soil nitrogen and dietary protein benefits of legumes. "Nitrogen is the major driver of productivity on our country and we simply can't continue to remove it from the soil without returning anything. This is why we're focusing on legumes and grazing management as sustainable long-term answers to maintaining pasture nitrogen supply, while bolstering plant diversity and animal diet quality," said Matthew.

Continues on page 2

FITZROY BASIN ASSOCIATION

CARING FOR OUR COUNTRY

Queensland Government

Editorial

Field days have been happening everywhere—in the Arcadia Valley, Clermont, Alpha and Clarke Creek districts. At most of them Indian couch encroachment into nitrogen run-down buffel pastures has been a hot topic. A group of graziers from Clarke Creek, Middlemount and Dingo are applying for MLA producer demonstration site (PDS) funding to trial ways of preventing and reversing Indian couch dominated pastures.

The Arcadia Valley field day showcased the results from the Bundaleer Legume Establishment PDS. Joe O'Reagain from the Fitzroy Basin Association led the PDS and has reported the results from the PDS in the article on the front page.

The Northern Grazing Systems project held field days at Clermont and Alpha. The discussion topics were grazing systems, the wet season spelling project, burning for productivity and climate signals and climate change. Please keep sending in your feedback sheets, it helps us provide articles that are relevant to your business.

Mick Sullivan and Byrony Daniels
CQ *BEEF editorial team*

Please use the feedback sheet provided to let us know of any topics you would like covered in the newsletter. If you know someone who would like to receive the newsletter, ask them to fill out their details and return the feedback sheet.

From page 1

In 2009 the Pearts applied to established an MLA Producer Demonstration Site (PDS) on their property that aimed to:

- promote the planting of legumes to address nitrogen run-down
- evaluate lower cost methods of establishing legumes
- evaluate the effects of intensive grazing on legume establishment
- monitor soil fertility responses to incorporating legumes into the pasture.

Trial design

Three legume species (butterfly pea, burgundy bean and siratro) were planted together across two paddocks (Brumby 9 and Brumby 10) of uniform buffel grass pasture on brigalow clay soils in December 2010 (figure 1). Both paddocks contained five sowing treatments—broadcast, broadcast near water point, direct drill seeder, crocodile seeder and control (no legume sown). Bumby 10 had intensive herd impact (200 head/ha for 12 hrs) applied immediately after sowing and Brumby 9 had no cattle in it immediately after sowing.

Legume plant population and total biomass were recorded before the end of the first growing season, and baseline soil fertility tests were taken at the end of the first growing season. Plant populations, end of growing season biomass and soil fertility are being monitored throughout the trial.

Results

Initial establishment counts (table 1) indicate that treatments involving soil disturbance or placing the seed directly into the soil double the establishment rate compared with broadcasting the seed. Herd pressure only demonstrated

BRUMBY 10 (36 ha)—Herd effect applied						BRUMBY 9 (50 ha)—No herd effect applied			
				Shared water point					
Broadcast (7 ha)	Direct drill seeder (7 ha)	Control (7 ha)	Croc seeder (7 ha)	Broadcast near water (7 ha)	Broadcast near water (10 ha)	Direct drill seeder (10 ha)	Control (10 ha)	Broadcast (10 ha)	Croc seeder (10 ha)

Figure 1: Trial layout of legume plots at *Bundaleer*

an effect in the crocodile seeder treatment, which may have been due to the herd impact increasing soil-seed contact within a tilled seed bed. Direct drill seeding treatments achieved twice the initial establishment of broadcasting, and herd pressure appeared to have no additional effect.

Table 1: Initial establishment counts (legume plants per ha) recorded 05/02/11. *Averages exclude control values.

Treatment	Herd Impact		Mean
	Without	With	
Broadcast	34386	32683	34386
Broadcast near water	38095	54167	38095
Direct drill seeder	61410	59907	61410
Crocodile seeder	62517	118000	62517
Control	0	0	0
Mean	**49102***	**66189***	**49102***

More recent results (table 2) show large declines in plant numbers and less noticeable differences in plant counts among the treatments. The initial total legume counts showed no difference between broadcast treatments (with or without herd impact), however the latest figures may point towards herd impact having an influence on longer term survival within this sowing method.

Table 2: Second round plant counts (legume plants per ha) recorded 04/05/12. *Averages exclude control values.

Treatment	Herd Impact		Mean
	Without	With	
Broadcast	14359	30526	22443
Broadcast near water	24800	27000	25900
Direct drill seeder	41600	23636	32618
Crocodile seeder	41000	32000	31851
Control	0	0	0
Mean	**28291***	**30440 ***	**29365 ***

Across all treatments, siratro is the most prevalent species to date, with burgundy bean appearing in moderate proportions and butterfly pea plant densities are very low. Plant attrition has been severe despite the excellent seasons since planting (figure 2). An approximate total of 448580 seeds were originally sown per hectare. With an estimated viability of 95%, this gives a total of 426151 viable seeds sown per hectare.

There are currently an average 29365 plants/ha, meaning that only 6.5% of the viable seed has germinated and survived to date. Despite these levels of attrition, current plant populations are still very acceptable. However, Stuart suggests it is important to consider these rates of loss when weighing up the costs and returns of different establishment methods.

"We know that removing grass competition and planting large-seeded legumes into the soil rather than broadcasting the seed will achieve better establishment and survival rates," he said. "While removing grass through cultivation (or herbicides) increases the preparation costs, it significantly reduces the risks of failure, particularly during poor seasons. You can also reduce the seeding rates and so save on seed costs. These issues need to be carefully considered in any plans to establish legumes."

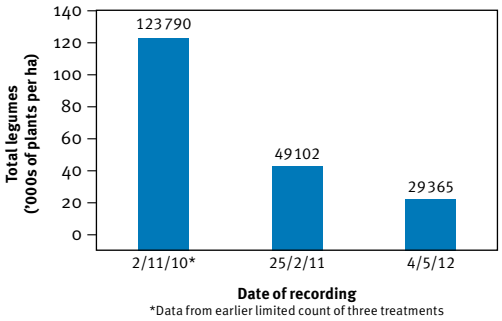

Figure 2: Plant population attrition over the life of the trial (average total legumes/ha).

Overall, the results of the trial are certainly interesting, however given the low sampling density and lack of replication it is difficult to draw any strong conclusions. One also has to consider the excellent 2010/11 season (1700 mm of rain), when viewing the results. This trial has tested some management techniques and demonstrated the scale of the problems associated with pasture run-down, indicating the need for more comprehensive research into legume establishment in buffel grass pastures.

Into the future

With the trial scheduled to finish in 2013, Matthew and Maryellen are focused most heavily on managing the legumes for survival and seedling recruitment. "The key to ensuring these plants persist will be grazing management for recovery and seed set," said Matthew. "These plants are really sought after by cattle and they simply won't survive long-term in the pasture if they are not given the opportunity to recover." The Pearts plan to continue monitoring plant densities and soil fertility beyond the life of the trial and will apply their learnings to future efforts to establish legumes on *Bundaleer*.

Distribution of Indian couch—monitoring changes in your pasture composition

Kari Paton
Natural Resource Management Officer
DNRM Emerald
07 4987 9332 or
07 4987 9300

Maurice Conway
Principal Technical Officer, Central Queensland Grower Solutions,
DAFF Emerald
07 4983 7414

Indian couch (*Bothriochloa pertusa*, also know as Indian bluegrass) is commonly seen on roadsides throughout central Queensland, however recently it appears to have been spreading through paddocks and pushing out buffel and native pastures. Cattlemen have observed it takes approximately one year longer to fatten stock on an Indian couch dominated pasture than it would on a mix of buffel and native pastures.

Indian bluegrass is an introduced grass from India and South Africa that has naturalised and now grows in many districts in eastern Queensland. It is thought that Afghan camel drivers may have brought many strains of Indian bluegrass to Australia as packing in their saddles. Over many years both DPI and CSIRO introduced Indian bluegrass for its potential as a pasture, lawn grass and also as a soil conservation grass to hold and stabilise erodible country. Its early spread was assisted when it was promoted as a ground cover around airstrips, including those at Charleville and Cloncurry, during World War Two.

Six distinct strains of the grass—Emerald, Biloela, Yeppoon, Medway, Bowen and Capella—have been deliberately introduced. Medway and Capella have a longer growing season before flowering and are considered superior for grazing purposes than the Bowen strain, which flowers early and profusely. The Emerald, Yeppoon and Biloela strains are later flowering and lower yielding. Biloela (released as Dawson) and Yeppoon (Keppel) are useful for rough lawns, ovals and footpaths.

Because the Bowen strain is the most prolific seeding strain it is usually the strain most likely to invade pastures. This is a similar story to buffel where shy seeding varieties like Molopo and Tarawinnabar have effectively disappeared, not because they weren't adapted but because of the high seed presence of other varieties such as American and Gayndah buffel.

In the 1980s a trial was conducted in Toowoomba to determine if there was better adapted or more productive material. In the trial 23 'naturalised' strains were planted alongside 134 strains introduced from India. When the lines were grouped into like types seven groups were identified and all but one group (a very low growing type) included at least one 'naturalised' representative.

In the 1970s Indian bluegrass spread rapidly into black speargrass pasture when anthracnose devastated Townsville stylo pastures across northern Australia, leaving native pastures exposed to high grazing pressure. This coincided with a crash in cattle prices when graziers were reluctant or unable to sell what were previously high priced cattle. The introduction of Brahman cattle, road trains and M8U allowed stocking pressure to be maintained on pastures for longer during droughts. It was suggested that Indian bluegrass played a significant role in reducing runoff and erosion by providing groundcover in the Dalrymple shire around Charters Towers.

Why is Indian couch taking over our pastures?

Overgrazing or reduced soil fertility have been commonly accepted as causing the spread of Indian couch. However, it is now colonising remnant vegetation, mountain sides and even national parks where grazing has been minimal. Obviously this contradicts the previously-accepted belief that Indian couch would only colonise areas where buffel is either in decline or has died out.

No specific studies have been undertaken on Indian couch since the 1980s and it is becoming increasingly evident that further research is critical to ensuring appropriate pasture management. The jury is still out regarding whether Indian couch is a desirable pasture species. Generally it is viewed more positively if it forms part of a pasture sward rather than being the dominant species, unless it is growing on previously bare ground.

This highlights the importance of pasture monitoring and recognising changes in pasture dominance. Some landholders are welcoming the invasion of Indian couch whilst others are rather concerned. However, it seems that the invasion is not only occurring in run-down or overgrazed pastures, and that is a concern. Andrew Ash and others have studied the distribution of Indian couch in Queensland and have recorded an increased presence of Indian couch in non-grazed areas. They concluded that climate may be playing a large part in the changes to pasture distribution.

As it stands, our current information is leading us to believe that Indian couch is an opportunist. If at any time your paddocks develop areas of bare ground, whether it is due to drought, nitrogen run-down, unplanned fire or overgrazing, they will be open to Indian couch invasion.

Information is crucial in assisting DERM understand the long-term impacts of the increased presence of exotic introduced grasses in lieu of a mix of native and exotic improved pastures. We have limited study resources and it is vital that we increase our information base, even if at first the evidence is anecdotal.

If you have either had success keeping Indian couch out of your paddocks or have successfully re-introduced a balance of natives in areas previously dominated by Indian couch, we would love to chat to you. You can contact Kari on 07 4987 9300.

Weaner and heifer management in Northern beef herds

New books available!

Digital copies can be downloaded at www.mla.com.au/Publications-tools-and-events/Publications

Hard copies can be ordered by calling the MLA membership services hotline on 1800 675 717 or email publications@mla.com.au

Managing your breeders for improved productivity

Ken Murphy
DAFF Rockhampton
07 49 360 337

Weaning rate is a good measure of breeder productivity. Weaning rate is the number of calves weaned for every hundred cows exposed to the bulls. This can be affected by many factors and it is important for the profitability of a beef business to keep the weaning rate as high as possible whilst being careful with the costs involved.

In any herd it is important to ensure that fertility diseases do not causes losses.

Recent work across northern Australia (Cash Cow project) has shown that breeders that calved between July and September had up to 40% less chance of getting into calf the following season than breeders that calved in the December to January period. In central Queensland a good rule of thumb is to get all the calves on the ground before Christmas. This allows the breeder to lactate during the flush of the summer season to produce a weaner as the season is drying off during winter.

Body condition is also very important. Cows with body score 1–2 have been found to have 20% less chance of re-conceiving than breeders with body score 4–5.

The type of country has a very strong influence on re-conception but without selling and buying better country you need to use supplements to optimise productivity for your property. On phosphate-deficient country, feeding phosphorus supplement during the summer, and year round on grossly deficient country, can improve fertility rates by 23%.

So how do you make the best of your country?

If disease is not a problem, then it is important to manage breeders to calve from October to December. You can bring your herd into line with this calving period if you remove breeders from the herd if pregnancy diagnosis indicates they will calve outside this period.

It is also very important to maintain body condition of the breeders. Weaning during the autumn or early winter reduces the effects of the dry (winter) season on breeder body condition. Lactation is a major drawback to a breeder's body condition. It is often said that the best supplement a breeder can receive is to remove the calf.

Low protein and energy during the last trimester of pregnancy is also a major factor in pregnancy rates. In central Queensland, protein is generally more important than energy and feeding protein will assist in maintaining body condition.

Once the calf is born losses can also be heavy. Maiden heifers have been found to have higher calf losses than mature breeders. Calves born during periods of extreme heat and humidity can also be badly affected. We can not change weather conditions but we can provide adequate shade to minimise the effects. It is also important not to disturb the animals during the calving period because mustering can cause heavy losses.

The Cash Cow project also found that cows that lost a calf one year often do the same again the following year.

Remember that what we do with our breeders this year affects their productivity next year.

Using fixed-time artificial insemination (FTAI) to enhance genetic improvement

Dr Sophia Edwards
Postdoctoral Research Fellow
School of Veterinary Science
The University of Queensland
07 5460 1098

The idea of accelerating genetic gain in any beef breeder operation is highly attractive. Although FTAI technology is not new, it has become the hot topic of many breeder operations in northern Australia. Why? The challenge for the northern beef industry is to disseminate identified superior genetics as efficiently and as expediently as possible so that the industry can meet the economic challenges it is facing. Artificial insemination is recognised as the most cost effective strategy to disseminate superior genetics.

What is FTAI?

FTAI allows artificial insemination of a large mob of females (up to 250 per day in good facilities) without the need for heat detection and at a predetermined or 'fixed' time.

How is this possible?

To achieve this we need to synchronise ovulation in the herd. Females selected for AI are treated with a series of hormones to induce approximately 75–85% (depends on breed and parity) to ovulate within a 12 hr window. Typical FTAI protocols for beef cattle involve the use of an intravaginal progesterone-releasing device such as Cue-Mate combined with oestradiol benzoate and prostaglandin $F_{2\alpha}$ treatments.

Problems with heat detection to identify candidates for AI

Artificial breeding is the most effective way to improve genetic gain in a beef herd but these gains are limited due to difficulties with heat detection in females. Traditionally, cattle are observed for expression of heat at least twice daily and subsequently inseminated approximately 12 hours later. For a heat detection program to be successful we require a couple of things:

1) Females to be cycling. Not all females will be cycling at the planned mating start date. It is common for less than 100% of *Bos indicus* heifers to be cycling at the age for mating and therefore pre-pubertal heifers will not be submitted to AI. Lactating cows, particularly with *Bos indicus* content, often experience postpartum anoestrous and so will not demonstrate heat and consequently not be submitted to AI.

2) Trained labour for heat detection is required. The inaccuracy of heat detection can be a major downfall to the success of an AI program. In a large mob of females it is hard to identify individuals that are expressing heat and draft accordingly (figure 1). Heat detection is easier in smaller mobs, especially if individuals are visually identifiable. The use of heat detection aids, such as Estrotect or Kamar (figure 2), can help however false positives can occur. The identification of heat (figure 3) in *Bos indicus* genotypes is often difficult as these females tend to have a reduced heat expression and a shorter duration of heat.

Figure 1: Heat detection can be difficult. In this large mob of even Brahman heifers there are three heifers demonstrating heat but they are hard to identify and draft off.

Figure 2: Estrotect heat detection aid. 100% rubbed indicates this heifer has been on heat.

Figure 3: Brahman heifer expressing heat. Heifers are individually identified, well handled and in a small group.

So how does FTAI overcome these issues?

Firstly, not all females need to be cycling at the time that we enrol them in an FTAI program. Because we use progesterone in the synchronisation protocol this can stimulate some heifers that are not cycling to ovulate (Polat et al., 2009). A recent research trial in central Queensland demonstrated that in a group of Brahman heifers that had only 50% of individuals with a corpus luteum (a structure on the ovary that forms after ovulation) at the start of the synchronisation program resulted in the same pregnancy rate to FTAI. This suggests that insemination of pre-pubertal or non-cycling heifers can achieve pregnancy (Edwards et al., 2012). Similar results have been achieved in non-cycling cows in South America (Sa Filho et al., 2009). However, although this is possible, we do not recommend enrolling a group of primarily non-cycling females in an FTAI program as this is unlikely to be effective.

Secondly, no heat detection is required so all the associated difficulties and inaccuracies are avoided.

Given these two substantial benefits it is possible to use FTAI on close to 100% of females in a herd. With the increased submission rate it is possible to generate more AI-sired calves using genetically superior sires. Using FTAI you can access otherwise expensive or inaccessible sires with highly attractive traits, such as polled-ness. Having a large number of calves with the desired traits results in a high rate of genetic gain!

What are the other benefits of using FTAI technology?

In an FTAI program up to 100% of eligible females are inseminated on one day so, under best practice management, this will result in about 40–60% of females getting in calf that day (conception rates depend on breed, age and lactation status). However, because ovulation of the whole herd has been synchronised, most of the females that did not conceive to AI will return 18–23 days later. We recommend, in herds where only one round of AI is feasible, that bulls that have passed a BBSE (as recommended by the ACV) are used at a bull to female mating ratio of 3:100.

We have demonstrated throughout northern Australia that up to 78% of females (Butler et al., 2011) are in calf in about a 23-day window. This means a couple of things for your business:

- females that conceive earlier in the breeding season calve earlier and have a higher chance of re-conceiving to calve again in a 12-month window
- calves born earlier in the breeding season are heavier at weaning, increasing the value of your weaner drop and an increased proportion of replacement heifers being pubertal at their expected time of breeding
- calves reach target sale weight quicker
- production of an even line of calves, making management easier.

How to start an FTAI program?

Different FTAI synchrony programs are available and the program chosen needs to suit your herd and situation. Factors that influence the choice of program include the number of females to be inseminated, available labour, price of semen, genotype, age or parity, proportion cycling and lactation status.

Management of females is paramount to successful AI and unfortunately is often disregarded or not considered in the planning. Management of females should start at least 12 months in advance of the FTAI program. We know that nutrition has a profound effect on the likelihood of a female conceiving to AI. *Bos indicus* heifers that gain weight and body condition are more likely to conceive to AI and have a normal oestrous cycle after synchronisation than heifers that are in poor condition (Butler et al. 2011b; Butler et al. 2011c). In some circumstances when pasture availability is not sufficient to reach nutritional requirements, supplementation may be necessary. Ensuring optimal nutrition will also increase the proportion of females that are cycling at the commencement of the AI program. It may also be worthwhile to vaccinate females for diseases that may cause reproductive loss such as pestivirus, vibriosis, leptospirosis and 3-day sickness. Familiarising females at weaning with handling facilities, yarding and feeding routines will reduce the stress they experience when being handled on multiple occasions on the days of synchronisation treatments and AI (Butler et al. 2010).

The quality of semen is as important to the success of an AI program as the preparation and management of females. We recommend that semen be assessed post-thaw to ensure the semen is in good condition prior to using in AI. In addition to using good quality semen it is also important to make sure the technician you employ has adequate experience with AI. If a large herd of females is being treated it is a good idea to have more than one technician available because fatigue can result in poor deposition of the semen, leading to a reduced pregnancy rate.

The science involved in reproductive efficiency is far from black and white. Precision and accuracy at every point of an AI program will result in the best possible outcome. It is strongly advised that you consult your veterinarian to assist in the planning and execution of your first FTAI program. Synchronisation of females for FTAI is quite easy—there are just a series of protocols to follow at specific time points. You might say “it is almost like baking a cake!” Attention to detail and best practice management will always attract the best possible result.