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Economic Review of Pasture Development Options for North Australian Beef Enterprises

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Economic review of pasture development options for north Australian beef enterprises

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Introduction

Beef cattle grazing (~14 million head) native pastures is the dominant economic use of northern grazing lands (2.3 million km^2). Few enterprises make positive economic returns in most years or achieve the necessary productivity gains (~2% per annum) to offset an ongoing cost-price squeeze (McCosker *et al.*, 2010). A significant contributor to poor performance is low reproductive performance, management of first calving heifers, calf growth and weaning rates and liveweight gain - linked to nutrition and the low quality of pastures. Pasture development technologies (Gramshaw and Walker, 1988) are available but uptake has been poor. Three pasture development options offering technical promise include (a) mosaic irrigation - small-scale schemes utilising favourable soils and access to water, (b) broad-scale over-sowing of native pastures with improved grasses and legumes, (c) high intensity-short duration (cell) grazing and (c) increasing stock access to underutilised pasture resources by expanding water and fencing infrastructure. How these options might alter the economic performance of enterprises has received limited attention.

A formal review employed simulation models and regional case studies to explore the scope for mosaic irrigation to change the production and marketing orientation of northern beef enterprises and deliver economic benefits (MacLeod *et al.,* 2013). Consideration was also given to alternative development options viz. broad-scale pasture sowing, high intensity-short duration (cell) grazing, and additional water and fencing infrastructure. The economic results of these options for three of the regional case studies are summarised in this paper.

Materials and Methods

Irrigation scenarios were developed for a representative enterprise in five regions based on agro-ecological contexts and market orientation for sale stock (MacLeod *et al.*, 2013).Yields of three categories of forages - forage sorghum (annual forage grass), lablab (tropical legume) and bambatsi panic (tropical perennial grass) - grown under irrigation on a standard soil (Grey Vertosol) at a site within five regions - Burdekin (Queensland), Barkly Tableland and Victoria River District (Northern Territory), and Pilbara and Kimberley (Western Australia) - was simulated with APSIM (Keating *et al.*, 2003). Pasture yields were simulated with GRASP (Littleboy and McKeon, 1997). Irrigation costs were based on a pivot irrigation development utilising a bore and diesel pump for a scale sufficient to meet irrigation demands in 80% and 100% of years. The NABSA herd economic simulation model (McDonald, 2012) was calibrated for the representative enterprises to generate estimates of animal productivity (growth, reproduction, mortality), turnoff and profitability (gross margin, net economic profit, and return on investment). The simulations were for 20 years (1990-2010). Pasture augmentation and infrastructure development scenarios also used NABSA while cell grazing results are drawn from Hall *et al*. (2011).

Mosaic irrigation case study examples – Barkly Tableland, Burdekin, Kimberley

It is not feasible to describe and present the results of all of the regional development scenarios that were employed in the CSIRO-ONA study (MacLeod *et al.* 2013). We briefly describe a single scenario encompassing the most productive forage type with 80% irrigation reliability for three of the regional case studies and summarise the results. The budgets used livestock prices and production input costs applicable at the time the study was conducted (late 2013).

Barkly Tableland (NT) - 5,000km^2, 22,000 breeding cows turning off 24 month old steers for live export to Asia at ~350kg liveweight/steer. Average stocking rate is ~5.6 adult equivalents (AE)/km^2. Irrigation scenario is 550ha (development cost = $5,000/ha) of lablab fed to steers in late spring/summer to reach a minimum liveweight of 580 kg/steer by 42 months.

Burdekin (Qld) - 30,000ha, 1,800 breeding cows turning off heavy steers for slaughter at a minimum liveweight of 580 kg/steer at ~42 months. Average stocking rate is ~1 AE/8 ha. Irrigation scenario is 50ha (development cost = $7,300/ha) of bambatsi fed year around to steers when sufficient standing forage is available to meet the same target weight at 30 months.

Kimberley (WA) - 2,800km^2, 11,000 breeding cows turning off 2 year old steers at ~330-350 kg/steer for live export to Asia, although this target is infrequently met (24% of years) due to seasonal conditions with an average turnoff weight of ~276 kg/steer. Average stocking rate is ~4 AE/km^2. Irrigation scenario is 60ha (development cost = $7,300/ha) of bambatsi fed year around to the steers when sufficient standing forage is available in late spring/summer to reach the target selling weight (330-350 kg liveweight/steer at 24 months) in 80% of years.

Results and Discussion
The results of the mosaic irrigation scenarios for the three regional case studies are presented in Table 1.

Table 1. Simulation results for three example case studies. Baseline vs irrigation development. Average for the simulation period 1990-2010.

	Barkly Tableland	Burdekin	Kimberley
	Baseline - nil irrigation		
Total stock carried (AE)	26,774	2,867	10,876
Gross Margin/AE	$114	$122	$62
Av. Net profit	$1,643,763	$155,406	$25,867
Av. Turnoff liveweight/steer	303	535	276
	Irrigation development (80% reliability)		
Irrigated crop	Lablab	Bambatsi	Bambatsi
Scale (ha)	550	50	60
Capital investment	$4.7 million	$422,750	$507,300
Irrigation cost - annual operating	$329,505	$32,205	$53,046
Irrigation cost - annualised capital	$448,016	$40,729	$48,874
Total stock carried (AE)	31,502	2,644	11,248
Gross Margin/AE	$137	$145	$81
Av. Net profit	$2,595,958	$257,295	$229,249
Av. Turnoff liveweight (kg/steer)	583	585	349
Av. Return on investment	20%	24%	40%

The availability of irrigated forage increases the productivity of the three enterprises by increasing the number of stock carried [1] and/or increasing the weight of the sale animals. The (mean) return on the investment is positive, ranging between 15% to 40%, but it should be cautioned that returns of this order on an additional investment for an existing enterprise would be viewed as borderline by some business analysts.When the irrigation was able to secure the opportunity to reliably meet the target market with a relatively small development scale and the gain per animal is relatively high, such as applied for the Kimberley bambatsi development, the projected returns (40%) are quite favourable.

Non-irrigation pasture development options: Irrigation is not the only forage-based option available for achieving productivity gains. Other options include (a) broad-scale development of existing native pastures through either sown pastures (*e.g.* buffel grass, Rhodes grass) or augmenting pastures with oversown legume species (*e.g.* stylos), (b) sub-division of pastures into smaller parcels to support some form of short duration-higher intensity (cell) grazing management systems, or (c) investment in additional property infrastructure to increase the effective grazing area (e.g. stock waters and subdivisional fencing).

These options were also explored in the wider study (MacLeod *et al.* 2013) for a limited range of regions – drawing on the NABSA simulations and published studies. Some estimated returns from these studies are summarised in Table 2.

Table 2. Projected returns on investments in non-irrigated pasture developments.

	Broadacre pasture development	Conversion to cell grazing	Water & fencing infrastructure
Region	Burdekin (Qld)	Fitzroy (Qld)	Barkly Tableland (NT)
Av. return on investment	24%	10%	21%
Study reference	Hunt *et al.* (2012)	Hall *et al.* (2011)	MacLeod *et al.* (2013)

The returns are of a similar magnitude to the mosaic irrigation scenarios (Table 1). The main point here is simply that northern enterprises have several avenues for increasing their productivity and some of these options may be competitive with irrigated pasture development.

[1] The total AEs are reduced for the Burdekin case study due to the reduction in age cohorts of the steers.

Conclusion

Northern beef enterprises critically need to increase their productivity to retain viability in the longer-term. As nutrition is a key driver of herd performance and market opportunity, access to quality feed resources at critical times is an obvious focus. Mosaic irrigation is flagged as a potential means to meet this goal and, under prevailing climatic and resource endowment and market prices and input costs, the option shows promise in terms of raising herd productivity and meeting some marketing goals. The projected returns from the simulation modelling are generally positive, especially for higher quality forages such as cereal legumes and perennial grasses, but not yet unduly competitive with alternative investment options such as broad-acre pasture development, novel grazing systems or further intensification of paddock infrastructure.

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