Chapter 7

Beef industry: constraints and opportunities

The key to the sustainability of forage-based livestock systems in the tropics is the human component. Managers of livestock systems manage defined areas of land for the purposes of achieving a desired life style for themselves, their families and in some cases for the stakeholders in a company. Money generated to fund the life style is determined by available markets, prices and costs, and the quality and volume of product.

This paper is about the constraints and opportunities facing tropical beef enterprise managers in northern Australia. It is based on analysis of a range of management options and their economic impact for different production situations.

Major Australian farm industry constraints

Profitability

Australian agricultural industries are not profitable!

Average returns to capital for the Queensland beef industry over the last three years have been 0.3% (91/92), - 0.1% (92/93) and 1.2% (93/94). The average Australian farm business 'profit' in 1993-1994 was negative $4 290. For 1994-1995, ABARE estimates it will be negative $13 000. Sixty-seven percent of Australian farms have a negative business 'profit'. Average farm debt as at June 1994 was $140 260. Table 7. 1 shows that farm debt has risen faster in the beef industry than in wool and broadacre enterprises.

In 8 years from 1985-1993 beef herd productivity rose about 17% and exports by a massive 72% to 802 kilotonnes. In the same period the average dressed weight price of export cattle fell by 18% in real terms (ABARE farm survey 1994).

Against these financial constraints, capital intensive opportunities may be inappropriate for many beef enterprises.

Table 7. 1. Farm debt in Queensland

	Beef $	Wool $	Broadacre $
1989/90	99 000	173 000	125 000
1990/91	120 000	210 200	134 000
1991/92	159 000	212 000	170 000
1992/93	185 000	275 000	179 000
1993/94	206 000	204 000	181 000

Source: ABARE Farm Survey Report 1994
Broadacre includes all grazing and grain industries

Markets

Enterprise managers are constrained by the number of markets available to them. The number of market options available to a producer (with given natural resources, climate and price structures) is determined by the growth rate (weight for age) of cattle achievable from the given natural resources, their likely carcass characteristics (Figure 5. 11, Chapter 5), and the costs of meeting the market. Assuming the market specifications can be met, the volume of product and the costs determine the amount of profit that is made by the enterprise in the short term. **In the long term, the health of the natural resources plays a critical role in sustaining profit** (Coffey 1994).

Opportunities

To maximise profit within a given market and price structure, managers need to:

- optimise volume of product by improving both cattle growth rates and reproduction rates
- minimise death rates
- improve product quality
- reduce costs.

Cattle growth rate

Increases in growth rates decrease the age of turnoff and increase the turnover rate or volume of production per unit time. It is important to distinguish between these two concepts.

Reducing age of turnoff

Average ages at which the four pairs of permanent incisor teeth erupt are about 25, 33, 41 and 50 months for *Bos indicus* x *Bos taurus* steers. It must be noted that there is a wide variation between animals when these pairs of teeth erupt. The ages at which most steers have less than a given number of teeth are of more interest because specifications state a maximum of 0, 2, 4 or 6 teeth (Rudder 1993a).

Ages at which one can expect 95% of *Bos indicus* x *Bos taurus* steers to meet specifications for a maximum of 0, 2, 4 and 6 teeth are about 23, 29, 36 and 44 months, respectively. This information can be used with liveweights required for a given market to estimate the post-weaning liveweight gains necessary to satisfy age specifications (Table 7.2). For example, assuming an average weaning weight of 185 kg at six months of age, post-weaning liveweight gain has to average 0.5 kg/day to reach 635 kg liveweight by 36 months of age (4 teeth) to meet premium Japanese markets.

Ensuring that steers regularly reach these liveweights by this age is a constraint to overcome. Annual liveweight gains for steers grazing **improved or good native pasture** appears to be approximately 0.4 kg/day, but ranges from 0.3-0.6 kg/day depending on the season, stocking rate and soil fertility. These pastures will regularly produce 300-360 kg steer carcases with six or fewer teeth (under 44 months of age). Annual variation in slaughter weights is generally small because seasonal conditions tend to average out over the years between weaning and slaughter for a typical Central Queensland marketing system (Rudder 1993a).

However, the trend for premium grassfed markets seems to be a maximum of four teeth (or about 36 months) at slaughter. This reduces the time from weaning to slaughter, and hence the benefits from seasonal averaging. The end result is that higher rates of gain are needed. These factors increase the need to evaluate the case for grain supplements to cope with adverse seasonal conditions, and the use of crop and pasture programs to optimise liveweight gains when seasonal conditions permit (Rudder 1993a).

Increasing rate of turnover

Turnover rate is an important concept because many forage livestock systems, particularly those that are based on more than one generation of progeny on a property before sale, are very sensitive to increases in growth rate. Table 7. 3 shows an 18% increase in annual growth from 130 to 160 kg results in greater profits than an 18% increase in reproduction from 70 to 85%. This happens because a large proportion of progeny reach market specifications a year younger. **The impact on profitability of increased growth rate on turnover is a concept not well understood by many managers in the beef industry** (Clark 1995).

By turning off all progeny a year younger, extra forage becomes available to:

- reduce stocking pressure
- increase breeder numbers.

However increasing breeder numbers, and reducing the number of saleable progeny in an enterprise could have negative implications for drought management. Replacing breeder stock after droughts is problematical.

Table 7. 2. Approximate post-weaning liveweight gains required to achieve age restrictions for a range of carcase weights based on a weaning weight of 185 kg at 6 months of age (Rudder 1993b).

Weight required		daily or annual (brackets) post-weaning liveweight gain (kg/head) for 0-6 teeth			
Carcase	Live	0 teeth	2 teeth	4 teeth	6 teeth
160-200	345	0.55 (200)	na*	na*	na*
200-240	425	0.8 (290)	0.35	na*	na*
240-280	500	0.65 (240)	0.5 (180)	0.4 (145)	0.3 (110)
300-360	635	na*	0.6 (220)	0.5 (180)	0.4 (145)

* Considered to be generally not applicable.

Table 7. 3. The relative impact of increases in growth rate and reproduction rate on the profitability of a typical central Queensland black speargrass beef enterprise, targeting Jap ox markets (Cheffins *pers. comm.*).

	Weaning rate	Growth rate	% turnoff by 3½ years	Gross margin
Typical	70%	130 kg/year	25%	$118 000
Increased reproduction	85%	130 kg/year	25%	$123 000
Increased growth	70%	160 kg/year	100%	$140 000

Improving growth rate

Livestock growth rate is strongly influenced by the environmental components of rainfall and soil fertility. There are also other factors and management options which impact significantly on growth rate (Figure 7.1). Growth rate is improved through:

- nutrition
- animal breeding
- disease control.

Nutrition

In forage livestock systems nutrition may be improved by:

- pasture management tactics (fire, spelling, stocking rate, tree and weed management)
- improved grass species
- legume augmentation of pastures
- tree legumes
- supplementary feeding
- the use of growth promotants.

Improvements in nutrition generally have a more profitable impact than animal breeding. For example, the analysis in Table 7. 4 shows there are greater benefits from legume augmentation of black spear grass production systems compared with two animal breeding options, although legume augmentation is also more capital intensive.

Table 7. 4. The impact of increases in growth rate and reproduction rate on a 4 000 ha black speargrass enterprise keeping the stocking rate constant at 935 beef equivalents. The current enterprise targets the Japanese Ox market. It is assumed that the cost of using bulls of different genotypes would be no more than current practice. It is also assumed that bull selection is done within the herd therefore there are no additional costs. It was estimated that the legume establishment would cost $30 000, therefore the break-even point would be reached in the 5th year and the enterprise would continue to be $30 000 more profitable than the current practice (Clark 1993).

	The enterprise now - current best practice	The enterprise in the 5th year of cross breeding	The enterprise in the 20th year of bull selection on Index	The enterprise in the 5th year of legume augmentation of pastures
Growth rate	130 kg/year	140 kg/year	170 kg/year	160 kg/year
Reproduction rate	70%	80%	80%	80%
Death rate	1%	1%	1%	1%
Invested capital	$1 335 600	$1 346 968	$1 361 500	$1 406 500
Value of output	$ 142 200	$ 152 842	$ 178 350	$ 175 000
Variable costs	$ 24 100	$ 23 116	$ 24 900	$ 25 000
Gross margin	$ 118 100	$ 129 786	$ 153 450	$ 150 000
Fixed costs	$ 46 470	$ 46 490	$ 46 450	$ 46 450
Operating profit	$ 71 630	$ 83 236	$ 107 000	$ 103 550
Managers salary	$ 20 000	$ 20 000	$ 20 000	$ 20 000
Return to capital				
Amount	$ 51 630	$ 62 360	$ 87 000	$ 83 550
Percent	3.86%	4.70%	6.40%	5.94%
Turnover rate - % of steers sold by 3½ yrs	25%	65%	100%	100%

Table 7. 1. A framework for identifying critical components, practices and resources for improving beef production systems.

STRATEGIC

CRITICAL MEASURES	COMPONENTS
• Disposal Income	• Planning
	• Land types
	• Markets
	• Marketing
	• Finances
• Operating Surplus	• Living areas
	• Climate
	• Seasons
	• Goals
	• Herd structure
	• Fencing
	• Water
• Pasture Management Tactics • Fire • Spelling • Fencing • Rotation • Weed control • Tree management	

OPERATIONAL

CRITICAL MEASURES	COMPONENTS	SUBCOMPONENTS	PRACTICES
Growth Rate	Nutrition	Pasture	Stocking rates
			Management tactics
			Mating Systems
		Legumes	Stylos
			Leucaena
		Supplements	Energy
			Nitrogen (H_20 treatment)
			Phosphorus (H_20 treatment)
		Growth Promotants	
	Genetics	X Breeding	
		Bull Selection	
	Health	Chronic diseases	3 day sickness
		Internal parasites	
		External parasites	
Reproduction Rate	Nutrition	Pasture	Stocking rates
			Management tactics
			Mating Systems
		Legumes	Stylos
			Leucaena
		Supplements	Energy
			Nitrogen (H_20 treatment)
			Phosphorus (H_20 treatment)
		Lacation	Early weaning
	Genetics	Bull Selection	
	Health	Reproductive diseases	Vibriosis
			Leptospirosis
		Internal parasites	
		External parasites	
Death Rate	Nutrition	Pasture	Stocking rates
			Management tactics
			Mating Systems
		Legumes	Stylos
			Leucaena
		Supplements	Energy
			Nitrogen (H_20 treatment)
			Phosphorus (H_20 treatment)
	Genetics	Bull Selection	
		X Breeding	
	Health	Acute disease	Botulism vaccination
Pasture Composition	Pasture species ratio		
Water Runoff	Water quality		

Pasture improvement and supplements

Foran *et al.* (1990) compared eight improved management technologies for a typical Northern Australian beef cattle property carrying about 3000 breeding cows located in the Katherine district of the Northern Territory. The options included combinations of cow and steer supplementation, and pasture improvement with *Stylosanthes* spp.

Over a 20-year period the predicted accumulated cash surplus for the superior cow herd supplementation, cow and steer herd supplementation, and pasture improvement options were $0.66m, $1.12m and $1.32m respectively. After real interest rates of 6% were charged on borrowed capital and company taxation was levied, however, the 20-year net surpluses were $0.40m, $0.66m and $0.35m respectively. Annual turnoff rates were 24, 21 and 19% of herd numbers, but 33, 37 and 36% of herd value respectively. These figures compare to an expected 20-year loss of $1.40m for an undeveloped property in the same area, with a turnoff rate of 14% of herd numbers, and 17% of herd value.

Foran *et al.* (1990) concluded that successful pasture improvement can result in a productive enterprise, but there are major capital investment costs during implementation, as well as risks of pasture failure. As a result, supplementation strategies are more attractive, because they require less capital investment, and can be suspended in difficult circumstances. However, supplementation without good land management can cause pasture and landscape degradation. **The principles of risk assessment are important for improved forage livestock systems.**

A major industry constraint is the lack of understanding of the concept of first limiting factors in nutrition. When pastures are perceived to be in poor condition 'shotgun' supplementation is generally practised. The poor adoption of wet season phosphorous supplementation practices is also due to this lack of understanding of first limiting factors (Clark 1995).

The cost/benefit of mineral and crude protein supplements for improved growth rate depends on circumstances, particularly prices. Supplementation with energy is generally more risky and very dependent on circumstances. Growth promotants generally increase profitability providing nutrients are not limiting.

Tree control and legumes

McIvor and Monypenny (1994) state that pasture development by killing trees and/or sowing legumes can have large, positive effects on net cash flow of a hypothetical property. Selective killing of trees without further improvement of the native pastures resulted in an increase in optimum stocking rate (and thus carrying capacity) and net cash flow under most of the conditions examined. Sowing legumes under live trees resulted in greater net cash flow than with either no development or tree killing alone. This system also was less affected by changes in season although systems where the trees were killed were less sensitive to changes in stocking rate near the optimum. The combination of sowing legumes and tree killing gave the highest net cash flow. These results suggest that pasture development using legumes can be a profitable investment (Table 7. 5).

Table 7. 5. Accumulated net cash flow (AccNCF) ($000s) for four pasture systems in relation to growing season, seasonal variability and stocking rate (SR_{NIL} and SR_{VAR} are the optimum stocking rates for constant and variable conditions respectively; the values in brackets are the AccNCF as a percentage of the AccNCF for that pasture system and that season with nil variability).

Pasture system[a]	Season					
	Poor variability			Good variability		
	Nil	Variable		Nil	Variable	
	SR_{NIL}	SR_{NIL}	SR_{VAR}	SR_{NIL}	SR_{NIL}	SR_{VAR}
LN	1350	90 (7)	90 (7)	3340	3030 (91)	3050 (91)
KN	1460	60 (4)	150 (10)	4060	3600 (89)	3630 (89)
LO	2410	1410 (59)	1480 (61)	4620	4200 (91)	4220 (91)
KO	3020	1710 (57)	1870 (62)	6560	5760 (88)	5810 (89)

[a]L = live trees; K = killed trees; N = native pasture; O = oversown legume.

Animal breeding

The appropriate genotype for an environment will be the one which results in optimum growth, reproduction and survival. In tropical and subtropical regions, high pasture quantity and quality usually coincides with high ambient temperatures, tick and/ or worm infestations and incidence of blight.

Zebu (*Bos indicus*), Zebu British and Zebu European genotypes have better heat tolerance, tick resistance, worm tolerance and resistance to blight than the British, European and British European (*Bos taurus*) genotypes. These stressors depress feed intake, and hence reduce growth and reproductive rates, more in British and European genotypes than in those which have about half or more Zebu component.

Cattle which have half or more Zebu component, have lower maintenance requirements than British and European genotypes. This results in Zebu - infused genotypes increasing or maintaining their liveweight longer into the dry season than British and European genotypes, and losing less liveweight during the later stages of this season. The capability results in higher annual growth and survival rates (Rudder 1993c).

Gains achieved by selection are slow (less than 1%/ year for any one attribute) but they are cumulative. Gains achieved by cross breeding are greater than those achieved by bull selection in the short term but need to be accompanied by selection to achieve the best outcome.

Table 7. 6 demonstrates the relative benefit of within herd/bull selection for improved growth and reproduction in two production systems based on different growth rates, herd structures and infrastructures. These data show how current herd structure influences the impact of increases in growth and reproduction rates (Clark *et al.* 1992).

Table 7.4 showed the relative benefit of cross breeding and bull selection for improved growth rate for a herd within a structure sensitive to improvements in growth rate. **However, Table 7. 6 shows that in herds with a different herd structure, the benefits are less obvious; this concept is not generally recognised in the industry** (Clark 1995).

Animal breeding technologies do not generally require large capital inputs. Animal breeding also enables animals to be breed for improved feed conversion which could be a major factor contributing to sustainable forage - livestock systems.

A major constraint in the industry is the perception (and common practice) that significant genetic gain is achieved by culling females. The reality is that 96% of the genetic gain of beef herds is achieved by bull selection, selection of females will contribute a maximum of 4%. This misconception is a major constraint to the adoption of bull selection technologies (Clark 1995).

Another constraint is the lack of understanding about the importance of setting breeding objectives that optimise profitability and are rational in terms of available Estimated Breeding Values (EBVs) (Clark 1995).

Table 7. 6. The effect of 20 years of within herd selection for liveweight and weaning rate on income of Central Queensland black speargrass and brigalow production systems (Clark *et al.* 1992).

Annual income and costs ($'000)	Speargrass		Brigalow	
	Base	**Selected**	**Base**	**Selected**
Growth rates	130 kg/year	170 kg/year	190 kg/year	203 kg/year
Reproduction rates	70%	80%	80%	88%
Death rates 130 kg/year	1%	1%	1%	1%
Gross income	142.2	1 78.3	167.9	178.6
Variable costs	24.1	25.0	24.0	24.6
Gross margin	118.1	153.3	143.9	153.9
Fixed costs	46.5	46.5	73.1	73.1
Operating profit	71.6	106.9	70.8	80.8
Salary owner	20.0	20.0	20.0	20.0
Net profit	51.6	86.9	50.8	60.8

Disease control

Chronic diseases (e.g. 3 day sickness) and external (ticks, buffalo fly) and internal parasites (worms) will decrease growth rates. The cost/benefit of treatments depends again on:

- the probability of occurrence
- the cost of no treatment (benefit)
- the cost of treatment.

Table 7. 7 provides an example where vaccinations contribute to improving profits. Other specific data on the cost/benefit of treatments is very dependant on local conditions and is difficult to find.

Reproduction

Increases in reproduction rate have these benefits:

- increases in numbers of progeny for sale
- increase in selection pressure for female replacements
- fewer numbers of breeders and greater number of saleable cattle available for de-stocking
- increase in cull cow sales.

The genetic contribution to improving reproduction by cow selection is very small, this concept is not understood by most tropical beef managers (Clark 1995). Better nutrition, disease control, and bull selection are the keys to improved reproduction rates.

The impacts of improving reproduction rates becomes increasingly important in enterprises which turn-off weaners and in enterprises where reproduction rates are low.

Newman (1992) draws attention to the implications for the management of cull cows that are non-pregnant. Cows should be sold as soon as possible for these reasons:

- the interest that could have been earned on the capital tied-up in dry cows
- the value of calves not weaned from dry cows
- non-productive use of available pasture by dry cows.

Table 7. 7 shows the benefits of increasing reproduction rates in a weaner producing enterprise. These improvements were achieved by early weaning down to 3 months, supplementation of young weaners, breeder supplementation with urea and phosphorus, and vaccination with botulism and vibriosis and 3 day sickness.

Table 7. 8 shows the impact of early weaning on reproduction, breeder mortality, turn-off percentage and profit.

Table 7. 7. Herd structure, turnoff and profit at branding rates of 60%, 75% and 80% (Holmes 1991).

	"Millungera" Producer Demonstration Site		
Branding Rate	60%	75%	80%
Adult equivalents	1300	1300	1300
Breeders mated	596	593	526
Average breeder mortality	5.3%	3.9%	3.9%
Average male mortality	4.0%	2.0%	2.0%
Male turnoff age (yrs)	1	1	1
Male sales number	173	199	206
Average male sale price ($/hd net)	250	250	250
Female sales number	138	174	181
Average female sale price ($/hd net)	324	328	346
Supplement and vaccine cost ($)	1 300	12 800	12 890
Herd gross margin ($ before interest)	80 650	91 630	95 630
GM/adult equivalent ($ before interest)	62.10	70.50	73.59

Table 7. 8. The impact of weaning system on the breeder fertility, mortality, turn-off percentage and profitability per breeder in a Kimberley herd (Anon. 1995).

Weaning System		Weaning Percentage (%)	Breeder mortality (%)	Turnoff percentage		Profit ($/breeder)
				% of the total herd	% of females in turn-off	
Traditional system (1 x yr at > 150 kg)		51	18	13	0	
Normal (2 x yr at 100 kg)		70	7	24	38	55
Early weaning	- 2 x yr at 100 kg	78	5	26	43	75
	- 1 x yr at 60 kg	85	2	30	47	115

Death rates

In extensive northern Australian beef enterprises deaths rates are often high. Figure 7.1 lists some of the practices which contribute to reduction of death rates. In a 5000 head Kimberley beef herd the saving of only 18 deaths will pay for botulism vaccination. It is calculated that gross margins can be increased by $6-$7 per head by regular botulism vaccination (Anon 1995).

Production volume, property size and costs

Culpitt (1992) defined economies of size as a significant reduction in average cost per unit of output as property size increases. Newman (1990) developed economy of size equations for properties in the Blackall and Longreach Mitchell grass areas. Newman concluded that the most significant gains from expansion will occur with the movement up to a 10 000 sheep flock, which is the estimated point when the labour from a small one family operation will be fully utilised.

Hinton (1993) says that in the Dalrymple Shire most producers agree that beef property sizes are too small (Table 7. 9). Producers agreed that high debts forced graziers to over-stock and that the price of land prevents small property owners from expanding. Hinton (1993) also showed that economies of scale operate in the Dalrymple Shire. Larger properties can operate more profitably by spreading fixed costs over a larger amount of output. Only the paid labour component increases with property size because mustering labour requirements increase.

Hinton (1993) states that herds need to be between 1792 AE and 2658 AE in order to break even with total resource costs less imputed interest. This was calculated assuming 10% debt levels and 10% real annual interest rates. Property amalgamation is necessary for properties less than 1000 AE to achieve economic efficiency and to remain viable over the long term. Larger properties can operate more efficiently and are more insulated against the effects of drought and market downturn.

Hinton (1993) found that after allowing for physical differences in country type, properties with small herds had higher stocking pressure than those with larger herds. High stocking rates were shown to be associated with low gross margins per adult equivalent.

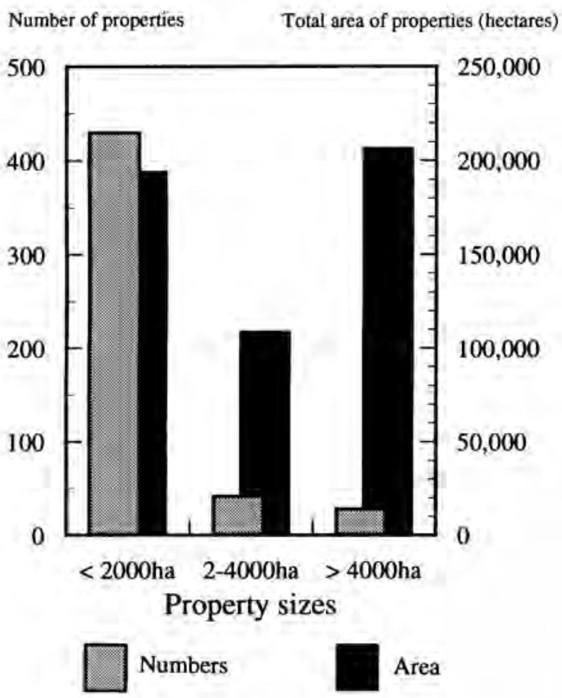
Clark *et al.* (1992) reported that in the Calliope Shire of Central Queensland producers stated that a sustainable living area would need to carry 1 000 head of cattle or 300-400 breeders and their progeny. This was calculated to be about 935 AE based on a dry beast of 450 kg. These producers also recommend a living area of 4 000 ha for their type of country. Figure 7.2 shows that 86% of properties are less than 2 000 ha (half the recommended area). In this Shire some opportunities exist for off-farm income.

Table 7. 9. Reasons for perceived decline in land condition (%) (Hinton 1993).

	Property size too small to support a family	The price of land prevents small property owners from expanding	High debts forced graziers to overstock
Strongly agree	15 (4.45)	20 (4.94)	27 (5.49)
Agree	43 (6.55)	63 (6.08)	61 (5.92)
Neither agree nor disagree	15 (4.58)	6 (3.16)	5 (2.80)
Disagree	26 (5.51)	9 (3.61)	7 (3.11)
Strongly disagree	2 (1.59)	3 (1.59)	0 (0)
	100%	100%	100%

() Standard error

Figure 7.2. The distribution of property sizes and total area of properties in Calliope Shire.



In the Calliope Shire of Central Queensland, increasing stocking rates may, in the short term, increase operating profit, as shown in Table 7.10. This explains why producers who are in need of cash flow overstock. Debt and small property size are the biggest constraints to achieving sustainable land use.

Product quality and costs

Rudder (1993b) compared options for producing steers and surplus heifers for different markets (Table 7. 11), and concluded that supplying the lower priced markets (LP) resulted in the highest net return ($50,600). This system is widely used in central and southern Queensland and has proved to be commercially robust.

Differences in the cost structure between properties will have a marked effect on the margins required to support production of younger cattle for premium priced markets. Also, the percentage of carcases that meet the target market specifications will exert an influence on prices realised.

Producing for the premium priced grass and cropfed markets (PP), the 90-150 day grainfed markets (GF) and the yearling 90-120 day grainfed markets (YGF) appears to be a higher risk venture than producing for the LP market because carcase specifications are tighter, costs of production are higher and management is more demanding. These factors mean that occurrences such as delayed sales, lowered prices, and managerial errors assume increased importance. Judgements regarding the commercial significance of these risks can be made only according to individual preferences.

Table 7. 10. Estimates of costs and returns from a 4 000 ha black speargrass beef enterprise at three different stocking rates (Clark *et al.* 1992).

Stocking Rate			2.3 ha/AE	4.3 ha/AE	9.7 ha/AE
Annual Liveweight Gain (kg)			100	130	150
Total AE			1724	935	417
Total Head			2226	1134	484
Number:	Weaners		621	330	144
	Breeders		1032	472	180
	Bulls		31	14	6
Deaths:	Cows		30 (2.9%)	11 (2.4%)	2 (1.8%)
	Growers		12 (2.1%)	5 (1.6%)	2 (1.5%)
Weaning Rate %			60	70	80
Regrowth Control		400ha/yr	@$40/ha	@$20/ha	@$5/ha
Drought Costs		1 in x yrs	1 in 5	1 in 6	1 in 8
		$/year	11174	4467	1 343
Operating Profit		$	88603	61440	17824
Return to Capital		s	68603	41440	-2176
Return to Capital		%	4.0	3.0	-0.2

1 AE = 450 kg steer

Drought:	Feed 2/3 of breeders
Sales - Typical enterprise	50% 27 month stores (mean weight 320 kg @ $1.02/kg); 50% 44 month bullocks (mean weight 580, 50% @ $1.22/kg, 50% @ $ 1.10/kg, mean price = $1.16); 100% 32 month cull heifers (mean weight 388 @ $0.96)

Table 7. 11. Estimated gross sales, production costs and returns (Rudder 1993b).

Production	LP	PP	GF	YGF
Gross Sales				
Cull cows	47 260	55 350	64 100	82 670
Surplus Heifers	28 130	33 640	28 000	36 110
Steers	123 490	156 040	176 280	135 620
Cull Bulls	3 540	4 150	4 800	6 200
Miscellaneous	1 500	1 500	1 500	1 500
TOTAL SALES	203,920	250 680	274 680	262 100
Costs				
Variable	23 620	51 410	100 440	98 130
Fixed	129 700	152 820	149 040	149 040
TOTAL COSTS	153 320	204 230	249 480	247 170
NET RETURN	50 600	46 450	25 200	14 930

LP = lower priced grassfed markets
PP = premium priced grass and cropfed markets
GF = 90-150 day grainfed markets
YGF = yearling 90-120 day grainfed domestic and export markets

Drought

Drought represents the risk that existing agricultural production may not be economically and environmentally sustainable, given variations in both the nature and the extent of the rainfall and in the responsiveness of the farming or grazing system to this rainfall. This may be due to the degree of climatic variability and/or to inappropriate, or ill timed, or inflexible, levels of production. These include the risk of severe land degradation by erosion, salinity or alkalinity; the risk of a permanent run down in the capital and resource base of the enterprise; and the risk of unsustainable cash flow. Thus the risks associated with drought are on par with the risks associated with the economic pressures that affect the structure of farm costs, and the risks associated with commodity market conditions which determine product prices. Variability in these three factors of climate, farm costs and product prices combine to produce the highly variable environment faced by producers in North Queensland.

Conclusion

Low profitability, lack of capital and relatively small property sizes are major constraints to realising opportunities for developing sustainable forage based production systems. The provision of off-farm employment opportunities could make a significant contribution to addressing financial constraints. If capital is available it is often more profitably invested off-farm.

The following are some low capital, on-farm investment opportunities:

- bull selection
- cross breeding
- better matching herd nutritional demands with seasonal nutrient supplies (controlled mating)
- early weaning
- mineral and protein supplementation
- use of certain vaccinations
- use of growth promotants
- legume augmentation of pastures
- tree management.

More capital intensive on-farm investment options are:

- energy supplementation
- tree management
- improved pasture establishment
- tree legume establishment
- land acquisition.

Many of these opportunities are not practised across the northern Australian beef industry (Clark 1995). There is also a lack of understanding of some important concepts and principles necessary to enable managers to utilise current knowledge about improved practices. **If current knowledge were to be utilised, and practices changed, the industry could be dramatically improved**.

The ineffectiveness of current information systems is a major industry constraint. Improved information communication systems could achieve more rapid change if designed to:

- develop motivation in managers
- ensure understanding of key principles
- enable on-going benchmarking of changes

Some key concepts and principles that need to be understood by managers in order to implement better practices for sustainable forage systems are:

- strategic planning
- risk/option analysis
- TQM and benchmarking
- climate prediction
- land type capability
- rangeland ecology
- water cycle and water use efficiency
- setting breeding objectives
- genetic gain is slow (< 1% for within herd selection)
- bulls are responsible for 96% of herd genetic gain
- first limiting factors in nutrition
- matching herd nutrient demand and pasture nutrient supply
- cost/benefit of herd health treatments
- turnover rate
- business management.

References

Anon. 1995. Pastoral Field days. Kimberley Beef Industry Team. Dept of Agriculture Kununurra. Western Australia.

Clark, R.A., Davis, G.P., Cheffms, R.C. and Esdale, C.R. 1992. Intergrating cattle breeding technologies into beef property management. *Proc. of Aust. Assoc. Anim. Breed. Genet.* 10: 345-348.

Clark, R.A., Boume, A.W.D., Cheffins, R.C., Gillespie, R.L., Lawrence, D.N., Murphy, K.J. and Esdale, C.R. 1992. Using the Local Consensus Data Technique to develop, improve, and enhance the adoption of Sustainable Grazing Land Management Systems. In: *Proceedings of the International Soil Conservation Organisation*, Sydney.

Clark. R.A. 1993. Local Consensus Data, grazing management practices needed and constraints to be overcome. *Proceedings of a grazing systems seminar.* Soil and Water Conservation Association of Australia, Rockhampton.

Clark. R.A. 1995. The Sustainable Beef Production System Project. Final Report. The Meat Research Corporation, Sydney.

Coffey, S.G. 1994. Permanence, Health and Beauty. Invited paper to the 1994 Annual Conference of the Australian Farm Management Society. Canberra, ACT.

Culpitt, R.A. 1992. Taroom Shire Economic Study. Economic Service Branch, Queensland Department of Primary Industries, Unpublished Monograph.

Foran, B.D., Stafford Smith, D.M., Niethe, G., Stockwell, T. and Mitchell, V. 1990. A comparison of development options on a Northern Australian beef property. *Agricultural systems* 34: 77-102.

Hinton, A.W. 1993. Economics of Beef Production in the Dalrymple Shire. Department of Primary Industries, Brisbane.

Holmes, W.E. 1991. Branding rates and age of turnoff. Insights from "Millungera". Department of Primary Industries, Townsville.

McIvor, G. and Moneypenny, R. 1994. Evaluation of pasture management systems for beef production in the semi-arid tropics: Model Development. *Agricultural Systems* 48: 1-23.

Newman, P.A. 1992. Economic Profile EP10. Breeding cattle on Mitchell grass. Department of Primary Industries, Longreach.

Rudder, T. 1993(a). Coming to terms with selling by specification. *Milne's Prime Beef*, March 11-14.

Rudder, T. 1993(b). Which market is most profitable for you? *Milne's Prime Beef*, May 1517.

Rudder, T. 1993(c). What breed of cattle best suit my enterprise? *Milne's Prime Beef*, October 18-19.