Sustaining productive pastures in the tropics 9. Managing cattle

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Abstract

Stocking rate and efficiency of production are the basics of sustainable management systems capable of responding to the severe threats of reduced prices and droughts.

Animal management involves the integration of complicated cross-disciplinary information within the context of whole property operation. The use of decision support packages to integrate the large amount of available biological, technical and financial information is a positive step in aiding meaningful decision-making for the short and long term. Simulated case studies are presented which describe various strategies used in two districts of north Australia, and the predicted outcomes when the various scenarios are subjected to climatic or financial stresses. While simulations in both districts support the argument that sustainability depends on property viability, another important factor is the greater possible flexibility in management responses which result on well developed enterprises with conservative stocking rates.

Recognition by researchers and advisers of the complexity of the system, and the development of integrated extension and support services which result in adoption of appropriate attitudes to management, decision-making and existing technology are priorities.

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Resumen

La carga animal y la eficiencia de producción son las bases de un sistema de manejo sostenido capaz de responder a las amenazas de la reducción de los precios y la sequía.

El manejo animal involucra la integración de la información de disciplinas traspuestas dentro del contexto de la operación global de la propiedad. El uso de paquetes computacionales de apoyo a las decisiones para integrar la gran cantidad de información biológica, técnica y financiera es un paso positivo hacia la ejecución de decisiones de ayuda a corto y largo plazo. Se presentan estudios de simulación, en los cuales se describen varias de las estrategias usadas en dos de los distritos del norte de Australia, y los productos predichos cuando varias posibilidades son sujetas a tensiones climáticas y financieras. Mientras que las simulaciones en ambos distritos apoyan el argumento de que la producción sostenida de depende de la viabilidad de la propiedad, otro factor importante en las empresas bien desarrolladas es la gran flexibilidad posible en las respuestas al manejo como consecuencia del uso de una carga animal conservadora.

Las prioridades consisten en un reconocimiento por parte de los investigadores y asesores acerca de la complejidad del sistema, y del desarrollo de un servicio de asistencia y apoyo integrado el cual resulta en la adopción de actitudes apropiadas hacia las prácticas de manejo, la toma decisiones y la tecnología existente.

Introduction

Cattle management in north Australia involves handling the complex processes associated with the biology and husbandry of the animals, as well as the considerable interaction with the pasture base, the business of financing the enterprise and

its development, and of obtaining returns on this investment. Central to this is the manager who needs to make the decisions.

Management decisions are made at various levels, defined in this paper as medium to long term 'Strategies' and shorter term 'Tactics'. The paper concentrates on the effects of cattle management attitudes and decisions on sustainability of pastures. It is argued that pasture sustainability cannot be separated from financial viability or herd productivity.

Case studies of hypothetical properties in Charters Towers and Katherine districts of north Australia are presented as examples of the effects of different management strategies (and the subordinate tactical decisions) on sustainability.

Sustainable management in a risky environment

The cattle manager

Most producers consider themselves to be carers for the land and express a keen desire to look after the land over the long term. However this stated objective is often over-ridden by the short-term financial inability to fulfil it, or because of the lack of suitable information on which to base sensible decisions. There are also some producers who take little account of the long term cost of short-term financial gain.

The ability to realise a sustainable and viable income is the ultimate determinant of a manager's ability to develop a management system that will sustain pasture.

Risk management

The response to risk by individual managers determines the type of management decision made and degree of adoption of particular practices (Bernado and Engle 1990). Foran and Stafford Smith (1991) have compared the responses, management styles and effects of external shocks on the enterprises of competent managers with different attitudes to risk. In central Australia a manager who aimed to keep risk at a low level (Risk Avoider) opted for a low stocking rate. This ensured continuous forage availability and the property was therefore resilient to climatic variability (eg drought). Returns for this property were moderate but constant. At the other end of the scale the high risk enterprise (Risk Preferrer) was an active cattle trader juggling stock numbers with season and markets. Overall returns were higher but markedly more variable between years. Both pasture systems could be sustainable.

Developing Management Strategies

In the hierarchy of decision-making there are a variety of long and medium term strategies, and short term tactics available to producers in order to improve performance of a given property. Some of the possible decision pathways are shown in Figure 1.

There is little opportunity for changing products through most of north Australia although the buffalo offers improved adaptation in the Top End of the Northern Territory. The options for change are therefore either to increase numbers or to increase efficiency; these goals must be met without detriment to the pasture resource.

Increasing numbers

Holmes (1988) argues that maximum profitability will lie between the extremes of maximising returns per head and returns per hectare. He notes that in practice this point is ill-defined and near maximum profitability may occur over a comfortably wide range of stocking rates.

The traditional low risk response to the ever tightening cost-price squeeze has been to allow for a natural increase in herd size for the lowest development cost. This has worked historically and remains an option in less developed areas such as Katherine, where more country may be obtained for relatively little cost through the provision of extra fences or waters. In areas where the boundary fence has intervened the "more cattle means more money" philosophy has failed. The result has been overgrazed pastures and a more variable income susceptible to climatic failure. In such instances seeking to increase income by increasing stocking rate has led to a much higher risk level. Meppem and Johnston (1990) suggested that to reduce risk a more conservative use of pasture was needed.

Reviews such as Burrows (1990), and studies such as described by McKeon *et al.* (1990), present strong arguments to suggest that, in general, stocking rates are at the upper end of the economically appropriate range, and probably past the point of pasture sustainability. There are, however, few examples or case studies and fewer hard data with which to convince cattlemen that the overwhelming conventional wisdom that

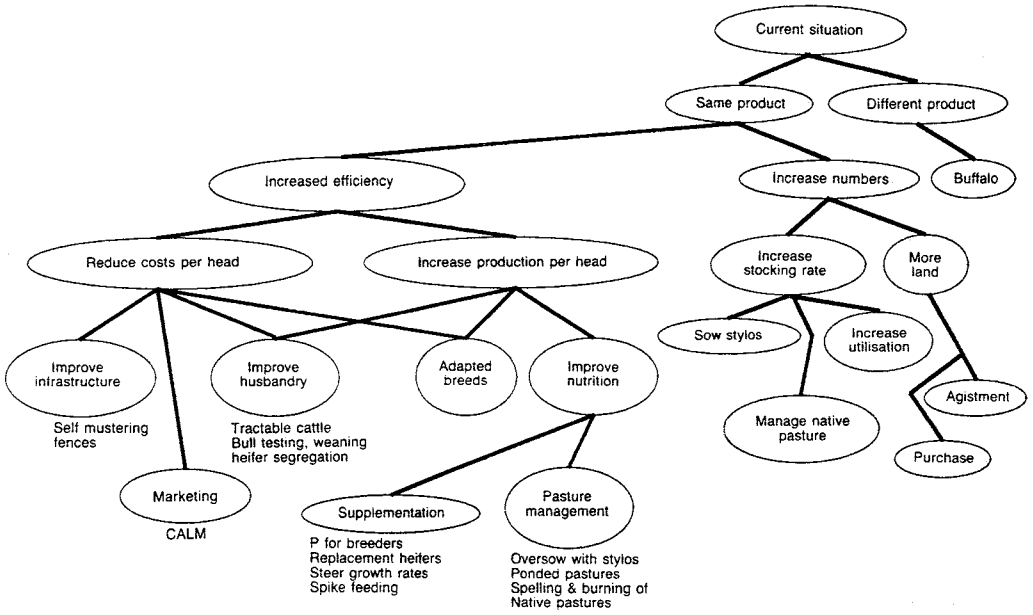

Figure 1. Some alternative strategies and decision pathways for improving the performance of a particular property in north Australia (adapted from Stafford Smith and Foran 1988).

"more cattle means more money" is not necessarily correct for sustainability, herd productivity or profitability.

Rare documented examples from the arid zone suggest that some moderate stockers (Purvis 1987; Morrisey and O'Connor 1988) have maintained or improved production per hectare despite having substantially lower stocking rates than their neighbours. Preliminary data from repeated breeder herd surveys in the Katherine region suggest an inverse relationship between stocking rate and breeder survival, branding rate and level of stock husbandry (G. Jayawardhana, unpublished data) as shown in Table 1. In this study increasing stocking rates reduced per head and per hectare production.

Radical grazing systems do not alter the relationship between stocking rate and productivity (Bryant *et al*, 1989). Manipulation of effective stocking rate by judicious placement of adequate water points (Stafford Smith 1990) and use of fire and fencing to spell pasture and change grazing habits are the major grazing management tactics available to north Australian cattlemen.

The maximisation of gross margin per head through increased efficiency of production would appear to be more in tune with sustainable production than the maximisation of per hectare returns.

Table 1. Stocking, weaning, breeder mortality and increase rates, and husbandry levels for 5 commercial breeder herds in the Katherine district of the Northern Territory. (G. Jayawardhana, personal communication)

Property	A	B	C	D	E
Stocking Rate (head/sq km)	5	6.5	7	9	9
Weaning Rate (%)	75	73	45	43	40
Breeder Mortality (%)	3	6	18	16	30
No. Weaners/100 sq km/year	380	470	310	390	360
No. Excess heifers/ 100 sq km/Year	170	200	30	50	−90
No. Excess heifers/1000 Breeders	345	305	45	55	−100
Average Annual Rainfall (mm)	900	500	900	500	900
Husbandry Level[1]	High	High	Med	Med	Low

[1]High Biannual weaning, full breeder supplementation
Med Biannual weaning, some supplementation
Low Annual weaning, limited supplementation

Increasing efficiency

Increasing efficiency can be achieved by either reducing costs per head or increasing production per head through the strategies and tactics illustrated in Figure 1.

Comprehensive reviews on strategies and tactics for increasing efficiency in north Australia have been prepared by Entwistle (1990), Vercoe (1990), Hendricksen *et al.* (1985) and Coffey (1990). Examples of tactics which contribute to sustainable strategies are presented in the case studies.

Integrating tactics and strategies for sustainable management

Illustrations of sustainable management packages are presented as simulated case studies for two districts. The Charters Towers district has provided examples of non-sustainable cattle management strategies over the previous decade (McKeon *et al.* 1990). While sharing a similar environment the Katherine district is less developed and less populated than Charters Towers. The pastures of the district are susceptible to overgrazing (Mott 1987).

1. Charters Towers

The Charters Towers district (Dalrymple Shire) consists of 270 beef properties ranging in size from 80 - > 1800 square kilometres (sq km), carrying 1000 to more than 10,000 head, with 3000 head considered a 'living area' (P.C. Smith, personal communication). Approximately 70% of properties breed and fatten cattle, turning off 4 year old bullocks dressing 250 kg or more. About 30% of the turnoff is female.

Production problems include high breeder mortality, low branding rates, low reproductive rates of maiden heifers and first calf cows, with the possibility of deaths and low growth rates in weaners. Steer growth rates vary from 30-110 kg/yr. 'Traditional Management' includes breeder and steer supplementation and annual weaning.

A strategy of 'Improved Management' is recommended to allow sustainable production. The recommendations are:

1. An annual vaccination against Botulism types C and D in phosphorus deficient and marginal country.
2. Treat weaners against worms in problem years.
3. Vaccinate bulls against Vibriosis.
4. Wean calves twice yearly down to 3-4 months and supplement with a protein meal during the first dry season.
5. Supplement first calvers to reduce mortality and improve conception rate for the second calving.
6. Use stylo and buffel grass pastures, and where appropriate, develop ponded pastures for weaners and steers, to allow earlier turnoff and reduce annual supplementation costs.
7. Use self mustering systems to reduce recurring mustering and handling costs.

Production parameters, and costs and returns for traditional and improved management scenarios are shown in Table 2.

Table 2. Production parameters, costs and returns, and gross margins for two simulated beef properties operating different management strategies in the Charters Towers district, Queensland (P.C. Smith, personal communication)

	'Fawlty Towers' (Traditional Management)	'Charters Powers' (Improved Management)
Herd size	3000 AE[1]	3000 AE
Cows & heifers mated	1155	1017
Branding Rate		
Maiden heifers	70%	80%
1st calf cows	30%	50%
Cows	60%	70%
Average	57%	68%
Deaths		
Weaners	10%	4%
Heifers	15%	7%
Cows	10%	5%
Males	2%	2%
Sales		
Cull heifers	29 @ $270	90 @ $300
Cows	126 @ $340	181 @ $340
Steers 4 y.o.	269 @ $540	309 @ $560
% Females/Total Sales	37%	47%
Variable Costs		
Weaners	$15	$30
Heifers	$13	$15
1st Calf Cows	$15	$28
Breeders	$15	$15
Gross Margin	$161,434	$211,100
Gross Margin/AE	$ 54	$ 70

[1]Animal equivalents

The likely outcome of adopting the 'Improved Management' strategy was calculated using computer simulation (Holmes 1989) and showed a marked improvement in gross margin per animal equivalent from $54 to $70, or on a whole herd basis from $161,000 to $211,000.

Estimation of safe carrying capacity in the Charters Towers area (as determined by modelling yearly pasture growth and allowing a 30% utilisation by grazing stock) suggest that actual stocking rates exceed these levels substantially (McKeon *et al.* 1990). If the $161,000 gross margin represents the level of income necessary for the property to be viable, then the adoption of the management strategy aimed at improving efficiency would allow this income to be achieved with a 25% reduction in stock numbers. Alternatively, if stocking rate is presently moderate, the extra income would provide for flexibility in marketing and ability to respond to drought conditions, or investment in pasture improvement to further increase flexibility in production strategies.

2. Katherine

The Katherine district is typified by property sizes ranging from 500 to 12,000 sq. km. with herd sizes between 1,000 and 70,000 head. Generally herd sizes have been substantially reduced due to the Brucellosis and Tuberculosis Eradication Campaign (BTEC) and a series of poor years. There is therefore room for expansion on most leases. Breeder mortality rates are high (10-25%) depending on breed, season and disease outbreak (Stockwell and Norton 1990). Branding rates are low (35-55%) (Perkins et al. 1988) with exceptional properties achieving higher rates (65-75%).

A recommended management package to improve herd efficiency includes:-

1. Vaccination against Botulism types C and D.
2. Wean Calves twice yearly on to good, ungrazed native pasture.
3. Supplement breeders, particularly with phosphorus in the wet season.
4. Segregate and provide preferential nutrition for heifers.
5. Supplement steers for improved growth rates to meet trade specifications for the live shipping trade to south-east Asia.
6. Use self-mustering techniques as appropriate to reduce mustering and handling costs.

There appear to be two possible scenarios for the immediate future. Increased fencing and infrastructure, smaller adapted herds, and the promise of increased prices from live exports will allow younger animals to be turned off as branding rates improve.

Maintaining smaller breeder herds would allow some pasture spelling. Alternatively, however, some managers have adopted the traditional low input-low output strategy (McCool 1990), maintaining minimal infrastructure and accepting lower turnoffs.

We examined the effect of various challenges on these alternatives using Rangepack Herdecon (Stafford Smith and Foran 1988) by establishing two herds on the basis of local data from commercial and research experience. The assumption was made that neither property carried a debt.

Production parameters and costs are described in Table 3. 'Lilo Downs' was set up with minimal input costs but correspondingly low biological rates and turnoff. 'Hiho Hills' adopted management strategies enabling increased productivity and turnoff but incurred considerably increased variable and development costs.

The properties were first run through 20 alternating poor and moderate years reflecting an average run of seasons as described by Foran *et al.* (1990). The responses in terms of annual cash surplus and herd size are shown in Figure 2. From a similar sized herd the cash surplus for 'Hiho Hills' was far superior at $220,000 compared with 'Lilo Downs' fluctuating $50-70,000 (including $25,000 off-property income). Under this benign run of seasons both scenarios are viable although ecologically 'Lilo Downs' may have degraded frontage or other favoured grazing areas due to a limited ability to control grazing patterns.

Table 3. Annual production parameters and costs for two simulated beef properties operating 'traditional' and 'increased efficiency' management strategies in the Katherine district, Northern Territory

	'Lilo Downs' (Traditional)	'Hiho Hills' (Increased efficiency)
Herd size	6500 AE	6500 AE
Cows and heifers mated	3047	2460
Branding Rate		
Poor-moderate year	45%-55%	70%-80%
Drought year	30%	30%-40%
Death Rates (%)		
Weaners	4%- 5%(10%)[1]	4%-5%(10%)
Heifers	11%-18%(25-30%)	4%-5%(10%)
Cows	11%-18%(25-30%)	4%-5%(10%)
Males	4%- 5%(10%)	4%-5%(7%)
Steer growth (kg)	60-90 (40)	110-130 (70)
Total costs/head	$36.00	$58.00

[1]Figures in brackets refer to rates in drought year.

The real test of sustainable management is when climate or markets threaten viability. The second scenario imposed a severe drought on the area in 1991 (Figure 2). Mortality rate increased for both properties and branding rate in the subsequent year was reduced. While 'Hiho Hills' recovered from drought by 1996 in terms of herd size and annual cash surplus without any changes to the management regime, 'Lilo Downs' went into negative cash flow and had not recovered after 20 years. Although reduced herd size may lead to increased production per head through reduced stocking rates, in practice further losses due to disease or season will keep production rates low. Similarly while overall stocking rates are reduced, the low levels of stock control mean that favoured areas will continue to be overgrazed. The reduction in herd size lowers the flexibility of the 'Lilo' management system and permanently reduces both the viability of the property and its ability to adopt improved management options.

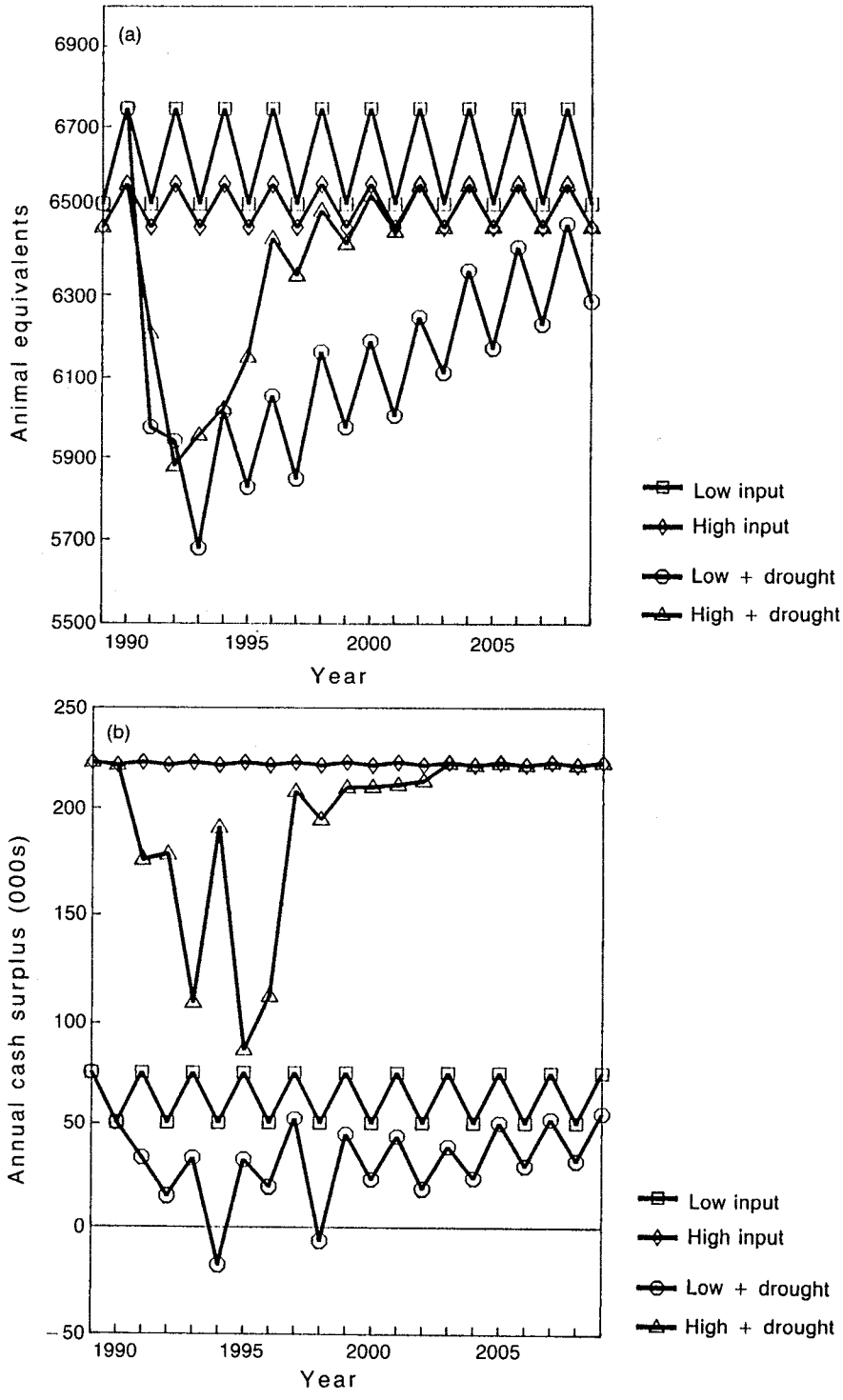

Figure 2. Predicted patterns of (a) herd size and (b) annual cash surplus for two Katherine properties: 'Lilo Downs' operating 'low input' (□, ○) and 'Hiho Hills' operating 'increased efficiency' (◇, △) management strategies for a run of average years, and through a drought year in 1991.

In the third scenario a 5% per annum cost/price squeeze is inflicted on the properties over a decade. Even with the very low cost structure on 'Lilo Downs' the operation goes into negative cash flow after only four years. The reduced flexibility of the biology and financial situation limits the manager's ability to adjust to the rapidly changing economic environment. The on-property cash flow is negative after only two years.

'Hiho Hills' is more drastically affected in absolute terms but the better initial productivity and financial situation would allow an opportunity to find a management response to the problem.

From these simple examples it is clear that low productivity rates will severely limit the flexibility of producers in adapting to meet climatic or economic threats in a sustainable fashion. While the relatively few operations with large cattle numbers (>5000 head) may endure under this system for some years, the cost price squeeze requires that the minimum number of cattle needed to be viable continues to grow. As well, under this system the negative effects of uncontrolled grazing on the landscape will increasingly become unacceptable to society at large.

Conclusions

An efficiently producing herd would appear to offer the northern industry the best chance of retaining the flexibility required to handle the variability of climate and markets and therefore operate sustainably.

The drastic and rapid reduction in real returns is a major threat to the ability of northern producers to manage for the future. This will be worse if properties are attempting to service a debt.

There must be a limit to the savings that can be made from reducing the cost of production. If producers and society are going to place a higher capital value on the land and pasture resource there needs to be an increased ability for managers to make the right decisions for the long term as well as for short term survival. The data and information base available is still largely

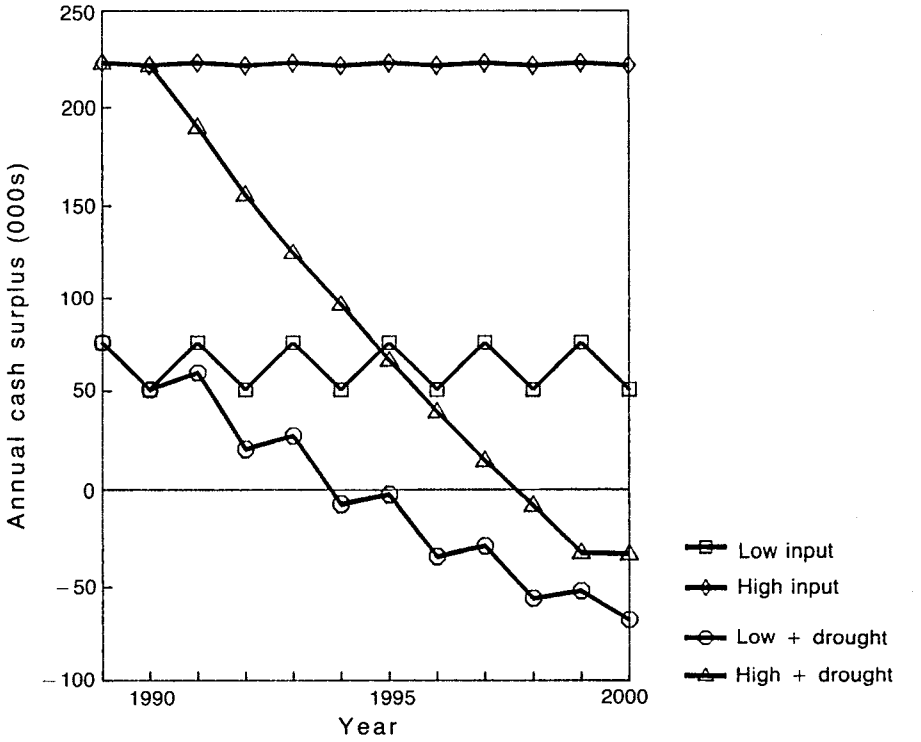

Figure 3. Predicted patterns of annual cash surplus for two Katherine properties: 'Lilo Downs' operating 'low input' (□, ○) and 'Hiho Hills' operating 'increased efficiency' management strategies (◇, △) for a run of average years, and for a similar run subjected to a cost-price squeeze of 5%/year.

divided on disciplinary lines. Traditional approaches to research and development concentrate at the "tactical" level. The development of computer software has helped to combine "Tactics" into "Strategies", thus enabling managers and advisers to make better decisions. They are often limited by the availability or integration of some key data. Models that link climate, pasture production and animal productivity, and that improve ability to forecast season are positive steps. Their applicability to all regions and at the property level need to be addressed.

Low risk methods of incorporating known animal management strategies that allow more efficient production at minimal cost have a higher development priority than new technology, especially if the new technology requires the manager to go into debt.

Reduced stocking rate is the key and overriding principle for viable production from a sustainable pasture resource.

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