

4 Strategies for sustainability

There are several strategies for ensuring long-term use and sustainability; many of these are interacting.

1. *Establishing guidelines for safe stocking strategies*

With a sufficient understanding of pasture responses to season, grazing pressure and fire, indicators could be developed to guide tactical management of grazing. These indicators would provide for timely adjustments to stocking rate and so avoid damage to grazing resources.

Information to support both tactical and strategic stocking rate decisions is required, such as:

- improved pasture husbandry practices relating to the maintenance of desirable or improved composition, production capability, utilisation and the management of natural or enhanced floristic diversity
- paddock design and the management of watering points
- a better understanding of livestock husbandry and nutritional requirements in relation to feed quality and quantity
- feral animal control and wildlife management.

Producers must have sufficient knowledge to be able to compare alternative strategies, rather than just being told what to do. This requires developing close or interactive links between producer and researcher; field station research should be linked with on-property research so that it can relate research to property management information.

2. *Establishing a better understanding of the management of resource diversity*

Understanding management of a diverse resource is particularly important for large properties where the pasture units are highly variable and the climate is unpredictable during the year; these conditions are found in Central Australia and in the smaller scale diversity of the highly dissected parts of the Top End of the Northern Territory and the Kimberley region.

Another case is large scale diversity within a region, rather than within a property, as found in the Maranoa and central regions of

Queensland. In these regions, lands of high and low pastoral and agricultural potential are interspersed—Queensland bluegrass, brigalow, eastern gidgee and eastern mitchell grass are intermixed with *Aristida-Bothriochloa* pasture communities. Here the management of resource diversity must be more at the inter-property, or catchment level, rather than within properties.

Over the whole of northern Australia, there is a problem in the management of frontage country; this has resulted from overuse of land which has higher soil fertility and is adjacent to water.

This strategy (2) overlaps substantially with Strategies 1, 3, 4, 6 and 8, but it is listed separately because, like Strategy 1, it addresses a complex problem. The individual issues need to be understood as well as the complex interactions.

3. *Establishing guidelines and techniques for monitoring the pasture resources*

The pasture resource must be monitored to determine whether its condition is stable, improving or declining. This will involve:

- monitoring of all aspects of the production system to develop the necessary understanding of the resilience, sustainability, degradation and recuperative processes of the system. Land managers must be involved in all phases of the monitoring process to encourage participation, awareness and education (see Strategy 2)
- regular periodic monitoring of the production resources of leaseholds. In all three states making up the northern Australia region, new Land Acts are in various stages of adoption. All will embrace new concepts of leaseholding designed to provide better incentives for responsible, long-term land management, and for regular monitoring (see Strategy 11)
- primary producers are increasingly interested in how they can monitor their own properties. With increasing availability of computerised decision support systems, property managers are likely to start using such information. Appropriate

monitored statistics will need to be considered within the scope of property management (see Strategy 8)

- monitoring is an important element of managing drought and understanding drought processes (see Strategy 6).

4. Reconsideration of fire as a strategic management tool

Fire can play a strategic role in grazing management, by helping to maintain pasture composition, and particularly in controlling woody weeds. It has particular relevance to Strategies 1, 7 and 9. In recent years, fire has been down-played as being environmentally unfriendly, however reduced use of fire (Roberts 1991) has more likely come about because of the shortage of fuel due to dry years, increased stocking rates, and more efficient utilisation of pasture biomass through the use of feed and mineral supplements (see Strategies 2, 7 and 9).

5. Greater use of on-farm research and acquisition of farm-related data

The wealth of farm information has to be tapped as a means of verifying and making the large amount of available research information relevant to the farm. This process requires a close liaison between researcher and client, i.e. the farm manager, particularly for the development of decision support systems as an aid to management (McKeon *et al.* 1986; Gillard and Money Penny 1990). This is already taking place in the form of the QDPI decision support packages—GRASSMAN and STOCKMAN (see Strategies 1, 2, 8 and 12).

6. Strategies for handling drought

Given that droughts are likely to recur and that some degradation in the pasture and soil resources is likely to follow, the recuperative processes after drought must be understood to develop property management options.

The knowledge base required to support Strategy 1 is also relevant to drought management. However, the contingency planning for drought and the actions taken during drought can have a substantial effect on what those options are after drought. At present drought is invariably dealt with as it occurs, without forward planning. There is, therefore, a need for better predictive capability and interpretation of past events so that drought

preparedness and management strategies are in place and degradation effects on the production resources are minimised (CSIRO 1990).

Although still in their early development, such prediction systems as RAINMAN (Clarkson and Owens 1991) are paving the way to better understanding and reliability. They require more feed-back from the producer level to improve their local usefulness (see Strategies 3, 5 and 8).

7. Addressing the serious weed problems and threats of weed invasion

Serious incursions of exotic woody and herbaceous weeds have developed in north Queensland over the last 10 years and are outlined in Appendix 3. In many situations, land has been made almost totally unproductive by invasion of weeds, while, in other areas, a formidable threat exists in the form of reservoirs of infection. In addition to these exotic species, and also some native ones, there is a widespread and endemic problem of woody regrowth from eucalypt and acacia species, particularly in southern Queensland (see Strategy 9). This is specifically important in such systems as the mulga and other acacia species in south-west Queensland and Central Australia, where finding the right balance between top-feed and ground-feed is not always easy.

Other areas of northern Australia may not have serious problems now, except for mimosa in the north-west of the Northern Territory, but there is always the threat of the exotic weeds colonising from north Queensland. Understanding fire ecology could be essential to the development of management strategies to address this problem (see Strategy 4).

8. Enhanced educational programs for producers

Such educational programs should be participatory and of a 'grass-roots' nature, with a strong emphasis on producer-derived information. This could come through a broadening of Landcare activities or such producer-based organisations as the Victorian River District or Centralia Land Management Associations.

Producers are requiring greater access to technology, and there is need for better channels of feed-back to researchers about their changing situations and requirements.

However, there is need for support and channels to facilitate and empower producer groups so that 'user-pays-user says' messages are representative of the producers and receive an effective hearing. Agricultural advisers need to play a responsive role rather than a command one. Landholders need to be able to access the new technologies, particularly in the use of computerised decision support systems, as this will be one of the most potent ways of advancing both management expertise and the technical base on which tailored systems will operate (see Strategies 1, 2, 3 and 5).

9. Tree management

Tree management issues arise largely in southern Queensland and in Central Australia. As mentioned under Strategy 7, woody species regrowth is an endemic problem and is likely to remain so where pasture lands exist on cleared or partially cleared eucalypt woodlands.

Fire is an important factor in control of regrowth. In the acacia woodlands, suckering from old rootstocks can be a serious problem, especially in the brigalow lands, but now only on lands that cannot be cultivated for crop production. In other areas, acacia regeneration by seedlings can be a problem, particularly after fire. This may be the case in the mulga and other top-feed acacia systems of south-west Queensland and Central Australia where a balance is needed between the tree density desirable for top-feed and that for pasture growth.

Another aspect of tree management that is of increasing concern is the effect of clearing on salinisation. Where solodic or texture contrast soils are widespread—as in the *Aristida-Bothriochloa* pasture community, considerable parts of the black speargrass, and some brigalow communities—salinisation could occur between 20 and 100 years after clearing. The Murray Darling Basin Ministerial Council is addressing this issue over a large part of eastern Australia, but little activity is being undertaken in Queensland except by the Queensland Department of Primary Industries (see Strategies 4 and 7).

In many areas where there has been excessive or unnecessary clearing, guidelines should show how to re-establish trees for shade, windbreaks, soil and water conservation, wildlife habitat and landscape aesthetics. For other areas where there is a case for tree

reduction, guidelines must show how this should be done, i.e. the degree and pattern of the removal (see Burrows *et al.* 1988).

10. Feral animals and wildlife

Uncontrolled populations of feral buffalo, pigs, donkeys, camels, horses and rabbits, and of native herbivores such as kangaroos and wallabies, all contribute to difficulties of management, particularly in the implementation of Strategy 1. For feral animals, there is a need to broaden the approach to their control. There are few examples anywhere of the successful eradication of feral animals, and most programs have eventually opted for control rather than elimination.

In terms of wildlife, while much work has been done in feed resource competition and dietary complementarity, there is a need for better monitoring of numbers, and for setting levels of population control which will balance competition with survival (see Strategies 1 and 2).

11. Improved conditions of leasehold

There are several cases where uneconomic sized leases are leading to over-use of the land resource to provide a livelihood for the landholder. Such situations exist in the Northern Territory Gulf region (Holmes 1990), and in the mulga lands in south-west Queensland, especially in the Maranoa district (Clark *et al.* 1992). While this is not a problem for research, it must be viewed as an environmental constraint to good land management.

There should be interaction between land holders, researchers, agricultural advisers and land administrators in setting and reviewing adequate living areas, and in helping to establish acceptable methodologies for monitoring the land resource and its management. At present, all three states comprising the region are developing a new generation of Land Acts (see Strategies 3 and 5), which should address these problems.

12. Better definitions of markets and formulation of production objectives

Where there are ill-defined market objectives, management options are decreased and resource-use planning is difficult. If the industry is to be made more efficient by emphasising sustainable improved production

on a per-head basis rather than on a per-hectare basis, market objectives for the necessary investments need to be defined.

A recent example of this is the beef meat and live animal market in Indonesia, which has given producers in the Northern Territory new

market objectives, just at the time (following the BTEC program) when they were most needed. Now there is a strong demand for decision support services to help with property planning (see Strategy 5).

Pasture communities at risk

At risk –

from overgrazing:

- with the use of feed supplements, pasture legumes, hardier breeds of livestock; and by feral animals:
 - black speargrass
 - ribbongrass
- on calcareous soils carrying sweet feed:
 - shortgrass annual pastures (Central Australia and Victoria River District)
- on systems carrying top-feed of edible acacias:
 - mulga pastures

from weed invasion and regrowth:

- exotic woody weeds:
 - parkinsonia, mesquite, prickly acacia:
 - mitchell grass (mostly Queensland)
 - rubbervine, chinee apple:
 - frontage country (Queensland Gulf and Peninsula)
 - mimosa:
 - ricegrass-*Hymenachne* (Darwin, north-west coastal)
- native woody weeds:
 - eucalypt regrowth:
 - southern black speargrass (central and southern Queensland (Qld))
 - eucalypt regrowth, shrubs and cypress pine regeneration:
 - Aristida-Bothriochloa* (central and southern Qld)
 - acacia regeneration with other shrubs:
 - mulga, other acacia (Qld, Central Australia and Pilbara)
 - acacia sucker regrowth:
 - brigalow (Qld)
 - acacia regeneration:
 - gidgee (Qld, Central Australia)

- exotic herbaceous weeds:
 - parthenium:
 - central Queensland bluegrass (Qld)
 - northern brigalow (Qld)
 - central eastern mitchell grass (Qld)
- native herbaceous weeds
 - pimelea:
 - southern alluvials (Qld)
 - southern brigalow (Qld)
- exotic grass weeds:
 - giant rat's tail grass (coastal south and central Qld)

from soil deterioration:

- soil fertility decline:
 - nutrient depletion:
 - derived rainforest pastures (Qld)
 - blady grass pastures (Qld)
 - heathland pastures (Qld)
 - other sown pastures
 - nutrient tie-up:
 - brigalow pastures (Qld)
 - Queensland bluegrass
- soil structural degradation:
 - surface scalding on red earth soils:
 - mulga (Queensland, Central Australia, Western Australia)
 - ribbongrass (Northern Territory, Western Australia)
 - surface scalding on fine-textured duplex soils:
 - some black speargrass (Qld)
 - some *Aristida-Bothriochloa* (Qld)
- soil profile degradation:
 - salinisation due to tree clearing on duplex soils with saline sub-soil:
 - some *Aristida-Bothriochloa* (Qld)
 - some black speargrass (Qld)
 - some brigalow pastures (Qld)

Problems and priorities

In ranking the problems in Table 4, we have chosen to group them into three levels of priority. When we asked people to allocate priorities to this list of 12, we found much diversity in view from individuals between regions as well as within regions. However, there was reasonable consensus when we grouped the responses into three levels. A further difficulty in this exercise is that not all problems are equally important over the four regions.

The listing is an approximate overall order of importance for all of northern Australia. In this ranking, Western Australia places low priority on further research into monitoring, not because it is not considered important but because that state has satisfactory monitoring

systems in place. The main problem is in processing the information acquired.

Western Australia places a high priority on fire research as they see fire as an invaluable tool in pasture management. This is apparent in the condition scores and land capability estimates in Table 3, because a much higher use is made of the poor quality pasture land than elsewhere.

Queensland places a high priority on on-farm research and data collection. This probably reflects the higher level of importance that decision support technology is given. It might also reflect more intensive land use in Queensland and more exposure of producers to extension personnel. The state is also strengthening its research on the problems of drought, and on property management strategies for drought.

**Table 4 Overall ranking of problems and ratings for each region¹
(rating of 1 indicates highest priority)**

Priority	Item	Qld	NNT	CA	WA
1	Stocking strategy	1	1	1	1
2	Managing resource diversity	1	1	1	1
3	Resource monitoring	1	1	1	3
4	Fire research	2	2	1	1
5	On-farm research/data	1	2	2	2
6	Drought	2	2	1	2
7	Weeds	1	2	2	2
8	Education	2	2	2	2
9	Tree Management	2	3	2	3
10	Feral animals/wildlife	3	2	2	3
11	Leasehold sizes/covenants	2	3	3	3
12	Market research	3	3	3	3

¹ Qld = Queensland; NNT = northern Northern Territory;
CA = Central Australia; WA = Western Australia

The issues for sustained live-stock production

The most important issues for livestock production in northern Australia are stocking strategy, how research is translated into practice, and the custodianship of land.

Stocking strategy

Overgrazing has led to the deterioration or degradation of some pasture land, but, when the grazing pressure is considerably reduced and the growing seasons are favourable, regeneration may be rapid. Long-term set-stocking leads to gradual deterioration of the more palatable species of the pasture, and some form of strategic spelling is beneficial to maintain desirable pasture composition. Spelling should not be confused with rotational grazing. Rotational grazing can lock the grazer into a mechanical pattern of utilisation rather than one in tune with the biological strengths and weaknesses of the desired pasture plants.

Important issues are:

- a long-term safe stocking rate that will maintain the pasture resource in a desirable and productive condition. In Queensland, the industry has been stocking mostly above that level for the past 10 years or more. High resource diversity can make this safe level difficult to determine. Improvement can come only from more efficient livestock production where fewer animals are needed to produce the same or better output. The feed resource must be used more strategically or improved to match both the livestock need and its own sustainability.
- strategic management of the grazing resource to counter either the overuse of the resource which is inevitable at times or any gradual erosion of the desirable pasture composition. In Queensland, there has been a general increase in the unpalatable wire grasses in the black speargrass, southern mitchell grass and *Aristida-Bothriochloa* pasture lands. While this increase can be attributed largely to overgrazing, it appears to be a long-term trend through good and bad years. In the Northern Territory, there has been an obvious decline in the

grazing-sensitive kangaroo grass and an increase in black speargrass. While this may not be considered a deleterious change in Queensland, it could be so in the floristically poorer systems of north-western Australia.

- strategic management of the resource to enable the implementation of livestock husbandry practices which will improve the efficiency of livestock output. Production per head, rather than per hectare, needs to be stressed; it may actually improve the per-hectare results.

Translating research into practice

Translating research into practice needs a much closer relationship between landholder and scientist. There is much farm-based information which should be used to help formulate research and to verify research results and assumptions used in computer models. In a two-way interaction, the landholder needs to be a close participant in all aspects of the work; in this way both parties learn and all relevant aspects of the problems are considered.

In structuring relevant research, two important questions need to be answered:

1. How will this work, directly or indirectly, affect the primary producer in terms of his output and the maintenance of a sustainable production resource?
2. How best can this research be organised by the institutional and scientific fraternity, given their different strengths and constraints, so that the results are eventually linked to the producer?

The custodianship of land

Pastoralists cannot be given absolute freedom in the use of leasehold land, and there is now increasing scrutiny as to how well they are managing the resource. However from the overall community point of view, they are generally fair tenants, they do not cost the community unduly in monetary terms, and they generate goods and services which are beneficial. Given a more rational set of checks and balances in the use of land, there is every reason for this land use being improved and sustained.

In turn, it is incumbent on the States to ensure that the leaseholds are fair, equitable and sufficient and that appropriate services are

rendered to maintain the viability of the enterprises and sustainability of their resources. It is not the role of this report to set priorities for land use. The report focuses on those areas which are presently used for pastoral purposes, and its assessments provide some indication of how well this is being done. It poses no alternative land uses—that is a political decision—but there must be discussion between actual and potential user groups so that the most socially, economically and ecologically acceptable forms of use eventuate.

There is likely to be an increased and competitive demand for land resources by such interests as mining, tourism, recreation, conservation (including national parks and reserves), and special cultural groups (aboriginal land). Some of these uses are self-sustaining, but others are not and must be funded by the public purse. Society, through its socio-political processes, will decide on the extent and cost of such apportionments. However, there is room for more conciliation and sharing of the fruits of research.

Off-farm effects of inappropriate resource use, which are long-term in their manifestation, may not be readily discernible on-farm. These may include gradual siltation of regional dams, nitrification and algal growth in waters as a result of the use of fertilisers or heavy concentrations of livestock, and latent salinisation.

Other issues that are more specific include exotic weeds, and the management of fires and of trees.

Exotic weeds

The exotic weeds of northern and central Queensland need to be contained and progressively reduced. While these weeds are now causing degradation of some production resources in that state, they also pose a massive threat to their associated areas and comparable communities in the Northern Territory and Western Australia.

Fire for management

There is widespread recognition of the value of fire in management. It may have had a history of irresponsible use, but, if used wisely and in an ecologically responsible way, it is one of the most beneficial tools in pasture management and the control of weeds. There may be social concern and some community education about the value of strategic burning.

Tree management

Tree management may not be simply a property-based consideration; one example is the case with salinisation affecting land off the property, or even over a whole area if the catchment drainage is involved. Flood peak levels of streams can be increased and water table recharge lessened if widespread clearing is undertaken. There may be a change in ecosystem quality for wildlife. Reafforestation needs to take into account the needs of wildlife habitat in terms of minimal area and linkages of habitat through corridors of forest.