Cattle and land management best practices in the Katherine region
Published by:
Northern Territory Government
Department of Regional Development, Primary Industry, Fisheries and Resources
ABN 84 085 734 992
March, 2009

© Northern Territory Government, 2009

ISBN: 978 0 7245 7171 0  (print version)
ISSN: 978 0 7245 7170 3  (web version)

Researched and compiled by staff of the Northern Territory Government,
Department of Regional Development, Primary Industry, Fisheries and Resources.

Designed by Sprout Creative.

Disclaimer
While all care has been taken to ensure that information contained in the Cattle and land management best practices in the Katherine region manual is true and correct at the time of publication, changes in circumstances after the time of publication may impact on the accuracy of its information.

The Northern Territory of Australia gives no warranty or assurance, and makes no representation as to the accuracy of any information or advice contained in this publication, or that it is suitable for your intended use.

You should not rely upon information in this publication for the purpose of making any serious, business or investment decisions without obtaining independent and/or professional advice in relation to your particular situation.

The Northern Territory of Australia disclaims any liability or responsibility or duty of care towards any person for loss or damage caused by any use of or reliance on the information contained in this publication.
The need for a Best Practice manual has been a subject under discussion for a long time. The rate of growth in the pastoral industry in the Katherine region has been phenomenal in recent times. With this change we have seen more pastoral land being utilised, ownership changes, subdivision of some pastoral holdings, and with these changes, an influx of new producers to the region. Intensification on some properties has also seen a need for revised management practices.

Given that a lot of the Katherine region was still fairly undeveloped there has been a steep learning curve about the best method of handling development and maintaining and improving country, controlling weeds and utilising best bet cattle husbandry practices. In some areas there has been little or no precedent to refer back to for guidance.

This manual has endeavoured to reflect the need for a balance between good practical producer knowledge and experience backed up by sound scientific advice. If more is needed on a subject reference sources are provided.

This manual needs to be a living document to enable producers to keep abreast with developments and new methods and techniques as they in turn become the new Best Practice. In order to cater for this need the plan is to periodically update this manual in an endeavour to reflect our progress and keep abreast of new technology.

I strongly recommend this manual for all producers. I am sure that it will be a big help for those starting out in our region and will keep existing producers abreast with new developments in our industry.

Cheers,

Keith Holzwart
Chairman KPIAC
This publication was compiled and edited by:

Jessica Mayes, formerly DRDPIFR
Sally Sullivan, pastoralist, Mataranka
Trudi Oxley, DRDPIFR Katherine
Neil MacDonald, DRDPIFR Katherine
Renee Golding, DRDPIFR Katherine

This publication would not have been possible without the generous assistance, persistence and patience from the following:

- Meat and Livestock Australia for their funding support.
- Major contributors to the chapters:
  - **Animal Health**: Sue Fitzpatrick with assistance from Peter Trembath (Katherine Vet Care Centre) and DRDPIFR staff.
  - **Cattle Management**: Neil MacDonald and DRDPIFR staff.
  - **Cattle Nutrition**: Kieren McCosker and DRDPIFR staff.
  - **Infrastructure and Station Development**: Trudi Oxley with assistance from Jim Addison (DAFWA), Caroline Green (DNRETAS), Sally Sullivan (Pastoralist) and DRDPIFR staff.
  - **Land Management**: Robyn Cowley and Trudi Oxley with assistance from Claire Brown (DNRETAS) and DRDPIFR staff.
  - **Other**: Trudi Oxley with assistance from Sally Sullivan (Pastoralist), Anne Walters (DNRETAS), Helen Neave (DNRETAS), Sarah Roche and Isobel Knight (ProAgove), Neil McDonald (Sherwood Kelpies) and DRDPIFR staff.

- Katherine Pastoral Industry Advisory Committee and local cattle producers.
- DRDPIFR staff.
- Staff from the Northern Territory Government Marketing and Communications division.
- Staff from the Northern Territory Government Publications division.

In particular, we gratefully acknowledge the diligence and tolerance of many contributors who are not DRDPIFR staff, busy people, and experts in their field who have significantly enhanced the knowledge of the department through contributing to this publication.

We would like to thank the producers of the Katherine region for their support in collaborating with research and extension projects over the years. Through generously adding their experience we collectively hold a large body of knowledge about how to sustainably and productively manage a beef cattle enterprise in the region.
# Table of contents

## Chapter One – Animal Health

1. Botulism 2
2. Bovine Pestivirus (BVDV) 4
3. Buffalo Fly 6
4. Clostridial Diseases 9
5. Coccidiosis 11
6. Disease Investigation 13
7. Dog Health 15
8. Emergency Animal Diseases 18
9. Heat Stress in Cattle 20
10. Horse Health 22
11. Leptospirosis 26
12. Poisonous Plants 28
13. Stringhalt 32
14. Tail Rot 34
15. Tetanus 35
16. Three-Day Sickness or Bovine Ephemeral Fever 37
17. Ticks 39
18. Tick Fever 41
19. Urea Poisoning in Cattle 43
20. Vaccination of Cattle 45
21. Vibriosis 47
22. Worms 49
23. Zoonoses 51

## Chapter Two – Cattle Management

1. Animal Equivalents 56
2. Animal Welfare 57
3. Artificial Insemination 59
4. Best Bet Cattle Management 61
5. Branding Cattle 63
6. Breeding Polled Cattle 65
7. Bull Breeding Soundness Evaluation 68
8. Bull Percentages 70
9. Bull Selection 72
10. Castrating Calves 75
11. Cattle Maturity Types 77
12. Condition Scoring 79
13. Crossbreeding 82
14. Culling Breeders 85
15. Dehorning 87
16. Heifer Management 89
17. Hormonal Growth Promotants 91
18. Mating Systems 93
19. Mothering Up 95
20. NLIS in the Northern Territory 97
21. Poddy Calf Rearing 99
22. Pregnancy Testing 101
23. Production Parameters 105
24. Spaying 109
25. Stock Handling 111
26. Transporting Cattle – Pre-transport Management 114
27. Water Consumption 117
28. Water Quality 119
29. Weaning 121
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAA</td>
<td>Agriculture Advancing Australia</td>
</tr>
<tr>
<td>AAC</td>
<td>Australian Apprenticeships Centre</td>
</tr>
<tr>
<td>ABL</td>
<td>Australian Bat Lyssavirus</td>
</tr>
<tr>
<td>ABN</td>
<td>Australian Business Number</td>
</tr>
<tr>
<td>AE</td>
<td>Adult Equivalent</td>
</tr>
<tr>
<td>AFIA</td>
<td>Australian Fodder Industry Association</td>
</tr>
<tr>
<td>AFPCS</td>
<td>Australian Fair Pay and Conditions Standard</td>
</tr>
<tr>
<td>AI</td>
<td>Artificial Insemination</td>
</tr>
<tr>
<td>AQIS</td>
<td>Australian Quarantine and Inspection Service</td>
</tr>
<tr>
<td>ASEL</td>
<td>Australian Standard for Export of Livestock</td>
</tr>
<tr>
<td>ATO</td>
<td>Australian Taxation Office</td>
</tr>
<tr>
<td>AWA</td>
<td>Australian Workplace Agreement</td>
</tr>
<tr>
<td>AZRI</td>
<td>Arid Zone Research Institute</td>
</tr>
<tr>
<td>BBMS</td>
<td>Best Bet Management System</td>
</tr>
<tr>
<td>BBSE</td>
<td>Bull Breeding Soundness Evaluation</td>
</tr>
<tr>
<td>BCS</td>
<td>Body Condition Score</td>
</tr>
<tr>
<td>BOM</td>
<td>Bureau of Meteorology</td>
</tr>
<tr>
<td>BOSSS</td>
<td>Bovine Sydromic Surveillance System</td>
</tr>
<tr>
<td>BSE</td>
<td>Bovine Spongiform Encephalopathy</td>
</tr>
<tr>
<td>BVDV</td>
<td>Bovine Viral Diarrhoea Virus</td>
</tr>
<tr>
<td>CALM</td>
<td>Computer Aided Livestock Marketing</td>
</tr>
<tr>
<td>CDC</td>
<td>Centre for Disease Control</td>
</tr>
<tr>
<td>CDU</td>
<td>Charles Darwin University</td>
</tr>
<tr>
<td>CIF</td>
<td>Cost, Insurance and Freight</td>
</tr>
<tr>
<td>CP</td>
<td>Crude Protein</td>
</tr>
<tr>
<td>CoP</td>
<td>Cost of Production</td>
</tr>
<tr>
<td>CRC</td>
<td>Cooperative Research Centre</td>
</tr>
<tr>
<td>CRMP</td>
<td>Consignment Risk Management Plan</td>
</tr>
<tr>
<td>CSIRO</td>
<td>Commonwealth Scientific and Industrial Research Organisation</td>
</tr>
<tr>
<td>CWA</td>
<td>Country Women’s Association</td>
</tr>
<tr>
<td>DAFF</td>
<td>Department of Agriculture, Fisheries and Forestry</td>
</tr>
<tr>
<td>DAFWA</td>
<td>Department of Agriculture and Food, WA</td>
</tr>
<tr>
<td>DC</td>
<td>Days to Calving</td>
</tr>
<tr>
<td>DEEWR</td>
<td>Department of Education, Employment and Workplace Relations</td>
</tr>
<tr>
<td>DNRETAS</td>
<td>Department of Natural Resources, Environment, The Arts and Sport</td>
</tr>
<tr>
<td>DM</td>
<td>Dry Matter</td>
</tr>
<tr>
<td>DMD</td>
<td>Dry Matter Digestibility</td>
</tr>
<tr>
<td>DPI&amp;F</td>
<td>Department of Primary Industries and Fisheries</td>
</tr>
<tr>
<td>DPIFM</td>
<td>Department of Primary Industry, Fisheries and Mines</td>
</tr>
<tr>
<td>DRDPIFR</td>
<td>Department of Regional Development, Primary Industry, Fisheries and Resources</td>
</tr>
<tr>
<td>EAD</td>
<td>Emergency Animal Diseases</td>
</tr>
<tr>
<td>EADP</td>
<td>Emergency Animal Disease Preparedness</td>
</tr>
<tr>
<td>EBV</td>
<td>Estimated Breeding Value</td>
</tr>
<tr>
<td>EC</td>
<td>Exceptional Circumstance</td>
</tr>
<tr>
<td>ECRP</td>
<td>Exceptional Circumstances Relief Payment</td>
</tr>
<tr>
<td>ELISA</td>
<td>Enzyme-linked Immunosorbent Assay</td>
</tr>
<tr>
<td>EMA</td>
<td>Eye Muscle Area</td>
</tr>
<tr>
<td>EMS</td>
<td>Environmental Management System</td>
</tr>
<tr>
<td>ENSO</td>
<td>El Niño Southern Oscillation</td>
</tr>
<tr>
<td>ERDP</td>
<td>Effective Rumen Degradable Protein</td>
</tr>
<tr>
<td>ESI</td>
<td>Export Slaughter Interval</td>
</tr>
<tr>
<td>ETP</td>
<td>Eligible Termination Payment</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>F1</td>
<td>First Cross</td>
</tr>
<tr>
<td>FBT</td>
<td>Fringe Benefits tax</td>
</tr>
<tr>
<td>FEC</td>
<td>Faecal Egg Count</td>
</tr>
<tr>
<td>FMD</td>
<td>Farm Management Deposit</td>
</tr>
<tr>
<td>FRSP</td>
<td>Family Relationship Services Program</td>
</tr>
<tr>
<td>FWIS</td>
<td>Fair Work Information Statement</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic Information System</td>
</tr>
<tr>
<td>GL</td>
<td>Gestation Length</td>
</tr>
<tr>
<td>GM</td>
<td>Gross Margin</td>
</tr>
<tr>
<td>GPS</td>
<td>Global Positioning System</td>
</tr>
<tr>
<td>GSP</td>
<td>Gross State Product</td>
</tr>
<tr>
<td>GTNT</td>
<td>Group Training Northern Territory</td>
</tr>
<tr>
<td>HGP</td>
<td>Hormone Growth Promotant</td>
</tr>
<tr>
<td>IIS</td>
<td>Interim Income Support</td>
</tr>
<tr>
<td>IMF</td>
<td>Intramuscular Fat</td>
</tr>
<tr>
<td>IPP</td>
<td>Indigenous Pastoral Program</td>
</tr>
<tr>
<td>ISO</td>
<td>International Organisation for Standardisation</td>
</tr>
<tr>
<td>ITS</td>
<td>Indigenous Training Scheme</td>
</tr>
<tr>
<td>ITEA</td>
<td>Individual Transitional Employment Agreements</td>
</tr>
<tr>
<td>LEAP</td>
<td>Livestock Export Accreditation Scheme</td>
</tr>
<tr>
<td>LISA</td>
<td>Livestock Identification Systems Administrator</td>
</tr>
<tr>
<td>LSS</td>
<td>Low Stress Stockhandling</td>
</tr>
<tr>
<td>LVR</td>
<td>Loan to Value Ratio</td>
</tr>
<tr>
<td>LW</td>
<td>Live Weight</td>
</tr>
<tr>
<td>ME</td>
<td>Metabolisable Energy</td>
</tr>
<tr>
<td>MJ</td>
<td>Mega Joules</td>
</tr>
<tr>
<td>MJO</td>
<td>Madden-Julian Oscillation</td>
</tr>
<tr>
<td>MLA</td>
<td>Meat and Livestock Australia</td>
</tr>
<tr>
<td>NAMS</td>
<td>National Agricultural Monitoring System</td>
</tr>
<tr>
<td>NIRS</td>
<td>Near Infrared Reflectance Spectroscopy</td>
</tr>
<tr>
<td>NLIS</td>
<td>National Livestock Identification Scheme</td>
</tr>
<tr>
<td>NOI</td>
<td>Notice of Intent</td>
</tr>
<tr>
<td>NPN</td>
<td>Non-protein Nitrogen</td>
</tr>
<tr>
<td>NT</td>
<td>Northern Territory</td>
</tr>
<tr>
<td>NTAgA</td>
<td>Northern Territory Agricultural Association</td>
</tr>
<tr>
<td>NTCA</td>
<td>Northern Territory Cattlemen’s Association</td>
</tr>
<tr>
<td>NTDAA</td>
<td>Northern Territory Drought Assistance Arrangements</td>
</tr>
<tr>
<td>NTLEA</td>
<td>Northern Territory Live Exporters Association</td>
</tr>
<tr>
<td>NVD</td>
<td>National Vendor Declaration</td>
</tr>
<tr>
<td>OH&amp;S</td>
<td>Occupational Health and Safety</td>
</tr>
<tr>
<td>OHSMS</td>
<td>Occupational Health and Safety Management System</td>
</tr>
<tr>
<td>OP</td>
<td>Organophosphate</td>
</tr>
<tr>
<td>P&amp;L</td>
<td>Profit and Loss</td>
</tr>
<tr>
<td>PAYG</td>
<td>Pay As You Go</td>
</tr>
<tr>
<td>PCR</td>
<td>Polymerase Chain Reaction</td>
</tr>
<tr>
<td>PI</td>
<td>Persistently Infected</td>
</tr>
<tr>
<td>PIC</td>
<td>Property Identification Code</td>
</tr>
<tr>
<td>PISC</td>
<td>Primary Industries Standing Committee</td>
</tr>
<tr>
<td>PTIC</td>
<td>Pregnancy Tested In-Calf</td>
</tr>
<tr>
<td>PWSNT</td>
<td>Parks and Wildlife Service of the Northern Territory</td>
</tr>
<tr>
<td>QDPI&amp;F</td>
<td>Queensland Department of Primary Industries and Fisheries</td>
</tr>
<tr>
<td>RBY</td>
<td>Retail Beef Yield</td>
</tr>
<tr>
<td>RDN</td>
<td>Rumen Degradable Nitrogen</td>
</tr>
<tr>
<td>RFID</td>
<td>Radio Frequency Identification Devices</td>
</tr>
<tr>
<td>SCA</td>
<td>Standing Committee Agriculture</td>
</tr>
<tr>
<td>SOI</td>
<td>Southern Oscillation Index</td>
</tr>
<tr>
<td>SP</td>
<td>Synthetic Pyrethroid</td>
</tr>
<tr>
<td>SS</td>
<td>Scrotal Size</td>
</tr>
<tr>
<td>STEP</td>
<td>Structured Training and Employment Program</td>
</tr>
<tr>
<td>TFN</td>
<td>Tax File Number</td>
</tr>
<tr>
<td>TIO</td>
<td>Territory Insurance Office</td>
</tr>
<tr>
<td>WA DPI</td>
<td>Western Australia Department of Planning and Infrastructure</td>
</tr>
<tr>
<td>WDOT</td>
<td>Willis Dropped Ovary Technique</td>
</tr>
<tr>
<td>WHP</td>
<td>Withholding Period</td>
</tr>
<tr>
<td>VET</td>
<td>Vocational Education Training</td>
</tr>
<tr>
<td>VRD</td>
<td>Victoria River District</td>
</tr>
<tr>
<td>VRRS</td>
<td>Victoria River Research Station</td>
</tr>
</tbody>
</table>
Introduction to the Katherine region

Introduction

The Katherine region is characterised by extensive pastoral properties (average 2,200 km²) producing feeder cattle predominantly for the live export market in South-East Asia. Production is largely based on native pastures. The industry is described in more detail in the Katherine Pastoral Industry Survey 2004, available from DRDPIFR, Katherine Research Station.

This manual is intended to cater for producers who are new to the region and want to understand the basics of operating in the Katherine environment and production systems, right through to the experienced long-term Katherine producers who want to know the pathways for further research information.

Many publications referenced in this manual are available from the internet or bookstores. If you have any difficulty sourcing a reference you are interested in, please call the Katherine Research Station for assistance on (08) 8973 9739. This manual is available online and will be continually updated.

www.nt.gov.au/drdpifr/

Size

The Katherine region can be divided into the following pastoral districts as defined by the Pastoral Land Management branch, Department of Natural Resources, Environment, The Arts and Sport (refer Figure 1):

- Katherine/Daly
- Roper
- Victoria River
- Sturt Plateau
- Gulf

219,692km² of the Katherine region is identified as having pastoral activity (Natural Systems Division, Katherine, DNRETAS).

Soils and vegetation

Katherine/Daly

This area is characterised by large areas of rugged hill and ridges. The areas of greatest pastoral importance are Tipperary red earths with tropical tall grasses such as black speargrass, kangaroo grass, white grass and perennial and annual sorghum.

Roper and Gulf

These districts are characterised by large areas of soils that are shallow, coarse textured and stony with abundant rock outcrops. Vegetation is predominantly open woodland dominated by Eucalyptus, with limited areas of grasslands on alluvial plains. There are extensive areas of lancewood forests. Grasses typically found on the more productive areas used for pastoral production include ribbon grass, silky browntop, perennial sorghum, white grass, black speargrass, limestone grass and soft spinifex.

Climate and season

The Katherine region has a semi-arid monsoonal climate with a ‘wet season’ from October to April, and a virtually rainless ‘dry season’ from May to September. There is a very marked contrast in average annual rainfall at Inverway Station (southern VRD) being 521 mm, compared with 981 mm in the north at Katherine.
**Victoria River District (VRD)**

In the higher rainfall northern area of the VRD the country is rugged and hilly with valleys of tropical tall grass and blue grass plains. Tall grasses include kangaroo grass, perennial sorghum, ribbon grass, bluegrass, black speargrass and white grass. In the southern area there are larger areas of more undulating country with plains dominated by Mitchell grass. Upland red country supports arid short grasses such as limestone, kerosene and wire grasses, with soft spinifex on the rockier hills.

**Sturt Plateau**

Red earths are the most widespread soil type in this district, interspersed with yellow earths and areas of alluvial clay. Vegetation consists mainly of ribbon grass, perennial sorghum, kangaroo grass and white grass with kerosene grass, Wanderrie grasses, wire grasses and soft spinifex on the more gravely rises.
Chapter One: Animal Health
Chapter One: Animal Health

Contents

1. Botulism 2
2. Bovine Pestivirus (BVDV) 4
3. Buffalo Fly 6
4. Clostridial Diseases 9
5. Coccidiosis 11
6. Disease Investigation 13
7. Dog Health 15
8. Emergency Animal Diseases 18
9. Heat Stress in Cattle 20
10. Horse Health 22
11. Leptospirosis 26
12. Poisonous Plants 28
13. Stringhalt 32
14. Tail Rot 34
15. Tetanus 35
16. Three-Day Sickness or Bovine Ephemeral Fever 37
17. Ticks 39
18. Tick Fever 41
19. Urea Poisoning in Cattle 43
20. Vaccination of Cattle 45
21. Vibriosis 47
22. Worms 49
23. Zoonoses 51
Botulism

Botulism is the most significant disease problem in the northern beef industry, with reported losses of up to 25% in an unvaccinated herd. Botulism should be considered present on all stations in the Katherine region. It is a clostridial disease prominent in cattle grazing on land deficient in protein and phosphorus. The disease is commonly associated with bone chewing by susceptible, unvaccinated cattle.

It is more commonly seen in breeding cattle as they generally experience large demands for phosphorus and protein in their diet due to lactation stress but both sexes are equally susceptible to the toxin. It is very common in rangelands of northern Australia in phosphorus deficient regions but it can occasionally occur in other scenarios, eg dead animals (snakes, rats etc) caught up in hay.

Clinical signs

Botulism is seldom diagnosed clinically as the classical signs are not always seen.

- refusal to eat and drink (paralysis of tongue)
- dehydration
- drooling of saliva
- sunken eyes
- weakness
- flaccid paralysis (back to front legs)
- aggressive behaviour
- often the classic signs are not observed in chronic cases, animals just appear weak and lethargic

Diagnosis

Clinical signs

- pull tongue out of mouth and may not retract
- bone or maggots in the reticulum ‘honeycomb’
- the omasum ‘bible’ may be hard and dry
- history of:
  - no, or ineffective vaccination
  - bone/carcase chewing
  - protein or phosphorus deficiency

Treatment

Treatment options are limited. Once a beast has absorbed botulinum toxin and has become affected nothing can be done to treat the animal or hasten recovery.

Prevention

- vaccination
- supplement phosphorus/protein
- remove dead carcases

Vaccination

It is recommended that all cattle be vaccinated with a bivalent (Type C & D) vaccine. Two types of botulism vaccine are available. A long-acting vaccine is available in single shots to provide protection for between one and three years. A conventional vaccine involves a single shot followed by a recommended booster four to six weeks later to provide protection for up to one year. A booster vaccine is required to maintain immunity.

SUMMARY OF BEST PRACTICE

- Vaccinate all cattle.
- Supplementary feed stock to prevent phosphorus or protein deficiencies.
- Botulism should be considered present on all stations in the Katherine region. Vaccination is essential and cheap, approximately $1.80 for a three year dose (2008).
Source
Fitzpatrick, S (2007), Botulism Poisoning in Cattle in the Northern Territory, Agnote 651 No. K29, DPIFM.

Further information
DRDPIFR Regional Veterinary Officer, Katherine Ph: (08) 8973 9739.

Related topics
Supplementation, Vaccination of Cattle.
Bovine Pestivirus (BVDV)

Pestivirus is common in Katherine region herds but timely detection is difficult.
Producers should consider pestivirus when there is a reduced pregnancy rate, abortions, weak, stunted or deformed calves, or an increased incidence of respiratory infections or diarrhoea in weaners.

Pestivirus (bovine viral diarrhoea virus) is an extremely complex disease that may be associated with reproductive losses, ill thrift and death in weaners and an increased susceptibility to secondary infections. Two Type 1 strains of BVDV, Triangle and Bega, have been identified in Australia. Infection is considered to be endemic in the Katherine region with varying prevalence in cattle herds throughout the region. Bovine pestivirus is spread by close contact between cattle. Temporary high-stocking situations such as mustering, yarding, trucking and supplementary feeding/watering sites contribute to the spread. The virus is spread in the saliva, nasal secretions, urine, faeces, semen and milk of persistently infected (PI) animals.

Affected animals recover completely and develop immunity. However if susceptible female animals become infected during pregnancy there are a number of different scenarios that can develop. Infection in the first trimester of pregnancy can lead to abortion or the birth of a persistently infected (PI) animal which in turn becomes a carrier. Infection in the middle trimester usually leads to abortion or abnormal, defective calves. Infection during the last trimester is usually associated with no reported problems.

If cattle are infected with the virus prior to joining, there is little impact on the herd. In fact one of the management strategies in endemic herds is to ensure all replacement heifers are run with a PI animal prior to mating so they have acquired immunity at the time of joining. The main concern with pestivirus is when a carrier (or PI) animal is introduced into a herd of susceptible pregnant females. The main risks are therefore from infected neighbouring animals or purchase of pregnant cows that may give birth to a PI animal.

Clinical signs
Pestivirus is capable of causing a range of disease ‘syndromes’ in cattle herds.
- embryonic death and decreased conception rates, resulting in lower weaning percentages
- dummy or abnormal neonatal calves
- persistently infected carrier animals that are usually (but not always) poor doers

Bovine viral diarrhoea virus (BVDV)
BVD occurs when healthy cattle are infected with pestivirus but the clinical disease is rarely seen in Australia, with most pestivirus infections going unnoticed, as pestivirus type II is not present in this country. Cattle infected with pestivirus are more susceptible to other infections due to a depressed immune response, especially in the feedlot situation where they are at more risk of acquiring Bovine Respiratory Disease. Infected cattle develop a strong immunity after recovery.
**Mucosal disease**

Mucosal disease occurs when a persistently infected animal is infected with a second cytopathic strain of pestivirus. The prevalence of mucosal disease is quite low (<0.5%) in Australian herds. Affected cattle drool excessively, appear depressed and feverish, and have persistent and often bloody diarrhoea, and sometimes a soft cough and lameness. The severity of mucosal disease varies from an acute form with death within a few days to chronic wasting disease.

With the acute form of mucosal disease, profuse diarrhoea and ulcers may be present in the nose, mouth, eyes and between the toes. At post-mortem, these ulcers are often found to extend right through the upper and lower intestinal tract. With the chronic wasting form of mucosal disease, calves just grow poorly. At post-mortem there are often no visible abnormalities, but microscopic changes can be found. Persistent infection with pestivirus should always be considered where some young cattle in a mob are doing very poorly while most of the other cattle are doing very well.

Most PI animals die within 18–24 months of birth, however there will be a very small proportion of persistently infected animals that are normal and appear healthy. These cattle, if selected as breeders, pose a significant risk to susceptible breeders in the herd.

**Diagnosis**

Blood samples (10–30) can be collected from a range of age groups in the herd to determine what proportion of the herd has been exposed to pestivirus. The antibody test can give an indication of whether pestivirus infection has occurred in the herd within the past 3–9 months. The antigen test (blood or ear notch sample) can identify animals that have ‘active infection’ and are shedding the virus. These are usually persistently infected animals. Fresh tissues from aborted foetuses can also aid in the diagnosis of reproductive problems associated with pestivirus.

**Prevention and control**

Control of bovine pestivirus focuses on ensuring replacement heifers develop a strong immunity before they are joined. In herds that are infected with pestivirus, exposure of naive cattle occurs when a persistently infected animal enters the group and spreads the infection by direct contact. In herds that are free of pestivirus, control focuses on appropriate biosecurity measures to keep introduced and neighbouring stock away from pregnant females.

**Vaccination**

A pestivirus vaccine (Pestiguard™) containing inactivated virus is available in Australia. Immunity is achieved following a course of two shots of the vaccine 4–6 weeks apart and maintained with an annual booster. Both shots of the vaccine must be given prior to joining for foetal protection to occur. Timing of booster vaccinations is not as critical as initial vaccination. Bulls should also be vaccinated in addition to breeders as healthy normal bulls can be transiently infected and shed pestivirus in their semen for a short period after natural exposure. The cost of the vaccine is approximately $6.00 per shot (2008)

**SUMMARY OF BEST PRACTICE**

- Consider further investigation if signs and symptoms of pestivirus are observed or low pregnancy/branding rates recorded.
- Where the virus is present, exposure during weaning is preferable to ensure replacement heifers develop immunity prior to joining.
- If pestivirus is suspected ensure possible PI’s are introduced into naïve herds when they are in the first two trimesters of pregnancy.
- A vaccine is available for use in herds where constant reproductive losses occur due to this virus and natural exposure is not achieved prior to joining or where unacceptable risks are identified.
- Producers considering introducing a control program should evaluate:
  - the BVDV status of the herd or breeders
  - the risk of introducing BVDV infection to a naïve herd
  - costs versus benefits of introducing the control program.

**Source**

Bovine Pestivirus Australia www.bvdaustralia.com

**Related topic**

Heifer Management
Buffalo Fly

Buffalo fly irritate cattle, interrupt feeding and cause sores, especially when infestations are high. Trials in the wet tropics have shown that buffalo flies can reduce beef cattle production by up to 16%. A small parasitic worm is associated with buffalo fly bites and causes skin lesions. Sores from buffalo fly infestations result in permanent hide damage, decreasing the value of the hide. Lesions may restrict access of stock to the live export trade.

Dark-coated cattle, bulls, older cattle and those in poor condition usually attract the heaviest infestations by the fly. *Bos indicus* cattle can carry high numbers of flies but do not appear to be as severely affected as other breeds.

**Shaded areas show buffalo fly distribution (MLA 2003)**

According to the Pastoral Industry Survey (2004), 65% of properties in the Katherine region use chemical fly-control treatments. Some pastoralists cull affected animals to delay the need to treat the entire herd and to build up a more fly-resistant herd. If the herd is carrying low numbers of buffalo flies, treatment may not be required. Other alternatives to chemical control include the buffalo fly tunnel trap, dung beetles and tolerating a certain level of fly burden. Use of these methods will minimise chemical resistance and residue risks.

Current buffalo fly control strategies aim to:
- reduce buffalo fly numbers to acceptable levels to prevent production loss
- provide for welfare considerations
- minimise chemical residue risks
- reduce reliance on chemicals by controlling flies with alternatives
- consider treatment costs and consider tailoring treatments for different herd groups, e.g. eartag the most vulnerable animals i.e. herd bulls
- be careful when using pesticides that could affect dung beetle populations; monitor dung pats regularly for dung beetle activity.
### Chemical control of buffalo flies (from Gibson 2005)

<table>
<thead>
<tr>
<th>Method</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Backline sprays</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP – e.g. Cypafly®, Sumifly®.</td>
<td>- gives instant relief</td>
<td>- resistance to SPs is widespread</td>
</tr>
<tr>
<td>OP – e.g. Supona®, Nucidol 200 EC® and Di Jet®.</td>
<td>- treatment can include tick control</td>
<td>- residues if WHP and ESI not adhered to</td>
</tr>
<tr>
<td><strong>Dips, sprayraces and full body sprays</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP/OP – e.g. Barricade S®, Blockade S® and Tixafly®.</td>
<td>- effective up to 16 weeks</td>
<td>- longer ESI</td>
</tr>
<tr>
<td><strong>Insecticide-impregnated eartags</strong></td>
<td></td>
<td>- extra handling for tag application</td>
</tr>
<tr>
<td>Note: Integrate eartags with other control methods over non-peak times</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OP – e.g. Spike®, OPtimiser®, Warrior®, Patriot®, Terminator® and Rabon®.</td>
<td>- low cost</td>
<td>- removal of tags before slaughter and after the designated time period</td>
</tr>
<tr>
<td>SP – e.g. PYthon®.</td>
<td>- self treatment</td>
<td>- resistance is possible if misused</td>
</tr>
<tr>
<td><strong>Dust bag</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bendiocarb (Ficam)®.</td>
<td>- low cost</td>
<td>- regulating height</td>
</tr>
<tr>
<td>Gold Cattle Dust Bag®.</td>
<td>- self treatment</td>
<td>- bag needs protection from rain</td>
</tr>
<tr>
<td><strong>Pour-on</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP - e.g. Cooper’s Cooper fly®, Brute Pour-on®, Ivermectin – e.g. Ivomec Pour-on®.</td>
<td>- ease of application</td>
<td>- longer ESI</td>
</tr>
<tr>
<td><strong>Backrubbers and rubbing posts</strong></td>
<td></td>
<td>- resistance to SPs is widespread</td>
</tr>
<tr>
<td>OP – Supona®, Nucidol 200 EC®, Di Jet®.</td>
<td>- low cost</td>
<td>- some pour-ons may be toxic to dung beetles</td>
</tr>
<tr>
<td>SP – synthetic pyrethroid, OP – organophosphate, WHP – withholding period, ESI – export slaughter interval</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Non-chemical treatment of buffalo flies (from Gibson 2005)

<table>
<thead>
<tr>
<th>Method</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Buffalo fly tunnel trap</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- non-chemical control</td>
<td>- non-chemical control</td>
<td>- initial cost</td>
</tr>
<tr>
<td>- self treatment</td>
<td>- self treatment</td>
<td>- may need to train stock to use trap</td>
</tr>
<tr>
<td><strong>Dung beetles</strong></td>
<td>- no chemicals used</td>
<td>- only a few species may be present</td>
</tr>
<tr>
<td>- biological control</td>
<td>- new species have to be physically introduced</td>
<td></td>
</tr>
<tr>
<td>- low cost method</td>
<td>- dry periods reduce numbers</td>
<td>- killed by some broad spectrum endectocides.</td>
</tr>
<tr>
<td>- initial establishment may be poor if beetles were either unsuited to area or didn’t spread</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Chemical control of buffalo flies

The development of resistance is a constant concern when using chemicals, especially when using synthetic pyrethroids (SPs). Correct application rates of products registered for buffalo fly control are critical to preventing the development of resistance. If products are used according to manufacturers’ directions, the amount and concentration applied should be sufficient to control susceptible populations of buffalo fly. Failure to observe the directions in regard to mixing rates and/or application method can lead to the application of sub-lethal levels of the active ingredient, increasing the likelihood of resistance developing in the buffalo fly population. Higher than recommended rates increase the risk of chemical residues in meat products. Strictly observe the withholding period and export slaughter interval for any treated cattle.

Where chemical control is considered necessary, fly numbers should be monitored. Delay treatment until fly problem is obvious on focus animals (those most susceptible to flies, e.g. bulls) or until animals are carrying more than 200 flies each (100 on each side). Use a self-treatment method such as back rubbers, a dust bag or insecticidal ear tags during the peak buffalo fly season. Buffalo flies are most problematic from the onset of the wet season until cooler months of the dry.

Buffalo fly tunnel traps are a non-chemical treatment method. They have proven to work well under intensive situations with well controlled waters and small paddocks. However, in the Katherine region and other extensive areas their success is limited by the difficulty of large paddocks, uncontrolled waters (especially during the wet season when flies are most prevalent) and training cattle.

Sources
Gibson, GJ (2005), Buffalo Fly Control. www2.dpi.qld.gov.au/health
MLA (2003), Recommendations for integrated buffalo fly control, MLA.
MLA (2005), Controlling buffalo fly on extensive beef properties. MLA.

Further information
MLA www.mla.com.au
QDPI www2.dpi.qld.gov.au

WHP and ESI
Australian Pesticides and Veterinary Medicines Authority www.apvma.gov.au

Related topic
Animal Welfare
Chapter One: Animal Health

Clostridial Diseases

Blackleg, tetanus, botulism, malignant oedema, pulpy kidney and black disease are all clostridial diseases and are amongst the most common causes of death of cattle in Australia. In all cases unvaccinated stock contracting any of these five diseases have very little chance of recovery. Botulism is by far the most important clostridial disease in the Katherine region, followed by tetanus. Deaths associated with other clostridial diseases are reported infrequently.

Cause

Clostridial bacteria cause disease through the production of highly poisonous toxins. Minute amounts of these toxins will kill cattle. The clostridial bacteria which cause these diseases form spores, which are resistant to many environmental conditions and can persist in the soil for years. Clostridial bacteria are also found to exist in the gut contents of healthy animals.

Blackleg (Clostridium chauvoei)

- Usually affects young, fast-growing cattle.
- Bacteria may enter muscle through small wounds or after bruising.
- Symptoms: fever with gassy swelling at the site of infection; or sudden death.

Tetanus (Cl. tetani)

- Infection usually enters via a deep puncture wound or from dehorning and castration wounds.
- Symptoms: muscle stiffness and tremor; whole body rigidity; protrusion of the third eyelid; convulsions and death.
- Note: Tetanus antitoxin should be used to provide immediate temporary protection if castrating or dehorning cattle that are not already vaccinated with tetanus toxoid.

Malignant oedema (Cl. septicum)

- Usually caused by infection of a deep wound.
- Symptoms: swelling at the site of infection; fever; muscle tremor and weakness; and death within 48 hours.

Enterotoxaemia or ‘pulpy kidney’ (Cl. perfringens Type D)

- Usually affects calves when conditions in the gut favour rapid growth of the bacteria i.e. introduction of grain rations.
- Often associated with bloat.
- Symptoms: bellowing; mania; diarrhoea; convulsions; paralysis; blindness or sudden death.

Black disease (Cl. novyi Type B)

- Usually occurs in cattle with liver fluke.
- Symptoms: severe liver disease, which is highly fatal within one–two days.
- Liver fluke is not present in the NT.
Clinical signs

• Cattle are usually found dead.

Diagnosis

• Characteristic clinical signs or post-mortem examination of recently deceased cattle.

Prevention and control

Treatment is difficult and rarely successful so prevention with vaccination is highly recommended. The ‘7 in 1’ vaccine provides combined protection against the five main clostridial diseases and two strains of Leptospirosis. Alternatively, a ‘5 in 1’ vaccine for only the five clostridial diseases can be administered. Many producers use the ‘5 in 1’ to prevent tetanus during castration, dehorning and branding. The botulism vaccine is not included in the standard clostridial vaccines. A separate bivalent vaccine for botulism is available. With costs around 20c/head (2008) for the ‘5 in 1’ vaccination, the cost of vaccination is likely to outweigh the cost of mortality.

Post-mortem

Post-mortems should be carried out promptly if clostridial disease is suspected, as diagnosis may be more difficult as time progresses.

SUMMARY OF BEST PRACTICE

• Vaccinate against clostridial disease with a ‘5 in 1’ or ‘7 in 1’ vaccine.
• Determine the cause of death if clostridial diseases are suspected to be a significant cause of mortality.

Further information


Related topics
Botulism, Tetanus, Vaccination of Cattle.
Coccidiosis

Cattle producers should be aware of the potential infection by coccidiosis (black scours) in weaners, which can cause significant setback and death. While every effort should be made to reduce the risk, the problem can be managed.

Cause of coccidiosis

Coccidiosis is a parasitic infection that can affect all domestic animals. Eleven species of coccidia have been identified as affecting cattle in Australia. However, only two cause disease in cattle – Eimeria zuernii and Eimeria bovis. Oocyst build-up occurs through faecal contamination of the soil through continual usage of calf/weaner compounds. It is mostly seen in calves and weaners under stress and in confined areas. It usually occurs in cattle up to 250kg liveweight at/or soon after weaning. The coccidia can be found in the gut of most animals. When their numbers build-up the damage to the cells lining the animal’s gut causes a severe clinical insult as a result of loss of blood and gut lining and causes malabsorption problems in the small intestine.

Clinical signs

• sudden onset of severe, foul-smelling diarrhoea which may be blood-tinged (black or red) and may also contain shreds of mucus
• dirty tail and stained hindquarters
• straining
• anaemia and dehydration
• decreased appetite
• depression

Once an animal becomes badly dehydrated and goes down, it will often die. Downers should be considered for euthanasia. Animals may require a long period of convalescence to recover from an infection if their weight gain and feed consumption are poor. Some may recover without treatment and some may be infected but not show any signs of disease. Cattle develop immunity only to the species of coccidia that infected them.

Diagnosis

Diagnosis can be confirmed by contacting the regional veterinary officer or stock inspector. Samples of fresh faeces will be taken.

Prevention, control and best practice management

• Feed weaner pellets or supplement containing an ionophore antibiotic, such as monensin, lasolacid, narasin or salinomycin.
• Reduce stress and overcrowding young stock.
• Do not confine to yards or small paddocks for long periods.
• Place feed and water troughs above the ground to avoid faecal contamination.
• Control is quite easy if diagnosed early.
Treatment

If an outbreak occurs:

• Affected animals should be separated from the others, and treated with prescription medication.

• Overcrowding should be reduced.

• Feed and water troughs should be high enough to prevent contamination with faeces.

• Electrolytes can be added to the water.

• Medicated feed, such as an ionic antibiotic should be used.

• High quality, highly digestible feed suitable for the age/weight of the animals should also be provided to ensure the best possible nutrition.

• Once a calf has developed severe scours, successful treatment is very difficult. Drenching with electrolyte mixtures will increase the chances of survival.

• An emergency homemade electrolyte mixture can be made by mixing 1 teaspoon table salt, ½ teaspoon baking soda and 125mL glucose in 1.2L of water.

• Amprolium, sulphadimidine, sulphaquinoxaline products prescribed by a veterinarian can be used for treatment.

SUMMARY OF BEST PRACTICE

• Routinely use medicated feed or supplement for weaners that contains a cociostat, particularly in times of stress. Always use it in calf rearing and weaner feedlotting programs.

• Manage an outbreak with medicated feed or supplement and good general nutrition.

• Consider intensive treatment for severe cases such as drenching with electrolytes.

• If prognosis is poor, consider euthanasia.

• Consider changing weaner handling locations if you have suffered an outbreak.

Source

Further information
MLA Cattle Parasite Atlas

Related topics
Poddy Calf Rearing, Weaner Management.
Chapter One: Animal Health

Disease Investigation

DRDPIFR animal biosecurity staff provide an extension service to pastoralists to identify and confirm the presence of disease in livestock. Disease events should be reported to your regional veterinary officer or stock inspector, who will follow up with a disease investigation. A comprehensive investigation can only be done when the event is reported early and there are clinical cases to examine and autopsy.

It is important to keep a record of the disease event on the Bovine Syndromic Surveillance System (BOSSS), a new web-based disease reporting and recording system. This detailed property herd health history is stored for access at any time.

Each property can be registered on the system with a username and password.

BOSSS contains information on 1,000 cattle diseases, including clinical signs, diagnosis, treatment, control and post-mortem guidelines for sample collection. This is particularly useful for remote properties, as producers can collect their own samples for diagnosis with a post-mortem kit.

Biosecurity staff can provide post-mortem training.

In addition to recording disease events on your property, this system can be used to help investigate disease problems in herds. Information recorded is used to identify potential diseases. Property data is confidential, but will contribute to regional averages that all participants can access. Your property information provides evidence of disease surveillance within your herd and is used for export certification. This helps maintain market access and support for international trade.

BOSSS is part of a remote-area surveillance system for the Australian livestock industry, developed as a project of the Australian Biosecurity Cooperative Research Centre.

Remember to ‘Look, check, ask a vet’. While the BOSSS website is a major step forward for reporting and collecting data on animal diseases, livestock owners are reminded not to rely solely on it if a sick animal is detected. Always contact your regional veterinary officer or stock inspector or call the Disease Watch Hotline on 1800 675 888.
SUMMARY OF BEST PRACTICE
Look, check, ask a vet.

Source
AusVet Animal Health Services.
www.ausvet.com.au

Further information
Disease Watch Hotline Ph: 1800 675 888.
DRDPIFR Regional Veterinary Officer, Katherine
Ph: (08) 8973 9739.
BOSSS www.ausvet.com.au

Related topic:
Emergency Animal Diseases, Poisonous Plants, Zoonoses.
The maintenance of station dogs’ health is critical to their usefulness and longevity. Nutrition, parasite control and vaccination are key considerations.

Nutrition

Commercial preparations of food for working dogs are available at local rural merchandise stores. These products usually provide an adequate, nutritionally balanced diet. Manufacturers’ instructions should be followed for feeding. Most station dogs also receive raw bones which are essential to maintain healthy teeth.

Feeding management of bitches during pregnancy and lactation is important to provide adequate nutrition. Feed intake should be increased to 1.5 times maintenance 2–3 weeks prior to whelping, doubled in the second week of lactation and tripled in the third and fourth weeks of lactation. Feed intake should then be reduced. Several small meals a day should be provided during the late stages of gestation and early lactation. Calcium supplementation is not necessary if the bitch is receiving a high quality, well balanced commercial diet. Pups can be introduced to semi-solid foods from 3–4 weeks and dry food from six weeks of age.

Internal parasites

Intestinal worms

Dogs should be medicated every three months to prevent intestinal worms. There are a variety of products available. It is important to read the product label to ensure that it treats ALL intestinal worms.

Bitches should be wormed at mating, one week prior to whelping, 2–3 weeks into lactation and again at weaning. Pups should be wormed at 2, 4, 6, 8, and 12 weeks of age, and then three-monthly.

Roundworm (Toxocara sp.)

Pups (4–6 weeks) are commonly infected and present with a pot belly, occasional vomiting and diarrhoea and ill thrift. Pups can be infected through the placenta, milk or by ingestions of the worm egg. Worms can be seen in the expelled faeces or vomit. CHILDREN can be infected.

Tapeworm (Dipylidium caninum/Echinococcus granulosus-Hydatids/Taenia sp.)

Scooting along the ground on the anus is a good indication of infestation. Dipylidium caninum tapeworm is transmitted by dogs or CHILDREN ingesting infected adult fleas.

Hookworm (Ancylostoma sp.)

Disease usually occurs in the first few months of life as most dogs develop immunity as they mature. Infection results in anaemia and bloody diarrhoea. Humans can be infected.
Cattle and land management best practices in the Katherine region 2009

Whipworm
Whipworms are not a problem in pups under three months of age. They are one of the most common causes of diarrhoea in adult dogs. Worm eggs can survive in the environment for up to five years.

Zipper worm (*Spirometra erinacei*)
Common in feral pigs. The adult worm can be found in dogs. The zipper worm has a complicated life cycle involving two separate intermediate hosts which are usually associated with bodies of fresh water (dams).

Heartworm
Caused by *Dirofilaria immitis* and spread by mosquitoes. Causes significant disease in northern Australia. Symptoms of disease start as lethargy following work, a slight cough and loss in condition and progress to coughing blood, collapse and accumulation of fluid in the abdomen as a result of heart failure. Pups can be started on heartworm medication between 1–3 months of age depending on the product. Preventative medication can be given in the oral form daily, in the oral or injectable form monthly or the injectable form annually. Ivermectin is not registered for use in dogs. (Caution: ALL collie breeds, Shetland sheepdogs, old English sheepdogs and dogs with merle-coloured coats or blue iris can be sensitive to ivermectin).

External parasites

Ticks
Dogs are host to 12 species of ticks, however only the brown dog tick (*Rhipicephalus sanguineus*), cattle tick (*Boophilus microplus*), and wallaby tick are seen regularly on dogs in the NT. The paralysis tick (*Ixodes holocyclus*) is not present in the NT. They cause significant illness and death of dogs in coastal areas of eastern Australia. The brown dog tick is a vector for *Babesia canis* which can cause tick fever in dogs. Ticks occur frequently in the wet season. Tick collars worn in close contact with the skin can kill ticks for up to five months. Acaricide washes and spot-on or spray medications are also used.

Fleas (*Ctenocephalides felis felis, Ctenocephalides canis*)
Fleas can cause uncontrollable itching (flea allergy dermatitis), anaemia, and are host to tapeworm. Fleas require humidity (70–80%) and warmth (18–35°C), but flea larvae will not develop in direct sunlight. Fleas are most commonly found in cracks and crevices and dark, shaded areas, where flea eggs can survive up to one year. Flea control must be aimed at control on the dog and around its environment. Ensure that the treatment products control both the adult flea (adulticide) and the larvae (insect growth regulator or IGR).

Mites
Mites cause mange. There are two main types of mange which result in hair loss: sarcoptic mange (*Sarcoptes scabiei*) and demodex mange (*Demodex canis*). Sarcoptic mange is highly contagious and causes severe itching. All in-contact dogs and bedding need to be treated with an acaricide wash. Demodex is a normal mite found on the skin, but some dogs have more than other dogs which predispose them to disease. It is not contagious and generally does not cause itching, but pups can be affected on their muzzle and paws when sucking infected bitches. There is a localised form affecting specific regions of the body, commonly the face or the forelegs or a generalised form affecting the entire body. The disease can occur in juveniles (3–18 months) or adults and can be confined to the feet. It is important to diagnose this mange as treatment programs are case specific. A skin scrape at your local vet is generally diagnostic.

Vaccination
It is highly recommended that all dogs are protected against core infectious diseases: parvovirus, distemper, and hepatitis (with C3 vaccination). While it is not yet common that dogs be vaccinated for tetanus, many veterinarians now recommend it. The kennel cough vaccine is generally required for kennelled dogs. Pups are protected against disease for the first six weeks of age by maternal antibodies received in colostrum from the vaccinated mother. Vaccinate bitches 1–2 months before mating to ensure the maximum immunity is passed on in the colostrum. Pups should then be vaccinated to provide active immunity to infection. Pups can be vaccinated with a three-shot program at 6–8 weeks, 12–14 weeks and then at 16–18 weeks of age or a two-shot program at 10 weeks and then 14–16 weeks of age. Pups should not have ANY contact with dogs outside the station until they have completed their vaccination program. All dogs should receive a booster shot annually.

Canine parvovirus
This viral disease causes severe vomiting and diarrhoea with blood, which results in dehydration. It is spread by infected faeces. Death can occur within 24 hours. This is a common disease in pups in the Katherine region, but can also affect older dogs. Dogs infected with hookworm are more susceptible to the disease.

Canine distemper
This highly contagious viral disease causes respiratory, digestive and nervous signs and causes death in up to 50% of unvaccinated dogs. Dogs present with depression, fever, loss of appetite and discharge of pus from the eyes and nose. It can progress to pneumonia, vomiting and diarrhoea and convulsions. Dogs that do recover may have permanent brain damage. It is spread by discharge from the nose and eyes of infected dogs. This disease is re-emerging in the Katherine region as the number of unvaccinated dogs increases.
Infectious canine hepatitis

This disease is also characterised by depression, loss of appetite, and diarrhoea. In addition dogs can develop tonsillitis and abdominal pain due to an enlarged liver. Severely affected dogs can die within 36 hours, whereas mildly affected dogs show lethargy and depression. Following infection, the cornea of the eye can become opaque in colour (blue eye).

Kennel cough (canine parainfluenza virus, canine adenovirus type 2 and Bordetella bronchiseptica bacteria)

Together contribute to kennel cough syndrome. The syndrome results in respiratory symptoms such as a dry hacking cough, nasal discharge and fever. The cough can be controlled with a teaspoon twice daily of ‘Medihoney’ and in severe cases antibiotics and cortisone to relieve the cough.

**SUMMARY OF BEST PRACTICE**

- Vaccinate against core infectious diseases: parvovirus, distemper and hepatitis (with C3 vaccination) and tetanus.
- Manage parasites as necessary. Worm regularly.
- Hygienic accommodation will provide less places for external parasites to lodge and will assist in parasite control and prevention.

**Further information**

DRDPIFR Regional Veterinary Officer Katherine. Ph: (08) 8973 9739.

**Related topics**

Working Dogs, Zoonoses.
Emergency Animal Diseases

Emergency animal diseases affect all livestock industries.

The Australian livestock industry benefits enormously from being free of many diseases that devastate animals in other countries. Any introduction of these diseases could have a catastrophic impact. Several committees have developed plans and trained people to monitor and eradicate any outbreak of these diseases.

What is an EAD?

Emergency animal diseases (EADs) are those diseases likely to have a significant effect on livestock, causing mortalities and production loss. They may also have a serious impact on human health and the environment. These diseases are categorised as exotic (brought in from overseas), emerging (new diseases originating in Australia) and endemic (already present here). Many of these diseases are notifiable in the NT.

Owners, managers, agents and veterinarians who suspect or have confirmed laboratory results of notifiable diseases must report them to DRDPIFR. A list of notifiable diseases and the reporting form is available on the DRDPIFR website.

The NT has the potential to be the first point of entry for many exotic diseases that can affect animals, plants or people. DRDPIFR has a Biosecurity Emergency Management Response Plan for dealing with exotic pest and disease outbreaks and other emergencies.

Livestock industry and community awareness

One objective of the EAD Preparedness Program is to ensure the community and the livestock sector are informed of and alert to the impact livestock diseases could have on the Australian economy, and are capable of responding in a coordinated manner to any incursion or outbreak. This program is designed to maintain producers’ awareness of the importance of emergency animal diseases and the appropriate action to be taken when one is suspected. For more information visit the Animal Health Australia website.

What should you do if you see a sick animal or suspect an outbreak of an emergency animal disease?

• Report it to your regional veterinary officer or stock inspector.
• Keep suspect livestock on your property and isolate them from other animals.
• Remain on the property and discourage visitors until the stock are investigated.

What signs should I look for?

• unusually high numbers of sick or dead animals
• blisters, ulcers or erosions of the mouth, udder or feet
• strange nervous signs
• bloody diarrhoea.
**Emergency Animal Diseases to watch out for:**
- Foot and mouth disease
- Mad cow disease
- Screw worm fly
- Rabies
- Australian bat lyssavirus
- Bovine tuberculosis
- Japanese encephalitis
- Surra
- Rinderpest

© DEFRA 2001

**SUMMARY OF BEST PRACTICE**
- Be informed about EADs.
- Report any animals suspected to have an emergency animal disease.
- Isolate diseased animals.
- Discourage movement onto and off the property.

**Sources**
Animal Health Australia
www.animalhealthaustralia.com.au
DAFF www.daff.gov.au

**Further information**
Emergency Disease Hotline Ph: 1800 675 888.
DRDPIFR www.nt.gov.au/drdpifr/

**Related topics**
Animal Welfare, Zoonoses.
Heat Stress in Cattle

The risk of heat stress in the Northern Territory is significant.

To reduce the risk of heat stress consider cattle selection, facilities and management.

Heat stress occurs when an animal has excess body heat that it cannot lose. Heat-stressed cattle will:

- eat and ruminate less
- seek shade or align themselves with the sun if there is no shade
- breathe with their mouths open, pant, salivate and splash water if it is available
- become unresponsive, lie down and start to die when their body temperature reaches 41.5°C

Minimising production of excess body heat

- Cattle with quiet temperaments are less likely to become excited (stirred up) and less likely to overheat. Steady mustering and quiet handling reduce the chance of cattle becoming stirred up.
- Efficient facilities promote the smooth flow of stock during handling and reduce the chance of cattle becoming stirred up.

Improving loss of excess body heat

- Adapted cattle have genetically determined physical features to better suit an adverse environment. For example, tropically adapted cattle have shorter coats, light coloured coats, longer dewlaps and more sweat glands to help lose body heat.
- Acclimatised cattle have seasonal adaptation to better suit an adverse environment. For example, cattle with a hairy winter coat will lose it before summer.
- Lean body condition increases the ability to lose heat. Fat cattle have a greater risk of heat stress because excess body fat acts as insulation and slows body heat loss.
- Rest gives cattle an opportunity to settle down, decrease production of body heat and increase heat loss. Rest can be especially important after helicopter mustering.
Reducing the risk of heat stress

- Shaded yards protect cattle from the heat of the sun. This is particularly important for British and European types of cattle. The shade must not interfere with the air flow through the yards.
- Cool, fresh water helps cattle lose heat through evaporative cooling. Buried water pipes and shaded troughs ensure delivery of cool water to cattle.
- Spraying or use of sprinklers help cattle lose excess body heat through evaporative cooling if humidity is below 50%.
- Room in yards and pens allows cattle to spread out. This maximises air flow and heat loss.
- Appropriate and efficient yard design will reduce stresses on cattle and the likelihood of heat stress.
- Handling during cool hours will reduce body heat build-up.
- Travelling during cool hours and after dark will reduce body heat build-up.
- Prevent overloading of trucks to optimise air flow and heat loss.
- Shaded lower truck decks can provide protection for cattle that are more susceptible to heat.
- Electrolytes may be provided to help cattle replace body salts and fluids lost during mustering and transport (electrolytes are not commonly administered in the Katherine region).
- Avoid working cattle during periods of extreme heat and humidity.

Give extra consideration to:

- Cattle recently vaccinated for tick fever. These animals can develop a reaction after vaccination as a normal part of developing immunity. If possible, consider vaccinating well before transport, to allow recovery from any reaction.
- Cattle travelling to hotter and more humid conditions. Transporting cattle from cool, dry areas to hot, humid areas markedly increases the risk of heat stress.

SUMMARY OF BEST PRACTICE

- Recognise heat stress can be a problem in the Northern Territory environment.
- Provide shade and cool, fresh water.
- Select for quiet, tropically adapted cattle.
- Avoid mustering, working cattle and transportation when excessively hot.

Source

Further information
Rural Chemical Industries (Aust) PL www.heatstress.info

Related topics
Horse Health

Nutrition

Horses are monogastric animals (one stomach) and fermentation occurs in the caecum and large intestine where large numbers of micro-organisms digest cellulose, utilise protein and non-protein nitrogen and synthesise certain vitamins.

Pasture and hay

Legume-grass mixes contain considerably more protein, minerals and vitamins than grasses alone. Stylos and cavalcade can be combined with improved grasses to achieve a top pasture. In sandy areas where pasture is short due to overgrazing, horses should be provided with supplemental roughage. Pasture and hay should be free of weeds. Old, excessively mature growth has less nutritive value than fresh, young growth. Mouldy hay should not be fed to horses because it can cause colic, laminitis and death.

Concentrates and other supplements

These include grains and by-product feeds high in energy and protein. Processing of grains before feeding is often desirable to improve nutrient availability and increase bulk, but grains that are cracked or rolled may become stale and/or mouldy. Over-gorging on grain can be catastrophic leading to rupture of the stomach and certain death. Care should always be taken to ensure horses don’t have free access to opened bags of grain on the back of station vehicles, at the poultry shed or around the stable. Ensure the latches of silos are securely locked as inquisitive horses can sometimes open them.

If a large volume of undigested grain reaches the lower gut, excessive fermentation will occur and can predispose to colic or grain founder (laminitis). If concentrates are to be fed, they should be fed only in small amounts and gradually increased over a period of weeks. In the event of grain overload, drench the horse with sodium bicarbonate and provide anti-inflammatories such as oral phenylbutazone if any is readily available. Seek urgent advice from a veterinarian if the horse is valuable.

Horses must not be fed more than 2.5kg grain in a single feed and should not be fed grain before exercise or transport. Dusty feeds should not be fed because they can lead to or aggravate respiratory problems. An artificial supplement feed can be made by soaking a dry ingredient with water and molasses.

Monensin is toxic to horses and care should be taken not to allow horses access to any stockfeeds such as weaner pellets or feedlot mixes that contain monensin (Rumensin®).

Water

Water requirements depend largely on the environment, the amount of work or physical activity, nature of the feed and physiological state of the horse. Daily consumption by an adult horse is typically 3.3L/100kg bodyweight. Water requirements could range from 20 to 60L/day. Clean, fresh water should be provided ad lib for all horses. Ensure that trough water is not too hot by checking the temperature with your hand. Heat stressed horses should be allowed...
to cool down before being given unlimited access to cold water. Small amounts of room-temperature water should be offered frequently while the horse is cooling down.

**Salt**

Horses should have access to salt, particularly when there is increased sodium loss through sweating. Horses in the Northern Territory should have access to a lick block throughout the wet season at least, but preferably year-round. Horses will seek out a salt block if they need it, so if your horse shows no interest, this is the best indication that the salt balance in their diet is adequate.

**Calcium and phosphorus**

Horses grazing introduced tropical pasture species such as buffel grass, kikuyu, purple pigeon grass and pangola grass, may require a calcium supplement in their diet. This applies primarily to foals and pregnant or lactating mares that have a higher requirement for calcium to supply the needs of growing bones and milk production. These grasses contain oxalates, which bind to calcium and is excreted through the urine inducing a calcium deficiency in the horse. The induced calcium deficiency affects the maxillary bones of the head and leads to ‘Big Head’ in horses. Feeds that are relatively high in calcium include lucerne, sunflower and linseed meals, calf manna (highly palatable and digestible protein and energy supplement) and molasses. Alternatively, powdered calcium supplements may be mixed with molasses.

**Vitamins**

Horses with access to green pasture and sunshine are unlikely to suffer from vitamin deficiencies. However, in the dry season when pasture availability and palatability is low, most horses will require supplementary feeding. Where possible, this should include some quality green feed such as fresh cavalcade or lucerne, or even grazing a lawn for a short period each week to meet their vitamin requirements. In cases of severe malnutrition, vitamin supplements may be required.

**Protein and carbohydrates**

Quality hay meets most of a horse’s nutritional needs. Horses with a higher demand for protein and carbohydrates (horses working hard), and those fed poor quality hay will require additional grain feeding.

**Sand**

Ingestion of sand when grazing depleted pastures at the end of the dry season causes ill thrift, diarrhoea and colic. Prevent by feeding sandlube weekly and supplementary feeding hay or by not flogging out your horse paddock.

**Poisonous plants**

Several species of *Crotalaria* (rattlepods) occur in the Katherine region. Some of these species contain pyrrolizidine alkaloid toxins which damage the liver. The ‘walkabout’ syndrome is characterised by depression, blindness and a staggery gait, often with weight loss. Liver damage is cumulative and irreversible, and death can be sudden. This syndrome is untreatable and affected horses should be euthanased. Diagnosis can be difficult, but it is usually based on clinical signs or a blood test for liver function. Prevention is the key. Do not overgraze paddocks, always supplementary feed in the late dry season and do not allow access to paddocks containing rattlepod.

For other plants in the Katherine region which are poisonous to horses, see Poisonous Plants.

**Parasites**

**Internal parasites**

All horses can harbour different types of worms but foals are more susceptible to large infestations especially after stressful incidents such as weaning, disease or transport. Commonly found types include bloodworms (*Stronylus* sp.), roundworms (*Parascaris* sp.), pinworms (*Oxyuris equi*), hairworms (*Trichostrongylus axei*), tapeworms (*Anoplocephala* sp.) and redworms (*Gyathostomes* sp.). Foals born during or close to the wet season and kept on pasture should be wormed monthly from six to eight weeks of age to six months.

The general recommendation for station horses is to treat them at the start and finish of the working season (immediately after and before the next exposure to worm larvae on pasture). To prevent the development of worm resistance to a particular class of chemical it is recommended that you alternate the active ingredient in the drench. Remember that the majority of the worm population is on the pastures, therefore coordinate treatments with fresh paddocks where possible. The minimum worming regime is to worm with ivermectin at the end of the dry season and to use a fenbendazole (e.g. Panacur®) at the end of the wet season.

Bot flies (*Gasterophilus* sp.) are not seen in the Katherine region, so it is not considered necessary to use a wormer that kills bot fly larvae. Horses imported from Queensland and more southern climates should have one treatment for bots on arriving in the Northern Territory.

**External parasites**

**Ticks**

Tick worry occurs in horses imported from cooler climates. Ticks can be easily treated with oral, injectable or topical application of parasiticides. All horses travelling south of the tick line must be inspected and sprayed for cattle tick by a stock inspector to ensure that ticks are not spread to designated ‘clean’ areas. NB Horses can not be treated with Amitraz.
Fly larvae (Habronema and Draschia sp.)
Fly larvae may burrow under the skin, causing ‘summer itch’, small hard lumps and non-healing sores. The larvae may also complicate or prolong the healing of other wounds and contribute to ‘proud flesh’. Infection with Onchocerca sp. microfilariae typically causes formation of hard but usually fairly un-reactive lumps, commonly in the neck or brisket. Treatment with a parasiticide such as ivermectin may cause lumps which become worse shortly after treatment, owing to the death of the insect larvae. This sometimes causes itching which needs to be treated with cortisone. However, once the larvae are dead they are easily removed by the body and the sores tend to heal without further complication. Horses with a tendency to develop summer sores should be protected against biting flies by using repellants and fly veils and rugs.

**Vaccination**

**Tetanus**
Tetanus is caused by the toxin produced by *Clostridium tetani*, a bacterium found in the environment. The disease develops following infection of a deep penetrating wound. It is often difficult to locate the actual injury which may be due to a nail prick when shoeing. The toxin invades the central nervous system and causes severe muscle spasms, rigidity of the body, extreme sensitivity to noise, and always results in death. The early signs are an anxious expression of the third eye lid becoming quite prominent in the corner of the eye. The disease is untreatable but easily preventable.

The Katherine region is considered to be a high-risk area for tetanus infection and all horses should be vaccinated from three months of age. Primary vaccination consists of two doses given four weeks apart, followed by a booster vaccination one year later, and then every three years for life. Unvaccinated horses that are wounded by a penetration through the skin or undergo surgery such as castration should be given tetanus anti-toxin for short-term protection (seven days) and placed on a vaccination program. Prevention costs $10. Treatment costs $1000 and is rarely successful.

**Strangles**
Strangles is a bacterial infection caused by *Streptococcus equi* subspecies *equi*, mostly seen in young horses kept together in large groups. The infected animal is feverish, off its food and usually has a thick mucous discharge from the nose that may or may not contain pus. The glands between the angle of the jaw and the throat (sub-mandibular lymph nodes) swell up and abscesses usually form. If an abscess fails to rupture, the airway may become slightly occluded, causing breathing problems.

Katherine is not considered a high-risk area for strangles infection but cases have been confirmed throughout the NT, especially during the campdraft season. The disease is contagious and is usually introduced to a population by an infected horse. Primary vaccination consists of three doses given two to four weeks apart, followed by annual boosters. Horses in the high-risk category can be vaccinated twice a year but this does not ensure complete protection. Vaccination may be done in conjunction with tetanus vaccination. It is recommended that competition horses be vaccinated and isolated from non-vaccinated horses in the stock camp. Vaccinate at the end of the competition season because vaccinated horses often become sore at the injection site.

**Salmonella**
The bacterium *Salmonella typhimurium* causes severe diarrhoea and other localised infections in very young foals and adult horses. This disease is uncommon in horses in the NT and vaccination is not recommended unless there has been a previous problem on the property.

**Herpesvirus**
There are a number of viral causes of respiratory disease in horses. Horses may present with a nasal discharge (which may be clear, yellow or green), often with a cough, and usually with poor performance and lethargy. Equine herpesvirus 1 (EHV-1) occurs commonly in horses under two years of age. Equine herpesvirus 4 (EHV-4) is more severe, can cause abortion in mares and is a notifiable disease. There is a vaccine available that offers some protection against these viruses although it is very expensive and not widely recommended in the NT.

**Teeth care**

Problem teeth in a horse may account for a multitude of problems: quidding (dropping food from the mouth while eating), failure to gain weight or weight loss, diarrhoea, throwing the head around, pulling on the bit, leaning to one side while riding, and head-shyness. Horses chew their food with a grinding side-to-side motion, so problems usually develop if the grinding edges fail to meet evenly. Sharp edges are produced on the teeth and these points begin to cut into the gums, causing ulceration, infection and pain. Sharp teeth can be rasped back. Skills, tools and knowledge are needed to do the job properly.

High-risk horses are those fed mainly on concentrates with little access to grazing. These horses wear down the molars, but not the incisors. This leads to headaches, wearing, nodding and poor feed conversion. It is correctable by appropriate trimming of the incisors.

**Hoof care**

Ninety-five per cent of lameness is due to hoof problems. The most common hoof problems are abscesses in the sole, stone bruises and seedy toe during the wet season. Both are relatively simple to treat but need prompt attention. The abscessed tissue is usually cut away to allow release of the pressure that causes pain. Stone bruises usually require time to heal. CORRECT SHOEING IS IMPORTANT.

Seasonal hoof problems include cracking of the hoof wall in the dry season. There are many hoof oils and dressings...
available that can be wiped or brushed onto the coronary band (periople) of the hoof to maintain suppleness that helps avoid cracking. In the wet season the opposite problem can occur, particularly if horses spend long periods standing in mud or water. The hoof wall softens and becomes more susceptible to penetrating injuries from stones and nails, sometimes leading to bruising and abscess formation. Water-excluding dressings such as Stockholm tar applied when the hoof is dry, and feed supplements such as gelatin or biotin additives may help to avoid these problems. Formalin treatment of infected soles is effective in the wet season.

Greasy heel caused by *Dermatophilus congolensis* bacteria also can occur in horses that live in warm, wet and muddy environments. Greasy heel appears on the horse’s heels as a scab or knotted hair that when removed reveals a greasy grey or yellowish and inflamed area. White horses or horses with white feet are particularly susceptible. It can be prevented by trying to provide a dry area in the paddock or erecting a shelter. Antibiotics and topical treatments may need to be applied.

**Other**

**Swamp cancer**

This is not a cancer as such, but a severe, deep-rooted fungal (*Pythium fungus*) infection that generally arises from a fly or tick bite and is rarely associated with a traumatic wound. It is generally seen in horses grazing wet, poorly drained, swampy areas. Horses in these ‘infected’ areas may suffer severe, life-threatening illness year after year. The lesions are raised and discharge a bloody mucoid substance. They are very painful and the horse often bites at the lesion and has blood on the muzzle area. Lesions can be on the body, legs or head. If the lesions are diagnosed early enough treatment is generally successful. Treatment includes surgical excision, intravenous and oral iodine, Pythium vaccination and topical iodine. Severe cases are difficult to treat and horses are often euthanased.

A condition often referred to as a swamp cancer is ulceration of wounds during the wet season caused by burrowing larvae of the habonema fly. This is discussed earlier in the external parasite section. This condition can be easily treated.

**Sarcoid**

These are seen commonly in the Katherine region. They look like a malignant cancerous wart and are caused by a papilloma-type virus. Treatment is by excision and topical medications. Recurrence is common. Speak to your vet about treatment options.

**Eye ulcers**

These are usually in one eye during the wet season caused by traumatic damage to the cornea and/or bacterial infection. Always check in the eye for grass seeds. Flush eye with saline, apply antibiotic ointment twice daily and cover the eye to protect from the sun, dust and wind.

**SUMMARY OF BEST PRACTICE**

- Handle all foals at weaning to the stage of being tied up. Treatment of unhandled horses can create more problems than it solves.
- Provide horses with a quality diet and supplement when necessary.
- Avoid grazing horses on pastures infested with *crotalaria*. *Crotalaria* plants in the horse paddock should be hand-pulled or spot-sprayed with a herbicide.
- Treat all station horses for internal parasites at the end of the wet season, and again at the end of the dry season.
- Commence a tetanus vaccination program for foals when they are weaned and first handled.
- Provide tetanus anti-toxin and tetanus vaccine to unvaccinated horses with penetrating skin wounds or surgical procedures. Maintain booster vaccination.
- To avoid strangles infection, segregate the station horses at camp drafts from those of other stations, and avoid sharing of water containers.
- Check teeth and feet regularly.
- Ensure horses DO NOT get access to stockfeeds and supplements that contain monensin. Urea is toxic also, but no more so than it is for cattle.

**Further information**

DRDPIFR Stock Course, contact Pastoral Extension Officer, DRDPIFR Katherine, Ph: (08) 8973 9770.


**Related topics**

Poisonous Plants, Tetanus.
Leptospirosis

In cattle herds, leptospirosis can result in reduced branding percentages. The disease can cause abortion, stillbirth, weakness and death in young calves when non-immune cattle are infected during late pregnancy. Leptospirosis is generally widespread in the Katherine region but losses from it are generally low. Livestock workers can contract leptospirosis from infected cattle, either by direct contact with infected urine when handling cattle, or indirectly through contact with contaminated water and soil. It is deemed an Occupational Health and Safety issue in dairies as farm labourers are more exposed to urine splash when milking. Leptospirosis in humans is a debilitating and sometimes prolonged disease which commences with severe flu-like symptoms and severe kidney (back) pain. It is a notifiable disease in humans.

Cause of leptospirosis

Leptospirosis is caused by Leptospira interrogans subspecieshardjo, pomona and tarrasui. Transmission of L. pomona in cattle mainly involves contact with urine of pigs and rats and commonly occurs in wet environments, eg. swamps having feral pigs.

Clinical signs in cattle

- abortion
- fever
- mastitis
- depression
- jaundice
- anorexia

Diagnosis

Diagnosis from a single blood sample can be difficult to interpret – especially if there is a mixed vaccination history.

- Collection of:
  - duplicate blood samples from 20–30 cows four to six weeks apart
  - urine sample
  - blood, liver, kidney, spleen from foetus
- Post-mortem shows:
  - yellowing of tissues
  - dark kidneys with haemorrhages

Prevention and control

Vaccination is not a routine management procedure in the Katherine region, but may be considered in a risk-based approach to preventing infection among livestock workers. Vaccines are available as ‘7 in 1’ with clostridial vaccines or as a bivalent leptospirosis vaccine. A booster is required four to six weeks after the initial dose, followed by an annual booster. Because the immunity provided by this killed vaccine barely lasts 12 months duration, it is recommended that animals be vaccinated when they are diagnosed pregnant.

Reducing feral pig populations is integral to leptospirosis prevention and control.

Leptospirosis can penetrate the membranes of the mouth, nose, eyes and broken skin. There is no vaccine available to prevent human infection. The risk of human infection is reduced in vaccinated herds.

SUMMARY OF BEST PRACTICE

- Avoid contact with urine of cattle and moist areas in the cattle environment such as muddy areas around water troughs and water holes.
- Human infection of leptospirosis is a notifiable disease.
- Reduce feral pig population.
- Since the eradication of Brucellosis, Leptospirosis is now the possible cause of an abortion storm in beef cattle, and should be reported and investigated as soon as it may be suspected.
Source

Related topics
Vaccination of Cattle, Zoonoses.
Poisonous Plants

The Katherine region has numerous plant species and some fungal and algal species that are potentially poisonous to livestock. The source of toxin, growth phase of plant and animal, and environmental and situational factors can influence the likelihood of poisoning.

Source of toxin

Vascular plant and algal toxins are known as phytotoxins. Fungal toxins are known as mycotoxins.

The condition of the toxic plant will affect its palatability. The toxicity of the plant can vary with growth stage. Some plants are poisonous during active growth, others during flowering or fruiting and others when wilting or drying off.

The animal

• Rumen microflora can either detoxify or potentiate ingested toxins. For example, horses and cattle may be affected differently by a particular toxin.
• Younger animals are generally more susceptible to toxins.
• Poorly fed animals and particularly hungry animals (following transport or yarding) are more susceptible.
• Animals in poor condition or stressed are usually more susceptible because they are hungry and vulnerable.
• Stock introduced to new areas may eat poisonous plants not eaten by local stock. Hunger may compound the susceptibility of new stock. Local stock may have a tolerance to toxins and are generally more likely to eat strange/toxic plants as they have not yet established good grazing habits.
• Length and intensity of exposure to the toxin will affect the likelihood of poisoning (i.e. how much and for how long the animal has consumed the plant).
The environment
• During dry periods some poisonous plants may remain green after pasture plants have dried off. Poisonous plants may be more attractive during these times.
• High temperatures, drizzly rain and cloud cover can affect the amount of toxin in some plants.
• Nutrient and mineral deficiencies of the soil may affect plant toxicity.

What should you do if you suspect a plant poisoning?
Contact your regional stock inspector or veterinary officer.

Diagnosis
• collect a thorough history and carefully record clinical signs
• examine sick animals and collect blood and faecal samples
• perform a post-mortem and collect blood and tissue samples, ruminal samples (most important) and intestinal contents
• examine the environment and collect plant, fungi, feed and water samples.

The situation
The likelihood of poisoning is increased when:
• hungry cattle are released, after transport, into yards or paddocks containing toxic plants
• inadequate feed forces stock to consume plants or parts of plants they would usually avoid
• fresh growth of poisonous plants occurs following fire or rain
• large numbers of poisonous plants are present with little alternative feed.

SUMMARY OF BEST PRACTICE
To prevent plant poisoning:
• Know which plants are poisonous in your region, (refer to table of common poisonous plants of the Katherine region over page).
• Always ensure newly introduced stock are put in ‘safe’ paddocks on arrival or have been well fed on good hay before releasing from the yards. Ensure weaners are ‘tailed-out’ on ‘safe’ pastures and/or put in ‘safe’ paddocks after weaning.
• Know what conditions may lead to poisoning.
• Avoid grazing of livestock in areas with poisonous plants especially when pasture availability becomes limited.
• Where possible, remove poisonous plants, use herbicides or biological methods (insects) to control growth and spread.
• Fence-off areas that are of particular concern – especially if based on historical records

Sources

McKenzie, R (2002). Toxicology for Australian Veterinarians [CDROM], University of Queensland, School of Veterinary Science.

Further information


Related topics
Animal Welfare, Disease Investigation, Horse Health.
# Common poisonous plants in the Katherine region

<table>
<thead>
<tr>
<th>Toxin</th>
<th>Plant species</th>
<th>Livestock affected</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ALKALOIDS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pyrrolizidine alkaloid</td>
<td>RATTLEPOD</td>
<td>Cattle, Horses</td>
</tr>
<tr>
<td></td>
<td><em>Crotalaria spp.</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>C. crispata</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>C. ramosissima</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>C. retusa</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>C. novae-hollandiae</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cattle</td>
</tr>
<tr>
<td></td>
<td><em>C. medicaginea</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>C. aridicola</em></td>
<td></td>
</tr>
<tr>
<td><strong>Diterpenoid alkaloid</strong></td>
<td><strong>IRONWOOD</strong></td>
<td>Cattle, Horses, Goats, Camels</td>
</tr>
<tr>
<td>Poisoning occurs in hungry, newly-introduced stock or with sucker regrowth.</td>
<td><em>Erythrophleum chlorostachys</em></td>
<td></td>
</tr>
<tr>
<td><strong>Pyridine alkaloid</strong></td>
<td><strong>NATIVE TOBACCO</strong></td>
<td>Cattle</td>
</tr>
<tr>
<td>Poisoning occurs in hungry, newly-introduced stock with high concentration of plant and little alternative feed.</td>
<td><em>Nicotiana spp.</em></td>
<td></td>
</tr>
<tr>
<td><strong>GLYCOSIDES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyanogenic glycoside</td>
<td><strong>FUSHIA / SPOTTED EMU BUSH</strong></td>
<td>Cattle</td>
</tr>
<tr>
<td></td>
<td><em>Eremophila maculata</em></td>
<td></td>
</tr>
<tr>
<td>Nitrate-nitrite</td>
<td><strong>BUTTON GRASS</strong></td>
<td>Cattle</td>
</tr>
<tr>
<td>Poisoning occurs when hungry livestock ingest lush plant from nitrogen-rich soils near or in yards.</td>
<td><em>Dactyloctenium radulans</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Portulaca oleracea</em></td>
<td></td>
</tr>
<tr>
<td>Fluoroacetate</td>
<td><strong>HEART-LEAF POISON BUSH</strong></td>
<td>Cattle</td>
</tr>
<tr>
<td>(compound used in 1080 baits)</td>
<td><em>Gastrolobium grandiflorum</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>GEORGINA GIDYEA</strong></td>
<td>Horses, Dogs</td>
</tr>
<tr>
<td></td>
<td><em>Acacia georginae</em></td>
<td></td>
</tr>
<tr>
<td>Unknown toxin</td>
<td><strong>BIRDSVILLE INDIGO</strong></td>
<td>Horses</td>
</tr>
<tr>
<td>Contains <strong>Indospicine</strong></td>
<td><strong>Indigofera linnaei</strong></td>
<td></td>
</tr>
<tr>
<td>The toxicity of plant is reduced the further north from Alice Springs it is found.</td>
<td><strong>COFFEE SENNA</strong></td>
<td>Cattle, Horses</td>
</tr>
<tr>
<td></td>
<td><em>Senna occidentalis</em></td>
<td></td>
</tr>
<tr>
<td>Aflatoxin</td>
<td><strong>MOULDY FEED</strong></td>
<td>Cattle, Horses</td>
</tr>
<tr>
<td></td>
<td><em>Aspergillus spp.</em></td>
<td></td>
</tr>
<tr>
<td>Unknown toxin</td>
<td><strong>Fungus producing dry, white coral-like structures on grass stems</strong></td>
<td>Cattle</td>
</tr>
<tr>
<td>CYCLIC PEPTIDES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Microcystin and Nodularin</td>
<td><strong>BLUE-GREEN ALGAE</strong></td>
<td>Cattle</td>
</tr>
<tr>
<td>Aflatoxin</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ALKALOIDS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cylindro-spermopsin</td>
<td><strong>TROPICAL-SUBTROPICAL</strong></td>
<td>Cattle</td>
</tr>
<tr>
<td></td>
<td><strong>BLUE-GREEN ALGAE</strong></td>
<td></td>
</tr>
</tbody>
</table>
### Clinical signs or autopsy findings

<table>
<thead>
<tr>
<th>Poison Type</th>
<th>Plant Species</th>
<th>Livestock Affected</th>
<th>Clinical Signs or Autopsy Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALKALOIDS</td>
<td><em>Crotalaria</em> spp.</td>
<td>Cattle, Horses</td>
<td>Weight loss, lethargy, jaundice, incoordination, blindness, repetitive yawning, headpressing. Horses may present with a dummy syndrome, but suddenly become manic and aggressive when restrained or handled.</td>
</tr>
<tr>
<td>ALKALOIDS</td>
<td><em>C. crispata</em>, <em>C. ramosissima</em>, <em>C. retusa</em>, <em>C. novae-hollandiae</em></td>
<td>Cattle, Horses</td>
<td>Ulceration of the oesophagus, licking of lips, grinding teeth, drooling saliva, inability to swallow, weight loss.</td>
</tr>
<tr>
<td>DITERPENOIDS ALKALOIDS</td>
<td><em>Erythrophleum chlorostachys</em></td>
<td>Cattle, Horses, Goats, Camels</td>
<td>Sudden death. There may be loss of appetite, abdominal pain, diarrhoea, staring eyes, loud, irregular heart sounds and difficult breathing. Haemorrhage may be seen in the intestine and heart. With sudden death, undigested leaves are often found in the rumen.</td>
</tr>
<tr>
<td>NITROGENOUS TOXINS</td>
<td><em>Dactyloctenium radulans</em>, <em>Portulaca oleracea</em></td>
<td>Cattle, Horses</td>
<td>Sudden death. Muscle weakness/spasms, rapid deep breathing, coma. Rumen bacteria convert nitrate to nitrite, which is absorbed into the blood and prevents the transport of oxygen around the body. The blood is brown in colour.</td>
</tr>
<tr>
<td>ALKALOIDS</td>
<td><em>Indigofera linnaei</em></td>
<td>Horses, Dogs</td>
<td>Hyperactive, vomit, froth at mouth, urinate and defecate repeatedly, convulsions, death. Dogs can bark hysterically with 1080 poisoning.</td>
</tr>
<tr>
<td>GLYCOSIDES</td>
<td><em>Eremophila maculata</em></td>
<td>Cattle</td>
<td>Acute: Sudden death, bright red blood. Chronic: Ataxia of the hind legs, urinary incontinence, difficulty calving, deformed calves.</td>
</tr>
<tr>
<td>CYCLIC PEPTIDES</td>
<td><em>Gastrolobium grandiflorum</em></td>
<td>Cattle</td>
<td>Heart failure, collapse, convulsions, death.</td>
</tr>
<tr>
<td>CYCLIC PEPTIDES</td>
<td><em>Acacia georginae</em></td>
<td>Horses, Dogs</td>
<td>Hyperactive, vomit, froth at mouth, urinate and defecate repeatedly, convulsions, death. Dogs can bark hysterically with 1080 poisoning.</td>
</tr>
<tr>
<td>CYCLIC PEPTIDES</td>
<td><em>Indospicine</em></td>
<td>Cattle</td>
<td>Sudden death or acute liver damage. Depression, loss of appetite, abdominal pain, rumen stasis, jaundice, swollen liver and gall bladder, haemorrhage in the intestine.</td>
</tr>
<tr>
<td>GLYCOSIDES</td>
<td><em>Senna occidentalis</em></td>
<td>Cattle, Horses</td>
<td>Liver necrosis. Depression, abdominal pain, jaundice, collapse, death.</td>
</tr>
<tr>
<td>CYCLIC PEPTIDES</td>
<td><em>Eremophila maculata</em></td>
<td>Cattle</td>
<td>Sudden death. Lethargy, loss of appetite, jaundice, widespread haemorrhage, liver necrosis.</td>
</tr>
<tr>
<td>CYCLIC PEPTIDES</td>
<td><em>Indigofera linnaei</em></td>
<td>Horses, Dogs</td>
<td>Black soil blindness. Onset of blindness, followed by rapid death.</td>
</tr>
<tr>
<td>CYCLIC PEPTIDES</td>
<td><em>Gastrolobium grandiflorum</em></td>
<td>Cattle, Horses</td>
<td>Sudden death or acute liver damage. Depression, loss of appetite, abdominal pain, rumen stasis, jaundice, swollen liver and gall bladder, haemorrhage in the intestine.</td>
</tr>
<tr>
<td>CYCLIC PEPTIDES</td>
<td><em>Indigofera linnaei</em></td>
<td>Horses, Dogs</td>
<td>Black soil blindness. Onset of blindness, followed by rapid death.</td>
</tr>
<tr>
<td>CYCLIC PEPTIDES</td>
<td><em>Senna occidentalis</em></td>
<td>Cattle, Horses</td>
<td>Sudden death or acute liver damage. Depression, loss of appetite, abdominal pain, rumen stasis, jaundice, swollen liver and gall bladder, haemorrhage in the intestine.</td>
</tr>
<tr>
<td>CYCLIC PEPTIDES</td>
<td><em>Gastrolobium grandiflorum</em></td>
<td>Cattle</td>
<td>Chronic liver damage. Weakness progressing to collapse and death.</td>
</tr>
</tbody>
</table>
Stringhalt occurs with the temporary or permanent upward fixation of the patella (knee cap) on the prominence of the femur (upper leg bone). The patella in cattle is attached by three ligaments to the tibia (main bone in the lower leg). The condition occurs when the inside (medial) ligament hooks over the top of the knee, locking the hindleg in extension until the animal can disengage it. When viewed from the side, the leg is locked straight in the extended position dragging behind the animal. When the ligament is disengaged, the limb jerks forward. Initially only stiffness of the hind limbs might be observed, which progresses to the jerky action in one or both limbs and eventually to dragging of the hind limbs.

A large study in Brazil concluded that nutritional deficiency seemed to be the most important factor affecting the occurrence of stringhalt and that cows, especially those who had just calved, were more susceptible than other animals. More animals presented with stringhalt during the dry season when pastures were of lower yield and poorer quality. The disorder was observed more in animals in poorer condition. Less than 0.5% of the herd showed signs of stringhalt.

Horses in Australia can also suffer from ‘Australian stringhalt’. While not proven, it is thought to be associated with the ingestion of toxins in some pasture weeds. Recovery can take 6–12 months. An anti-convulsant drug may ease signs of the disease in horses.

**Diagnosis**

- exaggerated, spasmodic flexion of one or both hind legs
- recollection of previous stringhalt episodes
- lameness after rest
- dragging hoof or hooves which may show signs of wear as a result of unusual gait
- local palpation of the joint

Signs of stringhalt may be present in varying degrees of severity.

**Prognosis**

- While spontaneous recovery does occur, the disorder is likely to recur intermittently.
- Surgical treatments ‘medial patella desmotomy’ are available but would not be economically warranted and should not be used in breeding animals because of the likelihood of inheritance.
- Animals with signs of stringhalt are not acceptable for live export.
SUMMARY OF BEST PRACTICE

- Cull breeding animals showing signs of stringhalt.
- Meet the nutritional needs of animals, especially cows just after calving.

Sources


Related topic
Supplementation
Chapter One: Animal Health

For many years now, the cattle industry has recognised a syndrome known as ‘tail rot’. It can occur in all breeds of cattle, but is reported more commonly in *Bos indicus* breeds, especially Brahman.

Although the prevalence of tail rot in Katherine herds is less than 1%, cattle with stumpy tails are rejected from live export with no alternative local market. It is of particular concern to producers when the syndrome occurs in a high proportion of cattle.

A primary cause of tail rot is not known, though bacterial, fungal and/or parasitic infections have been identified following laboratory testing on amputated tails.

**Diagnosis**

Tail rot is characterised by:

- hardening of skin tissue from the tail tip
- loss of hair from the brush of the tail
- gradual ‘rotting’ and loss of section of the tail
- healing with thin dark tissue covering the tail stump
- infection ‘pus’ breaking out from open wounds as the rot continues up the tail.

Cattle are at risk of septicaemia or infection entering the spinal cord causing meningitis. On occasions the infection continues to move up the tail causing paralysis of the hind legs.

One common cause of tail rot is trauma associated with a crushing injury which results in temporary or permanent loss of blood flow to the tail and may occur during yard work. When blood is prevented from reaching the end of the tail, the tissues are deprived of oxygen and begin to die, turning necrotic. Dingoes or wild dogs can be significant causes of trauma to the tail.

Tail rot occurs in cattle throughout the world due to a number of diseases including ergotism, fescue foot, deg nala disease and bucopa. These diseases affect other extremities of the body including the ears, nose and feet, unlike tail rot in Australia. Further epidemiological research is required to determine the factors contributing to tail rot infection observed in north Australian cattle.

**Treatment**

The only effective measure to prevent infection spreading up the tail is removal of the affected section of the tail. This is a veterinary procedure where the tail is surgically amputated at least one or two vertebral spaces above the active tail rot infection. It is essential that the tail artery is cauterised to stop bleeding, and a long-acting broad spectrum antibiotic, such as penicillin, is given to prevent further infection.

**SUMMARY OF BEST PRACTICE**

- Seek veterinary advice if tail rot is reaching unacceptable levels or amputation is required.
- Control wild dog populations.
Tetanus

Tetanus is an acute disease of mammals characterised by muscular spasms and increased sensitivity to stimuli. Tetanus occurs in humans and has been reported in all domestic animals except the cat. In the Northern Territory, the disease has been reported in horses, cattle, sheep, pigs and dogs. Horses are reportedly the most susceptible. Tetanus can be a common cause of death in weaners after castration and dehorning.

Clinical signs
- rigid muscles
- sensitive to light, noise and touch
- prolapse of third eyelid
- sawhorse stance
- pricked ears
- raised tailhead
- lockjaw
- bloat
- high temperature

Diagnosis
- clinical signs
- history of:
  - previous tetanus on property
  - no vaccination
  - poor hygiene with surgical procedures (castration, dehorning)
  - recent wound

Prevention and control
- vaccination
- wet down dusty yards
- disinfect castration and dehorning instruments
- apply antiseptic to wound
- remove animals from yards immediately after dehorning and castration

Vaccination
Hygiene at dehorning or castration is the first line of defence against tetanus. The tetanus vaccine is usually incorporated with other clostridial vaccines into a single vaccine such as ‘5 in 1’ or with the Leptospirosis vaccine ‘7 in 1’. It is also available as a ‘5 in 1’ vaccine with a vitamin B12 supplement. Vaccination against tetanus is not generally practiced but should be considered in cases where there is a clear history of the disease on the property or in the yards. If vaccinating, the recommended procedure is to vaccinate weaners and follow with a booster within four to six weeks. Often the booster is given at the following muster. The ‘5 in 1’ vaccine might cost in the order of 20c/hd, and ‘7 in 1’ about 80c/hd (2007).
SUMMARY OF BEST PRACTICE

- Aim to reduce contamination of surgical instruments by placing them in antiseptic while not in use.
- Adopt best practices for branding, castration and dehorning as per the MLA manual (see “Further information” box below), and investigate a ‘5 in 1’ vaccination program at branding followed by a booster 4–6 weeks later or at the next weaning muster.
- Prevent wounds from becoming infected by application of an antiseptic to the wound.
- Wet the yards down and move weaners out of the yards as soon as possible.
- Weaners and calves should be castrated and dehorned just before leaving the yards and not before trucking.
- Consider vaccinating weaners with a ‘5 in 1’ or ‘7 in 1’ followed by a booster, especially on properties with a history of tetanus.

**Source**

**Further information**

**Related topics**
Castrating Calves, Clostridial Diseases, Dehorning, Horse Health, Vaccination of Cattle.
Three-Day Sickness or Bovine Ephemeral Fever

Three-day sickness is a viral disease of cattle and buffalo. It is an endemic disease, affecting cattle across the Darwin and Katherine regions and the Barkly Tableland. Mosquitoes and biting midges spread the virus and their movement year by year determines the distribution of the disease. The clinical signs usually occur for a period of about three days.

Because natural infection provides a lifelong immunity, young stock are most commonly affected. The disease occurs much more sporadically in the more southern, cooler regions. If a region has been through several dry seasons and has not experienced any clinical cases, then the problem can become quite severe after a big wet and a much higher proportion of older animals will become infected as well. Valuable stud animals from the south will be susceptible because they have no natural immunity and because the clinical signs are much more severe in heavier animals.

Clinical signs
- fever and depression as evidenced by drooped ears
- lameness, muscular stiffness, shivering, twitching
- recumbency (downer)
- reduced water and food intake
- abortion
- drooling saliva, watering eyes and runny nose
- heavier and older animals more severely affected as extended periods of recumbency cause muscle damage

Diagnosis
- clinical signs
- collection of two blood samples (one when animal is sick and another three weeks later)
- occurrence during or following the wet season

Prevention and control
- vaccination
- provide shade, food and water (do not force to eat or drink)
- turn recumbent cattle from side to side

Vaccination
Live and inactivated vaccines against three-day sickness are available from vets. Both require an initial dose and a booster four weeks later. The live vaccine provides protection for up to one year and the inactivated for up to six months. An annual booster should be given each year, prior to the wet season.
Treatment

- It is best to leave the animal alone if too far from the yards.
- Provide shade, food and water (do not force to eat or drink).
- Turn recumbent cattle from side to side and a soft sandy area is most suitable.
- Valuable animals should be treated with analgesics and sometimes antibiotics when recumbent as secondary pneumonia may become a complication.

Implications for the cattle industry in the NT

- During an outbreak, mustering has to be disrupted because the stress it causes may increase mortality. Animals that go down may die of thirst in hot weather or suffer a loss in condition when feed is in short supply. Milk flow is diminished in lactating cows.
- Bulls may become temporarily infertile.
- Cows may abort in late stages of pregnancy.
- Stock moving from the Alice Springs region to the northern part of the NT during an epidemic run a high risk of becoming infected and developing clinical symptoms.
- After natural exposure to the disease, a long-lasting immunity is attained. Death occurs in only 1% of cases.

SUMMARY OF BEST PRACTICE

- Vaccinate all valuable animals that have been brought in from southern regions.
- Avoid mustering infected cattle.
- Ensure shade, food and water is provided to sick animals.
- Call your local veterinary officer or stock inspector to confirm diagnosis.

Source

Further information

Related topic
Vaccination of Cattle
Chapter One: Animal Health

Ticks

The cattle tick (*Boophilus microplus*) is the most dangerous external parasite of cattle in northern Australia. It transmits tick fever and, if uncontrolled, can cause serious losses to the cattle industry. Ticks were identified as one of the most common animal health problems in the Katherine region (Pastoral Industry Survey, 2004) with 62% of properties using chemical products to control them.

**Effects of ticks**

- Infested cattle lose condition due to ‘tick worry’ and loss of blood.
- Cattle ticks transmit the organisms that cause tick fever. This can be lethal to susceptible animals; others may suffer severe loss of condition.
- Previously unexposed cattle become heavily infested until they build up resistance.
- *Bos indicus* cattle and their crosses develop greater resistance than *Bos taurus* cattle.
- Animals in poor condition are especially vulnerable.
- Heavy infestations can kill calves and even adult cattle.

**Control**

- Use resistant cattle – in the Northern Territory, cattle tick control is usually through the use of resistant cattle. Treatment is confined to cattle being exported or cattle moving to or through tick-free areas.
- Use pasture spelling as a management tool together with strategic dipping. However, larval tick can survive up to six months in frost-free zone and it is difficult to incorporate this into practical pasture rotations, but a pasture has received a lengthy spell e.g. wet season, then all cattle going into that paddock should be treated – especially if they are not 100% Brahman genotypes.
- Tick control can be achieved by using pour-on or injectable products or plunge dips. Plunge dipping is efficient and effective and mainly used for sale cattle in the Katherine region. Plunge dips are not common on properties in the region as they are expensive to install and difficult to maintain and the products used in them do not offer sufficient protection to fit in with normal frequencies of musters. Various chemical products are available, including plunge dip organophosphates, synthetic pyrethroids and amidines (amitraz). The organophosphates are gradually being phased out of use and are only suitable for store cattle due to the withholding periods. Amitraz is probably the most effective knock down preparation available but it has no residual effect at all. It is suitable for treating cattle bound for the meat works but offers no protection against buffalo fly (if indeed a dual purpose is required).

Engorged female tick
SUMMARY OF BEST PRACTICE

- Use resistant cattle and select for resistance in replacement animals.
- Strategic treatment with chemical products (acaricide) and ensure careful attention is paid to using the correct dose rates and maintenance of dips. Under strength preparations can lead to resistance.
- Treat terminal sires with an appropriate pour on preparation that has a long residual action.
- Ticks can develop a resistance to acaricides so monitor resistance problems and frequently alternate chemicals used to minimise the risk of resistance.
- Spell paddocks to break the lifecycle.

The injectable and pour-on macrocyclic lactones and insect growth regulators (fluralaner) offer much more residual affect and will give protection for 4-6 weeks. Because fluralaner is excreted through the milk, calves suckling cows do not have to be treated. These compounds are ideal to use where strategic spelling is implemented into the program but they are not more expensive per head than the spray and dip chemicals and there is a 42 day withholding period for fluralaner.

These products would be most suitable to use on terminal sires which may have a lesser content of Brahman and are therefore more prone to tick infestations. They are also ideal for portable yards and where handling facilities and infrastructure is limited.

- Tick resistance in cattle is an inheritable trait and progress can be achieved by selecting animals with known resistance. The possibility of achieving this may become easier in the future due to ongoing research on gene markers for resistance. Nethertheless, if breeding your own bulls, tick burdens are one of the traits that should be recorded and included in the selection index if ticks are an issue in a particular region.
- Resistant ticks are generally not a problem in the NT because of the infrequent use of chemicals to control them, however if treatment practices change with the introduction of new genotypes and more intensive farming practices, then careful consideration should be given to choice and use of chemicals. Seek advice from DRDPIFR.

**Sources**


**Further information**


**Related topic**

Tick Fever
Chapter One: Animal Health

Tick Fever

‘Tick fever’ is caused by microscopic parasites transmitted to cattle by cattle ticks. These parasites invade and destroy red blood cells causing a severe and sometimes fatal disease.

Tick Fever

Key factors influencing the tick fever risk

Population of ticks on the property

- Properties in the marginal zone are most at risk.
- All stock introduced from tick free areas.
- Good seasons increase tick numbers.
- Neighbours may stock with infested or highly susceptible cattle.

There are two types of tick fever found in cattle in the Northern Territory:

- Bovine babesiosis (commonly known as tick fever or redwater) caused by Babesia bovis and Babesia bigemina parasites.
- Anaplasmosis, caused by the Anaplasma marginale parasite.

Tick survival on the pasture

- Larval stage ticks can survive on the pasture for two to six months.

Tick survival on cattle

- In some tick-infected areas there is resistance to commercial tick treatments.
- Bos indicus cattle carry fewer ticks than British and European breeds.
- Male cattle carry more ticks than female cattle.

Numbers of infected ticks

- Not every tick carries tick fever, i.e. ‘ticky’ cattle may not have been exposed to the parasites and therefore may not be immune to tick fever.

Natural resistance to tick fever in cattle

- British and European cattle are more susceptible to tick fever than Bos indicus.
- Older cattle with no previous exposure are more susceptible to tick fever than calves or weaners at three to nine months of age.
- Bulls are more susceptible to tick fever than other classes of cattle.
- Stressed cattle (e.g. poor condition, pregnant) and excessively fat cattle are more prone to tick fever.
Clinical signs
• fever (one week)
• yellow sclera (whites) of the eyes and mucous membrane (jaundice)
• anaemia
• reduced appetite
• stands with head down
• rapid breathing and heart rate
• red urine (Babesia)

Diagnosis
• clinical signs
• Babesia
  – blood smear from tail tip or ear
• Anaplasma
  – blood smear from jugular vein
  – infected red blood cells

The death rate of fully susceptible animals (European cattle from tick-free areas) is at least 20%. The death rate in susceptible Brahman cattle is thought to be less than 1%.

Prevention and control
Vaccination (blooding)
Tick fever vaccination (blooding) is recommended for cattle moving from tick-free areas into tick-infected areas. Cattle should be vaccinated at least one month before they leave the tick-free property to ensure lifelong immunity. If this is not practical, cattle may be vaccinated after they arrive and have recovered from the stress of the trip. They should be treated with a long-acting acaricide (pour-on) on arrival and be monitored for four weeks after vaccination in case they experience a reaction to the vaccine. The current live vaccines are much safer than their older counterparts.

Vaccine reactions may cause fever, ill thrift or even death. The risk of vaccine reactions increases with age, and bulls and pregnant cows should be observed following vaccination.

Export cattle from tick-free areas can be blooded prior to shipping, depending on the requirements of their destination.

Tick control
Organophosphate, synthetic pyrethroid and amidine products should be used to prevent cattle tick during the vaccination process but must be applied every three weeks to be guaranteed. Theoretically Macrocylic lactones and tick development inhibitors are less suitable because they do not affect the early (larval) stage of the tick.

According to the Pastoral Industry Survey 2004, 12% of producers in the Katherine region vaccinate for tick fever.

Treatment
Babesiosis
• Imidocarb (Imizol® or Imidox®, (1mL/100kg subcutaneous injection)
• Non-steroidal anti-inflammatories

Anaplasmosis
• Imidocarb (Imizol® or Imidox®, (2.5mL/100kg subcutaneous injection)
• LA Oxytetracycline
Imidocarb vaccinations will cost about $3.50 to $7/hd/2mL dose, depending on how many doses purchased (2008). If treating an animal that has experienced a vaccine reaction, ensure that the recommended dose is used (read the manufacturers’ label), as the higher doses will sterilise the animal and it will remain unprotected to future infections.

Tick fever vaccine can be ordered directly from the Tick Fever Centre or through your local rural merchandise store. It is a live vaccine and has a very limited shelf life. It is usually only dispatched in the first three days of the week to avoid freight delays over the weekend. ALWAYS contact the centre prior to ordering your vaccine so that suitable freight arrangements can be made and the necessary amount of ice is used in the packaging. Often the centre is closed over the Christmas break.

SUMMARY OF BEST PRACTICE
• Vaccinate cattle moving from tick-free areas into tick-infested areas at least four weeks prior to travelling.
• Properties in the marginal tick zone are most at risk and need to implement a vaccination program according to the length of time since tick were last present and the likelihood of reinfestation after the impact of the wet season has been assessed.
• Most tick fever outbreaks occur during the wet season when producers cannot easily get to the cattle. Musterling and stressing stock in the face of an outbreak can be disastrous. Weigh up the benefits of blanket injection as a part of normal husbandry.
• Control ticks.

Sources

Further information
Tick Fever Centre Ph: (07) 3898 9655.
MLA www.mla.com.au
MLA Producer Hotline Ph: 1800 155 900.
Radunz, B (2003), The Cattle Tick, Agnote 721 No. K39, DPIFM.

Related topics
Ticks, Vaccination of Cattle.
Urea Poisoning in Cattle

Urea poisoning is one of the more commonly suspected toxicities of cattle in the Northern Territory. Urea is used as a source of non-protein nitrogen (NPN) in feed supplements. In ruminants, nitrogen from urea is released in the rumen (as ammonia) and can be used by the rumen microflora to make protein. This protein then becomes available to the animal by the normal processes of digestion and absorption. However, if more urea is eaten than the rumen organisms can metabolise, then the ammonia is absorbed from the rumen and enters the blood. The ammonia is then converted back to urea in the liver, and is excreted by the kidneys. This pathway can easily be overwhelmed, and excess ammonia and urea circulate in the blood, causing poisoning. Poisoning can occur rapidly (from a few minutes to four hours after consumption). Suspect urea poisoning if cattle are found dead close to the supplement.

Causes of urea poisoning
• excess consumption of urea
• sudden introduction to high quantities of urea
• irregular consumption
• wet supplement

Clinical signs
• bloating
• twitching of ears and face
• grinding teeth
• abdominal pain
• drooling, frothy saliva
• rapid breathing
• frequent urination
• staggering
• bellowing
• recumbent (downer)

Diagnosis
• History of access to urea.
• Collection of blood and rumen fluid immediately after death.
• Post-mortem
  – bloat
  – white foam in airways
  – ammonia odour when rumen opened
  – rumen pH alkaline >7.5–8.0
• Sample of rumen and reticulum in formalin.
• Often a large pool of rumen fluid is seen on the ground at the nose of the beast. The animals usually suffer severe bloat and the fluid build up in gases forces the ruminal fluid out through the mouth when the animal dies.
Prevention and control

- Introduce urea into the diet gradually.
- Avoid supplement getting wet. Urea is hygroscopic, so is drawn to water, becoming concentrated.
- Avoid letting pools of water develop on top of supplement (this can even happen with large blocks).
- Thoroughly mix loose mix.

Treatment

- Relieve bloat by passing a stomach tube and drenching with approximately 45L of water and 6L of vinegar.
- May need to repeat drench within an hour.
- Note: Treatment is rarely effective.

SUMMARY OF BEST PRACTICE

- If cattle have not been previously supplemented start with pure salt and slowly, and gradually introduce supplement.
- Once supplementation is started, ensure cattle get consistent, regular access. If supply is interrupted for several days, recommence animals at a lower level.
- Feed loose mix supplement or blocks under a shelter to prevent urea getting wet.
- Suspect urea poisoning if cattle are found dead close to the supplement.

Source
www.nt.gov.au/drdfmfr

Related topic
Supplementation
Types of vaccines
There are three different types of vaccines:

- Live vaccines provide lasting immunity, usually with one dose.
- Inactivated or killed vaccines require a booster to provide lasting immunity.
- Anti-toxins and anti-serums provide immediate short-term immunity.

Immunity
Immunity in an animal is achieved through the body’s response to a foreign protein (vaccine). The immune system produces antibodies to the vaccine antigen. Adjuvants (materials that enhance the action of a drug or antigen) are added to vaccines to increase the immune response to the antigen. The antigen is slowly released from the injection site. Two commonly used adjuvants are aluminium hydroxide which remains at the injection site for a few weeks and an oil-based adjuvant which holds the vaccine at the site for a longer period.

Passive immunity is acquired as a foetus/calf by the transfer of maternal antibodies from the vaccinated mother through colostrum and the placenta. Active immunity is acquired following natural infection or vaccination. Vaccinations can involve a single shot, or a course of two shots, four to six weeks apart. The first dose provides protection against diseases for a few weeks. The booster provides protection for a few months. Most vaccines take between 10 and 14 days to provide protection. Annual boosters are usually required to maintain immunity. Stress (both management and nutritional) affect the development of immunity in an animal. Always aim to have stock in reasonable condition when vaccinated.

Equipment
Steel vaccination guns and all needles must be sterilised by boiling in water before and after use. The gun can be lubricated with a vegetable or castor oil (not paraffin) to prevent rubber seals from perishing, but this must be rinsed out with boiling water before use. To sterilise plastic guns, soak in 500mL water plus 20mL household bleach (4% w/v available chlorine) for one hour. Rinse with cool, boiled water before use. Avoid the use of strong disinfectants for sterilising. Vaccination gun needles should be 16 or 18 gauge and 12.5–15mm long. This length makes it unlikely to reach the muscle.

Technique
The vaccine should be delivered into the subcutaneous space under the skin (not into the dermis or the muscle). Pinch a section of loose skin and inject between the skin and the muscle into the subcutaneous space. The bevel of the needle should be parallel with the skin and the needle angled at 45 degrees (see diagram next page). Please note that some vaccines are injected into muscle.

Vaccination of Cattle
Vaccinations are available for several diseases of Katherine region herds e.g. botulism, vibriosis, tetanus. Adherence to manufacturers’ instructions, best practice hygiene principles and correct technique are critical to a successful vaccination program.
Two problems commonly occur when vaccinating:

1. Temporary or permanent enlargement of the localised lymph node or abscess formation at the injection site. This is usually a result of a contaminated needle or injection into the muscle. Injection into the muscle commonly occurs when the needle is angled at greater than 45 degrees.

2. Resistance to injection. This occurs when the needle is inserted into the dermis of the skin (rather than the subcutaneous space), and can happen when the bevel of the needle has been orientated away from the skin.

Correct injection technique (Fordyce, 2002)

SUMMARY OF BEST PRACTICE

- Record details of all vacancies used—batch number, expiry date and details of animals treated.
- Always read the manufacturer’s instructions for each vaccine, recommended vaccination program, dose rate, vaccination technique and site, storage and expiry date.
- Store vaccines in the refrigerator at 4°C (unless specified otherwise), and in esskies with bottles of iced water in shade at the yards. Vaccines are sensitive to heat and light. If vaccines are frozen or left in hot sun the protein is denatured. Using ineffective vaccines is a waste of time and money and does not provide protection.
- Vaccines should be placed in a cooler bag when being used.
- Do not save unused vaccines for future use, as they are usually contaminated. Discard vaccines not used within 24 hours of opening.
- To prevent needle reactions, inject between the skin and the muscle into the subcutaneous space. The bevel of the needle should be parallel with the skin and the needle angled at 45 degrees.

Source


Further information


Related topics

Botulism, Clostridial Diseases, Leptospirosis, Tetanus, Three-Day Sickness, Vibriosis.
Vibriosis

Vibriosis is a venereal disease of cattle transmitted at mating, including artificial insemination. Vibriosis is caused by the bacterium *Campylobacter*. The bacterium is a particularly persistent organism that inhabits the reproductive tract of cows. In bulls it may be present indefinitely in the prepuce, penis and in semen unless treated. It will not survive outside the animal. Cows infected at mating are likely to abort.

**Distribution**

Vibriosis has been found in every region of the Northern Territory. It has been recorded in 88% of herds in the Victoria River District and there is evidence to suggest that it is common in the Barkly and Gulf districts.

**Mode of infection and spread**

Sexually mature and active animals are susceptible to infection, unless already immune. The most common source of infection in a herd is through the introduction of infected bulls or cows. It is then spread from infected bulls to susceptible heifers and cows or from infected cows to susceptible bulls. Once introduced into a herd, it can be spread to any susceptible animals at mating.

When a cow is infected, the organism passes through the cervix and establishes itself in the uterus. This leads to inflammation of the lining of the uterus and oviducts. It is not until this inflammation subsides that further successful conceptions can occur, by which time the organism has been expelled from the reproductive organs. It is possible, however, that the organism may persist for some months in the vagina.

**Signs and symptoms**

There are no obvious symptoms in bulls. If a cow is infected with vibriosis at mating, she is likely to abort due to the early death of the embryo. The infection that occurs due to the presence of the bacteria prevents fertilisation from recurring. About 11% of infected females become permanently infertile due to obstruction of the oviducts and can be seen in herds as fat, barren cows. In endemic herds, the affects on conception rates are most evident in the maiden heifers as they are all susceptible. Animals that have overcome infection usually develop a sound immunity.

Although difficult to detect in the paddock, the most common signs of vibriosis are delayed conception and occasionally aborted foetuses between three and seven months of age. Weak or premature calves may be seen in herds that are affected by vibriosis.

**Diagnosis**

Vibriosis can be confirmed by subjecting vaginal mucus, preferably mucous discharge from the cervix when a cow is in heat, to laboratory tests, and by testing preputial washings from bulls. Samples are placed in special media for transport. *Campylobacter foetus* may also be identified in a stained smear or by culture. None of these diagnostic methods are completely reliable. Consequently, in most situations in northern Australia, the disease is assumed to be present and control measures initiated.
Control

The most effective way to control vibriosis is through a planned pregnancy testing and vaccination program. Removal of all empty cows from a herd will greatly reduce the level of herd infection. It is possible to treat animals with antibiotics but this is not considered economical or practical. Cows may develop immunity themselves after three to six months, and herd tolerance may occur naturally after two to three years, however, there is the possibility that some cows will remain carriers. Using virgin vaccinated bulls on heifers will be beneficial.

Vaccination

There are four possible vaccination programs:
1. no vaccination
2. vaccinate all bulls
3. vaccinate all bulls and heifers
4. vaccinate all bulls, heifers and cows

Opinions amongst experienced cattlemen vary with regards to which is the best program to implement. Some people advise not vaccinating at all, because they believe some exposure to the disease affords the herd a degree of immunity. Best practice recommendation is to vaccinate. In the past the preferred program has been to vaccinate bulls only and many producers still choose to do this. However, with the increasing value of cattle producers should now consider vaccinating heifers and bulls. A bivalent vaccine is recommended for use in vaccination programs and all animals should be vaccinated at least four weeks prior to joining.

Vaccination programs must be ongoing to be effective because animals will lose their immunity. Bull control is also critical to the success of the vaccination program.

Bulls

Initially require two 5mL doses, four to six weeks apart, and annual 5mL boosters. New bulls to the property should also receive the two initial 5mL doses. Two vaccinations will also clear the disease from infected bulls.

Cows and heifers > 18 months

One 5mL dose before joining will provide protection, followed by annual 2mL boosters prior to joining.

Cows and heifers < 18 months

Initially require two 5mL doses four to six weeks apart and then an annual 2mL booster prior to joining.

Note of warning

In a vibriosis-free herd, non-immune susceptible females will form a large proportion of the herd and an introduced or vibriosis-infected mickey bull could severely affect the next calving, especially if the current bulls are not vaccinated. The primary focus must be to prevent the infection establishing in the bull herd as they are the potential spreaders of the disease. One infected bull will only infect unprotected cows with which he mates, however if the problem is severe, vaccination of breeder cows is recommended.

SUMMARY OF BEST PRACTICE

- Use a bivalent vaccine in the vaccination program.
- All new bulls introduced to the property should be vaccinated twice, six weeks apart. Two vaccinations will clear the disease from most infected bulls.
- Full immunity will only develop after the second vaccination.
- The vaccination program will only be successful if total bull control is achieved.

Source

Jayawardhana, G (2002), Vibriosis in the Northern Territory, Agnote 745 No. K43, DPIFM.
www.nt.gov.au/drdpifr

Further information

Taylor, L (2005), Cattle Disease -- Campylobacteriosis or Vibriosis, Queensland DPI&F Note.
www2.dpi.qld.gov.au/health

Related topics

Heifer Management, Vaccination of Cattle.
Worms

Cattle disease associated with internal parasites (worms) is uncommon in the Katherine region. Dry rangelands and extensive grazing patterns prevent transmission opportunities for the free-living larval stage, except in exceptionally wet seasons when transmission is usually associated with areas of intense grazing.

Nevertheless, as intensification increases and more improved pastures are planted, internal parasites could become a problem if large numbers of young stock are depastured in small paddocks over the wet season.

Common worm species identified in the region include the small intestinal worm (Cooperia spp.), nodule worm (Oesophagostomum radiatum), and barber’s pole worm (Haemonchus placei). Worm burdens can be present (helminthiasis) without causing disease (helminthiosis). The main symptoms of parasitic disease include ill thrift, anaemia and/or scours. Calves are exposed to infective larvae from the day they start grazing. Cattle develop a strong acquired immunity by 18–24 months of age. Nutrition, especially protein, affects the rate of immunity development. Immunity in adult cattle can be compromised in periods of illness, malnutrition and in the periparturient period after giving birth.

Parasitic disease is usually only seen in weaners, and is commonly associated with periods of stress, exposure to high larval numbers in permanent weaner paddocks, high stocking rates or poor nutrition. Faecal egg counts are a useful indicator of adult worm burdens in young susceptible cattle.

A minimum of 10 individual fresh faecal samples are required for testing.

<table>
<thead>
<tr>
<th>Faecal egg counts (weaners)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Worm species</strong></td>
</tr>
<tr>
<td>-----------------------------</td>
</tr>
<tr>
<td><em>Cooperia</em></td>
</tr>
<tr>
<td><em>Oesophagostomum</em></td>
</tr>
<tr>
<td><em>Haemonchus</em></td>
</tr>
</tbody>
</table>

Small intestinal worm (*Cooperia* spp.)

Present in the small intestine. Adult worms penetrate the lining of the small intestine. Clinical signs include weight loss and anaemia.

Nodule worm (*Oesophagostomum radiatum*)

Present in the large intestine. Following ingestion, larvae penetrate the wall of the intestine and form nodules before migrating to the colon where they form adult worms. The nodules can impair intestinal function, especially fluid resorption which results in dark, foul-smelling diarrhoea. Disease may occur following weaning.

Barber’s pole worm (*Haemonchus placei*)

Present in the abomasum. The larvae puncture small blood vessels in the stomach wall and suck blood. Clinical signs include weakness, weight loss and anaemia. Severe cases show pale conjunctiva and mucosa, and swelling under the jaw and in the stomach.
Treatment

Effective management of parasite problems includes treatment of the animal and reduced pasture contamination. Anthelmintic treatments (chemical substances used to destroy internal parasites) are available in injectable, oral and pour-on formulations. Please note the withholding period and export slaughter interval and manufacturer directions before use.

Other internal parasite species

Liver fluke (Fasciola hepatica)
Liver fluke is not present in the NT. The intermediate host, Lymnaea tomentose (a snail), is not known to be present in this environment. Please be aware that animals travelling to Western Australia originating from a liver fluke area must be tested and treated for liver fluke before they cross the border.

Hydatids (Echinococcus granulosus)
Hydatid disease does not occur in the NT. Cattle imported from other states may present with old degenerate calcified lesions visible on post-mortem.

SUMMARY OF BEST PRACTICE

- Parasitic disease is usually only seen in weaners, and is commonly associated with periods of stress, exposure to high larval numbers in permanent weaner paddocks, high stocking rates or poor nutrition.
- Clinical signs can include weight loss, anaemia and weakness.
- Consider anthelmintic treatment of worms at times of maximum stress (weaning, second calf heifers). Under extensive NT conditions worm treatment is not normally practiced and the financial viability of drenching is not proven.
- Strategic drenching programs and pasture spelling need to be considered in intensive grazing systems on irrigated and improved pastures.

Sources

Related topics
Coccidiosis, Weaning.
Zoonoses

A disease which is naturally transmissable from animals to people is classified as a zoonosis.

Zoonotic diseases can spread through a variety of means such as livestock, household pets, wildlife or rodents, or by coming in contact with soil or water contaminated by animals.

The main zoonoses of concern to the Northern Territory are:
- Ross River and Barmah Forest Fever
- Murray Valley Encephalitis
- Gastro
- Leptospirosis
- Meliodosis

The other important zoonoses that are not prevalent in the NT are Q Fever and Hendra.

Practising good hygiene, wearing protective clothing, maintaining healthy animals and undertaking vaccination where appropriate, can minimise the risk of infection.

Refer to the table over page for specific details on some zoonoses.

SUMMARY OF BEST PRACTICE

The risk of infection by many zoonoses can be reduced through taking simple hygienic precautions, such as:

- Do a risk assessment of the region and identify the prevalence of disease mentioned. Vaccination programs (where available) may be warranted for staff in high risk areas.
- Avoid contact with urine and faeces of animals.
- Wash hands well after handling animals or birds and before touching food.
- Do not put unwashed fingers in your mouth.
- Always wear shoes and avoid walking through wet, boggy areas with bare feet.
- Worm pets regularly and seek veterinary assistance if your pet is unwell or you notice skin disease, diarrhoea or other disease.
- Wear gloves when handling animal faeces, game meat and gardening.
- Cook all meat well, especially game meat, such as wild pigs.
- Pregnant women and staff with immuno-suppressive disorders are most at risk.

Sources

Parkes, H (2003), Diseases that can be Transmitted from Animals to Humans, Agnote 819 No. K50, DPIFM.


Centre for Disease Control (CDC), Department of Health and Community Services, Katherine region Ph: (08) 8973 9049. www.nt.gov.au/health

ABC Health and Wellbeing www.abc.net.au/health/library


Better Health Channel www.betterhealth.vic.gov.au

Further information

QDPI www.dpi.qld.gov.au
Centre for Disease Control www.health.nt.gov.au
DRDPIFR www.nt.gov.au/drdpifr

Related topics

Dog Health, Leptospirosis.
<table>
<thead>
<tr>
<th>Zoonosis</th>
<th>Main animal host species</th>
<th>Symptoms in humans</th>
</tr>
</thead>
</table>
| **Ross River, Barmah Forest virus** | mosquito borne, native fauna and horses | • painful or swollen joints and muscle and tendon pain  
• raised red rash  
• long lasting fatigue and lethargy  
• fever  
• headache  
• light intolerance  
• swollen glands |
| **Kunjin, Murray Valley Encephalitis (MVE)** | mosquito borne | • high fever  
• severe headache  
• severe fits (especially young children)  
• neck stiffness  
• drowsiness, confusion and progression to deliriousness and coma  
• potentially fatal |
| **Australian Bat Lyssavirus** | Australian fruit - and insectivorous bats | • headache  
• fever  
• sensory changes around the site of the bite or scratch  
• excitability  
• an aversion to fresh air and water  
• weakness  
• delirium, convulsions, coma  
• often fatal |
| **Hendra virus** | Australian fruit bats | • influenza type illness which can progress to pneumonia  
• encephalitis (inflammation of the brain) type symptoms  
• i.e. headache, high fever, and drowsiness, which can progress to convulsions or coma.  
• can be fatal |
| **Erysipeloid** | fish, prawns and pigs | • bright red to purple lesions on the hands and forearms  
• abdominal pain  
• nausea and vomiting  
• loss of appetite |
| **Gastro-enteric zoonoses** | common in all livestock, wildlife or companion animals | • diarrhoea  
• fever  
• headache  
• depression  
• kidney failure with severe back pain and passing coffee coloured urine  
• chest or abdominal pain and coughing  
• skin ulcers or abscesses  
• can be fatal |
| **Leptospirosis** | cattle, pigs, dogs and rodents | • fever or chills  
• headache  
• severe muscle pain  
• bloodshot eyes  
• rash  
• jaundice (yellow skin and eyes)  
• chest or abdominal pain and coughing  
• skin ulcers or abscesses  
• can be fatal |
| **Melioidosis** | goats, pigs and soil | • high fever or chills  
• headaches  
• confusion, difficulty breathing  
• weight loss  
• chest or abdominal pain and coughing  
• skin ulcers or abscesses  
• can be fatal |
| **Q fever** | cattle, sheep, goats and kangaroos | • high fever, chills and sweats  
• muscle and joint pain  
• severe headache  
• cough  
• long lasting fatigue |
| **Ringworm** | horses, cattle, pigs, dogs and cats | • small pimple becomes large and red  
• itchy patches which leave scaly bald areas  
• as the patches expand, the centre clears to produce a ring  
• severity depends on the strain of the infectious organism |
| **Scrub typhus** | mites feeding on marsupials and native animals | • fevers  
• can be fatal  
• severe headache  
• mental retardation, hearing loss, mental retardation, seizures, cerebral palsy |
| **Sparganosis** | dogs, cats, freshwater crustaceans, reptiles, amphibians, birds and mammals | • larvae form slowly growing masses in the subcutaneous tissue or muscle which are itchy, inflamed and painful |
| **Tetanus** | various, especially horses and stock yards (dust, manure, soil) | • muscle spasms  
• difficulty breathing and swallowing  
• can be fatal |
| **Toxoplasmosis** | cats | • flu-like symptoms  
• if contracted by pregnant woman it can cause abortion or birth of infants which could suffer from eye infections, hearing loss, mental retardation, seizures, cerebral palsy |
<table>
<thead>
<tr>
<th>Zoonosis Main animal host species</th>
<th>Symptoms in humans</th>
<th>Likelihood of occurrence</th>
<th>Level of consequences</th>
<th>Risk management measures</th>
</tr>
</thead>
</table>
| Ross River, Barmah Forest virus   |                     | Prevalent – a case has been recorded in Katherine. | Medium | • protective clothing  
• insect repellents  
• reduce mosquito breeding sites |
| Kunjin, Murray Valley Encephalitis (MVE) |                     | Unlikely – there have been a few well known cases in north Australia. | High | • protective clothing  
• insect repellents  
• reduce mosquito breeding sites  
• avoid handling bats  
• wound treatment if bitten + seek medical help |
| Australian Bat Lyssavirus |                     | Not known in the NT  
4 well known cases in QLD | High | • avoid handling bats  
• wound treatment if bitten + seek medical help  
• people with immuno-suppressive conditions e.g. diabetes, AIDS, patients undergoing chemotherapy or radiotherapy are extremely vulnerable |
| Hendra virus |                     | Prevalent – especially in people handling livestock. | Medium | • maintain good hygiene  
• protective clothing  
• care with birth products  
• avoid swimming or wading in water that may be contaminated by the urine of wild animals  
• people with immuno-suppressive conditions e.g. diabetes, AIDS, patients undergoing chemotherapy or radiotherapy are extremely vulnerable |
| Erysipeloid |                     | Regular cases recorded in the Top End, especially from handling soil. | Medium | • beware of mud holes  
• protective clothing  
• people with immuno-suppressive conditions e.g. diabetes, AIDS, patients undergoing chemotherapy or radiotherapy are extremely vulnerable |
| Leptospirosis |                     | Very common in QLD, occurs infrequently in the NT. | Medium | • strict hygiene  
• take care with birth products  
• vaccine available |
| Melioidosis |                     | Unlikely | Low | • strict hygiene  
• be observant  
• it is highly contagious |
| Q fever |                     | Unlikely | Medium to high | • covered footwear + insect repellent in risk areas |
| Tetanus |                     | Prevalent disease in livestock, not common in humans. | Low to medium | • Avoid ingestion of contaminated water that has not been treated.  
• Make sure that meat and fish that might contain spargana is properly cooked.  
• vaccination  
• wound treatment |
| Toxoplasmosis |                     | Not common but cases have occurred. | High in those at high risk | • pregnant woman should avoid cats and items which have been in contact with cats  
• undercooked meats and raw vegetables and water supplies potentially contaminated with cat faeces should be avoided. |

**Gastro-enteric zoonoses**

Can include:

- Salmonella
- Campylobacter
- E coli
- Giardia
- Cryptosporidium
- Yersinia

Common in all livestock, wildlife or companion animals

- Prevalent
- • good hygiene

**Melioidosis**

- goats, pigs and soil
- Regular cases recorded in the Top End, especially from handling soil.
- • beware of mud holes
- • protective clothing
- • people with immuno-suppressive conditions e.g. diabetes, AIDS, patients undergoing chemotherapy or radiotherapy are extremely vulnerable

**Scrub typhus**

- mites feeding on marsupials and native animals
- Unlikely
- • covered footwear + insect repellent in risk areas

**Sparganosis**

- a tapeworm
- dogs, cats, freshwater crustaceans, reptiles, amphibians, birds and mammals
- Low to medium
- • Avoid ingestion of contaminated water that has not been treated.
- • Make sure that meat and fish that might contain spargana is properly cooked.
- • Make sure that meat and fish that might contain spargana is properly cooked.
Chapter Two: Cattle Management

Cattle and land management best practices in the Katherine region 2009
Chapter Two: Cattle Management

Contents

1. Animal Equivalents 56
2. Animal Welfare 57
3. Artificial Insemination 59
4. Best Bet Cattle Management 61
5. Branding Cattle 63
6. Breeding Polled Cattle 65
7. Bull Breeding Soundness Evaluation 68
8. Bull Percentages 70
9. Bull Selection 72
10. Castrating Calves 75
11. Cattle Maturity Types 77
12. Condition Scoring 79
13. Crossbreeding 82
14. Culling Breeders 85
15. Dehorning 87
16. Heifer Management 89
17. Hormonal Growth Promotants 91
18. Mating Systems 93
19. Mothering Up 95
20. NLIS in the Northern Territory 97
21. Poddy Calf Rearing 99
22. Pregnancy Testing 101
23. Production Parameters 105
24. Spaying 109
25. Stock Handling 111
26. Transporting Cattle – Pre-transport Management 114
27. Water Consumption 117
28. Water Quality 119
29. Weaning 121
Animal Equivalents

Animal Equivalents (AEs), also known as Adult Equivalents, are used to standardise stocking rates. There are several different systems in which the size of animals designated as 1AE varies. As long as the ratio between classes of animal is soundly based (from nutritional tables) any of these systems can be used.

In the Northern Territory, a 420kg cow or steer at maintenance is commonly considered to be 1AE (Table 1). There is very little difference between the feed requirements of a steer and a dry cow. A key understanding is that lactation adds greatly to the feed requirements of the animal, so a wet cow is more than 1AE. Therefore, a paddock which has a safe carrying capacity of 1,000 AEs could be stocked with 1,000 dry cows or 769 (1,000 divided by 1.3) wet cows.

**Table 1.** Animal equivalents of different classes of stock

<table>
<thead>
<tr>
<th>Class of stock</th>
<th>Animal equivalent rating</th>
<th>Average liveweight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Females</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weaner (up to 18 months)</td>
<td>0.50</td>
<td>200</td>
</tr>
<tr>
<td>Heifer (18–30 months)</td>
<td>0.75</td>
<td>300</td>
</tr>
<tr>
<td>Dry cow (&gt; 30 months)</td>
<td><strong>1.00</strong></td>
<td><strong>450</strong></td>
</tr>
<tr>
<td>Breeder cow with average weaning rate 75%</td>
<td>1.20</td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weaner (up to 18 months)</td>
<td>0.50</td>
<td>210</td>
</tr>
<tr>
<td>Two-year-old (18–30 months)</td>
<td>0.80</td>
<td>330</td>
</tr>
<tr>
<td>Three-year-old (30–42 months)</td>
<td><strong>1.00</strong></td>
<td><strong>450</strong></td>
</tr>
<tr>
<td>Four-year-old (45–54 months)</td>
<td>1.20</td>
<td>600</td>
</tr>
<tr>
<td>Bull</td>
<td>1.50</td>
<td>650</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pregnancy and calf (&lt; 6 months)</td>
<td>0.35</td>
<td>120</td>
</tr>
<tr>
<td>Horses</td>
<td>1.20</td>
<td></td>
</tr>
</tbody>
</table>

Further information


MLA EDGEnetwork® Grazing Land Management course. Contact Pastoral Production Extension Officer DRDPPIFR Katherine, Ph: (08) 8973 9739.

**Related topics**

Carrying Capacity, Production Parameters.
The basic needs for the welfare of cattle are:

- adequate water, feed and air to maintain good health
- comfort and freedom to move and express normal behaviour patterns
- protection from disease, injury or predation and appropriate action taken if it does occur
- protection from unnecessary, unreasonable or unjustifiable pain or suffering
- precautions against the effects of natural disasters such as flood or drought

**Water**

Cattle must have access to an adequate supply of suitable drinking water at all times. They should not be deprived of access to water for periods exceeding 24 hours, unless in transit in which case the Standards and Guidelines for the Land Transport of Livestock apply. See Water Consumption topic for approximate consumption requirements.

**Feed**

Cattle must have access to feed that will maintain their well-being. They should not be deprived of feed for periods longer than 48 hours. Animals in poor condition or in late pregnancy or early lactation should not be deprived of feed for periods exceeding 24 hours. Available feed should meet the requirements for maintenance, growth, pregnancy and lactation and provide for extra demands such as cold stress or exercise.

Arrangements should be made for a continued supply of feed in the event of drought or seasonal feed shortages. If pasture is poor in quality or quantity, stocking rates should be reduced accordingly. Nitrogen and phosphorus supplementation is recommended in most of the Katherine region.

**Precautions against the effects of natural disasters and predation**

Plans should be made and reasonable steps taken to ensure protection from the effects of natural disasters. In areas subject to flooding, care is necessary in paddock and facility design to allow access to high ground or to plan for stock evacuation to high ground.

Cattle must be attended to after a natural disaster such as a wildfire or flood. Animals should be assessed by a competent person. Immediate treatment or euthanasia may be required, depending on the animal’s condition.

All reasonable care should be taken to protect stock from predators.

**Cattle handling facilities, mustering and yarding**

Sheds, pens, lanes, ramps and other areas where cattle come together should be constructed and maintained to minimise stress, injury and disease. The design and construction of these should enable dust and noise to be minimised. Holding yards should be designed to minimise stress or injury and to allow all animals to stand, lie down, stretch and groom. Care should be taken to avoid overcrowding.

Thought should be given to the handling of unmanageable cattle. If they cannot be retained in the herd when mustering, they should be captured and transported, euthanized or left behind. Methods such as the use of shotgun pellets are unacceptable from an animal welfare perspective.

When mustering, consideration should be given to animals in poor condition or under other stress. They can be captured and transported, or if this would be too stressful, left behind near water.
Health
Appropriate preventative measures should be used for diseases that are common in the district or are likely to occur in the herd. Sick, injured or diseased cattle should be treated promptly and appropriately or euthanized.

Euthanasia of cattle
The preferred methods are:
• Overdose of anaesthetic under veterinary supervision.
• Using gunshot or captive-bolt pistol by the frontal method. The captive-bolt pistol or firearm should be directed at the point of intersection of lines taken from the base of each ear to the opposite eye (Figure 1).

Transport
Transport stress is usually indicated by weight loss, dehydration, reduced feed intake, physical injuries or respiratory disease. Limiting pre-delivery stress will minimise the stress load on animals. Also ensuring stock are not over-crowded, but are loaded firmly enough to minimise unnecessary movement in transport can help reduce transport-related problems. The longer the travel time, the more weight loss occurs, mostly by loss of body water. Cattle can be treated with electrolytes on long road transport trips.

Under the new Standards and Guidelines for the Land Transport of Livestock, the maximum allowable duration of a journey is primarily determined by the maximum amount of time that cattle can be deprived of water. For mature dry cattle, the maximum allowable duration is 36 hours. This can be extended to 48 hours if the animals are not showing obvious signs of fatigue, thirst or distress, and if the extension allows the journey to be completed within 48 hours. Diseased, sick, injured, weakened stock and heavily pregnant animals must not be consigned to travel.

Animal Welfare
Husbandry procedures
See topics Branding Cattle, Castrating Calves, Dehorning, Spaying and Stock Handling for further information on meeting animal welfare requirements in regards to husbandry procedures.

SUMMARY OF BEST PRACTICE
• Ensure animals have access to adequate supply of suitable drinking water and feed and are protected from natural disaster and predation.
• Ensure cattle handling facilities are designed to minimise animal stress and maximise animal comfort.
• Apply appropriate preventative measures for animal disease and treat sick or injured animals promptly and following animal welfare guidelines.
• Follow animal welfare procedures when carrying out husbandry procedures.
• Follow the Standards and Guidelines for the Land Transport of Livestock when transporting cattle.

Sources
WA Department of Planning and Infrastructure (2005), Best management practice: The grazing of cattle in the northern pastoral areas of Western Australia, www.dpi.wa.gov.au/pastoral/

Further information

Related topics
Branding Cattle, Castrating Calves, Dehorning, Transporting Cattle - Pre-transport Management, Vaccination of Cattle.
Artificial Insemination

Artificial Insemination (AI) in the Northern Territory has particular application in the breeding of replacement herd bulls from a select nucleus cow herd on the property. AI is too expensive for breeding steers. An alternative to AI is to run a nucleus herd specifically for breeding bulls.

Artificial insemination

AI as a management tool has some major advantages and disadvantages.

Advantages

• facilitates rapid genetic improvement
• allows access to new blood lines
• crossbreeding can occur without capital outlay on new bulls
• allows extended use of superior sires
• allows access to sires which would otherwise be outside the normal price range of a commercial producer
• reduces the risk of infection with venereal disease.

Disadvantages

• Conception rates are usually lower than in normal mating situations.
• Good holding paddocks and yards with race and crush are essential. Holding paddocks should be close to the yards and large enough with sufficient feed to hold the animals (otherwise mustering time becomes excessive).
• Careful planning and organisation of AI programs is essential.
• Resources and effort are required to detect cows in heat, unless a blanket program is used.

Cows

Cows should be:

• non-pregnant, and have calved at least two months prior to the program
• fertile
• disease-free
• in good condition (condition score 5 on a 9 point scale, refer topic Condition Scoring) and on a rising plane of nutrition
• from a suitable genetic base for herd improvement
• individually identified by ear tags or number brands
• vaccinated for vibriosis and leptospirosis (females showing signs of uterine infection should not be used).

Quiet, well-handled cattle are not essential, but are desirable. Wear and tear on man and beast are reduced with quiet, tractable cattle. Stressed or excited cattle have reduced conception rates.

At the start of the program a suitably qualified person should check each cow, per rectum, for pregnancy, normal reproductive organs and ovarian activity. Ideally, cows included in an AI program should have regular heat periods when non-pregnant. It is essential that females be in good condition (forward store) and preferably on a rising plane of nutrition if conception rates are to be satisfactory.
Use of non-lactating cows or heifers is recommended in *Bos indicus* cattle because lactational anoestrus can cause reduced conception rates. Heifers are preferable because good cows will always be lactating or pregnant. As a general rule, heat periods are initiated when heifers are 270kg body weight. Do not use females for AI if they are empty after exposure to a bull, unless they were simply lactating. The calf must be weaned before the AI program. If a bull cannot get a non-lactating female pregnant naturally, there is usually something wrong with her and she should be culled. The cows for use in a program should be identified a year before the program starts to allow appropriate management to be implemented. Heifers and skinny cows that have had weaners removed can be kept away from bulls so as to be in good condition for AI. Maiden heifers should be fed in the yard and processed through the crush on several occasions prior to their introduction to the program to get them used to the facilities. Low stress stock handling methods should be utilised at all times to maximise results.

**Facilities**

Prior to any program commencing, equipment and facilities must be of a satisfactory standard. Ensure yards, crush, shade cover, water supply at yards and a holding paddock (containing sufficient feed) are prepared well in advance. A squeeze crush is preferable as it avoids the need for restraint of the head. Sheaths, pistolettes, gloves, scissors, tweezers, liquid nitrogen and cylinders can be prepared and/or purchased at the same time as the semen is ordered.

**Approximate costs (2008)**

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI kit box</td>
<td>$230</td>
</tr>
<tr>
<td>Semen storage tank</td>
<td>$1,300–$2,000</td>
</tr>
<tr>
<td>Liquid nitrogen</td>
<td>$225 per 40L fill</td>
</tr>
<tr>
<td>Box of 100 heat mount detectors</td>
<td>$180</td>
</tr>
<tr>
<td>Chinball harness and paint</td>
<td>$240</td>
</tr>
<tr>
<td>Drugs for synchronisation</td>
<td>$15 per head</td>
</tr>
<tr>
<td>Semen</td>
<td>$7 to $200 per straw</td>
</tr>
<tr>
<td>Labour of two people for the duration of program</td>
<td></td>
</tr>
</tbody>
</table>

**Detection of oestrus and conception rates**

Successful artificial insemination depends on whether the inseminator can determine if a cow is in heat. Heat detection is essential to determine the time of ovulation. Observation is best undertaken in the early morning and late evening. Teaser steers or penis-deviated bulls with paint-marking chin-ball harnesses, tail paint or heat-mount detectors can be used to aid detection. Blanket AI (also known as fixed time AI) is done with no heat detection. Females are inseminated 48 hours after implant removal. These programs have lower labour costs but also lower conception rates.

Generally, for *Bos indicus* cattle in the Northern Territory, a single insemination delivered by an experienced inseminator under good to ideal conditions can yield the following conception rates:

- 40% (blanket)
- 50% (synchronisation and heat detection)
- 60% (natural heats and detection)

Less experienced inseminators, poor technique and other environmental factors can greatly reduce conception rates. *Bos taurus* animals are usually inseminated 12 hours after the first detection of oestrus (heat) while *Bos indicus* animals are best inseminated when heat if first detected.

**Records**

Record keeping is vital. A dedicated AI book should be ruled up and contain information about infections, weight, condition, lactational state, details on oestrus cycle and any other relevant comments. These can be transferred to a computer.

Well-maintained records may provide the information required to explain phenomena such as poor conception rates. Good records also aid in the identification of poor breeders. The inseminator can analyse the data and this may assist in planning future programs.

**Training**

In the Northern Territory, Charles Darwin University offers training in AI. Contact the course coordinator at the Katherine campus.

**SUMMARY OF BEST PRACTICE**

- Consider AI for breeding of bulls.
- Use non-lactating cows or heifers.
- Use natural heats and detection methods, and an experienced operator to maximise conception rates.
- Maintain thorough records of condition, lactational state, cycling etc.

**Further information**

Bertram, J (1993), *Breeding for Profit*, Queensland DPI&F.


Charles Darwin University, AI Course Coordinator, Katherine Campus, Ph: (08) 8973 8311.

**Related topics**

Bull Selection, Crossbreeding, Pregnancy Testing.
Chapter Two: Cattle Management

Best Bet Cattle Management

The Best Bet Management System (BBMS) was developed from 15 years of breeder herd management research at Kidman Springs, located in the Victoria River District. It is based on the principles of running tropically-adapted breeders on native pastures at moderate stocking rates, and providing adequate nutrition and protection from common infectious diseases. This system has led to a remarkable increase in herd performance in the Katherine region, with breeder mortality decreasing from 12% to 2% and weaning rates increasing from 50% to 80% at Kidman Springs.

What is the Best Bet System?
The Best Bet System is based on 10 basic management practices:

1. Use of moderate stocking rates (nominally 6–7 breeders/km²).
2. All calves heavier than 100kg are weaned and grazed on saved native pasture.
3. Breeders are culled for:
   – age (from 10 years old)
   – poor reproductive performance (empty and dry at April/May muster, or very long inter-calving interval)
   – body faults (bottle teats, collapsed udder, prolapsed uterus, severe injury etc.)
   – undesirable temperament.
4. Bulls run with adult breeders year-round at a bull:cow ratio of 5%, fertility tested annually and culled for age at eight years.
5. All stock are supplemented year-round with urea-based supplements in the dry and phosphorus-based supplements in the wet.
6. All animals are vaccinated annually against botulism (Clostridium botulinum) strains C and D. Bulls and replacement heifers are vaccinated annually against vibriosis (Campylobacter fetus).
7. Replacement heifers are:
   – selected at two years of age based on weight above 280kgs and desirable body type
   – control-mated each January for four months, and run separately from adult breeders until they wean their first calf
8. Mustering and weaning twice a year in April/May and September/October.
9. Use of tropically-adapted cattle.
10. Fire is used in the management of native pasture (25% of paddock burnt in late dry season when conditions permit).
Improved profit package

While the Best Bet System has produced a remarkable increase in herd performance, it has proven to be expensive in terms of labour and consumables (mainly supplement). With the constant price squeeze, industry has demanded research into increasing profit from the Best Bet System without significantly compromising performance.

Some of the Best Bet management practices are considered indisputable, but the first five could potentially be modified and result in greater profits. An economic model (Breedcow/Dynamax) was used to test this and showed an 18% increase in herd gross margin by implementing changed management practices.

Research to verify this prediction on a practical scale has been completed at Kidman Springs and Victoria River Downs stations (2004–2007). Results are still being analysed, but the proposed changes and interim results are as follows:

1. Stocking rates could be varied to match the land types in the paddocks (see Carrying Capacity). This appears to have a major effect on profit and should now be considered a standard recommendation.

2. Minimum weaning size could be varied year by year to match the paddock’s average breeder condition (see Weaning). This appeared to have a very minor effect on gross margin.

3. Aged breeders could be kept longer than 10 years if their teeth and condition remained satisfactory (see Culling Breeders). This also appeared to have a very minor effect on gross margin. Ideally though, aged breeders should be culled when they are at their maximum value. The ultimate decision will depend on the fertility of the younger breeders.

4. The bull percentage could be reduced from 5% to 2–3% (see Bull Percentages, Bull Breeding Soundness Evaluation). Considerable trial work on Cape York (a fairly similar environment to the Katherine region) showed that bulls at 2% were perfectly adequate. However to err on the side of caution, the current recommendation for the Katherine region is kept at 3%.

5. Supplements could be fed strategically to match the critical times of the year (see Supplementation). Reducing supplements to six months per year would substantially reduce costs, but the trial results have been inconclusive. There are many alternative ways of strategic supplementation and testing them heavily depends on season. DRDPIFR has no evidence yet to suggest that the current recommendation of year-round supplementation should be changed, but does recommend regular NIRS sampling.

SUMMARY OF BEST PRACTICE

• Adhere to the management practices recommended in the Best Bet Management System, giving consideration to the following departures:
  – varying stocking rates to match land type
  – reducing bulls to 2–3%
• Supplement year-round until trials produce evidence that it is more profitable to feed strategically at critical times of the year. Seasonal factors complicate results.

Source

Further information
Pastoral Production, DRDPIFR Katherine, Ph: (08) 8973 9739.

Related topics
Branding Cattle

Branding cattle and horses is a clear way of identifying ownership of stock, and can also play an important role in disease control programs and chemical residue traceback programs. This is important to both consumers and producers, to maintain confidence in the safety and integrity of livestock products.

Regulatory requirement

The Northern Territory Brands Act and Regulations use a three-letter brand system where one letter must be ‘T’ and a distinctive (symbol) brand system.

It is compulsory to brand cattle before they are moved off a property or are sold (unless they are less than eight months of age). Brands can be used on horses, buffalo and camels but it is not compulsory.

A brand is registered to a person or company for use on a nominated property. This means the branding iron can only be used by the registered owner (or their representative) on the registered property. It does not restrict branded cattle being agisted on other properties. To brand on a property not registered with the Registrar of Brands is an infringement of the Brands Act and Regulations and is an offence that incurs a penalty.

Owners of brands must give notification to the Registrar of Brands in the following events:

- change of property (if the owner moves from the registered property or the property is sold)
- change of branding position required
- cancellation required
- change of name by marriage
- notification of death
- transfer to a new owner
- change of contact address.

When a property is sold the property brand cannot be sold to the new owners. An agreement may be made in the sale contract to transfer the brand to the new owners. Transfers must be lodged with the Registrar of Brands. Alternatively, the brand may be cancelled or Change of Run, moving the registration to a new property.

The Northern Territory Brands Act and Regulations can be seen on the NT Government website.

In any proceedings, proof that an animal is branded in accordance with the provisions of this Act with a registered brand is prima facie proof that the animal is the property of the owner of the registered brand.
SUMMARY OF BEST PRACTICE

• Good restraint is essential for achieving fast and efficient branding.

• Check the irons are at the correct temperatures (blue hot, not black or red hot).

• Apply hot irons for 2–3 seconds only.

• Do not brand wet or emaciated, weak animals.

• Preferably brand young animals between two and six months old.

• Branding irons need to be cleaned regularly to stop smudging from built-up hair and skin and to reduce heat conduction.

A wire brush and/or a bucket of sand are good tools to have whilst branding to ensure the branding irons can be easily kept clean.

Source

Further information
DRDPIFR Regional Stock Inspector, Katherine, Ph: (08) 8973 9739.

Livestock Identification Systems Administrator (LISA)/Brands, Ph: (08) 8999 2033.


Related topics
Animal Welfare, NLIS in the Northern Territory.
Breeding Polled Cattle

Horned cattle cause significant losses through bruising during transport, and at feedlots and abattoirs. Carcase damage from horns is estimated to cost the beef industry $22.5 million per year.

While dehorning has been standard practice to eliminate the risk of bruising and danger to handlers, there are predictions of increased pressure, from a welfare perspective, to find alternatives. Breeding polled cattle is one such alternative.

Breeding polled cattle is a cost-effective alternative to dehorning and has a number of advantages in avoiding particular risks or costs such as:

- labour associated with dehorning
- infection of wound sites
- reduced growth rates while wounds are healing
- negative perception of the beef industry

**Horned, scurred and polled cattle**

It is important to establish a clear classification of horned, scurred and polled cattle. In horned cattle (Figure 1), the bony material is fused to the skull and grows as an extension of the skull. As young calves, the small horn is free floating, but will attach by about two months of age. Scurs are defined as bony tissue which are usually loosely attached and moveable (Figure 2). For management purposes, scurs generally do not need to be removed, as they do not pose the same risks as horns. However, some producers will remove the tissue in young animals if unsure whether the animal is scurred or horned. A ‘true’ or ‘clean’ polled animal (Figure 3) is without any bony tissue where a horn would normally grow and will often have a prominent bony feature on the top of the head, referred to as the ‘poll’. Scurred animals may also have a defined poll.

**Figure 1.** Dehorned heifer

**Figure 2.** Scurred bull

Note the slight polled feature on top of head.

**Figure 3.** Polled cow
**Inheritance of horns**

*Bos taurus breeds*

The genes which control the horn and poll trait in British and European breeds follow a simple mode of inheritance. There are two forms (alleles) of the gene – polled (P) and horned (p). An animal will always have two copies of every gene, one inherited from each parent. In this case, the polled gene is dominant over the horned gene. That is, the polled gene overrides the horned gene if both are present:

- Polled cattle can have either two copies of the polled gene (PP), or one copy of each (Pp), where P overrides p to result in a polled animal.
- Horned cattle can only have two copies of the horned gene (pp).

When parents pass on a single copy of the gene, it happens randomly, like flipping a coin. So a polled animal which has a gene combination of Pp has a 50% chance of passing on either allele to its offspring.

<table>
<thead>
<tr>
<th>Gene combination</th>
<th>Horn/poll status</th>
</tr>
</thead>
<tbody>
<tr>
<td>PP</td>
<td>Poll*</td>
</tr>
<tr>
<td>Pp</td>
<td>Poll</td>
</tr>
<tr>
<td>pp</td>
<td>Horned</td>
</tr>
</tbody>
</table>

* Often referred to as ‘true poll’

**Outcomes of matings**

The outcomes of matings are based on each parent contributing one copy of the gene. For example, if two horned animals (pp) are mated, the progeny can only be provided with a p allele from each parent. Therefore all progeny will be horned. If a polled animal with the gene combination of Pp is mated to a horned animal (pp), the possible combinations of the progeny alleles will be Pp or pp.

Selecting all polled bulls to mate to all polled cows will not guarantee 100% polled progeny, as either parent could carry the recessive horn gene (p) (Table 2). However, if you have a sire who always produces polled progeny, you can be confident that the bull is a true poll i.e. he does not carry the horn gene. Using horned animals in a breeding program increases the frequency of the horn gene in the herd, and increases the chance of having progeny with two copies of the horn gene and a resulting horned status.

**Bos indicus or tropically-adapted breeds**

The inheritance of horns is much more complex in tropical breeds. Scientists are still investigating the inheritance patterns of the horn/poll/scur status in tropically-adapted cattle. This description is based on the current knowledge.

As well as having the same gene controlling horns in *Bos taurus* (P), *Bos indicus* cattle also have a scur (Sc) and African horn (Ha) gene which control the horn/poll/scur status of the animal, and all three interact together. Both Brahman and adapted composite breeds are mostly influenced by the African horn gene. To complicate the inheritance of the trait further, it is thought that the African horn gene has a masking effect on the polled gene and both the African horn gene and the scur gene are sex-influenced. Sex-influenced in this case means that the horn status will be different for bulls and cows that have the same gene sequence. The methods by which the African horn gene and scur gene are sex-influenced are not yet understood.

*Bos indicus* cattle will only have the chance of being polled if they have the *Bos taurus* gene combination for being polled (Pp or PP). The alleles for the African horn and scur gene will then determine the horn status of the animal. If a *Bos indicus* animal has the *Bos taurus* gene for being horned (pp), it will be horned regardless of the combination of forms of the other genes. A Pp or PP animal can be horned if it is genetically horned at African horn gene (Haha or Haha).

The unfavourable allele (horn) of the African horn gene is represented by Ha, and the favourable allele (poll) is represented by ha. Due to the sex-influenced nature of the gene, a cow which has the African horn genes Haha will be polled, whereas a bull which has the same sequence will be horned. A bull must have the sequence haha to be polled. Therefore, a clean poll bull (no scur) does not carry the unfavourable African horn allele according to the present understanding of the inheritance.

The scur gene is also sex-influenced, where it is more likely for bulls to be scurred than females. Scurs will only appear in genetically polled animals as they have to appear at the same place as that of horns, that is to say that if an animal is horned it cannot express scurs even if it is genetically scurred.
Table 2. The results of mating different genetic combinations and expected progeny polled/horned status in *Bos taurus* cattle

<table>
<thead>
<tr>
<th>Polled/horned status of parents</th>
<th>True poll x true poll</th>
<th>True poll x horned</th>
<th>Poll x poll</th>
<th>Poll x horned</th>
<th>Horned x horned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genes of parents</td>
<td>PP x PP</td>
<td>PP x pp</td>
<td>Pp x Pp</td>
<td>Pp x pp</td>
<td>pp x pp</td>
</tr>
<tr>
<td>Possible genes of progeny and expected ratio</td>
<td>100% PP</td>
<td>75% PP</td>
<td>100% Pp</td>
<td>25% PP</td>
<td>50% Pp</td>
</tr>
<tr>
<td>Expected proportion of horned and polled progeny</td>
<td>All true polled</td>
<td>All polled</td>
<td>All polled</td>
<td>75% polled</td>
<td>50% polled</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Outcomes of matings**

It is far more difficult to breed for polled cattle in tropically-adapted breeds than in *Bos taurus* breeds, as the number of genetic combinations of matings and progeny is enormous. A clean polled bull (no scur) cannot have the horned allele of the African horn gene (*Ha*), but it may carry one copy of the horned allele from the *Bos taurus* gene, which may result in horned progeny if mated with a horned cow or a polled cow which carries a copy of the horned *Bos taurus* allele. Producers who breed Brahman or tropically-adapted cattle (e.g. Santa Gertrudis), will notice more horned and scurred bull calves than heifers because the genes are sex-influenced.

With the current degree of knowledge of the inheritance of horns in tropically-adapted cattle, *Bos indicus* producers would take an estimated 40 years to breed a 100% polled herd, if selecting solely for polled animals. However, with few polled animals in these breeds, a specific polled bull breeding program cannot be implemented easily. DNA tests are currently being developed by scientists, which aim to give an indication of the genetic potential of an animal to breed polled progeny and accelerate the polled breeding process. When released, the DNA tests could be used in conjunction with the selection for other economic traits to make breeding decisions and increase the frequency of polled animals in the herd.

**Source**


**Further information**


**Related topic**

Bull Selection

**SUMMARY OF BEST PRACTICE**

- Consider selecting for the polled gene to reduce the need for dehorning.
- Appreciate the complexity of breeding polled cattle in *Bos indicus* herds.
Bull Breeding Soundness Evaluation (BBSE)

The main method of assessing breeding soundness is to undertake a BBSE. It is recommended that the examination be carried out by a veterinarian or a similarly qualified and experienced person. A BBSE is a physical examination of a bull to measure his capability to successfully serve and fertilise the ova in the cow. The process evaluates the bull for a number of important reproductive traits. Critical faults can be picked up in a BBSE that will not be identified on visual appraisal alone e.g. semen quality.

A typical crush-side BBSE in the Katherine region will include:

- examination of testicles (size, tone, symmetry)
- examination of the penis, prepuce and sheath
- collection and evaluation of semen
- palpation of internal sex organs
- structural soundness of the legs, feet, eyes

Assessment of libido or serving ability completes a BBSE. While it is desirable to include this test, it is often omitted in extensive systems due to large numbers of bulls to be tested and cost and time constraints. BBSEs should be considered if aiming for 3% or lower bull percentages or a narrow conception period. It is more difficult to perform the serving ability test on Bos indicus breeds than on Bos taurus breeds.

Important soundness traits

Scrotal conformation and size

Scrotal size is an important trait related to calf-output of the bull, as it is directly related to sperm production capacity. Generally, the minimum size in two year old Bos indicus (Brahman) bulls is 30cm, and 32cm in two year old Bos taurus (British and European breeds) bulls. Body condition must be considered, as scrotal size can vary up to 4cm depending on body condition. When palpated, the testes should have firm resistance to pressure and move freely within the scrotum. Soft testes can indicate degeneration, while overly hard testicles can indicate swelling and infection. Both traits can result in abnormal sperm cell production and the bull should be inspected by a veterinarian.

Figure 1. Minimum scrotal size for two year old Bos taurus and tropical breed bulls in paddock condition

Bos taurus breeds  
Tropical breeds
If a bull has failed a BBSE?
If a valuable bull fails semen evaluation, consider retesting it again at a later date (perhaps 10 weeks later). Some conditions, such as three-day sickness or poor condition can cause temporary fertility problems in bulls.

In a commercial situation, bulls should not be given the chance to recover. If left in the herd without recovering, there is the risk that the infertile bull could express dominance and result in poor conception rates or prolonged conception periods.

Criteria for culling
- if advised by a veterinarian following a failed BBSE
- prolapse of the prepuce
- penile abnormalities or injury
- severe foot or limb faults or breakdown
- prolonged deterioration of body condition
- unacceptable temperament

**Limb conformation**

Selecting for leg structural soundness is very important in the Katherine region, where bulls must be capable of walking long distances. ‘Post-leggedness’ (overly straight in the hind limbs) should be avoided, as this puts strain on the hips when weight-bearing for service, and may interfere with a bull’s desire to mate. This also predisposes the bull to swollen hocks and arthritis in the hip and stifles joints. Sickle hock (overly angled in the hind limbs) is a less severe fault than post leggedness.

**Hoof structure**

Hoof structure is as important as limb conformation for bulls to be capable of walking long distances, and for lasting for years in the herd. A common fault seen in bulls is too much angle in the pastern joint, or ‘walking down in the pasterns’. The pastern is the joint directly above the hoof. This fault will eventually cause the feet to grow long and the dewclaws to wear down. Conversely, being too straight in the pastern joint will cause the feet to wear down excessively. Overgrown, curve or scissor of the toe claws should be avoided, as this can be an indication of poor limb conformation.

**Sheath size, shape and contents**

Pendulous and excessive length of the sheath should be avoided. These bulls can be prone to injury and prolapse of the prepuce. The penis should be examined while ejaculating to identify penile faults such as papillomas and retained frenulum.

**Body condition and weight**

Prolonged poor nutrition and deteriorated body condition will affect a bull’s capability to produce adequate quality sperm.

**Other important traits**

The eyes of the bull should be hooded to a degree, to protect from injury. The shoulders should not be large in proportion to the rest of the body, as this may result in calving difficulties. Width between the pin bones (the two points slightly below and to the outside of the tail) is important as an ease-of-calving trait for his daughters.
Bull Percentages

Bull percentages can be critical to economic outputs of the herd. A low bull percentage, without soundness testing, can lead to reduced weaning percentages and extended calving intervals. A high bull percentage will increase the cost of calf production. Both scenarios can reduce the profitability of the herd.

Bull Percentages

Bull percentages can be critical to economic outputs of the herd. A low bull percentage, without soundness testing, can lead to reduced weaning percentages and extended calving intervals. A high bull percentage will increase the cost of calf production. Both scenarios can reduce the profitability of the herd.

Bull Percentages

A survey conducted in the Katherine region showed the average bull percentage was 4.4%, which is slightly above the NT average of 4.3% across all regions.

The only way a producer can confidently reduce bull percentages in an extensive system is to include bull breeding soundness evaluations (BBSEs) into the breeding program. The main research into this subject was the ‘Bullpower’ project which was conducted on extensive properties on Cape York. The project found a bull percentage of 2% was sufficient when bulls were tested yearly for BBSE. DRDPIFR recommends a more conservative 3% with an initial BBSE and an annual visual check. A BBSE should be carried out by a veterinarian or a similarly qualified and experienced person. If a bull passes a visual appraisal for soundness, it cannot be guaranteed that it will sire calves. The semen evaluation component of BBSE is crucial in determining a bull’s siring ability. If bulls are not tested for soundness, it is best to allow a margin for sub-fertile bulls.

Cost per calf ($)

Table 1 shows examples for bull cost per calf calculations. Scenarios 1 and 2 compare the bull cost/calf where bulls have the same purchase price, but the bull percentage is lowered from 4.5% to 3% (with the inclusion of a BBSE into the breeding program). Scenario 3 demonstrates the potential purchase price provided the buyer asks for objective fertility information on the animal. It shows that, if required, a higher purchase price can be absorbed through the greater number of calves generally produced by a bull over its lifetime when a lower bull percentage is used.
### Table 1. Bull cost per calf calculations

<table>
<thead>
<tr>
<th></th>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bull purchase cost ($)</td>
<td>2500</td>
<td>2500</td>
<td>3000</td>
</tr>
<tr>
<td>Transport ($)</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Landed cost ($)</td>
<td>2600</td>
<td>2600</td>
<td>3100</td>
</tr>
<tr>
<td>Bull mortality (%)</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Effective bull cost ($)</td>
<td>2678</td>
<td>2678</td>
<td>3193</td>
</tr>
<tr>
<td>Salvage cost of bull ($)</td>
<td>800</td>
<td>800</td>
<td>800</td>
</tr>
<tr>
<td>Net bull cost ($)</td>
<td>1878</td>
<td>1878</td>
<td>2393</td>
</tr>
<tr>
<td>Average no. mating seasons</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Bull %</td>
<td>4.5</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>No. cows mated to bull/year</td>
<td>22</td>
<td>33</td>
<td>33</td>
</tr>
<tr>
<td>Weaning rate (%)</td>
<td>75</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>Calves per breeding lifetime</td>
<td>83</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>Bull cost/calf</td>
<td>$22.63</td>
<td>$15.02</td>
<td>$19.14</td>
</tr>
</tbody>
</table>

### Reducing bull percentage for genetic improvement

Large herd size and a high bull percentage in the Katherine region suggests that large numbers of bulls are purchased by some enterprises, which could result in the average quality of sires being relatively low. By reducing the bull percentage, a buyer can concentrate on purchasing better quality bulls, leading to genetic improvement of the herd. The long-term benefits of improving the genes entering the herd today should not be underestimated, as a bull purchased today will influence the herd through its genes for the next 14 years.

In practice, in large continually mated herds it is difficult to do a full BBSE on all herd bulls every year. A practical bull program for such herds is to regularly purchase young BBSE tested bulls, vaccinate annually with vibrio vaccine, cull any bulls with prolapse and obvious abnormalities and don’t keep old bulls in the herd unless they are of exceptional genetic value.

### SUMMARY OF BEST PRACTICE

- Bull percentages can be reduced to 3% if bulls are soundness evaluated by a veterinarian prior to joining.
- Reducing bull percentages increases genetic gains and profitability provided those bulls have desirable genes for the herd.
- Maintain a young bull herd – this will increase genetic gain and reduce the number of infertile bulls in the herd.
- Always insist on a full BBSE when purchasing new and expensive bulls.

### Sources

Bertram, J. (2003), *Bull Selection, Buying Better Bulls QDPIF.*


### Further information

MLA EDGENetwork® – The Breeding Edge course.
Contact Pastoral Production Extension Officer, DRDPIFR Katherine, Ph: (08) 8973 9739.

### Related topics

Bull Selection

The selection of bulls is critical for the genetic improvement of the herd. Selection criteria will differ according to the environment, management systems and target markets. With so many traits to take into consideration, it is helpful to establish a breeding objective for your operation, and to revise this often.

Breeding objectives

When considering your breeding goals, there are a number of factors to take into consideration:

- customer/market requirements
- traits of economic importance
- current performance levels
- future herd production targets
- heritability of traits.

Traits requiring emphasis in selection can be identified by comparing current performance levels with future targets and customer/market requirements. Keep all economically important traits in mind to avoid inadvertently selecting one important trait over another. As with all goals, a breeding objective should be specific, measurable and attainable. Greater progress can be achieved with traits that are more highly heritable i.e. more influenced by genetics and less by environmental factors. Focus on traits of economic importance rather than traits that have more to do with ‘tradition’ or ‘personal preferences’.

Estimated Breeding Values (EBVs)

EBVs are calculated values of an animal’s genetic merit for a particular trait. These values are shown as a + or – for each animal and each trait relative to the base for its breed. This figure also takes into account the heritability of the trait and correlations with other traits. The figures are generated by BREEDPLAN, a beef cattle genetic evaluation system, based in Australia. For example, a bull may have an EBV for 400-day growth of +10kg. Half of the calf’s genes come from the bull, so without knowing the mother’s EBV you could predict this bull has the genetic potential to produce calves 5kg heavier at 400 days than a bull with an EBV for 400-day growth of +0kg.

An accuracy percentage is assigned to each EBV for an animal and indicates the confidence level of the EBV. The accuracy figure is based on the amount of information available on the animal. In addition to sire and dam information, the accuracy value increases as the number of brothers, sisters and progeny with measurements increases (accuracies range from 0–99%). Accuracy should always be taken into account when considering an animal’s EBV.

EBVs mostly cover traits for animal growth, reproduction and carcase characteristics (Table 1). Not all of these traits will be measured on every animal. Animals from extensive areas such as the Katherine region are less likely to have the full range of traits recorded. More information would be available for animals in more intensive grazing systems. Some breed societies have developed figures for traits of particular interest. For example, marbling potential is valued highly in Angus cattle, and is heritable, so an EBV has been developed for IMF% (Intramuscular fat). However, there are very few Brahman seedstock with EBVs for IMF%, as this is not a trait commonly selected for in the Brahman breed.
EBVs are a tool to be used in conjunction with other methods of selection. Visual assessment and Bull Breeding Soundness Evaluation (BBSE) are still important to check that the bull is structurally sound and fertile as well as having genetic potential.

Single trait selection should be avoided, as antagonisms between traits can actually lead to production losses. A selection index, or $index, incorporates EBVs into a formula of trait selection, tailored for a particular production system and target market. A $index ensures genetic selection is balanced for herd profitability in the given production environment. $indices are available through various breed societies, and can also be tailored for individual properties/companies.

Benefits of spending more on bulls

There are some simple calculations to determine the cost-benefit ratio of purchasing higher quality bulls which have been evaluated for soundness. By purchasing fertility-tested bulls, your bull percentage may be confidently reduced, while genetically superior bulls should produce calves with higher production potential.

Consider the scenarios of purchasing three classes of bulls (Table 2):
- Bull 1: Inexpensive, average quality bull with no BBSE
- Bull 2: Average quality bull with BBSE
- Bull 3: Good quality bull with BBSE and 200-day growth EBV of +20kg

Table 2 shows that cheaper bulls may not always be the best value in the long run. Bull costs can be reduced by reducing bull percentages as seen in the comparison on Bull 1 and Bull 2, or by buying bulls with superior EBVs which result in better lifetime value of production, as in the example of Bull 3.
Homebred bulls

Breeding bulls ‘on-property’ has both advantages and disadvantages:

Advantages:
- It is a cost-effective method of attaining high quality genes, provided the sires are of a high quality.
- Bulls entering the commercial herd will have been bred in the environment in which they must perform.
- Animals of uniform age under uniform environmental and pasture conditions can be compared and selected.
- If data is collected on the bull breeding herd, superior commercial bulls which fit the operation’s breeding objectives can be selected with confidence.

Disadvantages:
- For significant herd improvements to be achieved, a long-term program must be planned and adhered to.
- A bull breeding herd requires more intensive management than the average commercial herd in an extensive cattle operation.
- Time and labour requirements are higher for effective implementation of selection practices. Producers unaccustomed to being objective in selecting herd bulls may find recording and individual identification tasks onerous.

Whether crossbreeding or straight breeding, greater genetic progress and increased profitability result from improved objectivity and the ability to define the genetic differences of the bulls on offer.

Expected herd life of a bull

Bulls should have reached sexual maturity at two years of age. Introducing bulls to a herd as three-year olds wastes a year of their breeding life. When purchasing bulls from other regions, always attempt to relocate them to the property at least three months before their intended use. This will give them time to acclimatise and allow bulls to recover from the negative effects relocation can have on fertility. Some producers now purchase their bulls as yearlings and allow them a full 12 months to grow out before being used. They may not grow as well, but their genetic potential is the same and their calf getting ability is enhanced as they are fully acclimatised when required for use. Bulls should be culled at eight years of age.

SUMMARY OF BEST PRACTICE

- EBVs can be used as a selection tool to identify superior genetics, but should not be used in isolation from other tools e.g. visual assessment, BBSE.
- Avoid single trait selection.
- The lifetime production value of a bull can be enhanced by selecting genetically superior bulls that have been soundness evaluated.
- Higher priced bulls with positive EBVs in priority traits may yield a higher value of production in their herd life than cheaper bulls.
- Breeding homebred bulls is a cost-effective way of attaining high quality genes and ensuring environmental adaptability (provided objective recording practices are implemented and genetic differences evaluated).
- The expected breeding life of a bull is approximately five years, if entering the herd as a two-year old.

Source
BREEDPLAN www.breedplan.une.edu.au

Further information
MLA EDGENetwork® – The Breeding Edge course.
Contact Pastoral Production Extension Officer,
DRDPIFR Katherine, Ph: (08) 8973 9739.
Bertram, J. et al (2005), Beef cattle bull costs per calf, QDPI. www2.dpi.qld.gov.au/beef/

Related topics
Chapter Two: Cattle Management

Castrating Calves

Calves should be castrated at the youngest possible age. There are two main methods of castration in the Northern Territory: surgical and by using rubber rings.

Surgical castration
1. Restrain the calf (calf cradle, crush, on ground).
2. Check the two free moving testes are present in the scrotum.
3. Trap one of the testes against the base of the scrotum by firmly squeezing the testes (always remove the testes closer to the ground first to minimise contamination of the second incision).
4. Make a positive incision on the trapped testes with a sterile scalpel, from about halfway up the scrotum to the midline of the base of the scrotum.
5. Ensure the incision in the skin and think fibrous capsule surrounding the testes is long enough to allow the testis to be squeezed out through the incision. This also allows adequate drainage.
6. Cut the fibrous tissue (which holds the epididymis to the tunica vaginalis) close to the body so that the cut fibrous tissue, testicle with epididymis are free. Then manually separate the sperm duct and fibrous tissue. Cut the sperm duct and fibrous tissue close to the scrotum, leaving the testicle attached only by the blood vessels.
7. The testis should now be pulled firmly away from the animal and removed in one tearing action without allowing it to re-enter the scrotum.
8. Any obvious loose tissue should now be removed in a similar fashion.
9. Repeat the procedure on the other testicle.

Rubber ring castration
- Can be used on calves up to two weeks old.
- Rings must be tight enough (and purchased recently) to shut off blood flow in arteries and veins.
1. Restrain the calf.
2. Check that both testes are present in the scrotum. Squeeze testes against the base of the scrotum.
3. With the legs of the applicator facing the belly of the calf, squeeze the handles to stretch the ring so it can be placed over the scrotum.
4. Place the expanded ring over the scrotum and release the handles when both testes are trapped between the ring and the base of the testes.
5. It is important to release the ring just above the testes, not at the base of the scrotum.
6. The applicator can now be removed by slipping the legs from under the ring.
7. Palpate the scrotum gently to make sure both testicles are present below the rubber ring.
SUMMARY OF BEST PRACTICE

- Do not castrate in very hot, humid weather — this increases the risk of bleeding, try to castrate early in the morning.
- Use sharp clean instruments.
- Scalpel blades should be changed for every 15 to 20 calves. No. 21 or 23 scalpel blades are ideal for castration.
- Ensure proper calf restraint.
- Use appropriate disinfectant at the correct strength and change it regularly. Keep scalpel blades in disinfectant when not in use.
- Keep branding and recovery areas as clean and dust-free as possible. Use sprinklers. Cleaning the cement floor will help minimise contamination. Prevalence of bacteria is high in yards, therefore castrated animals need to exit the yards as soon as possible.
- Maintain operator hygiene and keep facilities clean.
- Remove processed animals from yards as soon as possible.
- Process as many animals as possible as calves rather than weaners.
- Dehorn and castrate weaners as the very last act in the weaning process so weaners can exit the yards as soon as possible after castration.
- Trucking of recently castrated calves and weaners should be avoided.

Source

Further information

Related topics
Animal Welfare, Dehorning, Tetanus.
Chapter Two: Cattle Management

Cattle breeds are often classified as early, medium and late maturing, but there is also considerable variation within breeds.

**Early**
Angus, Wagyu, Shorthorn (most British breeds)
- smaller breeds
- put on fat more easily at a lighter weight
- beef is more likely to marble
- fertile because fat/condition is related to fertility
- stand up to dry conditions well because they have a lower maintenance requirement
- good eating quality for Western consumer tastes
- earlier sexual maturity so heifers conceive their first calf at a lower bodyweight

**Medium**
Brahman, Droughtmaster, Tuli, Belmont Red, Santa Gertrudis
These breeds have characteristics that are midway between early and late maturing cattle breeds.

**Late**
Large European breeds such as Charolais, Simmental, Blonde d’Aquitaine, Limousin
- larger, leaner breeds
- condition and fertility of cows will decline if stocking rates are not adjusted to take into account the higher feed consumption (maintenance requirements) of larger breeders
- often favoured by feedlotters because they can get a bigger carcase before it becomes over-fat; reducing trading costs and also feed costs (because it takes considerably more energy to produce a kilogram of fat than a kilogram of lean beef)
- good eating quality for Asian consumer tastes for lean meat
- meat cuts may be too large

Maturity type is based on the mature weight of a breed, calculated from the weight of a breeder at a set level of fat cover.

The major implications for Katherine region pastoralists is that understanding the maturity type is the most important decision when considering breeds either as purebred or as components of a crossbred. Since maturity type has profound effects on both fertility and market suitability the choice of maturity type is likely to be more important than the breed itself.
There have been signals from South-East Asian feedlotters that over-fatness is becoming a problem in Brahman feeder cattle exported from the NT. South-East Asian clients receiving our live export cattle may eventually consider late maturing breeds to be more suitable for their feedlotting operations (they want lean rather than fat meat). This demand can be met by crossbreeding with larger mature sized (e.g. European) cattle, however the larger breeders that result may have management implications in the Katherine region.

Crossbreeding research is being conducted by DRDPIFR to produce animals that will be late enough maturing to give a big lean carcasse in Asia while their mothers still maintain the fertility and survival traits of the Brahman cattle in the region. This research suggests that many Katherine region stations could produce late maturing progeny equivalent to a quarter Charolais without adversely affecting their productivity. Research at Kidman Springs found that half Charolais cows lost weight and had a slightly higher mortality rate than straight Brahman cows, but they still maintained a weaning rate of 82% and a breeding herd efficiency of 31.7 kg weaned per 100kg of cow mated.

Sources


Further information
Bertram, J et al (1993), Breeding for Profit, Queensland DPI&F.

Related topics
Bull Selection, Crossbreeding, Production Parameters.
Chapter Two: Cattle Management

Condition Scoring

Body condition scoring (BCS) is an important tool for herd management, especially in the breeding herd. It is basically the scoring of an animal’s overall body tissue reserves. This is normally done by visual inspection. It is a quick, cheap and easy way of describing the condition of animals to assist in making management decisions such as segregating for different supplementation regimes, predicting whether breeders are in adequate condition to conceive, and for describing sale cattle for marketing purposes. It can also be used to describe cattle for animal welfare purposes. Condition scoring is least useful for calves and young growing cattle.

It is important not to confuse BCS with fat scoring. Some systems have evolved purely to estimate fat thickness, e.g. the Ausmeat system. Fat scoring involves palpation as well as visual assessment. Although some scoring systems suggest a high predictability of P8 fat depth, research using real-time ultrasound scanning shows that the variation within score is very high, with substantial overlap between categories. Even though condition scoring is not as accurate as fat depth, it is a quick and practical tool.

There are several different scales in use across the country for body condition scoring. DRDPIFR uses a 9 point scale and this is recommended for use across the NT. However for those familiar with other scales conversion factors are included in the figures which follow.

Cattle management

The BCS of beef cows at the time of calving has a dramatic impact on subsequent re-breeding performance. Cows that calve in a BCS 3 or 4 have difficulty exhibiting their first heat by three months after calving. Whereas cows that calve in BCS 6 or 7 have adequate nutrition and tend to cycle within three months of calving and will generally have a pregnancy rate better than 80% (Holroyd and Fordyce, 2002). Condition scoring takes into account frame size when describing the condition of cattle since average weights can be misleading (i.e. a short fat cow can weigh the same as a tall poor cow). Condition score at mating is more important than weight for determining if pregnancy occurs.

Cows of thin condition (BCS 4 or thinner) produce less colostrum and give birth to less vigorous calves which are slower to stand and such calves have been found to have an impaired immune system reducing their ability to overcome early calf-hood disease challenges. This illustrates the importance of targeting mature cows to calve in a BCS of at least 5. Because first calf heifers are still growing after calving, they need to be fed so they are a BCS of 6 at calving.

BCS is affected by stocking rates, the type of season, weaning strategy, supplementation regime and the productivity of the country.

Northern Territory condition scoring

As mentioned earlier the condition scoring system recommended for use in the Northern Territory is based on scores from 1–9 described in the figures below. A BCS 5 cow is in average condition and represents a logical target for most cow herds, whereas a BCS 1 cow is extremely thin and a BCS 9 cow is extremely fat. The key areas for evaluation are the backbone, ribs, hips, pinbones, tailhead and brisket. Palpation of cows for fatness along the backbone, ribs, and tailhead will help refine your skill to visually score body condition.

If BCS is new to you, it is recommended that operators mentally describe the condition in words first then convert that description to a number. For example, look at an animal and think it is between average and fat condition, then give it a score 6. If scorers attempt to have a number as a standard for condition scoring, drift in scoring will occur both within and between times of scoring. It is important that the same operator does the condition scoring to be compared.

Another system used is the Ausmeat system which describes fat objectively in millimetres and then this is converted into a fat score. Fat scores range from 1 (lean) to 6 (very fat).

**Condition Score 1**  
(Ausmeat 1, NBRS 1, Fat = 0 mm)  
Marked emaciation. Pins sharp to touch, emaciated legs, protruding hooks, ribs clearly visible, very small hump. Should either be destroyed or removed from the herd, dried off if wet and taken to the hospital paddock.

**Condition Score 2**  
(Ausmeat 1, NBRS 2, Fat = 0 mm)  
Wasted leg muscle, transverse processes project sharply, ribs clearly visible, slack skin over hump.

**Condition Score 3**  
(Ausmeat 2, NBRS 2, Fat = 0 mm)  
Ribs clearly visible, muscles slightly concave, pins prominent, tail head prominent, transverse processes visible individually, dorsal spine pointed.

**Condition Score 4 – Poor, low fertility**  
(Ausmeat 2, NBRS 3, Fat = 4 mm)  
Ribs, hips and pins visible, transverse processes cannot be seen individually, unlike CS3.

**Condition Score 5 – Backward store**  
(Ausmeat 3, NBRS 4, Fat = 6 mm)  
Fat muscle, ribs and dorsal spine just visible.

**Condition Score 6 – Forward store**  
(Ausmeat 3, NBRS 5, Fat = 9 mm)  
Hook visible, dorsal spines cannot be seen or easily felt, animal smooth and well covered.
Chapter Two: Cattle Management

**Condition Score 7 – Fat**
(Ausmeat 4, NBRS 6, Fat = 12 mm)
Dorsal spine can be felt with firm pressure but feels rounded rather than sharp, full hump, animal is smooth and well covered, but no major fat deposits.

![Condition Score 7](image)

**Condition Score 8**
(Ausmeat 4, NBRS 7, Fat = 17 mm)
Obvious fat deposition, transverse processes cannot be seen or felt.

![Condition Score 8](image)

**Condition Score 9**
(Ausmeat 5, NBRS 8, Fat = 30 mm)
Heavy depositions of fat on tail head and brisket. Dorsal spine, ribs, hooks and pins are all fully covered and cannot be felt even with firm pressure.

![Condition Score 9](image)

(Courtesy International Livestock Research Institute).

**Sources**


**Further information**


**Related topics**

Animal Welfare, Transporting Cattle – Pre-transport Management.
Crossbreeding

Crossbreeding can be defined as ‘mating different breeds’. There are two reasons for mating different breeds of cattle:

- making a blend of desirable characteristics from two or more breeds that complement each other
- obtaining benefits from the heterosis (also known as hybrid vigour) occurring in crossbred cattle

The first generation of crossbred cattle (F1) often outperform their parents’ breeds in productive traits such as breeder fertility and steer growth rates.

There are numerous beef cattle breeds in Australia. To simplify the discussion on crossbreeding, these can be categorised into five groups:

- Asian Bos indicus (Brahman, Sahiwal)
- African Bos indicus (Boran)
- British Bos taurus (Hereford, Shorthorn, Angus, Devon)
- European Bos taurus (Charolais, Limousin, Simmental, Salers)
- African Bos taurus (Africander, Tuli)

The tropical adaptation, potential fertility and potential growth rate of the five breed groups relative to each other are listed (Table 1). These rankings are a general guide only and variation within breeds results in considerable overlap between breed groups for most traits.

The skill in crossbreeding is to optimise desirable characteristics and minimise the undesirable. An example of crossing complementary breeds or breed groups to improve the productive traits of crossbred progeny is to improve growth rates in steers of a small or medium-size British or Bos indicus breed. A producer could crossbreed using a high-growth-rate European sire breed. The male progeny would be expected to have higher growth rates than the British or Bos indicus breed while the female progeny would have lower maintenance requirements than a European breed cow.

Larger changes can be made in a single generation by crossbreeding rather than selecting from within a pure breed. The pros and cons of different breeds must be considered carefully when planning to use complementary breeds to ensure their progeny meet expectations in the desired traits and do not cause problems in other areas. Retaining sufficient adaptation to the environment in which the crossbred cattle are expected to perform is an essential aspect of crossbreeding. Retaining sufficient adaptation is critical in hotter and more humid areas where external parasites such as cattle ticks and buffalo flies present significant challenges to cattle.

The greatest benefits of hybrid vigour from crossbreeding come from the first cross (F1) generation. The strategies for breeding after the first cross are more complex.
Table 1. The relative tropical adaptation, potential fertility and potential growth rate of breed groups

<table>
<thead>
<tr>
<th>Breed group</th>
<th>Tropical adaptation</th>
<th>Potential fertility</th>
<th>Potential growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asian Bos indicus</td>
<td>Very high</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>African Bos indicus</td>
<td>High</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>British Bos taurus</td>
<td>Low</td>
<td>Very high</td>
<td>High</td>
</tr>
<tr>
<td>European Bos taurus</td>
<td>Very low</td>
<td>High</td>
<td>Very high</td>
</tr>
<tr>
<td>African Bos taurus</td>
<td>Medium</td>
<td>Very high</td>
<td>Low to medium</td>
</tr>
</tbody>
</table>

There are four structured crossbreeding program options available after breeding the F1:

- grading up
- forming a stabilised composite breed
- using a terminal sire
- rotational crossing

Grading up and forming a stabilised composite breed result in a return to purebreeding in the medium to long term, while using a terminal sire and rotational crossing continue crossbreeding.

**Grading up** (or top-crossing) means using the same sire breed each generation, and pure breeding in the medium- to long-term. This system requires the least management input, but results in loss of hybrid vigour with each generation. Compared with straight breeding, grading up may require extra management input on extensive stations to control mickey bulls and ensure calves are actually sired by the new bull breed.

**Forming a stabilised composite** (or synthetic) breed involves crossbreeding initially, then closing the crossbred herd at some point and selecting breeding stock from within the herd to form a stabilised new breed over several generations. Composite breeds may be formed from two or more breeds. The herd may be closed immediately after the F1 generation or after later generations, depending on the number of breeds included and desired proportions of each parent breed in the new composite breed. Stabilised composite breeds have the advantage of retaining a proportion of hybrid vigour in a purebred animal. The amount of hybrid vigour is dependent on the number of parent breeds used to develop the composite. Once stabilised, the breeding program returns to purebreeding and requires less management input. Braford and Droughtmaster breeds are Australian examples of two-breed composites formed by crossing Brahmans with Herefords and Shorthorns, respectively. Making a new stabilised composite is a major operation that requires many thousands of breeders and extensive selection over subsequent generations, making it a task that cannot be carried out by a small business alone.

**Using a terminal sire** means no male or female progeny are retained. Cows are mated to bulls of a different breed with superior growth and carcase attributes and all progeny are marketed. Terminal sires can be used over a proportion of a purebred or crossbred herd to improve the value of sale or slaughter progeny. An example applicable to some areas of northern Australia is using Santa Gertrudis x Charolais bulls over a portion of a high-grade Brahman cow herd and marketing all progeny. Use of terminal sires over the whole herd is not practical in the Katherine region because the purchase of replacement breeders is not viable.

**Rotational crossing**, also known as criss-crossing, involves the use of two or more breeds. Two-breed rotational crossing involves mating cows to the bull breed that was not their sire. The system requires greater management than grading up or using a composite breed because breeder groups are segregated and bulls mated accordingly. However, a greater proportion of hybrid vigour is retained. Bull control to ensure the right bulls are mated to the right cows is a big issue, especially in smaller herds. In extensive areas, producers attempting rotational crossing should expect and accept some progeny will result from unintended matings.
### Table 2. Maximum heterosis (hybrid vigour) retained in each crossbreeding system

<table>
<thead>
<tr>
<th>Mating system</th>
<th>Maximum heterosis (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grading up</td>
<td></td>
</tr>
<tr>
<td>generation 1</td>
<td>100</td>
</tr>
<tr>
<td>generation 2</td>
<td>50</td>
</tr>
<tr>
<td>generation 3</td>
<td>25</td>
</tr>
<tr>
<td>generation 4</td>
<td>12</td>
</tr>
<tr>
<td>generation 5</td>
<td>6</td>
</tr>
<tr>
<td>Composite</td>
<td></td>
</tr>
<tr>
<td>2 breed</td>
<td>50</td>
</tr>
<tr>
<td>3 breed</td>
<td>67</td>
</tr>
<tr>
<td>4 breed</td>
<td>75</td>
</tr>
<tr>
<td>5 breed</td>
<td>80</td>
</tr>
<tr>
<td>6 breed</td>
<td>83</td>
</tr>
<tr>
<td>Terminal sire</td>
<td></td>
</tr>
<tr>
<td>2 breed</td>
<td>100</td>
</tr>
<tr>
<td>Rotational crossing (2 breed)</td>
<td></td>
</tr>
<tr>
<td>generation 1</td>
<td>100</td>
</tr>
<tr>
<td>generation 2</td>
<td>50</td>
</tr>
<tr>
<td>generation 3</td>
<td>75</td>
</tr>
<tr>
<td>&gt; generation 7</td>
<td>67</td>
</tr>
</tbody>
</table>

**Composite**

Note: Heterosis is determined by number of parent breeds, and proportions of parent breeds.

**DRDPIFR crossbreeding research**

A composite of 56.25% Brahman, 12.5% Africander, 12.5% Tuli, 6.25% Charolais, 6.25% Hereford and 6.25% Shorthorn is being compared with the Brahman at Victoria River Research Station (VRRS). This cross gives a mix of 81% tropically-adapted *Bos indicus* and 19% unadapted *Bos taurus* and can be expected to retain about 64% of heterosis in the second generation onwards. Both the composite bulls and the comparison Brahman bulls are selected on weight, testicle size and percentage normal sperm at yearling. Heifers are selected on pregnancy. Any cow not pregnant and with a weaner at foot in the first round is culled. None of the animals are treated for worms, ticks or buffalo flies. For further information on this research contact Gehan Jayawardhana, DRDPIFR, Darwin.

Another project at VRRS (The Relative Breeding Herd Efficiency of Adult Charolais X Brahman and Brahman Cows Grazing Native Pasture in the Victoria River District), is measuring and reporting on the relative breeding herd efficiency (kg calf weaned per 100kg of cow mated) of adult cows containing 25% later maturing genes in a two-way criss-cross crossbreeding program, relative to purebred Brahman.

The key points to come out of this project so far are:

- ¼ Charolais breeders consistently recorded higher liveweights than Brahman breeders
- ¼ Charolais breeders recorded production figures similar to those of Brahman breeders
- Weaning weights of Brahman, Charolais and Charolais weaners were similar

NIRS results indicated that the nutritional quality of the breeding herds paddocks were similar.

**Sources**

MacDonald, N. DRDPIFR Katherine Ph: (08) 8973 9746.

Phillips, A. (2001), *Beef Cattle Genetics applied to Extensive Herds*, DPIFM and MLA.

**Further information**


**Related topics**

Bull Selection, Cattle Maturity Types.
**Culling for low fertility**

There are two main methods of identifying unproductive cows in a herd — either by pregnancy testing or by using an ear-tagging system that records lactation intervals.

**Using pregnancy testing to identify culls**

Cows are pregnancy tested at the first-round muster and culled if empty and dry. Although some good breeders may be culled, the culled cows will be, on average, less fertile than those kept. Some producers may choose to pregnancy test again at the second-round muster to ensure cows can be spayed to sell the following year.

**Advantages**

- a quick, one-step method
- no need to pregnancy test at second-round musters.

**Disadvantages**

- Culling all empty and dry cows will remove some potentially productive animals that just had their last calf at the ‘wrong’ time of year.
- Through this system, cows with a long inter-calving interval of up to 18 months are not culled as they are generally either pregnant or wet. A herd with a high proportion of such sub-fertile breeders will not be able to achieve high weaning rates above about 80%.
- Pregnancy testing does not identify the cows that are always pregnant but do not raise a calf. They may habitually abort or be poor mothers and fail to look after their calf.

Greater selection pressure can be applied by pregnancy testing wet cows too and drafting off those that have not re-conceived. Few stations could afford to do this every year because it is difficult to keep inter-calving intervals to under 12 months, and in some years an unsustainable number of cows would be due for culling.

**Tagging system to identify culls at consecutive musters**

A tagging, notching or tattooing system may be devised to track cows’ wet/dry status at muster. Different coloured tags may be used to reflect wet/dry status, or a mark made on an existing tag. Alternatively, NLIS tags may be useful for tracking the wet/dry status of individuals.

**Advantages**

- identifies cows that are always pregnant but do not often raise a calf
- no need for pregnancy testing.

**Disadvantages**

- needs ear tags
- needs accurate record-keeping.
Culling for age

According to the 2004 Pastoral Industry Survey, producers cull breeders at an average age of 10.5 years, with a minimum age of eight and a maximum of 15. After 10 years, mortality rates can increase and fertility can decrease. The best option is to check the animal’s teeth – if the teeth are fine, a cow can go on producing until about 16 years old. Some country areas can be harder on teeth than others.

Culling for temperament

Temperament is a highly heritable trait. There are economic benefits and occupational health and safety benefits in culling for temperament. Cattle with poor temperament have more carcase bruising (especially in the expensive, high-quality meat cuts) and tend to have tougher meat.

Culling for physical problems

Several physical problems require culling e.g. stringhalt. Bottle teats is a genetic weakness that rarely improves, and it is best to reduce the incidence in the herd by culling. Bottle-teat cows that are still wet can be identified for later culling by using a tagging system.

Cull female policy

With the decreasing age of male turn-off, the opportunity exists to maximise station profits by developing a robust cull female policy. There is no blanket recommendation available but proceeds from female sales can approach 50% of the income of cattle sales. It varies immensely between stations and depends on the fertility of the breeder herd, the mortality rates in the breeder herd and the differential price between cull heifers and cull cows. In general however, reducing the age of the cull cows can offer substantial economic returns by improving the overall average price received for females sold.

Example of a tagging system

(assuming cows are mustered twice a year)

- If dry, put in tag button (different colours each muster and for first or second time dry). Keep a meticulous record of the colour tags used for each muster.
- If a cow is wet next time she is in the yard, remove button.
- If a cow is dry three times in a row – cull.

<table>
<thead>
<tr>
<th>Cow</th>
<th>1st muster</th>
<th>2nd muster</th>
<th>3rd muster</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dry</td>
<td>Dry</td>
<td>Dry</td>
</tr>
<tr>
<td>2</td>
<td>Dry</td>
<td>Wet</td>
<td>remove tag</td>
</tr>
<tr>
<td>3</td>
<td>Wet</td>
<td>no tag</td>
<td>Wet</td>
</tr>
<tr>
<td>4</td>
<td>Wet</td>
<td>no tag</td>
<td>Wet</td>
</tr>
<tr>
<td>5</td>
<td>Wet</td>
<td>no tag</td>
<td>Wet</td>
</tr>
<tr>
<td>6</td>
<td>Wet</td>
<td>no tag</td>
<td>Wet</td>
</tr>
</tbody>
</table>

Sources


Oxley, T. (2004), Pastoral Industry Survey 2004 Katherine, DPIFM.

Jackson, D. (2005), Cattle Temperament – Much more than ease of handling, QDPI.

Related topics

Breeding Polled Cattle, NLIS in the Northern Territory, Pregnancy Testing, Stringhalt, Weaning.
Dehorning calves is an essential management practice for the Northern Territory’s cattle industry. It is vital that dehorning and castration of weaners takes place as the last act in the weaning process before animals are moved to the weaner paddock. This minimises the risk of infection of any open wounds. Cool and dry conditions are best as wet weather significantly increases the risk of infection and healing time.

Dehorning

Dehorning knives
Ideal for young calves less than two months of age, where the horn bud has not attached to the skull. The cut should start 2cm from the base of the horn bud. It is essential that a complete ring of hair is removed to ensure that no horn-forming tissue remains to grow into a scur.

Scoop dehorners
Ideal for calves two to six months of age, where the horn bud has attached to the skull. Scoop dehorners can open the frontal sinus creating a large hole – something that should be avoided wherever possible because of the increased risk of infection.

Cup dehorners
Suitable for older calves. A drawback with this design is that the front of the dehorners may ‘ride up’ the horn, resulting in partial removal of the horn bud and increased likelihood of a scur forming. This can be avoided by a second person pushing down on the front of the dehorners or by taking several ‘cuts’.

Guillotine dehorners, surgical wire, horn saw and tippers
Can be used to dehorn older cattle if done using local anaesthetic or under the direction of a veterinarian. Dehorning cattle older than 12 months is not recommended and is illegal in the NT, unless undertaken by a veterinarian. These instruments can also be used to ‘tip’ the horns of adult cattle, i.e. remove only the insensitive part of the horn.

Export
Polled or dehorned cattle are preferred for live export. However, cattle with horns 12cm or less in length and blunt are eligible. Dehorning wounds must be healed prior to selection for export.

Transport
Polled or dehorned cattle are preferred when transporting cattle. Cattle with horns may be transported within Australia with no ban associated with horn length. However, additional space must be provided during transport. Dehorning wounds must be healed prior to transport.
Figure 1. Basic structure of the horn

SUMMARY OF BEST PRACTICE

- Do not dehorn in very hot and humid weather. This increases the risk of bleeding, try to dehorn early in the morning.
- A complete ring of hair must be removed to ensure that no horn-forming tissue remains to grow into a scur.
- Use sharp clean instruments.
- Ensure proper calf restraint.
- Use appropriate disinfectants of the correct strength and change regularly every 15–20 calves.
- Reduce dust to minimise contamination, maintain operator hygiene and keep facilities clean.
- Remove processed animals from yards as soon as possible.
- Process as many animals as possible as calves rather than weaners.
- Dehorn and castrate weaners as the very last act in the weaning process.
- Experienced, competent operators are needed to perform the task of dehorning. Do not attempt to do it without adequate knowledge and training.

Source


Further information


Live Export Accreditation Program (LEAP)
www.ausmeat.com.au


Related topics

Heifer Management

The way heifers are managed can have a large effect on their performance later as breeders. The main thing to keep in mind is that body condition has the biggest effect on heifer fertility and so management should aim to get heifers into the best condition economically possible.

Yearling management

After weaning, heifers are put into a heifer paddock and kept there, separate from bulls, until they are ready for their first joining, usually around two years of age. At this time some producers just put them in with the rest of their breeders while others join them in a separate group.

Joining weight

Joining weight has been shown to be the major factor in influencing fertility, providing there are no disease problems. Fertility increases with joining weight. Most heifers with high Brahman content on native pastures in the Katherine region will not attain a sufficient weight to be fertile until around two years of age. Some heifers can take longer if conditions are not conducive to good growth. A good target joining weight for maiden heifers is 275kg.

There are significant benefits from managing heifers to increase joining weight. Conception rates of about 80% should result from heifers with at least a 275kg joining weight. Heifers can be joined at lighter weights, as it is more desirable that they conceive at the right time of year. Heifers will probably get pregnant later in the year if bull control has not been successful and they have not previously conceived. This will result in them calving out of season and will increase the chances of mortality of the heifer and/or the calf as well as increasing their inter-calving interval.

Timing of joining

The timing of joining should be set so that heifers will be calving just before pasture conditions are at their best. This will allow heifers to have access to the best possible nutrition while lactating. Other factors that affect the timing of when bulls are put out include availability of labour and access to paddocks. Many properties put the bulls out as the last job before the onset of the wet season when staff depart and access may become an issue.

In the Katherine region, most heifers conceive in January or February after a couple of months of good growing conditions making December a good time to put the bulls in with maiden heifers. Time of joining can be modified for different parts of the Katherine region to coincide with the predicted start of the wet season (i.e. on average, the wet season starts later in the south of the region, so joining can be delayed there).
**Fertility and re-conception**

The fertility of lactating first calf heifers is the lowest of all females in the herd, with re-conception rates after the first calving often being less than 20% by the first-round muster. Fertility is lowest in lactating first calf heifers because of the high nutritional requirements necessary for lactation and maternal growth to occur at the same time. As a result, lactating first calf heifers are often in poor condition and will not re-conceive until after weaning and spending several months on good feed.

Body weight/condition is the major factor influencing re-conception rates. Segregation of heifers from weaning until their first calf is weaned allows them to be managed so that their condition can improve (for example, with supplementary feeding). Provision of phosphorus over the wet season after weaning can significantly improve growth rates in yearling heifers and increase the probability of achieving target mating weights in acutely P deficient regions. Early weaning of heifer calves will also help to reduce loss of condition. Very small (under 100kg) calves may then require special management, and targeted supplementation.

**Bulls**

If possible, it is best to use young bulls (about two years old and vaccinated against vibriosis) on maiden heifers. Bull control is very difficult in the Katherine region (due to flood fences being washed down, scrub bulls and missed bulls) so there is always a chance heifers may come into contact with a bull infected with vibriosis. Vaccinating heifers for vibriosis might be considered.

Selecting bulls for calving ease and low birth weights will produce low birth weight calves and will reduce the likelihood of calving difficulties. Brahman cows generally have small calves and few calving difficulties. Problems increase with crossbred herds.

**Mating system**

A limited joining period at the first joining is a good idea so that heifers do not get pregnant and have their first calf at undesirable times of the year (e.g. middle of the dry season).

**Vibriosis vaccination**

Experiments in the VRD region have shown a benefit from vaccinating maiden heifers against vibriosis prior to their first joining. See Vibriosis for further information.

**Spike feeding**

Supplementing, or spike feeding pregnant maiden heifers is the practice of feeding an energy supplement, such as grain, for about six weeks prior to calving. This stimulates the hormonal system before the strain of lactation starts, and has been shown to significantly increase ovarian activity and re-conception rates in first calf heifers. Although spike feeding has shown to be effective in the Katherine region (for example in trials at Kidman Springs) it is not cost effective every year. Cost effectiveness depends on calving occurring at the expected time and reasonably typical seasonal conditions (not excessively dry or wet years).

**SUMMARY OF BEST PRACTICE**

- Use young bulls and bulls that will produce low birth weight calves.
- Segregate heifers until target joining weight is achieved, and preferably until they have weaned their first calf.
- Where possible, limit mating season to reduce out-of-season calves.
- Vaccinate bulls and consider vaccination of heifers against vibriosis.
- Spike feeding pregnant heifers may be worth considering.

**Further information**


Australian Brahman Breeders Association
www.brahman.com.au

**Related topics**

Bull Selection, Mating Systems, Production Parameters, Supplementation, Vibriosis, Weaning.
Hormonal Growth Promotants

Hormonal growth promotants (HGPs) are slow-release implants containing steroids that can increase growth rates, improve feed efficiency and alter carcase composition in cattle. The aim of HGP use is to enable stock to reach market specifications at a younger age. Growth promotants are particularly effective for steers, as they act in a similar way to the bull’s natural hormones inactivated by castration.

HGPs can be expected to boost growth rates by an average of 0.1kg/day provided implantation coincides with a period of adequate nutrition and therefore weight gain. Administering HGPs to cattle that are going backwards is of little or no benefit. Nutrition determines the level of response to HGP implants, so it is important to take seasons into consideration when planning the timing and length of HGP application. The best response to HGPs are therefore usually obtained in suckling calves as they are on a good plane of nutrition, however this could prove difficult to achieve in extensive situations.

While a significant number of producers choose not to use hormones for marketing reasons or as a matter of personal choice, HGPs remain one of the simplest ways of increasing production and herd profits. Most companies and many private producers implant steers from weaning, and almost all animals will also be implanted if they enter a feedlot finishing stage.

**HGP variations**

There are two broad types of hormones: oestrogens (female hormones) and androgens (male hormones).

Oestrogen-based HGPs stimulate the pituitary gland to release more of the animal’s own growth hormones, resulting in increased feed intake and weight gain. The main oestrogenic compounds are oestradiol and zeranol.

Common commercial oestrogen-based HGPs are Compudose®, Synovex®S and Ralgro®.

The main androgenic compounds are testosterone and trenbolone acetate. Androgen-based HGPs stimulate the production of body tissue by direct action on the cells, improving feed efficiency and promoting the production of lean meat. Androgens are rarely used alone. Androgen-based HGPs usually contain a combination of an oestrogen and an androgen (oestradiol and trenbolone acetate). Common commercial products are Revalor®G, Revalor®S and Synovex® Plus.

**HGP application**

HGPs are available in different preparations, with different periods of efficacy (e.g. Compudose® 100, 200 and 400-day). Some producers implant weaner steers at first-round with a 400-day product so the weaners will not need any further treatment prior to being sold. However, release of the hormone is not constant throughout the implant’s life, but tends to reduce in time. The implant’s most effective period will be wasted on weaners treated in the middle of the dry season because they are unlikely to be growing enough to benefit from the hormones. Implantation with a 200-day product at a second-round muster would be more effective.

Recent research by CSIRO has shown that repeated implantation can be effective with only a slight reduction in the hormone’s efficacy (contrary to earlier beliefs that HGPs were only effective once in an animal’s life). For producers with small paddocks who can bring their cattle in regularly, maximum production may be gained by more frequent implantations with perhaps a 100-day product just prior to the growing season.
**Side effects**

HGP s are not recommended for animals to be used for breeding. In particular, androgens may reduce reproductive ability in females. In males, side effects from HGP implants, especially androgens, include high tail carriage, pizzle prolapse and secondary sexual characteristics.

The animal’s response to HGP implants will usually result in a greater percentage of muscle rather than intramuscular fat or marbling. This may result in a carcass that is less tender than that of an HGP-free animal.

**Market restrictions**

Animals implanted with HGPs are not eligible for European Union markets and other selected premium markets.

**Producer obligations**

Producers must:

- sign a declaration when HGPs are purchased from a retailer indicating the property on which they are to be used
- permanently identify all stock treated with HGPs with a 20mm equilateral triangle ear mark in either ear (ear punch must be available at all HGP retail outlets)
- keep records of HGPs purchased and used including batch number and wastage
- keep records of treated stock purchased and sold including origin and destination.

**Identifying cattle implanted with HGPs**

NLIS devices are required for ALL cattle (HGP and non-HGP treated) moving to other properties, abattoirs or saleyards anywhere in Australia (cattle going directly to live export in the NT are currently exempt from NLIS tags). All cattle treated with HGPs must be identified with a triangular ear notch. Market access in other states may require the completion of a National Vendor Declaration (NVD) which includes a declaration to identify whether cattle have been treated with HGPs. For mixed consignments, separate NVDs may be required. Although individual animal identification with NLIS has eliminated the need for tail tags, some states still require pink or green tail tags to declare that cattle are free of HGPs.

**SUMMARY OF BEST PRACTICE**

- Sign the HGP declaration form at retail outlet.
- Identify HGP treated stock with the triangle ear mark.
- Record all HGP purchases, batch numbers, use and wastage.
- Record treated stock purchased or sold.
- Keep breeding stock free of HGPs.
- Treat cattle with HGP implants of appropriate length of efficacy and at the best time to take advantage of growing conditions.
- Treat calves while still suckling if possible.

**Sources**

www.nt.gov.au/drdpifr/

Tyler et al (2004), Managing a beef business in the subtropics, QDPIF.

www.publish.csiro.au

Lennon, P. (2005), Hormonal Growth Promotants, Factsheet 40/00, Primary Industries and Resources SA.  
www.pir.sa.gov.au

**Related topics**

NLIS in the Northern Territory, Weaning,
Mating Systems

Timing and distribution of calving are two significant factors that influence average weaner weight and kgs weaned. Increasing the proportion of breeders calving in the favourable time of year will increase in profitability of your herd. Different mating systems direct different levels of emphasis towards the timing of calving and are discussed below. Each mating strategy needs to be carefully considered for its practicality in being able to achieve the desired level of cattle control.

Continuous mating

Continuous mating is common in northern Australian beef herds. Bulls are run with cows continuously and calves are born throughout the year. In the Katherine region, 75% of producers continuously mate all breeders (Katherine Pastoral Industry Survey, 2004).

Benefits

• If a cow aborts a calf or her calf dies, she can potentially get pregnant again much sooner.
• It requires little effort to manage bulls and maintaining paddock security is not so critical.
• It requires a lower level of management.

Disadvantages

• Calves born late in the wet season or early dry season do not reach suitable liveweight for weaning until late in the year. Low liveweight and poor feed conditions make management of these second round weaners for subsequent turn-off or breeding more difficult.
• Increased costs associated with preventing mortality of lactating breeders throughout the dry season.

Seasonal mating

Seasonal mating, sometimes referred to as controlled mating, influences the timing of when calves are born. The major objective is to time mating to match the increase in feed quality because nutritional requirements peak during early lactation. In the tropics, the main aim of seasonal mating is to prevent dry season lactation.

Time of calving needs to be planned to synchronise the nutritional demands of breeders with the nutritional quality of the pasture. The nutritional demands of breeders is high while lactating, peaking shortly after calving. Therefore, the optimum time of calving is generally October to December for much of the Katherine region.

According to the Katherine Pastoral Industry Survey (2004), pastoralists used an average joining season of five months. This is in line with recommendations from other areas of northern Australia which have found a five month period to be a ‘safe’ compromise to achieve the benefits of seasonal mating, and prevent a drop in weaning rates as calving patterns change. It is also a practical approach which allows the bulls to be distributed before it becomes too wet to move about and allows them to be removed at first-round saving the need for a special muster.

In situations where seasonal mating is too difficult to carry out over the whole herd, targeting resources to seasonally mate heifers is a most desirable strategy which gives the breeder herd the best possible chance of at least starting in an optimum calving pattern.
Benefits

- Minimising dry season lactation and the associated supplement costs.
- Better able to produce a more even line of cattle which enhances marketing and cash flow predictions.
- Benefits in terms of stocking rate if the second-round weaners do not have to be held over for an extra year before they meet market requirements.
- Potential cost savings associated with the ability to reduce or avoid the second-round muster, with consequent labour savings and reduced incidence of mis-mothering causing death of calves.
- Reduced mortality of weaner mothers in late dry season.
- Better bull control which reduces the spread of venereal diseases.

Disadvantages

- By eliminating a second round of mustering all calves would potentially have to be branded as a weaner the following year.
- Total bull control can be problematic in the Katherine region due to flood fences being washed down, the presence of scrub bulls and bulls being left behind when mustered with helicopters.
- Seasonal conditions may cause large numbers of cows to ‘slip’ from the optimum calving cycle and miss joining if the joining interval is short (less than three months). A five month joining period can help to overcome this problem.
- Changing from continuous to seasonal mating may have a short-term decrease of calving percentage (one to two years).

Breeder herd segregation through pregnancy testing

In areas where bull control is difficult a useful strategy to achieve some of the benefits of seasonal mating can be to segregate breeders according to pregnancy status. If a cow falls out of the optimum calving pattern, foetal aging allows her to be segregated in another herd which receives different management, or to be culled and replaced with a breeder that will calve at the optimum time.

Benefits

- Enhancing herd fertility by culling sub-fertile and lower gross margin groups of breeders (i.e. those who will be lactating throughout the dry season).
- Better use of supplements which can be targeted to groups which have most need and where responses will be best, e.g first calf heifers.

Disadvantages

- The need for pregnancy diagnosis to determine status.
- Additional management to undertake and monitor putting the practice in place.
- Problems with cows being moved around the property, often they may return to their ‘home range’.

SUMMARY OF BEST PRACTICE

- If possible, physically relocate breeder bulls well away from breeder paddocks in the non-mating period.
- Strategically locate bulls in holding paddocks before the onset of the wet season to enable their introduction into the herd during the wet season with a minimum of fuss.
- Consider physical removal, by catcher or euthanasia, of non-musterable bulls in breeder paddocks.
- Take advantage of having bulls separated by fertility testing and vaccinating before re-introduction to the breeder herd.
- Keeping the average age of bulls down and making sure they are well handled and educated will help.
- As a first step in seasonal mating implement with first calf heifers.

Sources


Oxley, T (2004), Pastoral Industry Survey 2004 Katherine, DPIFM.

Further information

Meat and Livestock Australia (2006), Managing the Breeder Herd; Practical Steps to Breeding Livestock in Northern Australia, MLA.


Related topics

Bull Percentages, Bull Selection, Culling Breeders.
Mothering Up

Mis-mothering that occurs through handling can be a significant contributor to calf loss which can largely be avoided. Mis-mothering can occur in a number of situations such as being left behind during the mustering process, in the yards, being separated from mothers on the way back to their home paddock and from first calf heifers walking away from their calves. It is important to be aware that cows don’t necessarily automatically mother up and that your staff might not understand this.

Symptoms and consequences of mis-mothering

Symptoms include mis-mothered calves alone at troughs drinking, standing in the same spot on their own for extended periods of time, hollowness and sunken eyes and erratic behaviour by mothers, especially heifers.

Whilst it may be convenient in the short-term to save time by allowing mis-mothering to occur, producers may be better off financially to adopt mustering and herd management strategies that may minimise mis-mothering losses.

Mis-mothering losses could decrease the weaning rate by 1–3%. For example for a 4,000 cow breeding herd mis-mothering losses could be 40–120 calves. The costs of mis-mothering, apart from the animal welfare issue, also include the cost of raising poddy calves, the foregone income from future sales and having fewer potential replacement breeders.

Best practice to aid mothering up

- Do not muster at peak calving times.
- Leave cattle in yards for a minimum amount of time as possible, but avoid rushing them through processing.
- Do not draft mobs with lots of baby calves to go to other paddocks, because a calf will go back to where it had its last suck if it is separated from its mother.
- Never let cows run back to the paddock without holding the lead up, always steady them out of the yards and settle them before walking.
- Hold cattle up in holding paddocks (overnight) before letting them go back into the paddock to allow time to mother up, or hold cattle around a water point until mothered up. Many cows will need to be tailed long enough to have time to have a feed before they will be ready to think about collecting their calf.
- Minimise disturbances to a cow and newly born calf, especially in the first 24 hours.
- Heat at the end of the year seems to escalate the problem. Try to minimise the effects of hot weather on baby calves by handling early in the day or late afternoon.
- When walking cows and calves don’t pressure the tail too much. Allow the mothers to come back down the mob to their calves. Try to handle cows and calves in a way that will prevent or minimise them being separated. Avoid long distances to stock yards and don’t keep breeders yarced any longer than required.
- Get your weaner training program and stockhandling right so that cows are calm when handled and are not rushing around forgetting their calves.
- Choose (when possible) chopper pilots that have good stockman skills and give clear instruction prior to muster.
Mothering up for identification purposes

Often you may need to identify which calves belong to individual cows if a mob is being drafted to go to different paddocks, to identify weaner mothers or for herd improvement programs.

- Separate the calves from the cows overnight. The calves will then run back to their mothers when they are let back in the next day and will be easier to cut out as the mother’s udders are bagged up and the calves are more likely to stay with them trying to get a feed.
- You can hold the group of wet cows you wish to mother up in yards separated from the rest of the mob and use a creep which allows only calves to go under.
- On horseback in a large cooler settle the mob and cut out pairs. You will probably find the slower you can move through the mob to cut out the faster you will finish.
- DNA testing is an (expensive) option for situations where you need to identify progeny of cows and bulls.

Related topics

Heat Stress in Cattle, Poddy Calf Rearing, Stock Handling.
The objective of the National Livestock Identification System (NLIS) is to develop and implement national livestock identification and tracing systems. NLIS will facilitate rapid and accurate tracing of livestock movements across all jurisdictions, and provide consumers and the market with confidence in the safety and integrity of Australian livestock and livestock products.

NLIS uses radio frequency identification devices (RFIDs) in cattle and a national database to record individual animal movements. Legislation that underpins the registration of properties and the use of approved identification devices is contained in the Stock Diseases Act and Regulations.

The mandatory use of RFIDs for Northern Territory cattle moving from property to property commenced on 1 July 2007. The owner of the property of destination is responsible for ensuring that the transaction is recorded on the NLIS database.

There are two types of NLIS devices or RFIDs used for the permanent identification of cattle: breeder tags and post-breeder tags.

**Breeder tags** are white and are used to permanently identify cattle before they leave their property of birth.

**Post-breeder tags** are orange and are used to permanently identify introduced cattle that were not born on the property.

The Property Identification Code (PIC) and NLIS logo are on the front of the tag. The NLIS logo and the words ‘Do not remove’ are stamped on the back of the tag button. Tags must not be removed until the animal is processed at an abattoir. Cattle only need to be permanently identified once, either with an NLIS breeder device or an NLIS post-breeder device. If cattle you buy are already identified with an NLIS device, do not attach a second NLIS device.

The tag is issued for application on a specific property only and cannot be applied to cattle on another property. Breeder and post-breeder tags cannot be sold, given away or re-used.
The Department of Regional Development, Primary Industry, Fisheries and Resources (DRDPIFR) has developed demonstration sites where the infrastructure requirements necessary for reading RFIDs during normal cattle handling procedures can be viewed. Field days and producer workshops are being conducted at demonstration sites in each region. DRDPIFR field staff provide technical support for pastoralists to develop on-property systems.

**SUMMARY OF BEST PRACTICE**

- The mandatory use of RFIDs for Northern Territory cattle moving from property to property commenced on 1 July 2007.
- White breeder tags are used to identify cattle born on your property.
- Orange post-breeder tags are used to identify cattle introduced to and not born on your property.
- Tags must be attached to the right (offside) ear.

**Source**

NLIS in the Northern Territory brochure, July 2006.

**Further information**

Email: ntnlis@nt.gov.au

Up-to-date information can be found on the DRDPIFR website www.nt.gov.au/drdpifr/nlis

Fact Sheets are available on the following topics:

- Plan for the Implementation of the NLIS in the Northern Territory July 2005 to June 2008
- Summary of Cattle Identification and Documentation Requirements – 2006
- Property Identification Code (PIC) Registration
- How to Find a Property Identification Code (PIC) for a Northern Territory Property
- NLIS components (on-farm systems, id devices, equipment)
- NLIS animal identification devices and applicators
- Opening an account with the NLIS Database
- Electronic Weigh Scales and Data Collectors
- Update your Property Details
- NLIS contacts - Interstate and NT
- Getting started with NLIS
- Key dates for NLIS in the NT
- RFID Readers
- Ordering NLIS Devices
- NLIS for shows, rodeos sporting events
- NLIS compatible software
- NLIS database transfers
- NLIS for buffalo in the NT
- NLIS for saleyards
- NLIS for trucking yards, dip yards
- NLIS Live Export Cattle
- NLIS for NT Abattoirs

NT Property Identification Code (PIC) search facility: pic.primaryindustry.nt.gov.au

**Related topic**

Live Cattle Export Industry
Poddy Calf Rearing

As the value of cattle has increased over the past two decades, the rearing of poddy calves has become economically justifiable. Calves can become ‘poddied’ for a variety of reasons and may be in quite poor shape when received. Initially they may require extra attention if dehydrated, depressed, lacking appetite or scouring.

Dehydrated calves

Dehydration should be treated before feeding with milk. Administration of an electrolyte mixture will increase the chances of survival. Electrolyte mixtures are commercially available or a home-made mixture may suffice (mix 1 teaspoon table salt, ½ teaspoon baking soda and 125mL glucose in 1.2L of water). Once the calf is stabilised, milk feeding can begin.

Colostrum

It is vital that the newborn calf receives colostrum from its dam or artificial sources within the first 36 hours of birth. Colostrum is the first milk secreted by the udder during the first days following birth, and is characterised by a high protein and antibody content. Colostrum provides passive immunity to disease and helps build up vitamin and mineral reserves. Once the calf has received colostrum, it can be fed solely on whole milk or milk replacers, until its rumen develops to a stage where it can digest solids. Some milk replacers now contain colostrum. A supply of frozen colostrum can be kept in the freezer. It is best to keep only good quality colostrum e.g. from the milker or a cow in good condition. The quality of colostrum varies markedly depending on the condition of the cow and the time elapsed since calving. A colostrometer (Hygrometer) can be used to test the quality before freezing.

Feeding routine

• Care must be taken not to overfeed calves, especially during their first three weeks of life.
• Feeding twice a day is satisfactory.
• Once a day feeding may begin at two to three weeks of age only if the calf is healthy and feeding well. The total daily requirement of milk should be fed in the morning. Plenty of cool, fresh water should be provided for the rest of the day.
• Calves on once a day milk feeding usually have a good appetite for dry feed and are easier to wean onto solids.

Milk replacers

• Milk replacers are available at stock and station agents and feed stores.
• Milk replacers should be reconstituted and fed as directed by the manufacturers (usually 1kg of powder to 10L of water, fed at a daily rate of 10% of calf bodyweight).
• Increasing the proportion of powder is often recommended for once a day feeding to reduce the total volume of milk replacer/milk formula required. For example, a thriving, well-grown calf of 50kg liveweight requires about 4.5L of milk formula mixed at 11% concentrate, if fed once a day.
• Milk may be fed at temperatures between 6°C and 38°C. It is generally recommended the milk temperature be between 35°C and 38°C.
Teat or bucket feeding?

Calves may be fed from a bucket or on teat feeders. Both have advantages and disadvantages.

Initially, it may be easier to get calves to feed from a teat. Saliva production may be greater when teat feeding which could be beneficial for digestion or to maintain fluid intake in scouring calves. Teats have to be kept clean and replaced when they deteriorate.

To train a calf to drink from a bucket, back it into a corner, stand astride its neck and place two fingers moistened with milk into its mouth. As the calf starts to suck, gently lower its mouth into a bucket of warm milk taking care not to immerse the nostrils or it may inhale milk. This may have to be repeated several times before the calf will drink unaided. Care must be taken that the calf does not become reliant on having a warm hand near its mouth. The base of the bucket should be placed at least 30cm above the ground to ensure the oesophageal groove channels milk into the abomasum properly.

Regardless of the method used, it is very important for each calf to receive a measured amount of milk daily. Teat feeders are more suited to feeding large numbers of calves but once older, a calf may drink more from the bucket than from a teat. The speed of drinking has little effect on milk utilisation.

Scours

Scouring can have several causes and can be a life-threatening condition. The calf may need to be taken off milk and placed on electrolytes until scours subside. If scours continue, treatment with commercial medication may be warranted, in consultation with a vet.

Water

Calves will begin to drink water between one and two weeks of age, and by six weeks may drink four to five litres a day. Milk feeding once or twice a day does not supply enough water for the calf, so fresh, cool water should be available at all times.

Solid feed

- The calf should have access to solids from one week of age in the form of concentrates (see below) and a little good roughage hay to stimulate rumen activity. Avoid feeding excessive amounts of green grass in the first 6–8 weeks of age as digestive upsets can occur.
- Milk or milk replacer should be fed up to 8–10 weeks of age until the rumen has developed properly.
- Concentrates can be introduced by placing a small amount in the milking bucket. As the calf finishes drinking you can rub a little concentrate on its muzzle to encourage the calf to taste it. If you are feeding a number of calves, you will find that once one or two start eating the supplement, the rest will follow. By three weeks of age, a calf should be able to digest small amounts of grain, meals and hay and should be given access to young green pasture.
- Depending on the quality of the pasture, supplementary feed with hay and concentrates may be needed until the calf is about four months old.
- Calf concentrates should be highly palatable, coarse textured, high in energy (over 75%) and protein (over 16%) and low in roughage (less than 15%).

- A simple home-mix could consist of four parts cracked or crushed grain (oats, barley, maize or wheat) and one part linseed, soybean, peanut or cottonseed meal. Molasses may be added to the mix to make it more attractive to the calf and encourage it to eat more.
- The inclusion of a rumen modifier such as Rumensin™ in feed will assist rumen activity and may help prevent coccidiosis. Care must be taken though, as poorly mixed or inappropriate doses of Rumensin™ are toxic.
- If pasture is scarce or of poor quality, supplement it with good quality hay (protein content more than 13%). True protein or bypass protein is essential in young calves; non-protein-nitrogen sources such as urea are not suitable for young calves, cottonseed meal or copra are ideal.

Weaning

- The calf’s rumen must be functioning well before it can be weaned. It takes 10 weeks before the rumen is fully functional.
- If the calf has been offered solids from one week of age you may consider weaning it off milk after eight weeks of age.
- Early weaning is only possible if the calf is healthy, eating well and consuming a minimum of 650g of meal a day. Some calves will reach the target consumption earlier than others, so it is best to feed concentrates separately if feeding more than one calf.
- Once the target consumption is reached, the calf can be weaned off milk by either reducing milk over a one week period or stopping the milk abruptly.

SUMMARY OF BEST PRACTICE

- Treat dehydration and scours if necessary.
- Newborn calves must receive colostrum.
- Feeding twice a day is satisfactory.
- Milk replacers can be fed via a bucket or teat feeder.
- Avoid excess green grass before eight weeks of age as digestive problems and bloating commonly occur.
- Good quality pasture, hay or concentrates should be provided before and after weaning.
- Wean when the calf is eating a satisfactory quantity of solid feed.
- Cool, fresh water should be available at all times.

Sources

Bohning, G. (2000), Feeding the Orphan or Early Weaned Calf, Agnote 503 No. J47, NT DPIFM.


Further information

Calf Notes, www.calfnotes.com

Related topics

Coccidiosis, Weaning.
Most producers are able to learn this procedure from a three day course (NT Rural College), but substantial follow-up practice is required to attain reasonable levels of accuracy and speed. Training by qualified practitioners is highly recommended, rather than self-teaching or being taught by unqualified people. Pregnancy testing is an invasive procedure which could cause distress to cows and affect their later behaviour in yards. It is not just a matter of feeling for a calf; other internal organs may be mistaken for a foetus. Careless palpitation can damage early pregnancies, and can induce early calving in late pregnancies.

**Reasons for pregnancy testing**

The main reason for pregnancy testing is to be able to detect non-pregnant cows. Detection of unproductive females and determining the suitability of animals for live export are the main reasons for pregnancy testing. Many stations in the Katherine region test all of their dry cows and sale females.

Pregnancy testing of animals for export must be conducted by a registered vet or an accredited person. Females destined for export or feedlots must be tested and declared not detectably pregnant to ensure that they do not calve on board ships or in feedlots. The NT is unique in accrediting non-veterinarians to carry out this task. Accredited operators are tested only on their ability to detect pregnant/non-pregnant animals but do have to demonstrate a high level of reliable diagnosis. Cows sold by liveweight may attract a higher price if they have been certified to be not detectably pregnant.

Diseases and management problems affecting the whole herd can be identified much earlier if cattle are pregnancy tested. Low pregnancy rates in one particular mob, for example, might indicate poor bull performance. Poor fertility throughout the whole herd might be caused by an infectious disease or perhaps an inadequate plane of nutrition prior to joining. Checking the stage of pregnancy may assist segregation of cows into different calving groups in order to manage them differently.

The details below are for explanatory purposes only and are not intended to replace appropriate training.

**Partial testing of herds**

Generally only partial herd pregnancy tests are conducted in the Katherine region, with only dry cows being tested at the first-round muster. In order to get a complete picture of how a herd is performing, entire herd pregnancy testing is required.

Common practice in the Katherine region is to pregnancy test only dry cows at first-round muster and cull non-pregnant animals from the herd. This culling regime will identify females that have a calving interval of more than 18–24 months. Generally this culling regime would remove 7–10% of breeders for infertility.
Diagnosing pregnancy

Experienced operators are able to reliably diagnose pregnancy from two months, and more speculatively from six weeks (in some cases from four weeks). Cows diagnosed as ‘empty’ may be very early pregnant, so ‘not detectably pregnant’ is a better description.

Signs of pregnancy can be divided into two groups: suggestive or definitive.

**Suggestive signs**
- a change in the size and location of the reproductive tract
- the presence of a mature corpus luteum
- detection of fluid in the uterine lumen (fluctuance)
- enlargement of the middle uterine artery and fremitus
- detection of a heavy cervix when attempts are made to lift it.

**Definitive signs**
- palpation of the chorioallantois using the foetal membrane slip technique
- palpation of the amniotic vesicle
- palpation of placentomes
- palpation of the foetus.

**Characteristics of a non-pregnant tract**
- absence of fluid filling in both uterine horns
- both horns of the uterus having a thick, meat-like consistency
- both horns of the uterus being tapered terminally
- both horns of the uterus being slightly coiled and the ovaries easily located by following them in a reverse ram’s horn direction.

**Determining stage of pregnancy**

Experienced operators aim to determine the stage of pregnancy to the nearest month. Early pregnancies (2–4 months) are harder to detect but can be aged accurately. Well advanced pregnancies (6–9 months) are easy to detect but more difficult to age accurately.

Operators use a range of indicators to determine and age pregnancy (Table 1). Early pregnancy is determined from changes in the size and texture of the horns of the uterus. As the foetus grows, the reproductive tract descends further into the abdominal cavity. From 2.5 months, the cotyledons (attachment points between the maternal and foetal blood supplies) become detectable. These grow and change shape throughout pregnancy and form a key indicator. The weight on the reproductive tract increases as the foetus grows and descends into the abdomen, until by five months the foetus is far forward, often out of reach. After six months the size of the foetus brings it back into reach again. Another indicator used to confirm late pregnancies is fremitus, a distinctive buzzing in the arteries supplying blood to the uterus. In the last trimester, the pregnancy becomes increasingly difficult to age precisely. There is often not enough room for the operator’s hand to clearly feel the size of the foetus, and there are natural variations in calf size and calving time.
<table>
<thead>
<tr>
<th>Months pregnant</th>
<th>Membrane slip</th>
<th>Amniotic vesicle (relative size)</th>
<th>Size of Foetus</th>
<th>Foetal head size crown</th>
<th>Middle uterine artery</th>
<th>Cotyledons</th>
<th>Uterine character</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+</td>
<td>½ finger</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>slight enlargement</td>
</tr>
<tr>
<td>1.5</td>
<td>+</td>
<td>1 finger</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>slight enlargement of uterus with thinning of uterine wall</td>
</tr>
<tr>
<td>2</td>
<td>+</td>
<td>&gt;4 fingers Mouse size</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>pregnant uterine horn full with fluid and non-pregnant horn filling</td>
</tr>
<tr>
<td>2.5</td>
<td>+</td>
<td>&gt;Hand and thumb 1 finger</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>both uterine horns full with fluid and descending into abdomen (8–12cm)</td>
</tr>
<tr>
<td>3</td>
<td>+</td>
<td>Rat 3 fingers</td>
<td>1–1.5cm (&lt; 5 cents)</td>
<td></td>
<td>12–16cm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.5</td>
<td></td>
<td>4 fingers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>14–20cm</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Kitten size Hand and thumb</td>
<td>Hand and thumb</td>
<td>Up to 0.5cm; strong pulse</td>
<td>1.5–2.5cm (5–10 cents)</td>
<td>&gt; 20cm unable to retract</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Large cat</td>
<td></td>
<td>0.6–0.8cm; fremitus preg side</td>
<td>2.5–4cm (50 cents)</td>
<td>uterus well down right of midline, may be out of reach</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Small dog</td>
<td>Approx. 1 cm; fremitus preg side</td>
<td></td>
<td>4–5cm (bantam egg)</td>
<td>uterus well down right of midline, foetus may be out of reach</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>Medium dog</td>
<td>1.2–1.5cm; fremitus both sides</td>
<td></td>
<td>5–7.5cm (chicken egg)</td>
<td>foetus begins to ascend</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>Large dog</td>
<td>1.4–1.7cm; strong fremitus both sides</td>
<td></td>
<td>6–9cm (duck egg)</td>
<td>foetus continues to ascend</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>Calf</td>
<td>1.5–1.9cm; very strong fremitus both sides</td>
<td></td>
<td>8–12cm</td>
<td>udder bagging</td>
<td></td>
</tr>
</tbody>
</table>
Recommended guidelines for timing of pregnancy testing

**Heifers:** Manual palpation: Minimum 7–8 weeks after last day of mating. Conducting pregnancy diagnosis at the correct time enables culling of infertile heifers before they consume valuable pasture. Significant numbers of heifers should be joined so those that don’t conceive can be culled at the time of pregnancy testing.

**Mature cows:** Pregnancy testing of cows is generally most convenient at weaning. In controlled situations pregnancy testing is conducted 50 days after the last day of mating, at the latest.

**Accreditation**

Pregnancy testing of export cattle must be undertaken by a registered veterinarian or accredited pregnancy tester.

The Northern Territory Government (uniquely) will accredit competent non-veterinary pregnancy testers. Competency is assessed by CDU Rural Campus, Katherine, based on recognised prior learning or training, and a theory examination and practical test. The assessment can be done on scheduled dates at CDU’s Mataranka Station or on a commercial station by prior arrangement.

Accreditation lasts for three years and maintenance relies on ongoing pregnancy testing activity (an average of at least 500 animals/year).

AQIS requires the tester’s accreditation number on declaration forms for export, relating to pregnancy status.

**Gaining experience**

After successful training, people will be able to diagnose and age pregnancy in most cows reasonably accurately. Substantial follow-up practice is required to become fast enough to operate on a commercial station. A good operator can test 500–1,000 animals per day (50–100 per hour) without losing accuracy. This requires considerable practice, often acquired over several years and testing several thousand animals per year. It is important to remember that accurate diagnosis depends on checking several factors, not just one. Also, reproductive tracts of cows vary considerably because of differences in age, body size, calving history and other factors. Beginners who rush will make mistakes.

Beginners, working slowly, find it difficult to get sufficient opportunity to practise, and as a result many do not end up using their pregnancy testing training.

**SUMMARY OF BEST PRACTICE**

- Learn the basic pregnancy testing skills in a 3-day course run by CDU at the Katherine Campus. Teaching yourself or learning from an unqualified person is not recommended and can be harmful to cows.
- Practise to become competent and fast.
- Use only registered vets or accredited persons to certify non-pregnant cows for export.
- Use pregnancy diagnosis to select, cull and manage breeders.

**Sources**


**Further information**

Charles Darwin University, Rural Campus, Katherine, Ph: (08) 8973 8311.

**Related topics**

Artificial Insemination, Culling Breeders, Heifer Management, Mating Systems.
Reproductive performance measures

Reproductive ability for cows can be thought of as the ability to conceive and wean a calf each year following puberty and is commonly measured using pregnancy diagnosis, lactation status following pregnancy diagnosis or branding/weaning rates.

It is important to recognise that the common methods of measuring reproductive performance (such as calving rate, weaning rate and calving interval) represent the average of the herd, and not the proportion of the herd performing at the recommended targets. Focusing on the proportion of the herd that is performing at the recommended levels is particularly important when wanting to improve reproduction rates. An example of one of these measures is the proportion of the herd re-conceiving in less than three months or proportion of cows calving between October and December.

When investigating low herd fertility rates, it can be useful to calculate a number of reproductive performance measures to identify where losses are occurring. For example, a combination of pregnancy diagnosis, lactation status, branding rates and weaning rates will help to determine stages and possible causes of low herd fertility.

Pregnancy rate

The pregnancy rate represents the number of females that conceived relative to the number joined.

\[
\text{Pregnant females} \times 100\% \\
\text{Females joined}
\]

Branding rate

The branding rate represents the proportion of calves branded relative to the number of breeders mated in the previous 12 months. Incorporated in this measure are pregnancy losses and calf mortality at calving.

\[
\frac{\text{Calves born within a 12 month period}}{\text{Females joined in the previous 12 month period}} \times 100\%
\]
Weaning rate

Weaning rate represents the proportion of weaners weaned relative to the number of breeders mated in the previous 12 months. Incorporated in this measure are pregnancy losses, calf mortality around calving and calf survivability to weaning which may include some husbandry practices such as dehorning or castration.

There are two common methods for calculating weaning rate.

**Method 1:**

\[
\frac{\text{Calves weaned}}{\text{Females joined in previous 12 month period}} \times 100\%
\]

**Method 2:**

\[
\frac{\text{Number of weaners in yard}}{\text{Number of cows in yard}} \times 100\%
\]

Method 2 is an easy way of working out the weaning rate; however, it does not incorporate breeder mortalities or culling practices. It is not a realistic measure of breeding herd performance and Method 1 should be used where possible. The average estimated weaning percentage for the Katherine region over a three year period up to and including 2004 was 71%, with a minimum of 50% and a maximum of 85%. Table 1 shows the variation between districts according to the Pastoral Industry Survey 2004.

### Table 1. Weaning percentages in different districts (2004)

<table>
<thead>
<tr>
<th>District</th>
<th>Average weaning (%)</th>
<th>Minimum (%)</th>
<th>Maximum (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kath/Daly</td>
<td>69</td>
<td>60</td>
<td>80</td>
</tr>
<tr>
<td>Roper</td>
<td>67</td>
<td>60</td>
<td>75</td>
</tr>
<tr>
<td>Victoria River</td>
<td>74</td>
<td>60</td>
<td>85</td>
</tr>
<tr>
<td>Sturt Plateau</td>
<td>70</td>
<td>60</td>
<td>80</td>
</tr>
<tr>
<td>Gulf</td>
<td>64</td>
<td>50</td>
<td>70</td>
</tr>
</tbody>
</table>

Research breeding herds at Victoria River Research Station (VRRS) have consistently recorded weaning rates of between 80–85%. These herds are supplemented year-round and weaned at 100kg.

Inter-calving interval

The inter-calving interval represents the average number of months between successive calvings in a herd. This measure also represents the average time it takes the herd to get back into calf (that is carried to term) after calving. Calculating inter-calving intervals relates to calving rate (Figure 1) and can be used in investigating where potential losses are occurring.

On site investigation of breeding herds has shown that inter-calving intervals on commercial stations range between 14 and 15 months. Breeding herds at VRRS have recorded inter-calving intervals of between 13 and 13.5 months.

![Figure 1. Relationship between inter-calving interval and calving percentage](image)

Losses from confirmed pregnancy to weaning

Research conducted in northern Australia has indicated that losses from confirmed pregnancy to weaning ranged between 15 and 30% in heifers and 5 to 10% losses in breeder mobs are not uncommon. If reproductive losses greater than this occur, an investigation is recommended.

Even though some of the causes of these losses have been determined, the relative contribution of each of these causes has not been determined. A study conducted on the Barkly Tableland found that 63% of calf losses in heifers were perinatal (five months before birth to one month after birth) and were primarily due to dystocia, mis-mothering and unknown causes. An MLA funded project conducted across northern Australia, ‘CashCow’, aims to identify the risk factors significantly associated with perinatal mortality. Using these findings, studies will be designed to improve our ability to explain these losses.

Wet cow re-conception rate

The wet cow re-conception rate represents the proportion of cows that are pregnant and lactating and is generally recorded at first-round muster. The wet cow re-conception rate in May/June is often between 35 and 45% on commercial stations. The wet cow re-conception rate does not relate closely to weaning rate in continuously mated herds between years but it does represent the proportion of the herd capable of re-conceiving while lactating, which is sometimes used as the basis for a breeder being retained under intensive culling regimes. Wet cow re-conception can be especially low in second calf heifers (less than 10%). Wet cow re-conception rates of 30–40% are often recorded in the Katherine region. These figures are highly dependent on the condition of the cows at the time of calving which is influenced by season, genetics, stocking rate, supplementation and weaning practices.

Breeding herd efficiency

Breeding herd efficiency (BHE) is one of the most informative measures of breeding herd productivity. It is a measure based on weaner production from the weight of cows mated, and is therefore independent of cow size (maturity type). BHE is commonly presented as kg weaned per 100kg breeder mated, 1 tonne of breeder mated or per AE. It is recommended that the kg weaned per AE be adopted. A benchmark of 150kg weaned per AE mated (33.5kg weaned per 100kg breeder mated) the previous year is commonly cited for the Katherine region.
**Turn-off efficiency**

A more complete measure of breeder herd productivity that can be used is turn-off efficiency. It is a measure based both on weaner production and breeders sold from the weight of cows mated the previous year. This measure is commonly presented as either kg/AE mated or kg/km².

\[
\text{BHE (kg/AE mated)} = \frac{\text{kg weaned}}{\text{kg of breeders mated in previous 12 month period}} \times 450
\]

\[
\text{kg/AE mated} = \frac{\text{kg weaned + kg surplus & cull breeders sold – kg replacement breeders added}}{\text{kg of breeders mated in previous 12 month period}} \times 450
\]

\[
\text{kg/km}^2 = \frac{\text{kg weaned + kg surplus & cull breeders sold – kg replacement breeders added}}{\text{area (km}^2) \text{ herd utilised in previous 12 month period}}
\]

**Mortality rate**

Breeder mortality rates are often underestimated and can be difficult to determine between years. Table 2 shows the average district mortality rates in breeders according to the Pastoral Industry Survey 2004.

**Table 2.** Mortality rates according to district (2004)

<table>
<thead>
<tr>
<th>District</th>
<th>Average mortality (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kath/Daly</td>
<td>2.2</td>
</tr>
<tr>
<td>Roper</td>
<td>3.3</td>
</tr>
<tr>
<td>Victoria River</td>
<td>3.0</td>
</tr>
<tr>
<td>Sturt Plateau</td>
<td>3.2</td>
</tr>
<tr>
<td>Gulf</td>
<td>2.7</td>
</tr>
</tbody>
</table>

Results from well-managed recorded herds indicate that annual breeder mortality should be less than 2%.

Breeder cow mortality rates are the single most important parameter to identify, and for the industry to acknowledge and address, in the northern beef industry. Invariably, the figures are grossly underestimated and reported—especially from regions where mustering efficiency is a problem as the majority of dead animals are seldom seen.

There are three easy ways to gauge whether a problem with mortality rates exists or not:

1. Weaning numbers compared to sales data: The sales number should be slightly less than the number of calves weaned annually in a herd that is not in a build phase.
2. Sale of cull heifers: Properties that never sell cull heifers, or only a small proportion of heifers, are indicative of enterprises that have a significant problem.
3. The proportion of females that are sold each year as a percentage of total sales: If a breeding herd does not have significant mortality rates in the breeders, and if the size of the herd is not increasing over time, then approximately 48%+ of the turn-off should be females.

**Weighing cattle**

Weighing cattle is a very accurate but imprecise measure because an animal’s weight is greatly influenced by gut fill. Liveweight measurements are more precise when cattle have been fasting, thereby reducing the variation in gut fill. Fasting is either wet or dry and is usually conducted over a 12 hour period (a night). In a wet fast animals have access to water only. In a dry fast animals have no access to water or food. Animals under a dry fast lose approximately 7% of their full weight after 12 hours.

Stage of pregnancy also influences liveweight which can be corrected for using Table 3.

**Table 3.** Weight of gravid uterus to correct cow weight for pregnancy (O’Rourke et al., 1991)

<table>
<thead>
<tr>
<th>Months pregnant</th>
<th>Weight of gravid uterus (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>1</td>
</tr>
<tr>
<td>2.0</td>
<td>2</td>
</tr>
<tr>
<td>3.0</td>
<td>4</td>
</tr>
<tr>
<td>4.0</td>
<td>7</td>
</tr>
<tr>
<td>5.0</td>
<td>11</td>
</tr>
<tr>
<td>6.0</td>
<td>17</td>
</tr>
<tr>
<td>7.0</td>
<td>26</td>
</tr>
<tr>
<td>8.0</td>
<td>40</td>
</tr>
<tr>
<td>9.0</td>
<td>58</td>
</tr>
<tr>
<td>9.4</td>
<td>67</td>
</tr>
</tbody>
</table>
**Liveweight gains**

The liveweight gain (LWG) of an animal is influenced by a number of factors including age, condition, stocking rate, pasture type, maturity type, genetics, disease and environmental factors. A large amount of variation exists between regions and within herds. A current MLA funded project 'Identification of causal factors affecting liveweight gain in Northern Territory Cattle Herds', aims to define the main influencing factors of LWG in NT herds.

Post-weaning performance in the Katherine region is commonly reported as between 100–150kg/ha/yr depending on the location. Animals put on most or all of their weight gain during the wet season with little or no liveweight gains generally recorded across the dry season; some animals may even lose weight across the dry season. The lighter weight group weaners usually perform better during the dry season and across the year than their heavier counterparts. A study conducted at Mt Sanford found that calves weaned at 100–140kg recorded LWGs of 3.2 kg/hd across the dry season as opposed to those weaned at 221–260kg which recorded LWGs of -19.2 kg/hd. However, even though heavier weaners did not perform as well in terms of LWG, their final weights were heavier than the weaners that were weaned at a lighter weight.

Apart from timing of calving, a pre-weaning liveweight gain, or calf growth is a major influencing factor of weaning weight. Factors that may influence pre-weaning weight gains are nutrition (both cow and calf), genotype, and sex. Pre-weaning growth rates of calves at VRRS were recorded as 0.83kg/hd/d during the wet season and 0.65kg/hd/d during the dry season. Male calves on average across seasons have a pre-weaning growth rates of 0.76kg/hd/d and female calves 0.71kg/hd/d.

**Further information**


Meat and Livestock Australia (2006), *Managing the Breeder Herd; Practical Steps to Breeding Livestock in Northern Australia*.


**Related topics**

Bull Selection, Heifer Management, Weaning.
Spaying (also known as ovariectomy) is the surgical removal of the ovaries. It is often used in northern Australia in extensive beef cattle herds as a contraceptive method when control of bulls is difficult. Spaying to avoid pregnancy is an important way of guaranteeing survival and value-adding to cull females. This is particularly important for export markets.

Spaying is a skilled technique. Courses are available through the CDU Rural College and accreditation is available from the Chief Veterinary Officer (DRDPIFR) for laypersons who plan to work as skilled operators. These notes are not in any way an adequate basis for learning to spay, and are not intended for that purpose.

The two main methods of spaying used in the Northern Territory are the Willis Dropped Ovary Technique (WDOT) and flank spaying. Flank spaying is no longer recommended except where practised by an experienced vet and may now contravene the Animal Welfare Act. The WDOT is therefore the only technique discussed in detail here.

**Willis Dropped Ovary Technique**

The WDOT has been widely adopted in northern Australia since its introduction in 1997, particularly in heifers. It is known as the ‘dropped ovary’ technique because when the ovaries are cut off by the ovariotome they drop inside the abdomen.

The ovariotome, a stainless steel rod about 48cm long and 6mm in diameter, is introduced into the vagina and placed against the vaginal wall above the cervix. The operator then inserts a gloved arm in the rectum to manipulate the reproductive tract. The vaginal wall is then pierced with the spearhead end and the ovariotome passed into the abdomen. Each ovary is then manipulated per rectum and placed into the oval hole of the ovariotome. The ovaries are cut off by pulling back on the ovariotome which draws the ovaries into the cutting slot. Australian cattle veterinarians have produced a manual on this technique (see Further Information).

**Benefits of the WDOT include:**

- speed (quicker than other surgical spaying methods)
- reduced risk of mortality in non-pregnant cattle
- done in a standard crush
- shorter recovery period
- no hide damage.

**Selecting cattle for spaying using the WDOT**

Candidates for spaying are surplus lactating cows and heifers. Surplus dry cows are usually already in marketable condition and do not need to be spayed. De Witte, et al. (2006) suggest the following factors should be considered when selecting females to be spayed.

**Animal size**

The minimum size of an animal depends on the size of the operator’s hand and forearm relative to the size of the animal’s anus and rectum. A liveweight of 180kg is the recommended lower limit.

**Body condition**

Although females in poor condition can be WDOT spayed, there are a number of reasons why it is better to wait until
the body condition score has improved before performing the procedure. Animals in poor condition:

- are prone to pneumorectum (sucking air into the rectum) which increases the difficulty and risks associated with the procedure
- may be suffering anaemia from internal or external parasites, and so may have a higher mortality rate after spaying.

**Time since calving**

Recently calved cows should not be spayed using the WDOT. It is recommended that cows not be spayed using this technique until four weeks after calving.

**Stage of pregnancy**

Early pregnant animals, up to about four months gestation, can be spayed with the Willis three technique.

**Feed and water**

It is not necessary to have a water curfew before spaying. A 12-hour feed fast reduces rumen fill and assists with the performance of the operation. Water should be made readily available and easily accessible for at least 10 days following the procedure.

**Time of year**

In hotter times, females should be spayed in the early morning or late afternoon. Plan to spay as many females as possible at the first-round muster. Heavy tick burdens and dehorning the animal at around the same time, particularly in the late dry season, may result in severe stress to the animal and increase the risk of mortality.

**Flank spaying**

The flank spaying method is suitable for use on pregnant cows or heifers that are too small for WDOT spaying. When performed by very experienced veterinarians, there is no evidence of worse outcomes from flank spaying than the WDOT. For any other operators, this technique is not encouraged.

Vets conducting flank spaying may refer to ‘webbing’ the animal as an alternative to removing the ovaries. Webbing involves severing the mesosalpinx ligament connecting the ovaries and the fallopian tubes without removing the ovaries. Anecdotal evidence suggests that webbing animals can minimise mortalities in certain classes of stock, particularly well-conditioned breeders.

**Chemical spaying**

There is considerable interest, particularly from remote areas, for producers to be able to spay cows with a simple vaccination or implant. This is technically possible. In the early 1990s, a product called Vaxstrate® was released, but it was not a commercial success and was later taken off the market. Since then better products have been developed, but have not been released because they too would be more costly than surgical spaying and are not commercially viable. There appears to be no prospect of these products being released in the near future.

**SUMMARY OF BEST PRACTICE**

- The WDOT is most acceptable. Flank spaying cannot be condoned anymore.
- Animals should not be unnecessarily stressed before, during or after spaying.
- A water fast is not necessary before spaying.
- A 12-hour fast reduces rumen fill and assists with the operation. Following spaying water should be readily available.
- Concurrent spaying and dehorning is not recommended. Animals recently dehorned, carrying heavy cattle tick burdens, or weak or emaciated should be allowed to recover before spaying.
- Effective restraint in a cattle crush must be used for the safety of the animal and operator.
- Spaying must not be performed under extreme environmental conditions of heat, cold or rain.
- Hygienic techniques must be employed.
- Spayed cattle should be allowed to settle on to feed and water in the yards for several hours after spaying, before returning to a paddock.
- Spayed cattle should be monitored and not droved for long distances.
- Three weeks after WDOT spaying (or six weeks after flank spaying by an experienced vet), animals are considered sufficiently recovered for sale and long-distance transport.

**Sources**


**Further information**

The Dropped Ovary Technique for Spaying Cattle – A Training Manual,

Contact Australian Cattle Veterinarians Ph: (07) 3423 1799 or Email: aacv@ava.com.au for a copy.

**Related topics**

Animal Welfare, Culling Breeders, Heifer Management.
Chapter Two: Cattle Management

Stock Handling

Understanding the value of a safer working environment for staff and improved performance from livestock has resulted in many producers investing in low-stress cattle handling techniques and training. The Pastoral Industry Survey for the Northern Territory (2004) showed that low-stress stock handling ranked seventh most frequent out of 27 types of training undertaken on properties.

The business benefits of training staff in animal handling are significant, leading to improved production gains, better meat quality and higher economic return for the livestock industry. Research shows that one of the major causes of losses in meat quality (bruises, meat downgrades) is poor handling by stockpersons. Defects can be caused by poor transport and pre-slaughter handling (bruising and carcass downgrades). From a live export perspective, animals stressed by inappropriate handling during loading and transit have been shown to have higher shrinkage rates and take longer to go back on feed.

Characteristics of cattle

Good stockhandlers will have an understanding of behavioural characteristics of cattle and will:

- realise that cattle view us as predators. Understand that because cattle are prey animals, their main instinct is for self-preservation. This can make them cautious and fearful until they have learned otherwise. Remember not to take cattle’s behaviour personally when they don’t do what we would like them to. They could feel like they are in a life or death situation.

- understand that cattle fear novelty and that an unusual object, or something out of the ordinary may often be the reason for balking. They require time to make sure that it is not something that is going to hurt them.

- know the importance of body language when working cattle. Cattle understand intent; if we have aggressive body language they will react to protect themselves from this.

- appreciate that cattle are social herd animals. Separating an animal from the mob can be stressful for it. Understand that a mob has a social hierarchy and that mixing different mobs of cattle will affect this. Sometimes a handler will be less of a threat than a more dominant beast and the most direct line of escape might be straight past (or over) the handler. Stockhandlers should be aware of this as new social hierarchies are determined.

- understand that cattle like to follow each other and that this can be used to the handler’s advantage.

- understand cattle have poor depth perception which makes it hard for them to read how far away a handler is. Gentle side to side movement from a handler can help animals gauge where the stockperson is and help avert potential stand-offs. Give them time to look at where they are going.

- know cattle have a limited field of vision which means anyone working outside their field of vision will cause them to turn around to see what is pressuring them (Figure 1).
Stock Handling

Figure 1. Field of vision of a cow. They cannot see into the shaded area when their head is forward. (Blackshaw 1986)

- know that cattle have different optimal hearing frequencies to us and that high frequency sounds induce fear. Humans can hear a range of 64–23,000 Hz, dogs can hear 67–45,000 Hz, and cattle can hear a range of 23–65,000 Hz which makes them much more sensitive than people to loud, high pitched noises.

- understand that animals have an invisible ‘bubble’ of personal space around them which is referred to as the flight zone. It is the distance at which animals will take action to move themselves away from a person. This differs according to the temperament of the cattle and the amount and type of de-sensitisation, or handling they have received. Brahman cattle are renowned for having a larger flight zone than other breeds, but also for responding well to training.

Pressure, release and position

Stress is not necessarily the same thing as pressure. Stress displays as a series of physiological symptoms such as raised cortisol (a stress hormone) levels and increased heartbeat which normally would help them to react to danger to save themselves. High levels of repeated exposure to stress, makes them more prone to illness and poor productivity. Cattle that have been desensitised to stressors of husbandry and transport are more likely to be calm and responsive when exposed to them again. Animals will quickly demonstrate signs of being stressed if pressures are applied which they do not understand or know how to react to or gain relief from.

Reducing stress in livestock does not mean no longer placing any pressure on livestock. Research shows that animals that have never been previously exposed to any handling or pressure experience more stress, ill health and lower growth rates than those who have received the right type of handling both prior to, and when they are trucked and placed in a new environment.

Reducing stress requires handlers to have an ability to read the reactions and body language of the cattle and have a good understanding of a cow’s field of vision, and where to place themselves in that field of vision to achieve the desired result. The eye can be divided into three sections. Positioning in the forward section stops or slows the animals, the middle section allows you to travel with, or drift the animals and the moving into the rear section of the eye causes the animals to move forward away from the handler.

Undue stress is not necessarily caused by pressure being applied to an animal; it is more about whether the pressure is appropriate to the response required and if it is released quickly enough for the animal to learn that they can react in such a way as to remove the pressure (and that they are not going to be harmed by that pressure). Hitting and yelling should not be required. Livestock handlers must be observant enough to read the animal’s body language to gauge where they should be positioned, and have the timing to react quickly and remove themselves from the edge of the flight zone when the required amount of pressure has been applied to achieve the desired outcome. Little pressure is required when handlers are skilled observers of the animals. Handlers skilled at reading the livestock and placing themselves in the correct position in relation to the flight zone and the sections of the animals eye, will have softer, more willing, less stressed and more productive cattle.

Working with the mob

Working the lead of a mob is an effective method of reducing stress on livestock. Applying too much pressure from behind (particularly if the animals can’t see handlers) means animals are unable to gain relief from the stress of the move, causing them to break back over handlers or out of the mob. While an animal may be blamed for misbehaviour, invariably a handler’s incorrect position or inability to read the animal has placed too much pressure on it, leaving it with nowhere to go, except out of the mob.

Observant livestock handlers look for the leaders in the mob, understanding that these animals will often be the most sensitive to pressure, and use them to get the mob where they need to go. Brahman cattle are known for their following behaviour, and experienced stock people will capitalise on this. If the lead is worked correctly, the tail will follow.

In addition to the production benefits of training the animals, weaner tailing can be an excellent time to teach new staff to observe how a mob works, the effects of pressure and release, understanding flight zones, correct placement around the animal and the mob to achieve the desired direction and identifying leaders and their behaviour.

Understanding livestock behaviour and using it to increase the welfare of animals and staff is rewarding from a welfare and economic perspective. Livestock handling courses are a good way to gain ideas and information.
SUMMARY OF BEST PRACTICE

- Implementing good stock handling techniques benefits staff and animals from welfare, OH&S and economic perspectives.
- Reducing stress requires an ability to read and respond to the animals’ body language which removes the pressure from them.
- Stock handling requires knowledge of flight zones, when to apply pressure, when to release pressure and correct positioning of handlers.

Sources
Blackshaw, J. (1986), Notes on some topics in applied animal behaviour, University of Queensland, St. Lucia. www.animalbehaviour.net.

Further information
Bud Williams Stockmanship School www.stockmanship.com
Low Stress Stock Handling www.lss.net.au
Dr Temple Grandin’s website: Livestock Behaviour, Design of Facilities and Humane Slaughter www.grandin.com
Working Dog and Stockhandling Courses.
Contact Neil McDonald Ph: (08) 8973 9746.

Related topics
Transporting Cattle - Pre-transport Management, Weaning, Working Dogs.
Transporting Cattle – Pre-transport Management

Transport is acknowledged as one of the most traumatic events in a domestic animal's life. Management of livestock prior to transport has a large impact on how well they will travel. Stress during transport has been linked to decreased meat quality, increased levels of sickness and decreased productivity (e.g. increased shrinkage). It is therefore in a producer’s best interest to ensure that stress is minimised wherever possible.

Communication with driver

Ensure that you let the driver know the following:

- where and when to load
- where cattle are going
- type (breed and class) and number of cattle to load
- fitness/condition of cattle (including pregnancy status)
- road conditions
- expected weather conditions
- how long the cattle have been off water and feed
- how cattle have travelled in the past.

Loading facilities

Loading is one of the more stressful events of the transport process, and the quality of the facilities can have a big influence on this. It is the responsibility of the producer to provide adequate and well-maintained holding and loading facilities. This includes ensuring no protrusions or sharp edges exist which may cause injury, and the provision of ramps that meet minimum design standards. This will enable trucks to align correctly, and for cattle to load/unload more efficiently.

The minimum standards as recommended by the Queensland Department of Primary Industries and Fisheries for single deck loading ramps for cattle are:

- floor height maximum 1,200mm
- loading ramp width 760mm
- unloading ramp width 3,000mm
- ramp sides height 1,800mm
- catwalks 800–900mm
- platform at least 1,500mm long (flat area at the top of the ramp)
- sliding gates at the top and bottom of the loading ramp.

For more information on single and double deck loading ramp design refer to the QDPIF Note ‘Cattle transport: minimum design standards for loading ramps’ (see Sources).

Mustering

Mustering should be carried out quietly and carefully to avoid undue stress to the animal. Cattle require time to settle after mustering, particularly after a difficult yard up or in adverse weather conditions. The Australian Model Code of Practice for the Welfare of Animals states that a rest period after mustering and handling of at least 12 hours is essential before transport. Experienced truck drivers observe that spelled cattle always travel better.

Curfew

Keeping cattle off water and green feed 6–12 hours prior to transport helps to improve the transport process. Cattle that are not fasted will defecate and urinate more, creating a slippery surface regardless of the crate floor.
This leads to more animals slipping and going down on the journey. Research has shown that loss of balance and falling significantly increase stress during transport (Swanson & Morrow-Tesch, 2001).

**Loading densities**

Loading cattle too light or too heavy results in diminished welfare of the stock. Cattle need enough room to regain their feet if they go down. They also need to be in close enough contact with other animals to mutually support each other. Research has shown that cattle transported at higher than recommended stocking densities have elevated levels of stress, bruising and go down more. The losses attributable to overloading far outweigh the gains of a few saved dollars in transport costs, particularly if a beast dies in transit.

The person best able to determine the appropriate loading rate will be an experienced driver, who has trucked thousands of cattle, and witnessed how cattle travel. A guide to loading densities is shown in the following figures.

**Good density**

**Shrinkage rates**

Feed and water curfews, in combination with transport, can result in significant weight loss, mainly through loss of body fluid and gut contents. On average cattle will lose 8% bodyweight over 1,000km, but much lower or higher rates do occur. The length of time that cattle are deprived of feed and water is the single greatest factor in determining the degree of shrink experienced. However, cattle can lose more weight in hotter weather, if they are of poor temperament or are stressed. The effectiveness of electrolytes in reducing dehydration and weight loss (pre- and post-transport), while best practice in some places, is questionable. Few producers in the Katherine region administer electrolytes pre-transport.

More recently, research suggests that a pre-transport novel oral supplement (osmloyte glycerol) could reduce loss of body water, assist in delaying effects of dehydration, aid preservation of carcase protein and quality and boost the immune system (MLA 2005).

Shrinkage rates will be less when:

- all stressors are minimised
- cattle have had time to settle after muster and yard procedures, e.g. pregnancy testing, drafting
- cattle are of quiet temperament.

**Look after the drivers**

Transporting cattle is not an easy business, with drivers often travelling a long way to get to the loading point, and having a long way to go before cattle are unloaded. Remember, a truck travels slowly on rough roads. It is a matter of courtesy for the producer to have everything right to go when the trucks arrive and with increased focus on fatigue management policy for drivers, producers have a role to play in ensuring drivers are able to maximise their driving time for the benefit of themselves and the industry.

A few points to note:

- A driver should not be expected to work in the back yards and isn’t covered by workers compensation if he gets hurt.
- Cattle should be drafted and ready to load when trucks arrive.
- Ask if drivers need a hand to load and how you can best be of assistance.
- Offer drivers a shower and a feed.
- Ensure the relevant paper work is filled out correctly and supplied to the driver.
- Consider driver fatigue and the trip length when planning when to load cattle.
SUMMARY OF BEST PRACTICE

- Plan trucking movements with due consideration to spelling and feed curfews, weather, access, driving times etc.
- Communicate your requirements to the driver and appreciate his requirements and constraints.
- Show hospitality to truck drivers.
- Carefully consider loading densities. Seek the truck driver’s advice.
- Ensure loading facilities meet minimum standards for safety and welfare of stock and handlers.
- Minimise all stressors. Allow cattle time to settle after mustering, pregnancy testing, branding etc.

Sources


Further information


Related topics

Animal Welfare, NLIS in the Northern Territory, Stockhandling, Yard Design.
Water Consumption

Animals need water for biological functions such as excretion of waste in urine and faeces, transportation of nutrients in the blood, milk production and control of body heat by sweating and panting. The body of an adult cow contains 70 per cent water. A 10 per cent loss of total body water without replenishment can be life-threatening. On a hot day, loss of water in urine, faeces, respiration and sweat can amount to 15 per cent of liveweight. Only about a quarter of daily requirements may be replaced from green pasture and the rest must be replaced by drinking water. Cattle on dry feed need to drink all their water requirements.

Water consumption requirements

The water requirements of cattle are closely related to dry matter (DM) intake of feed. The daily DM intake of roughage diets (e.g., pasture) 60% DMD is about 2% of liveweight for young cattle and 1.8% or less for adults.

For Brahman-type cattle (Bos indicus), daily water requirements are estimated to be 4.5L/kg DM intake of feed at ambient temperatures of 25°C, rising to 8L/kg DM feed intake at 35°C (SCA 1990). Temperate cattle (Bos taurus) require up to 25% more water than tropical breeds. Productive breeder cattle require at least 30% more water than dry cows. High humidity with higher temperatures increases thirst as does water containing salt at concentrations above 2,000mg per litre.

Estimates of allowances for water for Brahman-type cattle at different ambient temperatures are given in table 1, assuming on average a DM intake of feed of 1.8% liveweight.

Water trough supply

A water trough with dimensions of 6m x 0.375 radius holds 1.325 cubic metres of water or 1,325L and takes 11 minutes to fill at flow rate of 50L a minute. Cattle need about 30–50cm head space (depending on size of animal) to access the trough and their drinking rate is about five litres of water per minute.

The number of Brahman weaners (250kg) on dry feed at the end of the dry season (30°C) that can be supplied with their daily water requirements by a trough holding, 1,325L may be calculated as follows:

- Each weaner will require 27L per day.
- The trough can supply the requirements of 49 head (1,325/38). If 20 animals on each side (head space 30cm) can access the trough at once, all 40 head are able to drink their requirements in about 5 ½ minutes and the water supply should keep up.
- If the trough refills at 1,200L every 10 minutes, 44 weaners can drink their allowance every 10 minutes, or 264 head an hour.
- At this rate, a total of about 800 head can be watered over a three-hour period. The maximum time suggested for a mob of cattle to remain at watering points on a daily basis is six hours.

In reality, water requirements of cattle vary from day to day and they usually drink about one third of their requirements at one time. A common rule of thumb is to allow sufficient trough space and water supply for 10% of the herd to drink at once.

The above example is only provided to put supply and allowances of water for cattle into perspective. You will need to recalculate water requirements for your own situation and this should be based on maximum projected water allowances and stocking rate, plus a safety margin.
Table 1. Water requirements for *Bos indicus* cattle (Litres/day)

<table>
<thead>
<tr>
<th>Liveweight (kg)</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>25°C</td>
</tr>
<tr>
<td>250</td>
<td>20</td>
</tr>
<tr>
<td>300</td>
<td>24</td>
</tr>
<tr>
<td>350</td>
<td>28</td>
</tr>
<tr>
<td>400</td>
<td>32</td>
</tr>
<tr>
<td>Pregnant (450)</td>
<td>47</td>
</tr>
<tr>
<td>Lactating (12L milk)</td>
<td>59</td>
</tr>
</tbody>
</table>

**SUMMARY OF BEST PRACTICE**

- Calculate water requirements for your own situation based on a maximum projected water allowance and stocking rate, plus a safety margin.

**Sources**

SCA (1990), *Feeding standards for Australian livestock: Ruminants*. CSIRO.


**Related topics**

Dam (Excavated Earth Tank) Establishment, Distance to Water, Water Quality.
Water Quality

Quality of water has a direct effect on daily consumption of water by stock. This in turn influences feed consumption and overall performance. Poor water quality can cause a reduction in intake and lead to health problems and loss of production. Water should be tested for its suitability for stock. The most important things to test in water for domestic stock use are pH, salinity (often measured as electrical conductivity, EC) and chloride levels. Water testing services are available at Berrimah Diagnostic Services Water Chemistry Laboratory. Samples for domestic stock use can be taken in an ordinary plastic bottle and do not require refrigeration.

pH
Water for domestic stock use should be in the pH range of 6.5 to 8.5. If the pH is less than 5.5, acidosis and reduced feed intake may occur. Highly alkaline water (over pH 9) may cause digestive upsets and diarrhoea, lower feed conversion efficiency and reduce intake of water and feed.

Salinity
Salinity (total dissolved salts) is the sum of all mineral salts present in the water, including sodium, calcium, magnesium, chloride, sulphate and carbonate. The maximum salinity level for beef cattle is 9,000mg/L, but any more than 6,000mg/L is not suitable for lactating cows and calves. Evaporation can cause an increase in total dissolved salts. Water tested from dams or rivers as suitable for stock early in the dry season, may become significantly more saline as the year progresses.

Chloride
An excess of chloride is synonymous with salt (sodium chloride) toxicity. In ruminants, excessive chloride levels increase osmotic pressure in the rumen. This causes a reduction in food intake. Excess sodium chloride can result in dehydration, kidney failure, nervous system dysfunction and death. The maximum acceptable level of chloride in water for beef cattle is 4,000mg/L.

Fluoride
Excessive amounts of fluoride in water supplies can cause production losses. Fluoride concentrations of more than 2mg/L in water can cause tooth damage to growing animals and bone lesions and brittle bones in older animals. If the feed contains fluoride then the maximum fluoride level should be only 1mg/L.

Calcium
Levels above 1,000 mg/L may cause phosphorus deficiency by interfering with phosphorus absorption in the gastrointestinal tract.

Sulphate
No adverse effects should be expected below 1,000mg/L. Between 1,000 and 2,000mg/L sulphate can cause diarrhoea, particularly in young cattle. Concentration above 2,000mg/L can cause chronic or acute health problems.

Nitrate
Excess nitrate can cause toxic symptoms and even death by reducing the oxygen carrying capacity of the blood. Stock may tolerate higher nitrate concentrations in drinking water provided nitrate concentrations in feed are not high. Levels above 1,500mg/L are likely to be toxic and should be avoided.
Blue green algae

Blue green algae (cyanobacteria) is not a common problem in the Katherine region, but is worth watching out for, and investigating if you experience unexplained deaths in cattle. Pollution of water with fertiliser and excreta provides nutrients for algal blooms which grow rapidly under warm sunny conditions, particularly in shallow water. The consumption of only small quantities of water infected with the bacteria can be lethal due to the high concentration of neurotoxins.

Dams should preferably be deep with relatively small surface area, and if blooms occur, stock should be denied access. Water tanks should have covers to exclude light to prevent growth of bacteria.

Sources

SCA (1990), Feeding standards for Australian livestock: Ruminants. CSIRO.

Further information

Berrimah Diagnostic Services Water Chemistry Laboratory Ph: (08) 8999 2196, BAL Building, Berrimah Farm, Makagon Rd, Berrimah.

Related topics

Water Medication, Water Requirements.
Weaning is a crucial management practice to ensure breeder body condition is maintained. A well-managed weaning program increases the ability of the breeder to maintain sufficient body reserves to re-conceive whilst lactating, and decreases her chances of mortality at the end of the dry season.

Weaning as a herd management tool

The ideal minimum size of weaners is a topic for debate amongst Katherine pastoralists. Weaning is principally to protect cow condition, so the timing and frequency of weaning and size or age of weaners may vary between stations depending on the nutrition available. The average weight of the weaner crop can be much higher than the minimum weaning weight and will depend on when peak calving occurred.

Research at Victoria River Research Station has shown that weaning down to a minimum of 100kg (roughly three months old) has no long-term effects on the growth of the weaner, provided good-quality native pasture, preferably wet season spelled, and a urea supplement are made available. It is well documented that lighter weaned calves with functioning rumens experience no long-term setbacks compared with their heavier weaned cohorts. In fact, research at Mt Sanford indicated that lighter weaners performed better than heavier weaners over the dry season.

The 100kg weaning weight is a good compromise between the requirements of the calf and maintaining adequate condition of breeders. Producers in the Katherine region indicated in the Pastoral Industry Survey (2004) survey that their minimum weight at first-round averaged 108kg, and minimum weight at second-round (when breeder condition is more of an issue) averaged 98kg.

Brahman cattle are particularly subject to lactation anoestrus where a breeder experiencing inadequate nutrition is prevented from cycling due to the hormonal response to suckling of a calf. In order to achieve a 12 month calving interval or less, breeders have to maintain sufficient body reserves to cycle and re-conceive within three months of calving. In Bos indicus cattle, conception rates usually increase after weaning however, if a 12-month inter-calving interval is to be achieved, the breeder must be pregnant at the time of weaning. Weaning therefore should be seen as a tool to prevent the breeder cow loosing excessive condition and to ensure that she actually calves in condition score of around 5 (see topic Condition Scoring). Weaning generally needs to be carried out twice-yearly in continuously mated herds to counter lactation anoestrus and the difficulty of maintaining breeder condition during the harsh dry season. Evidence from north Queensland shows that weaning at the start of the dry season conserved breeder liveweights by 10–15kg/month over the dry, about twice the benefit of feeding urea-based supplements (Dixon, 1998).

A higher incidence of breeders with insufficient body reserves to re-conceive soon after calving results in these breeders lactating during un-favourable conditions and high numbers of out-of-season calves. Consequences of this include increased breeder mortality and supplement costs and having to keep young stock longer in order to reach target turn-off weights.

Early weaning is weaning from 100kg down to 60kg or less, sometimes warranted under conditions such as very dry years or to ensure survival of heifers. Some producers practise this successfully but the cost and benefits need to be considered very carefully. This decision requires balancing the economics of the infrastructure, feeding and management costs of maintaining such young weaners against the costs of breeder mortality and anoestrus and supplement/feed required to prevent breeder mortality during poor seasons.
Weaning processes

Training
As with people, the younger the calf, the easier it is for it to learn. Weaning is an ideal time to expose cattle to the stresses they will need to handle later in life. Ensuring their first experience is as pleasant as possible (providing feed, water and a free run through the handling facilities) reduces the stress experienced when husbandry procedures are practised on them throughout their lifetime. Keeping weaners in yards for at least five days also allows them to learn to eat novel foods such as hay, pellets or supplements, establish social orders in confined spaces and de-sensitises them to noises and movements of people and vehicles. This equips them to handle these stresses much better when exposed to them in later life.

It is important to expose weaners to all of the types of handling they will receive later in life e.g. tailing out on horseback during the day will teach them to be handled by horsemen, working them through the yards on foot will familiarise them with people on the ground. Weaning is the ideal time to introduce cattle to dogs. Having a few quiet trained older animals with the weaners is a good way of helping settle the weaners down more quickly and provides a lead for fresh weaners to follow.

Research conducted through the Beef Co-operative Research Centre on the effects of yard weaning on subsequent feedlot performance found that after 90 days on feed, the estimated added value of yard weaning, even after deducting costs, was $25/head over cattle just weaned into the paddock. This benefit was mainly attributed to increased growth rates when on feed. It has also been proven that calves weaned properly also have a much lower prevalence of disease, such as Bovine Respiratory Disease, when they enter feedlots.

Nutrition
As discussed earlier, the most cost-effective strategy for feeding weaners over 100kg is to provide wet season spelled pasture with a urea-based supplement in the dry season and a phosphorus-based supplement during the wet season.

Early weaned calves require an energy and true protein source, in addition to good quality hay or saved pasture. Sources of energy and true protein include feeds such as copra meal and calf pellets. The main costs of early weaners are for nutrition, infrastructure and management. But it is generally cheaper to feed weaners than to supply sufficient feed to lactating cows. Weaners rations need to ensure animals below 100kg’s are growing at least 0.4 kg/day to prevent stress-related post-weaning diseases such as coccidiosis. Drafting weaners into lines according to size when feeding in yards helps to prevent bullying.

Consult the Animal Production Officer Katherine for assistance with formulating rations and calculating the cost of different strategies for feeding weaners.

Health
Coccidiosis is a major threat to weaners under nutritional stress (see Coccidiosis). Including rumen modifiers such as Rumensin™ in a ration will help prevent the incidence of coccidiosis. All weaners should receive immunisation for botulism at weaning. Vitamin A and E deficiencies can occur in prolonged drought situations where cattle do not have any access to green pick. Deficiency does not often occur in the Katherine region, but may be considered if there is a prolonged dry season. Vitamin A and E deficiencies are treated by an intramuscular injection of a Vitamin A, D & E supplement.

SUMMARY OF BEST PRACTICE

• Wean twice-yearly, as early as possible in the dry season, down to 100kg.
• Feed weaners lighter than 100kg energy and true protein and try to have them separated from larger animals that may bully them from the feed. Handle weaners in yards, on horseback and foot, teach them to eat hay and drink from troughs.
• Vaccinate all weaners against botulism.

Sources

Further information
MLA (2006), Managing the breeder herd: Practical steps to breeding livestock in northern Australia, Meat and Livestock Australia, Sydney.
MLA EDGEnetwork® – The Breeding Edge course.
Contact Pastoral Production Extension Officer, DRDPIFR Katherine, Ph: (08) 8973 9739.
MLA EDGEnetwork® – The Nutrition Edge course.
Contact Pastoral Production Extension Officer, DRDPIFR Katherine, Ph: (08) 8973 9739.

Related topics
Botulism, Castrating Calves, Coccidiosis, Culling Breeders, Dehorning, Production Parameters, Stockhandling.
Chapter Three: Cattle Nutrition

Contents

1. Beef Cattle Management Throughout Dry Periods 126
2. Near Infrared Reflectance Spectroscopy (NIRS) 128
3. Supplementation 131
4. Water Medication 134
Chapter Three: Cattle Nutrition

Beef Cattle Management Throughout Dry Periods

The regular, reliable seasons experienced across much of the Katherine region over the past decade can give producers a false sense of security. Poor seasons can and do occur, and a strategy to deal with less than average rainfall is essential. If stocking rates (and therefore grazing pressure) are not adjusted to reflect actual seasonal conditions, land condition and pasture quality will decline.

Pasture management

Heavy grazing of perennial species during their vulnerable growing season leads to a reduction in pasture root biomass which results in the plant having a lower chance of surviving subsequent dry spells. The combination of drought and heavy grazing can accelerate the death of many grasses and significantly contribute to the degradation of land condition.

Perennial species are important in maintaining land condition as they not only provide groundcover but their robust root systems help hold the soil together. If these plants are lost, flow-on effects such as erosion are more likely to occur.

Herd management

The combination of long-term pasture degradation and lighter seasons can have serious effects on overall herd productivity if unmanaged. In a monsoonal environment, the optimal calving period is October to February, when the period from cows calving to re-conceiving is shortest. If breeder herds are not managed accordingly, i.e. weaners are left on their mothers and breeders’ body condition falls below 4 (on a 9 point scale), the likelihood of cows calving in this optimal period is reduced. A cumulative reduction in herd productivity results. Breeders may take a number of years to synchronise with the optimal calving season again. Therefore, it is important to prevent undue loss of breeder condition in the dry season in order to maintain or improve weaning percentages.

Weaning is a cost-effective tool for managing breeder condition. It is cheaper to feed the calf than to feed the cow sufficient to both maintain body condition and lactate. In normal years weaning calves down to 100kg will assist breeders to maintain condition over the dry and improve their chances of getting back in calf later in the year. In drought conditions calves can be weaned down to 60kg if given appropriate feed and management. If weaning lighter than 100kg protein meals, such as copra or cottonseed, are required for survival and to stop stunting.

There are several options which can be taken when supplementing weaners, from survival feeding through to achieving growth targets:

- Low cost, no supplement, but the problem may be survival. This option requires spelled native pastures and close monitoring and would only be suggested for weaners weighing more than 150kg.
- Low cost urea and minerals with spelled native pastures. This would hold weight loss and may have small gains and would be suggested for weaners weighing more than 100kg.
- High cost protein meal which would produce weight gains. This is required for weaners weighing less than 100kg.

Animal nutrition and supplementation

Supplementation of the entire herd is advisable, particularly in drier years. As soon as grass stops growing, nitrogen levels begin to decrease. This means that urea may be required earlier in the dry season than in wetter years. It is important...
to remember that cattle will eat up to 20% more pasture when supplement is available. This is a crucial factor to consider when calculating forage budgets and stocking rates and evaluating management options.

Lighter seasons will also affect the quantity and quality of annual species such as Flinders grass, forbs and some legumes. These species are highly nutritious and play an important role in overall diet quality, contributing significantly to weight gain over the wet season. Shorter growing seasons for these plants means there are less of them and they may lose their nutritional value sooner, placing greater pressure on the remaining pasture.

**Duty of care**

The *Animal Care and Protection Act 2001* places a legal duty of care on all persons in charge of animals to provide appropriate care. The duty of care places a clear obligation on producers to implement reasonable drought management strategies for the welfare of their animals. The *Australian Model Codes of Practice for the Welfare of Animals* have been developed to define appropriate animal care and to determine acceptable animal welfare standards. A copy of these codes can be downloaded from www.publish.csiro.au.

**Drought assistance measures**

Drought assistance measures are available in drought periods from the Commonwealth and Northern Territory governments (as at January 2006).

**Northern Territory government drought assistance measures include:**

- **Exceptional Circumstances Interest Rate Subsidy (NT 10% contribution)**
  - provides business support (interest rate subsidy) to farm enterprises that are viable in the long-term, but are in financial difficulties due to an Exceptional Circumstances (EC) event
  - is available when regions have been EC declared.

- **Northern Territory Drought Assistance Arrangements (NTDAA)**
  Encourages primary producers to:
  - adopt self-reliant approaches in managing for risk, especially climatic variability
  - facilitates the maintenance and protection of the agricultural and environmental resource base of the NT during periods of increasing climatic stress
  - facilitates the early recovery of rural industries consistent with long-term sustainable levels.

Assistance measures include loans, grants and freight subsidies. These subsidies are available from the second year of an NT drought declaration and for up to three years in a recovery period.
Near Infrared Reflectance Spectroscopy (NIRS)

Faecal near infrared reflectance Spectroscopy (NIRS) uses faecal samples to estimate diet quality selected by animals.

NIRS gives an estimate of the following facets of the diet as selected by the animals:
- Crude Protein (CP) concentration
- faecal Nitrogen (N) concentration
- dry matter digestibility (DMD)
- non-grass percentage

These estimates allow the prediction of:
- liveweight gain
- if a response to urea will appear on a rumen degradable nitrogen (RDN)

NIRS diet quality estimates are most accurate in forage-only diets. Molasses-urea supplements, cereal grain or protein mixes are reported to influence NIRS estimates. NIRS is a valuable management tool, particularly for predicting animal responses to rumen degradable nitrogen.

Sample collection

How to collect samples

1. Fresh dung is required and is usually found at watering points, supplement stations or cattle camps.
2. Care should be taken to avoid contamination with soil or plant material or dung beetles.
3. Samples from 10–15 different animals should be combined to make a composite sample. Put the composite sample in an appropriate, labelled container such as a zip-lock plastic bag for storage and despatch. Refrigerate or freeze the sample as soon as possible after collection. Try to keep the sample as cool as possible.
4. Samples must be dried before sending them for analysis. If drying facilities are available, samples can be oven-dried at 60–65°C. The sample should be broken up during drying to hasten the process. The dried sample can be posted. Sun-drying can be used as an alternative to oven-drying. DMD estimates on sun-dried faeces are recorded to be about 1.5% lower than those on oven-dried faeces but values can be corrected if sun-drying is noted on the information sheet for that sample.
5. Alternatively, frozen fresh samples can be delivered to Katherine Research Station accompanied by completed Symbio Alliance’s Analysis Request Form and Field Data Collection Sheet (available on the Symbio website). Katherine Research Station staff will oven-dry your sample and despatch for processing. Note: Symbio Alliance were the only known service providers at time of printing.
Submitting the sample and costs

Place the sample and completed Analysis Request Form and Field Collection Data Sheet in the pre-paid courier bag provided and post to Symbio Alliance for testing. The cost of postage is currently included in the price of analysis: $45 per sample (2008).

If you require an estimate of phosphorus content, note this on the Analysis Request Form. Phosphorus analysis is an additional $25 per sample (2008).

How often to sample

The reason for analysing samples will determine frequency of samples. Monthly samples are often collected. To generate annual trends, the collection of samples every two months may suffice.

Results

The results are usually returned in an email, with an MS Word document attachment (Figure 1).

Sun-drying samples

1. The faecal sample to be dried should be placed on a piece of clean, flat galvanized iron or other non-absorbent sheet.
2. The sample should be spread out like a pancake to a thickness of 10mm or less.
3. After about four hours in the sun, the sample should be turned over to keep the sample in one piece.
4. After another four hours, the sample should be dry provided the weather remains sunny.
5. Once dry, samples can be broken up and placed in labelled zip-lock plastic bags for sending to Symbio Alliance.

Caution: If the samples are not properly dry, they can sweat in the zip-lock plastic bags and become mouldy. An alternative is to put the sun-dried samples in labelled paper bags, or even wrap them in newspaper.

Figure 1. Example of a results record provided by Symbio Alliance

How to interpret results

Dietary CP concentration

Dietary CP results represent the protein content of the pasture selected by the animals. In northern Australia, dietary CP results are usually below 10%, even during periods of active pasture growth. For the pasture to meet the maintenance requirements of a 400kg non-pregnant and non-lactating Brahman cow, a dietary CP content of approximately 5% is recommended.

Faecal N concentration

Faecal N is comprised of undigested N, microbial N and N losses from the animal (endogenous N) and can be used as an indicator of the adequacy of RDN. When faecal N concentrations fall below 1.3%, a response to urea supplementation can be expected.

Dry matter digestibility

DMD is an indicator of the energy in the pasture and represents the energy available for digestion and absorption. In northern Australia, a digestibility reading of 65% or more represents a good high-quality pasture, most probably green, lush and actively growing. A reading of 45% is low and probably indicates that the energy levels are below maintenance requirements. The supplementation of energy is rarely cost-effective in the Katherine region and therefore, animals should be removed from the paddock.
Non-grass percentage

Non-grass percentage estimates the proportion of the diet selected by animals that is not grass i.e. the proportion of top feed and forbs in the diet. During the dry season, the non-grass proportion could be in the order of 30–40% and in the wet season 10–15%, depending on the country.

Predicted liveweight gain

Growth rate is affected by animal factors as well as dietary factors. To achieve meaningful results from NIRS samples, information relating to the animals should accompany samples such as age, sex, weight and condition.

Predicting response to RDN

NIRS predictions of metabolisable energy (based on DMD and CP) allow the estimation of the amount of RDN being supplied to the rumen. The ratio, DMD/CP, indicates whether rumen fermentation and pasture intake are limited by effective rumen degradable protein (ERDP). A response to RDN (urea) supplementation is likely when the DMD/CP is greater than eight and highly likely when greater than 10.

The DMD/CP ratio should provide a measure of the ERDP being supplied. It is recommended that at DMD/CP 16, an animal requires 90g of supplementary urea and 0g at DMD/CP 7. The suggested amounts of supplementary urea at various DMD/CP ratios in Table 1 should be appropriate.

Care would be needed to avoid urea toxicity when the larger amounts of urea indicated below are fed, particularly to animals of low liveweight.

Table 1. Recommended amounts of supplementary urea for cattle 250–350 kg liveweight when the DMD/CP ratio is measured with NIRS (Dixon and Coates 2005).

<table>
<thead>
<tr>
<th>DMD/CP ratio</th>
<th>Amount of supplementary urea per head per day (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8–9</td>
<td>20</td>
</tr>
<tr>
<td>9–10</td>
<td>30</td>
</tr>
<tr>
<td>10–12</td>
<td>50</td>
</tr>
<tr>
<td>12–14</td>
<td>70</td>
</tr>
<tr>
<td>&gt; 14</td>
<td>90</td>
</tr>
</tbody>
</table>

Sources

McCosker, K. DRDPIFR Katherine.


Further information

Kieren McCosker, DRDPIFR Katherine, Ph: (08) 8973 9739.

MLA EDGEnetwork® Nutrition EDGE course.

Contact Pastoral Production Extension Officer DRDPIFR Katherine, Ph: (08) 8973 9763.

Symbio Alliance www.symbioalliance.com.au

Related topics

Native Pastures of the Katherine Region, Supplementation.
Supplementation

Cattle grazing native pastures in the Katherine region are generally limited by protein during the dry season and phosphorus (P) during the wet season. Research from VRSS (Kidman Springs) in the 1990s showed that feeding supplement to previously un-supplemented breeders was the key component in decreasing mortality from 13% to 2%, and increasing weaning rates from 50% to 80%.

Symptoms of nutrient deficiencies in cattle
- poor condition
- animals licking each other, posts etc
- chewing bones
- eating soil
- dull, woolly coats
- general listlessness
- sunken eyes
- poor productivity
- high incidence of broken bones

Wet season and dry season supplementation – why they are different?

Although the dry season might logically seem to be the time when supplementation would be needed, in fact for most parts of the Katherine region, research has clearly indicated that providing phosphorus in the wet season gives the most benefit.

It is easy to justify the costs of dry season supplements when feeding poor condition cows to improve survival and conception rates. Compensatory weight gain should be considered when evaluating the benefits of supplementing growing cattle during the dry season. Compensatory gain is faster than normal rate of gain (i.e. in the wet season) following a period of restricted gain (i.e. during the dry season). The difference between supplemented and un-supplemented young cattle at the end of the dry season may become negligible over the wet season, provided the un-supplemented cattle did not lose weight or suffer a nutritional deficiency.

Acute P deficiency causes ‘pegleg’ where cattle (especially breeders) develop an arched body, staggering gait and thin brittle bones. Cases of pegleg are getting rarer. Chronic P deficiency is more important economically than acute deficiency and the only noticeable sign of a chronic P deficiency is greatly reduced performance.
Supplement distribution

The two main forms of supplementation are loose mix or blocks. Loose mix is a cheaper option but can be problematic during the late dry/early wet when there is a risk of rain causing urea poisoning. Supplement shelters should be provided if wet season loose mix is being fed. Commercial blocks are often used during the wet season as they are hard-setting and there is less risk of urea poisoning. This strategy can be useful in transition times when dry season supplement containing urea is necessary, but storms can occur.

Water medication is the cheapest option for delivering nitrogen but requires intensive management, and may not be effective for wet season supplementation in paddocks with surface water as the stock may not regularly drink from the trough (see Water Medication).

Some producers used molasses to carry nutrients, when they were available from the sugar mill in the Ord.

The best feeding strategy with lick is to feed twice a week, rather than daily. This prevents greedy animals from eating all the supplement and allows shy feeders the chance to eat some.

Supplement ingredients

The main supplement ingredients are urea during the dry season and a P source such as Kynophos in the wet season. Some pastoralists add vitamins and trace minerals to their supplement, but unless there is a known deficiency, it is more cost-effective to concentrate on providing the key limiting nutrients (protein and P).

- **Urea** is a concentrated form of non-protein nitrogen for making protein. It is more economic to feed breeders urea than to feed true proteins such as copra meal or cotton seed meal. Urea feeds the microbes in the animal’s gut which assists them to digest dry fibrous grass over the wet season. It is important to introduce urea gradually over a number of weeks to allow stomach microbes to adjust. Final daily intake should be about 0.1g/kg bodyweight (35–40g for a 400kg cow). Once started on urea it is important the animals receive regular access to supplement. If cattle unavoidably miss out on urea supplementation for a couple of weeks they must be restarted at a lower intake level. Urea is only an effective supplement when there is dry feed available. It is also important when feeding urea to monitor pastures, as urea increases animal pasture intake.

- **Kynophos** contains approximately 22% P (along with 23% calcium). Cheaper fertiliser-grade phosphates should not be used because of problems with excess fluorine and cadmium.

- **Sulphate of ammonia** (GranAm®) contains a small amount of nitrogen but is mainly used to supply the sulphur required in the making of protein from non-protein nitrogen. It is also used to slow down consumption as cattle seem to dislike the taste.

- **Salt** is the animals’ main craving. It is used as a carrier to attract cattle onto the supplement and also to control consumption. Cattle also require some salt (sodium) in their diet.

Lick recipes vary for the early and late periods of the wet and dry seasons (Table 1).

<table>
<thead>
<tr>
<th>Season mix</th>
<th>Ingredients (%)</th>
<th>When to feed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urea</td>
<td>Kynophos</td>
<td>Sulphate of ammonia</td>
</tr>
<tr>
<td>Late dry season</td>
<td>30</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wet season</td>
<td>0</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Early dry season</td>
<td>10</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dry season</td>
<td>15–25</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Reduce if consumption is lower than required.
**Intake and feeding**

- Intake for breeding cows should be 70–100g/head/day. Cattle will eat more in the late dry season and less at the start of the wet season.
- Supplement should always be available and intake can be manipulated by using different proportions of ingredients.
- There may be some benefit in feeding pure salt to cattle before you begin feeding urea. This is a cheap way of satisfying initial craving and reduces the risk of urea poisoning.
- A strategy to reduce supplementation costs is to segregate cattle with a high requirement, e.g. feed a higher quality supplement to poor condition lactating cows.

---

**SUMMARY OF BEST PRACTICE**

- Supplement cattle to address protein deficiency in the dry season and phosphorus deficiency in the wet season.
- Intake of supplement can be controlled by varying the proportions of sulphate of ammonia and salt.
- Supplementation for growing stock may be more specific (see Weaning).

---

**Source**


**Further information**

DRDPIFR Animal Production Officer Ph: (08) 8973 9739.

MLA EDGEnetwork® Nutrition EDGE course. Contact Pastoral Production Extension Officer DRDPIFR Katherine, Ph: (08) 8973 9739.


**Related topics**

Best Bet Cattle Management, Hay: Buying and Producing, Heifer Management, Introduced Pastures for the Katherine Region, Native Pastures of the Katherine Region, Urea Poisoning in Cattle, Weaning.
Chapter Three: Cattle Nutrition

Water Medication

Water medication is the process of delivering nutrient supplements to livestock through the water they drink. This innovative process is becoming more widely adopted across northern Australian cattle properties. With traditional methods of supplementation such as lick blocks and loose mixes, some animals over-consume, some get too little and others none at all. Water medication delivers the correct dose to all animals.

Recommendations

It is strongly recommended that first-time users proceed with caution and thoroughly research their specific needs before installation.

A water chemistry test on each bore or water source is essential for designing the correct nutrient mix. Adjustments will be necessary to allow for the pH and dissolved salts in the water supply. Several nutrient formulations are available for different water situations and feeding requirements. Some users may require acidic formulations to neutralise alkaline water and formulations to provide phosphorus, trace elements and vitamins. Water chemistry can have a huge influence on the success of water supplementation, so it is imperative to have all of your water supply and nutrient requirement information prior to medicator installation.

When new to water medication, install only one unit to start with. Set it up close to the homestead where it can be easily monitored and teething problems solved before establishing more units. The risk of over-dosing will be reduced if only one, or at most, two people are responsible for the water medicator(s).

Producer economic calculations have demonstrated that when more than seven or eight units are installed, the equivalent of one full-time person will be required to fill, monitor and service the medicator units. Although this sounds costly, it can be argued that the improvements in cattle performance and reduced cost of supplementation outweigh the extra labour cost. This form of nutrient delivery can be extremely successful if managed correctly. Failure of a water medication system can have disastrous results.

The proven positive aspects of water medication systems generally outweigh the negative aspects.

Advantages

• cheapest form of supplementation available
• every beast in the paddock receives the supplement
• congregation around watering points is reduced due to the absence of lick blocks and loose mixes, which act as attractants.
Disadvantages

- use is not recommended if surface water is available in the same paddock
- upfront cost of units (although costs are quickly recovered)
- requires skilled operators to manage, monitor and service units
- reported failures
- other forms of supplementation such as loose licks and blocks cannot be used in conjunction with water medicators.

Critical failure of water medication systems can result in cattle deaths through urea poisoning. The reasons for reported failures have included:

- operator error
- equipment malfunction
- system failure
- damage, corrosion and wear on equipment and fittings.

Table 1. Cost comparison of supplementation methods

<table>
<thead>
<tr>
<th>Product</th>
<th>Cost/tonne ($)</th>
<th>Recommended feed rate (g/head/day)</th>
<th>Urea (%) in product</th>
<th>Urea at recommended rate (g)</th>
<th>Actual rate to deliver 60g urea</th>
<th>Cost/head/day to deliver 60g urea (¢)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proprietary water medication mixes</td>
<td>970</td>
<td>55</td>
<td>72</td>
<td>40</td>
<td>83</td>
<td>8</td>
</tr>
<tr>
<td>Loose mixes</td>
<td>550</td>
<td>150</td>
<td>30</td>
<td>45</td>
<td>200</td>
<td>11</td>
</tr>
<tr>
<td>Blocks</td>
<td>1,200</td>
<td>70</td>
<td>30</td>
<td>21</td>
<td>200</td>
<td>24</td>
</tr>
<tr>
<td>Commercial liquid NPN supplement</td>
<td>500</td>
<td>1,000</td>
<td>4.7–11.6</td>
<td>50</td>
<td>1,200</td>
<td>20–50</td>
</tr>
</tbody>
</table>

(MLA 2006).

SUMMARY OF BEST PRACTICE

- Thoroughly research your water medicator and supplement needs.
- Install one unit close by, initially, to become familiar with the water medication system.
- Conduct a detailed chemistry analysis of the water supply.
- Ensure employees managing water medicators are appropriately skilled.

Sources

Russell Teece, former manager, Pigeon Hole Station.

Related topics

Introduced Pastures for the Katherine Region, Native Pastures of the Katherine Region, Supplementation, Water Quality, Water Consumption.
Chapter Four: Infrastructure and Station Development

Cattle and land management best practices in the Katherine region 2009
Chapter Four: Infrastructure and Station Development

Contents

1. Cattle Dips 138
2. Cattle Yard Design 140
3. Dam (Excavated Earth Tank) Establishment 143
4. Geographic Information Systems (GIS) 146
5. GPS Data Collection 148
6. Paddock Design 151
7. Roads and Fences 153
8. Telemetry 157
Cattle Dips

Plunge dips are the most efficient way to control cattle ticks. It is essential that dip products are mixed and managed correctly. Overstrength and understrength dips are detrimental to productivity. Incorrect dip strength can contribute to the development of chemically-resistant strains of cattle ticks.

Calculating the dip volume

Dip volume can be determined by:

- using a flow meter to measure the amount of water going into the dip
- filling the dip from a tank of known capacity
- using the formula:
  \[ \text{volume} = \text{average length} \times \text{average width} \times \text{average depth}. \]

When the volume has been calculated, the amount of chemical required can be determined according to the manufacturer’s instructions. Never add more than the specifications state. The topping-up rate is also determined according to the manufacturer’s instructions. Before dipping, run at least 30 head of ‘stirrer’ cattle through the dip to distribute the chemical evenly. Animals used as stirrers should be returned to the main mob and dipped again. Always measure the dip level after stock have been treated and again before the next treatment to allow you to determine the replenishment rate. Overstrength dips are uneconomical due to chemical wastage, toxicity (particularly with weak or young stock), and can lead to residues in meat, potentially jeopardising our markets. Understrength dips do not give a good tick kill rate and can cause delays in trucking as a result. Erecting a roof over the plunge dip can reduce evaporation and prevent rainfall entering the dip.

Recording

It is a sound policy to record all dip activity. This is especially important when several people are involved with cattle dipping. Record the date, volume, number of stock dipped, amount of chemical added, amount of liquid at completion and analytical results.

Sampling

Dip samples must be collected after the dip has been stirred. Take the sample in a wide mouthed glass container as the last beast is still swimming from the jump-in end, around one metre out and one metre deep so that the sample is thoroughly mixed. Never use a container that could be mistakenly used for other purposes. The sample should be labelled with the property name, dip location, brand of chemical, sample date and contact details. Dip samples are processed weekly at Berrimah Chemistry Laboratory, and can be dropped at Katherine Research Station for packaging and delivery.

If ticks are surviving your dip treatment they may be resistant. Testing for resistance can be organised through your stock inspector.
SUMMARY OF BEST PRACTICE

- Always follow manufacturer’s instructions when using chemicals.
- Maintain good records of dip activity.
- Sample the dip regularly.

Source

Further information
Regional Stock Inspector, DRDPiFR Katherine Ph: (08) 8973 9739.

Related topics
Ticks, Tick Fever.
Cattle Yard Design

Good cattle yard facilities are extremely important for occupational health and safety and to ensure animal welfare standards are met.

A well-designed and functional set of yards should provide:

• safe, efficient handling of cattle
• good facilities for drafting and loading cattle
• good restraint for husbandry practices such as tagging, vaccinating, branding, castrating, dehorning
• a safe working environment.

When designing and locating cattle yards, important considerations are:

• the maximum number of cattle to be accommodated, incorporating large, cooler-type yards for big mobs
• water availability and provision
• materials
• animal behaviour, cattle flow, use of curved designs and visual barriers
• gate safety
• dust suppression and yard orientation
• procedures to be carried out in the yards (drafting, weighing, AI, NLIS, vaccinating, tagging, branding, castrating, dehorning, spaying, trucking)
• access for trucks or road trains
• drainage, soil type and access if wet season use is anticipated.

Using a portable yard initially can test a design before construction of a permanent set of yards. If new to the region, consider visiting other yards in the area with a reputation for working well. Consult DPIFM staff about yards which work well.

Location

Water availability will be a major consideration in the location of yards. Yards should be on country with good drainage. Most yards, regardless of land type, will become very dusty if regularly or constantly used and a sprinkler system should be considered. The orientation of the yards should take into account the prevailing winds so the main work areas (crush, branding cradle and race) are not coping all the dust from back yards. Also consider prevailing winds when deciding where to yard up from. Cattle prefer to travel into the wind, but this will result in reduced visibility for staff yarding up. Locating the yarding-up area where there will be a cross-wind allows dust to be blown to the side of the mob.

Materials and construction

Budget considerations will influence the choice of yard design and construction materials.

Wood is rarely used in the Katherine region because of the prevalence and voracity of termites and fires and the ready availability of steel. Steel should be strong enough to prevent breakages occurring when cattle run into rails. Use of light steel will be false economy in the long run. Drafting and forcing yards, for example, need to be able to withstand high pressure. Mesh and cable may suffice for coolers and weaner yards.
Construction needs to allow cattle handlers to escape from yards quickly and easily if necessary. Yards made from railway sleepers are strong and durable but can impede climbing in and out of yards and have a reputation for being hot to work in.

Portable panels are often used for trial yards, temporary yards, for special purpose applications or where the expense of permanent yards cannot be justified. Exercise caution when using portable yards because they may cause injury when they shift unexpectedly and they are generally not as strong as permanent yards. Some producers have a permanent core of forcing and drafting yards and the race, and use panels to make the holding yards. When taking this approach, consider making gateways with permanent materials and running panels off these.

**Miscellaneous design and construction tips:**

- A head-bail in place of a slide gate at the start of a race can control the flow of cattle more easily and avoid pile-ups of cattle in the race.
- Weld two chains on the outsides of gates for extra yard security if gates are not being wired at night.
- Ensure the branding area is concreted and has access to water to allow a high level of hygiene.
- Crushes should have a built-in floor or be installed on a cement pad.
- When concreting posts, ensure the concrete is above ground level to prevent water pooling around the bottom of the post causing it to rust and break under pressure.
Animal behaviour

Understanding and using natural cattle behaviour is important to the success of any yard design. The following aspects of yard design consider animal behaviour:

- Screened fences where animals are crowded together (e.g. pound and forcing yards) prevent them seeing activity that may upset them.
- A solid crowding gate prevents cattle from seeing light through it and turning towards it.
- Curved races and catwalks facilitate natural following behaviour and prevent animals seeing the crush.

Occupational health and safety considerations

- Use trees or roofs to shade areas such as the crush and branding cradle for worker comfort and safety.
- Put a small yard around the branding cradle and crush to protect people and gear from agitated animals.
- Ensure water is easily accessible for workers, especially in the vicinity of chemical use.
- Consider removal of a race rail to facilitate safer bang-tailing and vaccination and prevent kicking injuries. To make a larger space between rails four and five use 50mm rail at 380, 600, 850 and 1,150mm from the ground to the top of the rail. Lighter rail may be used at 1,460 and 1,800mm from the ground (40mm), as these rails do not receive the same pressure as the rails below.
- Suppress dust.
- Design drafting yards or use commercially available race or round-yard draft designs to reduce the need for people to be in with animals.
- Provide strategically located gates for easy access to and exit from yards. In the absence of man-gates, ensure rails allow staff to climb out of the yard safely and quickly if a worker is pursued by a beast.

**SUMMARY OF BEST PRACTICE**

- Consider occupational health and safety of workers.
- Consider animal welfare and hygiene.
- Test designs with portable yards prior to construction of permanent yards.
- Consider natural animal behaviours.

**Sources**

Greg Scott, Regional Stock Inspector, DRDPIFR.
Jack Wheeler, Katherine Research Farm Manager, DRDPIFR.
Gordon McBride, Technical Officer, DRDPIFR.
Blackshaw, J. and McGreevy, P. (2003), Notes of some topics in applied animal behaviour, School of Veterinary Science, The University of Queensland. www.animalbehaviour.net

**Further information**


**Related topics**

Paddock Design, Stock Handling.
Dam (Excavated Earth Tank) Establishment

Excavated earth tanks are the most common type of stock-water dam in pastoral areas. They are favoured where ground water is either unavailable, of poor quality or supply, or at considerable depth.

Dams are an attractive option where water supplies are required at long distances from homesteads because of their minimal maintenance requirements, especially if they are ‘walk-in’ dams. While gully dams, for example, may be more efficient in terms of their earth moved to water stored ratio, excavated tanks have much reduced evaporation (better depth:surface area ratio) and do not require a sizeable, stable by-wash. Appropriately sited, designed and constructed excavated tanks will not be compromised by the high intensity rainfall events of northern Australia.

The success of a surface water harvesting/storage system depends on:

- comprehensive planning focused on landscape evaluation
- appropriate design, site surveying and pegging
- pre-construction site and soil evaluation
- construction to design criteria
- post-construction management and maintenance

Planning

Identify the catchment using aerial photos, maps, ‘Google Earth’ and local knowledge and then locate an appropriate nearby site for the dam. Try to scope all likely sites. Ground-truth this information and select the most promising site. Also try to match expected annual catchment run-off production to dam storage volume. Excessive volumes of run-off are difficult to manage. Catchment production is a factor of rainfall, catchment area and annual run-off efficiency. Run-off efficiency is driven by catchment soil types, vegetation type and density, topography (slope), micro-relief, and catchment shape.

Locate dams away from incised water courses where possible, as these indicate that the water flow is erosive.

A well-designed dam will reduce evaporation to 70% of that recorded with a Class A evaporation pan. Assuming a complete annual recharge, this will result in 60% of the stored water being useable by livestock and 40% lost to evaporation.

A useful livestock water consumption figure for planning is 50L (0.05m³) per day per non-lactating adult animal (cattle).

Design

Design focus should be on evaporation and erosion/silting minimisation, together with efficient cost-effective earthmoving.

Minimise dam silting by using a pipe inlet to convey run-off from the catchment to the base of the dam and by using wing banks to temporarily store run-off. This allows silt to settle outside the dam. The opening to the pipe inlet should be protected with a concrete abutment to prevent damage from livestock and to keep it clear of any material which might hinder water flow. The incorporation of a ‘trash catcher’ into the abutment design is recommended. The use of silt-pits is not recommended.
Slope the top of the dam bank outwards to protect the inside batter from accelerated water erosion. This also reduces fouling of the water from faecal material deposited by stock on the dam wall.

Reduce evaporation losses and lower water temperature by constructing a deep dam. A depth of greater than 6m is recommended.

Minimising water surface area by keeping the inside batter slope ‘steep’ (3:1) further reduces evaporative losses. A steep batter slope also reduces the risk of livestock bogging and when used with a small dam basal area, maximises stored water depth for any given run-off event.

Reduced air flow across the water surface can be achieved by constructing a dam wall that does not incorporate a ‘berm’ or ‘table’. This also improves earthmoving efficiency.

Round dam design results in more efficient earthmoving as the excavated soil is moved the least distance. This design also negates the accelerated batter erosion often experienced in the mitre corners of square and oblong dams.

Overflow (by-wash) locations should be chosen so as to minimise soil erosion risks.

Site evaluation
Sites should be test-drilled to the designed depth plus one metre, prior to construction, to test for soil water-holding capacity and presence or not of a salty water table or rock. A maximum of five investigative test holes is required per dam site. Soils should also be assessed for clay content, strength and dispersion in water. In general terms, preferred soils contain at least 25% clay and are of medium strength and dispersion. Medium strength clays that stiffen with hand-moulding make firm inside batter slopes.

The site should be pegged to indicate the dam centre, dam bank, inlet and wing bank locations. This information should be accurately recorded and conveyed to the earthmoving operator prior to construction. Any other works proposed in the catchment should also be pegged and recorded.

Construction
The key to successful construction is to employ a competent operator with the appropriate earthmoving machinery! Commonly, a bulldozer or bulldozer and scraper combination are used. Some bulldozer operators prefer to push material on a 4:1 batter slope for most of the construction and then cut back to the design criteria of 3:1 in the final stages. This allows most of the excavated material to be moved efficiently.

Any part of the soil profile identified as containing sub-standard material should be benched out and re-packed with good quality material.

SUMMARY OF BEST PRACTICE
• Plan thoroughly considering site location, catchment condition, run-off and erosion potential.
• Test soils.
• Use appropriate machinery and a competent operator.
• Ensure agreement is reached with contractors on rates and construction methods prior to construction.
Chapter Four: Infrastructure and Station Development

Further information
Department of Agriculture and Food, WA. www.agric.wa.gov.au
Addison, J.S., Law, R.J. and Eliot, G.B. (2003), Dam Design for Pastoral Stock Water Supplies, Department of Agriculture, Western Australia.

Related topic
Roads and Fences
Chapter Four: Infrastructure and Station Development

Geographic Information Systems (GIS)

Geographic Information Systems (GIS) are a computer-based method for recording, analysing and displaying geographic information such as roads, watercourses, habitat types, soil types or any other physical features that can be mapped on the ground. GIS can be used for property planning, creating accurate station maps and calculating distances such as lengths of fence lines or grazing radius from water points.

Google Earth is a form of GIS that displays geospatial datasets from around the world. It can be used to zoom in and out of property features and calculate distances between points. The satellite imagery used on Google Earth can also be used as a monitoring tool for groundcover.

How can GIS be used in the pastoral industry?

With access to geospatial datasets, GIS can be used for many purposes including:

- displaying existing property infrastructure
- locating new fence lines and calculating costs and paddock areas
- performing grazing radius calculations
- determining the location for new water points
- calculating long-term carrying capacities
- displaying fire history data
- locating sites of significance.

What is the link between a GPS and a GIS?

A GPS (Global Positioning System) can be used to capture the geographic coordinates of any physical feature or landmark. This geospatial information can then be added to a GIS and combined with other datasets (spatial or non-spatial). The data can then be used to provide further information and displayed on an accurately scaled map.

How can I get access to GIS?

A range of GIS software is available for purchase with costs dependent on the tools required and the capability of the computer. Many software companies provide training opportunities to gain operating skills either in a classroom situation or on the internet. Software used by the Northern Territory Government includes ESRI, MapInfo and ERMapper.

There are also cheaper software packages such as PAM, Fugawi and FarmMap. These user-friendly packages are often used for mapping existing infrastructure. They have very limited GIS capabilities, but can perform simple tasks such as measuring between points, or along fence lines. This software is readily available, affordable, requires minimal training, and is relatively simple to import data into.
What GIS datasets are available for property owners?

A wide range of Northern Territory natural resource geospatial datasets are owned, stored and managed by several Northern Territory Government departments (DNRETAS, DRDPIFR). These departments may provide access to their datasets, and a cost may be incurred. Geoscience Australia stores a large amount of geospatial data and information on their website.

The extensive catalogue of data includes:

- property infrastructure data
- cadastral information (e.g. property boundaries)
- soils, land systems and land unit data
- vegetation information
- water resources (e.g. bore locations and reports, aquifer information)
- remote sensing and satellite imagery datasets
- topographic data at various scales (Geoscience Australia).

Example of using a GIS in the pastoral industry

**Objective:** To develop and stock a new area.

**Considerations:** Location of fence lines and watering points to optimise paddock area and pasture use and minimise costs, erosion risk and maintenance requirements.

**Procedure:**

- Use a GPS to establish location data for current infrastructure.
- Use a GIS to collate land unit, soil type, topographic and water resources data.
- Determine the best positions for water points. Use the GIS to look at grazing distances and calculate the number of watering points required.
- Establish the best positions for fence lines in relation to soil types and topography to minimise erosion and the number of creek crossings and reduce numbers of end assemblies.
- Use the GIS to calculate paddock areas for each scenario and for rapid calculation of the costs of development using lengths of fence, poly pipe and numbers of waters required.
- Produce maps of proposals or final design for bank managers, staff, sacred sites clearances, funding or grant applications etc.

**Summary of benefits of GIS**

GIS can assist land management planning decisions by:

- assisting in the development of property management plans
- preparing budgets for infrastructure development proposals
- calculating potential fence lines, waters and grazing radius circles
- assisting in location of fences in relation to topographical features, including land and soils types
- locating sites for bores, dams and turkey nests
- producing accurate maps.

Further information

DNRETAS, Rangeland Management Branch, Katherine, Ph: (08) 8973 8104.

DRDPIFR, Pastoral Production Division, Katherine, Ph: (08) 8973 9739.

Geoscience Australia www.ga.gov.au

Related topics

GPS Data Collection, Paddock Design.
GPS Data Collection

The Global Positioning System (GPS) is a worldwide satellite-based navigation system made up of a network of 24 satellites and their ground stations. The hand-held GPS receiver uses these satellites as reference points to calculate positions accurate to a matter of metres, with advanced receivers making measurements to better than a centimetre. GPS receivers work in any weather conditions, anywhere in the world, 24 hours a day. The system is managed by the United States Defence Force. There are no subscription fees or setup charges to use a GPS receiver.

What is a Map Datum?

A map datum is a set of parameters and control points used to accurately define the shape of the earth. A map datum must always be selected on a GPS receiver before any data collection has begun.

AGD66 – Australian Geodetic Datum 1966
(sometimes noted as AU66 on some GPS receivers)

- Suitable for Australian region only.
- The origin point is approximately 200m SW of the earth’s centre.

WGS84 – World Geodetic System 1984

- Origin point based on centre of earth’s mass.
- This datum was developed for standardisation of global coordinates and compatible use of GPSs.

GDA94 – Geocentric Datum of Australia 1994
(only available on new GPS receivers).

- The origin point based on centre of earth’s mass.
- This datum is slightly more accurate than WGS84 (the difference is less than a meter).
- Mapping agencies in Australia will refer to GDA94 but for practical purposes it can generally be regarded as the same as WGS84.

What is the difference between datum AGD66 and datum WGS84?

Coordinates will shift approximately 200m in a north-easterly direction using datum WGS84 compared with datum AGD66. The same coordinates are displayed for both locations, so it is essential to know which datum you have selected on your GPS.

An example of using the WRONG map datum

A proposed bore is located using a GPS and the coordinates are given to the bore driller without specifying the datum used. The bore was drilled in the wrong paddock.

Recorded location, 228828E, 839193N (WGS84 Datum)

Bore drilled here, using the SAME coordinates as provided, but using Datum AGD66 on the GPS. This location is approximately 200m south-west of the WGS84 datum location.

A local example of using the wrong map datum has occurred between two stations on the Sturt Plateau. The boundary fence between the properties is out by about 100m because the wrong map datum was used. Over a 40km fence line, this equates to 400ha of land lost by one of the stations.
What is the RIGHT map datum to use?

You can collect geographic data using a GPS for many reasons: to plot a new fence line, to locate a proposed bore on your property map, or to send information to a government agency.

Important points to note:

- If you are providing information to a third party, ask what datum is preferred.
- The datum on your GPS should be the same as the map that you are using.
- The datum is usually noted on most maps (generally under the scale bar).
- Always RECORD the datum you have selected on your GPS.

Coordinates (sometimes referred to as navigation settings)

Geographic data can be collected with a GPS using different coordinate systems:

- latitude and longitude, measured in degrees (often called geographic coordinates)
- eastings and northings, measured in metres (UTM projection, often called grid coordinates)

Latitude and longitude

Latitude (lat) measures the earth’s surface in a north-south direction. The equator is 0° latitude and the poles are at 90° latitude. South of the equator is noted as a negative. Longitude (long) measures the earth’s surface in an east-west direction from 0° long at Greenwich, England to 180° east and west.

Example:

The location of Katherine, using datum WGS84 in geographic coordinates (latitude, longitude) can be written several ways:

- Decimal degrees (d.ddd) – 14.47°, 132.26°
- Decimal minutes (d.mmm) – 14° 28.2’, 132° 15.0’
- Degrees, minutes, seconds (dms) – 14° 28’ 12”, 132° 15’ 0”

Easting and northings

A mathematical projection has been used to convert the curved earth to a flat surface in measurement units of metres. The UTM (Universal Transverse Mercator) projection creates 60 zones of 6° longitude each. UTM zones 52 and 53 are used for the Northern Territory, separated by the 132° longitude. Be aware that one set of coordinates is used for all 60 UTM zones! The UTM zone is noted next to the coordinate location on your GPS.

Example:

The location of Katherine, using datum WGS84 in UTM zone 53 should be written as 205002, 8399012. (Handy hint: eastings have six numerals and northings have seven numerals).
Which coordinate setting should I use?

Easting and northing coordinates are measured in units of metres and are a lot easier to plot on a map than latitude and longitude using degrees. Grid lines marked on topographic maps are also in metres and provide a good base reference for plotting coordinates.

Converting coordinates

Datums and coordinate systems can be changed after data has been collected. It is extremely important that GPS settings are not altered during data collection. If you are doubtful, continue with the same datum and coordinate system. ALWAYS record the datum and coordinate system used on your GPS for future reference. For more information about maps, datums and coordinate systems, refer to the National Mapping Division of Geoscience Australia website.

Record your position using a waypoint

A waypoint is an averaged coordinate position that is saved in the GPS receiver memory and can be given a unique name. Descriptive information about each waypoint should be written down as it is collected. The waypoint name, an associated comment and also the order of notation are valuable pieces of information the user will need at a later time. Fewer errors are made plotting coordinates on maps or providing data to a third party when the information is clear and concise. A spreadsheet is an easy way of writing coordinates with the associated details. Alternatively, data can be downloaded directly from the GPS to a computer.

SUMMARY OF BEST PRACTICE

1. Who needs this data?
   If you are providing data to a third party always CHECK which datum and coordinate system is preferred.

2. Select a datum on your GPS.
   - WGS84 is the default on your GPS receiver. For practical purposes GDA94 is the same as WGS84.
   - The datum on your GPS receiver should match the datum used on your map (usually under the scale bar).
   - DNRETAS Pastoral Property maps were originally datum AGD66 but are now compiled using GDA94. Read the information on your property map carefully.

3. Select a coordinate system on your GPS.
   - Latitude and Longitude
     - A pilot may prefer to use degrees, minutes and seconds.
     - Convert the coordinates after collection, to either decimal degrees (d.dddd) or to easting and northings by changing the GPS navigation settings.
   - Eastings and Northings
     - Select UTM on your GPS. Metres are easier to measure or plot coordinate position on maps.
     - Eastings have six numerals, northings have seven numerals.
     - The UTM Zone is noted on your GPS next to the coordinate location (either 52 or 53 over the NT).
     - Record the UTM Zone for future reference.

4. Waypoints
   To increase the accuracy for a waypoint average, turn the GPS off and turn it on again when you are closer to your destination. Leave the GPS on in a fixed position and note how the accuracy improves.

5. Be consistent!
   Do not change your GPS settings during data collection.

Further information
Geoscience Australia, National Mapping Division.

Related topics
Geographic Information Systems, Paddock Design, Roads and Fences.
Good paddock design has profound implications for cattle management and station profitability. When opportunities arise to construct new paddocks or modify existing paddocks, getting the design right is well worth the effort.

**Wet and dry season grazing**

Paddocks designed for year-round grazing require areas suitable for both wet and dry season use. In many parts of the Katherine region, that means including significant areas of both black and red soils. Cattle do not like grazing boggy areas in the wet season, so they stick to well-drained areas such as red soils. It is important that areas of red soils are sufficiently large as over-grazing in the early wet season has a critical effect on pasture condition. A purely red soil paddock will tend not to have as good year-round production as a mixed paddock because in the dry season red soil pastures dry out quicker than those on black soil.

A good example of this principle can be seen at Kidman Springs. Over a number of years, the best production has been from Conkerberry paddock which has a good mix of red and black soils. In 2001, Rosewood paddock, which also performed well, was split into two trial paddocks. Rosewood West was left with mainly black soil. Over the next few years, its small area of red soil was overgrazed, and wet season cattle production from that paddock became very poor.

Fencing different land types separately is a valid strategy, but requires careful management. Almost certainly this will involve rotational grazing on a seasonal basis.

**Quality of paddock**

Matching the quality of paddock to an appropriate class of animal is an important part of running an efficient cattle production system. The best quality paddocks should be allocated to weaners, heifers and steers requiring diet quality for growth. Adult breeders are generally able to maintain reasonable breeding performance in poorer quality paddocks when managed at a conservative stocking rate, weaned appropriately and provided with mineral supplementation. Breeders need to be in good, and preferably improving, condition to conceive but after that they preferentially divert nutrients to the maintenance of their foetus or as milk for their calf, and they gain or lose bodyweight through the year as a buffer.
Cattle and land management best practices in the Katherine region 2009

Water point development and paddock size

The development of new water points is a major issue in the Katherine region (see Distance to Water). Many paddocks have inadequate access to water points leading to localised over-grazing around the troughs and under-utilised areas far from water. Supplying several watering points in large paddocks partially evens out grazing, but since cattle are creatures of habit, they do not always make full use of all the waters provided. Subdividing large paddocks into smaller units is a more reliable way of getting cattle to graze evenly. Centrally-located water points are less convenient for management than waters shared in corners or across fence lines, but they allow more even grazing over the whole paddock.

Paddock sizes in the Katherine region are large, particularly in the Victoria River and Gulf Districts. The Pigeon Hole project found that a paddock size of 30–40 km² with a central water point provided a good compromise between achieving more even grazing distribution and increased costs. Below 30 km², the fencing and other development costs increased sharply.

Sensitive and fragile land systems, river frontage, unmanageable areas of permanent natural water or stony upland country of very low productivity require specific land management considerations, including the option of not being grazed at all.

Laneways

Despite the additional cost of constructing laneways, the savings in labour have the potential to out-weigh the cost. Many stations are developing laneways that feed from paddocks all the way to the yards, and find this makes mustering much more manageable.

Other methods of improving grazing distribution

Other techniques for attracting cattle to under-utilised areas within paddocks include placement of feed supplements, improving the attractiveness of the vegetation through fire and creating roads. If cattle are readily eating supplement, it can be gradually moved away from the watering point. If cattle are not readily eating supplement, it can be moved closer to the water source. Rotational burning of different parts of the paddock attracts the cattle onto the burnt areas. The burnt area must not be too small, otherwise an over-grazed and degraded patch can result. Cattle, especially Brahmans, naturally follow tracks and there have been successful examples of managers encouraging cattle to walk out by creating a track for them to follow.

SUMMARY OF BEST PRACTICE

• A good paddock for year-round grazing requires a balance of well-drained areas for wet season grazing (often red soil) and productive areas that maintain pasture quality well into the dry season (often black soil).
• Avoid creating a black soil paddock with only a small area of red soil which will become degraded when cattle over-use it in the wet season.
• Growing cattle require the best paddocks. Breeders can be productive on poorer land with appropriate management.
• Increasing water availability and reducing paddock size yield production advantages. Economically, the minimum paddock size is about 30 km².
• Laneways can be an excellent investment.
• Encourage cattle to change their grazing patterns using placement of supplements, rotational burning and creating tracks.

Sources

Further information
DRDPIFR Katherine, Pastoral Production Ph: (08) 8973 9739.
MLA EDGEnetwork® Grazing Land Management course. Contact Pastoral Production Extension Officer DRDPIFR Katherine, Ph: (08) 8973 9739.

Related topics
Cattle Yard Design, Distance to Water, GPS Data Collection, Grazing Strategies, Land Condition, Supplementation, Water Quality.
Roads and Fences

Careful construction and positioning of fences and roads will maximise efficiencies and reduce maintenance requirements. Roads and fence lines often serve as firebreaks and their location and maintenance can be critical in fire management and control. Clearing permits are not required for ‘linear infrastructure’ on stations.

Roads

Station roads are usually graded tracks, often along fence lines, necessary for access to watering points, lick stations, yards etc. The standard of road required will be determined by the class of vehicle expected to use it (road trains or light vehicles), the level of use and whether or not year-round access is required.

Location

The location of station roads on high ground, ridgelines and catchment boundaries will minimise erosion risk. Some soil types are more stable and less erodible than others. Wet season access will be improved by sticking to red soils or rocky or gravelly areas, avoiding black soils and grey/yellow earths where possible. Grey, yellow or pale termite mounds and tea tree stands are indicative of potentially boggy areas. In areas with little slope, roads have been used to run water into dams. Creek and river crossings will be most successful if located at right angles to the river, where river banks are lowest, where there is only one well-defined channel and on straight stretches.

Construction

Most station roads are simply constructed with a grader. The route may or may not be cleared with a dozer. Forming of roads with a low crown along the centre will assist drainage and improve trafficability after rain, although crowning should be avoided in places where water needs to cross the road. Crowning may necessitate consideration of other erosion control works such as whoa boys or mitre drains. Where roads are unformed, avoid creating windrows which will concentrate water on the road and cause erosion and boggy sections. Windrows created by dry season grading can be spread back across the road prior to the next wet season. When grading, the direction in which soil is taken can be alternated, to prevent the construction of an ever-increasing windrow and gradual deepening of the road. Once a windrow has been left under a fence, it is very difficult to remove.

Gravelling or capping of sandy or boggy areas might be warranted. Small pipes under the road (such as 6” poly pipe) can assist drainage in trouble spots. Where the road or its verges are likely to concentrate water and erode, the construction of erosion control structures is recommended. Trafficability is important where banks are constructed across roads. Compaction and stability of the road and erosion control works will be greatest when there is some moisture in the soil during construction.
Maintenance
Annual post-wet season grading of roads is usually required to re-form the road, repair erosion control or drainage works and to remove vegetation. Sometimes erosion control works can be removed for the dry season or during times of high traffic and reinstated before the onset of the wet season. Increasingly, chemical control of vegetation along roads and fence lines is used to reduce grading requirements. Chemical application using quad bikes or from the air allows vegetation removal in wetter areas long before roads will carry heavy machinery. This can be important for fire control.

Fences
Location
Fences are located to achieve the best use of the country, taking into consideration pasture types, location of waters, river frontage protection, soil type, slopes, fire management and cattle management. Fence lines also serve as roads and firebreaks. The location of fences on ridgelines will reduce the risk of erosion and the need for erosion control measures. In the long-term, maintenance costs will be less. Avoid locating fences and roads down long straight slopes or steep slopes, on unstable soils or near existing erosion.

Construction
Fences are most commonly constructed using steel posts and rails for end-assemblies, steel pickets and barbed wire, with droppers or spacers between pickets. A typical fence in the Katherine area would have steel end-assemblies, star pickets spaced at 1.5m, with one or two droppers between and three or four barbed wires. Wood is rarely used for posts any more because of its susceptibility to fire and termites, and the ease of use and ready availability of steel. Lancewood (Acacia shirleyi) and ironwood (Erythropelium chlorostachys) are the preferred species of wood. True to its name, ironwood is hard on tools and equipment. Lancewood yields hard, straight timber.

For ease of construction and early protection against erosion, erosion control banks can be placed along the cleared and graded fence line prior to erection of the fence. The use of a residual herbicide such as diuron might be considered to reduce regrowth of trees and shrubs on the line.
Maintenance
Traditionally, fence lines are graded with the objectives of providing a good road, an effective firebreak and protecting the fence from fire.

Herbicides are now being used in some places to keep fence lines clear, reducing the necessity to grade. This can have time, cost and soil conservation advantages. Herbicide such as Graslan™ may be useful to control shrub and tree regrowth under the fence, out of reach of the grader.

Drainage and erosion control
In the long run, construction of erosion control works will be cheaper than repairing damage from erosion.

Erosion of roads and fence lines can result in:
- significantly higher maintenance costs
- increased travelling time
- increased vehicle maintenance costs
- reduced firebreak effectiveness
- reduced life and effectiveness of fences
- siltation of waterholes
- occupational health and safety hazards.

Erosion control on roads requires consideration of the likely amount of run-off expected, soil erodibility, slope and disposal or discharge of water. Effective and safe drainage is critical to erosion control. The three components of road drainage are surface, side and cross drainage.

Surface drainage
Crowning of roads allows drainage from the centre of the road towards sides. Crowns are only effective if the crown is higher than the adjacent land and should be avoided where water needs to cross the road. Water can be taken from the upslope side of a road to the downslope side by putting a slight crossfall on the road in the same direction as the slope. Alternatively, water can be intercepted on the upslope side with a drain and directed to a table drain, culvert or invert for the road crossing.

Side drainage
Table drains are excavated, flat-bottomed drains running parallel to the road. They direct water to disposal areas further downslope. Excavated material can be used for crowning. V-shaped drains are more likely to erode than flat-bottomed drains and are not recommended. Not many station roads will have table drains. Large table drains should be designed by an expert.

Mitre or off-shoot drains take water out of table drains or directly from the side of the road in the absence of a table drain. These drains direct water away from the road. They should also have a flat base (rather than a v-shape) and slope gently away from the road (0.5–1% slope depending on erodibility of the soil). Mitre drains must spill into stable, undisturbed areas, preferably from a level sill. The spacing of mitre drains depends on the slope of the road or table drain, soil type and rainfall. Tables are available in Land Notes (see Further information) to calculate spacing. As an indication only, a road of slope 1% might require mitre drains spaced at least every 120m. Drains must be long enough to ensure water does not end up back at the road.

Cross drainage
Cross drainage is required where water needs to be taken across the road from upslope table drains or drainage lines. Inverts and floodways are designed for water to flow over them while minimising erosion. Inverts may require the replacement of natural erodible material with rock or gravel. Floodways often use culverts or pipes to take base flows but are overtopped by larger flows. Protection of the downstream faces is critical to their success. Culverts are pipes designed to take water under the road. The pipes should be positioned on a slight slope to prevent siltation and often protection from erosion is required at the outlet and sometimes the inlet too.

Whoa boys
Whoa boys are banks constructed across roads to intercept and dispose of water flows. They can be constructed by cutting a channel on a grade of 0.3% across the road, dumping excavated material on the downslope side and then compacting and smoothing the bank. Alternatively, imported material can be used to construct the bank. Broader banks or incorporation of ramps will improve trafficability. Whoa boys must spill into undisturbed, stable areas. A level sill can be constructed to spread water where it spills out. This can be constructed with a grader by cutting a flat drain on the contour and spilling soil on the upslope side. It is important not to disturb the disposal area when constructing banks and sills. Whoa boys must be long enough to ensure water does not return to the road.

Design and construction
As a very rough rule of thumb, erosion control banks or drains on station roads and fence lines should be spaced every 50m on slopes less than 3% and at least every 25m on slopes greater than 3%. Bank and drain construction should begin at the top of the catchment and proceed downslope.

A grader, dozer, loader or tractor can be used to construct banks, depending on the size of bank required, source of material and availability of machinery. A dumpy level is a good investment for obtaining appropriate bank spacings and grades. A builder’s laser level or home-made hose level can also be used. On significant slopes and erodible country, ‘eyeballing’ will not be sufficiently accurate.
Most stations use graders for road, fence line and firebreak maintenance. Grader driver training schools have been developed by DNRETAS Soil Conservation staff, Landcare groups and private consultants. The Victoria River District Conservation Association and the Roper River Landcare Group have been hosting ‘grader schools’ in the Katherine region. Grader drivers are provided with information on the causes of erosion and are instructed in minimising windrow formation and using the grader to form roads and construct banks, flat-bottom drains and level sills.

On stations in tropical areas, it is not feasible to design roads and erosion control works to cope with very intense rainfall events and occasional blowouts might be expected.

SUMMARY OF BEST PRACTICE

- Minimise erosion potential by locating roads and fence lines on ridgelines, avoiding erodible soils and steep slopes.
- Avoid concentrating water with windrows and build up roads.
- Construct erosion control structures on roads, fence lines and firebreaks where necessary, giving consideration to appropriate size and spacing of structures.
- Encourage grader drivers to attend an Erosion Control Workshop.

Source
Darryl Hill, Soil Save, Katherine, Grader school course notes (unpublished).

Further information
DNRETA Land notes (2006)

Land Note ASLN-01 Road drainage, November 2006.
Land Note ASLN-02 Gully rehabilitation and stabilisation, November 2006.
Land Note ASLN-10 Repairing Tracks, Firebreaks and Fencelines to Minimise Erosion, November 2006.
Land Note ASLN-12 Water Movement and Drainage, November 2006.

Related topic
Paddock Design
Telemetry

The cost of visiting remote watering sites is high, especially in hot, dry weather when frequent checks are essential. Telemetry is an emerging technology and one of the most important innovations in managing stock and water on large properties.

Telemetry allows remote monitoring of water using radio, satellite or telephone systems and can be capable of turning water on and off as required, as well as visualising situations via digital images. The installation of repeater units can improve the range of UHF telemetry systems. The main benefit of telemetry is savings in labour and fuel costs by reducing the amount of travel required to check watering points. Monitoring can be carried out from a base point.

Telemetry has been trialled in the Barkly and Alice Springs regions over recent years and is currently in use in the Pigeon Hole project which incorporates:

- remote monitoring of the water level in a dam, trough or tank
- control and monitoring of bore pump engines
- monitoring water volume pumped from bores
- monitoring of alarms and nutrient/water usage from water medicators
- monitoring and logging rainfall from around the station to use in pasture growth prediction models
- viewing a digital photo of a trough.

The technology has not been adopted by many producers because reliability and development costs and cost savings have not been fully investigated. The 21st Century Pastoralism™ project in the Alice Springs district, is currently analysing reliability and costs and benefits. At time of writing, there are two known commercially available systems.

Average costs to install basic telemetry systems on-site are:

- base station, servicing up to 100 watering points, from $1000
- monitoring system for each individual watering point, from $2000

Source
Further information
DRDPIFR www.nt.gov.au/drdpifr/
Desert Knowledge CRC
– 21st Century Pastoralism™ Project
– WaterSmart Pastoral Production™ Project www.desertknowledgecrc.com.au
MLA, Pigeon Hole project www.mla.com.au
Stockman Telemetry System
www.telemetry.stockmanelectronics.com.au
Observant www.observant.com.au

Related topics
Chapter Five: Land Management

Cattle and land management best practices in the Katherine region 2009
### Chapter Five: Land Management

**Contents**

1. Biodiversity Conservation on Pastoral Land 160
2. Carrying Capacity 162
3. Climate Change 164
4. Distance to Water 166
5. Environmental Management System 168
6. Fire Management 170
7. Grazing Strategies 173
8. Hay: Buying and Producing 175
9. Introduced Pastures for the Katherine Region 178
10. Land Condition 180
11. Native Tree and Shrub Management 183
12. Native Pastures of the Katherine Region 185
13. Rangeland Monitoring 188
14. Tree Clearing on Pastoral Land 190
15. Weed Management 192
Biodiversity Conservation on Pastoral Land

Biodiversity is the variety of all life forms. It includes:

• the genetic variation within species
• all species of plants, animals and other organisms
• all habitats (land types, ecosystems)
• all the processes linking species and habitats, such as nutrient recycling and the provision of clean water.

Managing biodiversity is not about maximising the number of species. It is about conserving the plants and animals, and their habitats, which are native to a particular area or region.

How can pastoral land managers contribute to the conservation of biodiversity in the NT?

The Northern Territory is unique in having most of its natural vegetation and freshwater ecosystems intact. Land management practices such as management of weeds, feral animals, fire, grazing, tree clearing, improved pastures and infrastructure development can all influence biodiversity outcomes. Local Landcare or conservation group facilitators can assist in sourcing funding for biodiversity conservation projects on farm.

What can you do to optimise biodiversity conservation on your land?

1. Manage for good land condition

Many activities you are already carrying out to ensure sustainable productivity on your land will also contribute to the maintenance of biodiversity. For example, managing weeds, ferals, fire and grazing to maximise your land condition is good for cattle production and good for biodiversity.

2. Manage for diversity of habitats

Different plants and animals require different habitats: some prefer regularly burnt areas and some prefer areas that haven’t been burnt for a long time. Some require both open areas (to forage) and dense grassy areas (to nest). Cool fires burn patchily and create a diverse habitat that suits a lot of different species. Similarly, a variety of grazing regimes support more species than an even level of grazing because some plants and animals are more abundant in moderately grazed areas, while others occur only in very lightly or ungrazed areas.

3. Identify areas of high conservation value

Species and habitats vary in their importance for biodiversity conservation. Some places and species require more management effort because they have high conservation value or are particularly susceptible to damage. DNRETAS has maps of areas of special conservation value for each bioregion in the Territory (Northern Territory Parks and Conservation Masterplan).

The maps show:

• vulnerable and endangered species
• rare vegetation and habitat types, especially where these are not already represented in the current reserve system
• areas with high species diversity or large breeding populations
• waterways and associated wetland and riparian areas
‘Refuge’ areas with historically low grazing pressure are also significant for biodiversity.
4. Identify potential threats to areas of high conservation value

Some management can have a negative impact on biodiversity. Careful assessment of your property to identify areas of particular conservation value can help you manage for productivity and conservation. Potential threats to biodiversity include weeds, overgrazing, grazing in sensitive areas, unmanaged fires, feral animals, tree clearing, sowing pastures and adding waters to areas previously remote from water.

5. Develop an adaptive management plan to protect areas of conservation value on your land

Sometimes the best way of managing an area for conservation outcomes is not immediately apparent. There may be little information about optimal management of a habitat or species of interest. In this case, implementing an adaptive management approach helps to provide information about whether the management you have put in place is working to achieve your desired outcomes.

The steps in adaptive management are:

• Develop a plan, including identification of species and habitats of interest, appropriate management and monitoring.
• Implement the plan on your property or as part of a group across the catchment.
• Use information from monitoring to measure the plan’s effectiveness.
• Distribute findings to all those who took part.
• Review the plan and make changes if necessary.
• Adopt changes into a new plan and implement.

6. Work with your neighbours

Developing joint management strategies for weeds, feral animals, riparian areas and fire (for example) with your neighbours and across your local catchment can maximise land management and biodiversity benefits.

Case study

A land manager wishes to improve the distribution of grazing on the property. Paddocks are very large and many of them are more than 5km from water. Adding waters will increase the carrying capacity of the property by allowing cattle access to previously water-remote areas. However, areas remote from water currently act as biodiversity ‘refugia’. Some native plants and animals are sensitive to grazing and can only be found in areas where there has been little or no grazing. To conserve such species, the landholder can fence off part of the water-remote area and exclude it from grazing. The landholder, researchers or local conservation group can monitor the plants and animals in the ungrazed and nearby grazed areas to assess if management is contributing to biodiversity conservation.

Examples of activities to conserve biodiversity on pastoral lands

• Fence off waterways and wetlands completely to exclude grazing, or partly to allow controlled grazing in sensitive areas.
• Retain some areas with little or no grazing pressure. If adding waters to previously water-remote areas, fence off a small area from grazing to be used solely for the conservation of biodiversity.
• Rest large areas of country through rotational grazing and spelling of paddocks.
• Control weeds and feral animals.
• Maintain diversity of habitat through diversity of fire and grazing regimes.

SUMMARY OF BEST PRACTICE

• Manage for good land condition and a variety of burning and grazing regimes.
• Identify areas of high conservation value that may need special management to protect them.
• Implement a management plan and monitor outcomes.
• Review success of management and adapt if required.

Source

DNRETA (2005), Northern Territory Parks and Conservation Masterplan
DNRETAS, Darwin. www.parksmasterplan.nt.gov.au

Further information

Tropical Savannas CRC, Land Management in northern Australia. www.landmanager.org.au
DNRETAS, Biodiversity Conservation Division (North), Ph: (08) 8995 5000.
Greening Australia, Katherine, Ph: (08) 8972 2349.
Landcare www.landcareonline.com

Related topics

Carrying Capacity

Stocking paddocks according to accurate assessments of long-term and short-term carrying capacity is critical to:

• animal productivity (per area and per head)
• long-term land and pasture condition
• productivity and enterprise profitability.

There are two main tools available for estimating paddock carrying capacity:

• One for calculating a paddock’s long-term carrying capacity, defined as the average number of animals a paddock can be expected to support over a planning horizon (5–10 years).
• One for calculating a paddock’s short-term carrying capacity, defined as the number of animals a paddock can support for a season or year.

Carrying capacity is often confused with the term ‘stocking rate’ which refers to the number of stock per unit area at a particular time. Stocking rate may or may not match the short-term or long-term carrying capacities.

Calculating long-term carrying capacity

An objectively calculated long-term carrying capacity provides a useful benchmark for individual paddocks and the property.

If you do not have the knowledge and experience of the stocking levels appropriate for maintaining or improving land condition, you will need to collect some information to allow you to calculate long-term carrying capacities.

Long-term carrying capacity depends on the:

• current mix of land types
• condition of these land types
• climate
• evenness of use by cattle
• accessibility due to water availability and geography
• grazing strategy or method
• goals for animal production and land condition.

The formula for calculating long-term carrying capacity (in AE/km²) is:

\[
\text{Expected pasture growth for an average year (kg/ha) x utilisation rate (\%)} = \text{AE/km}^2
\]

Forage demand per animal equivalent per year (kg)

DRDPIFR has well-researched pasture models for many areas of the Katherine region which can predict growth based on land condition, land type and rainfall.

For example: Using a 70th percentile growth figure (an amount of growth you could safely expect in seven out of ten years) on a black soil, the above formula can be used as follows:

\[
\text{Pasture growth (1900 kg/ha) x utilisation rate (20\%)} = 10 \text{ AE/km}^2
\]

Forage demand per adult equivalent per year (3650kg)

The resulting answer is a guide to the average, long-term stocking rate that should be ‘safe’ for that particular location, land condition and soil type, assuming the paddock has sufficient water points (see Distance to Water).

Benefits of determining long-term carrying capacities

• Sticking around this carrying capacity will be ‘safe’ in most years, reducing the need for regular forage budgeting to ensure both feed supply and pasture cover remain adequate.
• A benchmark is available for projections on capital expenditure and property valuations.
• Long-term carrying capacities provide a guide for the timing and duration of grazing in a paddock. If on occasions the calculated carrying capacity is exceeded, closer monitoring and management of these areas may be required in subsequent years.
• An objective measure is provided which can validate your ‘gut feel’ and experience and can be passed on to others.

Disadvantages of stocking according to a long-term carrying capacity

When stocking to a long-term carrying capacity, there is potential for land to be overgrazed in some years and undergrazed in others. Undergrazing can result in increased fire risk and missed opportunities to increase production from the paddock. The effects of overgrazing include increased weeds and unpalatable species and decreased pasture growth and animal productivity. These issues can be addressed by regular forage budgeting.

Forage budgeting for calculating short-term carrying capacity

The number of stock able to be safely carried on an area for a short period of time requires information on:
• pasture on hand
• anticipated pasture growth
• forage quality and desired animal performance
• end of dry season yield and cover targets.

The short-term carrying capacity will usually differ from long-term carrying capacity due to variation in the distribution and amount of rainfall received. Long-term and short-term carrying capacities are related: the average short-term carrying capacity over 10 years should equate to the long-term carrying capacity.

When stocking paddocks from year-to-year at around the long-term carrying capacity, forage budgeting is recommended to anticipate periods of either over-grazing or under-grazing. End of dry season is the most critical time to do this and coincides with first round mustering, helping plan decisions on sales, culling and other adjustments in numbers within and across paddocks.

Forage budgeting can be used to support stocking strategies based on closer matching of pasture availability and animal numbers from year-to-year, with the intent of taking advantage better years while responding early to below average years. More active management of stock numbers from year-to-year carries additional with respect to animal performance and changes in market prices, and requires a good understanding of forage budgeting techniques.

Forage budgeting can be learnt with minimal training and a lot of practice. Photo standards are available in many areas. A minimal approach would involve driving around the paddocks, estimating standing pasture available for grazing at the end of the wet season and then adjusting cattle numbers to ensure that residual yield and groundcover targets are met. These targets will differ according to land type and average rainfall. A rule of thumb for a black soil would be to budget on leaving about 1,500kg/ha to provide adequate residual grass and groundcover going into the next wet season. On less productive land types, a rule of thumb would be to leave at least 60% groundcover. Software is available through DRDPIFR for calculating forage budgets but collection of accurate data on pasture yield and composition assessment is required.

Frequent adjustment of cattle numbers via forage budgeting is best applied in paddocks with a uniform land type, and in paddocks to be used for sale stock or other classes of stock whose numbers can be easily adjusted.

Advantages of using a forage budgeting approach for calculating short-term carrying capacity

• Temporarily increased stocking rates can take advantage of ‘runs’ of better years.
• A detailed understanding of pasture condition is developed.
• The risk of over-grazing is reduced.

Disadvantages of using forage budgeting approach for frequent adjustment of stocking rate:

• Timing of stocking rate adjustments is critical; otherwise the risks of overgrazing or poor animal performance can actually be increased.
• Requires very active monitoring of forage supply, land condition and markets.

The MLA EDGEnetwork® Grazing Land Management course will equip people with the necessary skills and tools to calculate both short-term and long-term carrying capacities.

SUMMARY OF BEST PRACTICE

• Attend an MLA EDGEnetwork® Grazing Land Management course.
• Stock according to accurate carrying capacity calculations.
• Use estimates of both long-term and short-term carrying capacities for managing stocking rates.

Source

Further information
DRDPIFR Rangeland Management course.
Contact Pastoral Production Extension Officer DRDPIFR Katherine, Ph: (08) 8973 9739.
MLA (2006), Grazing Land Management: Sustainable and productive natural resource management, MLA, Sydney.
MLA EDGEnetwork® Grazing Land Management course.
Contact Pastoral Production Extension Officer DPFIM Katherine, Ph: (08) 8973 9739.
Partridge, I. (1999), Managing Grazing in Northern Australia: A grazier’s guide, Queensland DPI&F.

Related topics
Grazing Strategies, Land Condition.
Climate Change

‘Climate change’ is the term given to changes in climate attributable to human activity. It is now considered, with more than 90% certainty, that increased temperatures around the world since the 1950s are a result of increased amounts of greenhouse gases in the atmosphere.

The main greenhouse gases are carbon dioxide, methane and nitrous oxide, all of which act as a blanket around the earth preventing heat from escaping. This is a natural phenomenon but is being enhanced by release of additional carbon dioxide and other greenhouse gases since the start of the industrial revolution. In the Northern Territory, 17% of the annual emissions of greenhouse gases are methane from cattle, which is about twice the percentage that applies to Australia as a whole. A further 35% of NT emissions arise from bushfires, plus 4% from agricultural soils and 4% from land clearing.

Rainfall and temperature changes in the Katherine region

Over most of the Katherine region, rainfall has been increasing in recent decades especially the last 15 years. However, current opinion is that this extra rainfall may be the result of South-East Asian pollution forcing the monsoon south, rather than global climate change.

Climate models predict a significant increase in temperatures in the Katherine region and the Top End. Rainfall prediction is more difficult and different models are currently reaching different conclusions. It does appear that there is less chance of reduced rainfall in the Top End compared to most other parts of Australia. However, even if the region continues to receive similar rainfall, the amount of water available for plant growth may decrease because evaporation is expected to increase.

The other likely change is that the frequency and severity of extreme events (droughts and cyclones) are expected to increase.

Possible vegetation changes

Regardless of changes to temperature and rainfall, the increased carbon dioxide levels are expected to have direct effects on vegetation in the region. The growth of woody species is likely to be favoured over that of grasses. All other things being equal, there may be modest increases in length of the growing season. However, there is likely to be reductions in pasture quality in terms of both protein content and digestibility.
Costs and opportunities

The issue of climate change is too new to be able to predict its long-term effect on cattle businesses in the Katherine region, but it is likely that indirect factors will have an impact, irrespective of any direct climate effects on regional production.

For example:

- Climate change is predicted to have more effect on rainfall in southern Australia than in the north, so the Katherine region may become even more attractive to interstate investors.
- The effect on our competitors and markets is not yet clear.
- There may be local opportunities from carbon offset schemes.
- Future measures to reduce agriculture’s contribution to greenhouse gases may result in extra production costs.
- There may be changes to land management practices related to fire and tree-grass balance.
- Fuel costs are expected to continue to increase.
- Increased costs of grain and fuel may affect the feedlot industry which would affect all cattle markets.

Carbon offsets

There is a rapidly developing voluntary carbon offsets market. While this may present a future opportunity for producers to offset cattle emissions, the market is currently largely non-regulated. It is possible that not all of them will be formally recognised in the future National Trading Emissions Scheme, and involvement in some of these early carbon offsetting schemes should be considered high risk. There are a number of unresolved questions related to sequestered carbon, such as responsibility for loss through fire or drought.

SUMMARY OF BEST PRACTICE

- Expect some climatic change, understanding that current models predict temperature increases across Australia but are less certain in their prediction of rainfall impacts. Northern Australia is less likely to have reductions in rainfall compared to southern Australia.
- Expect the frequency of droughts, cyclones and floods to increase.
- Treat carbon offset schemes with caution until national accreditation standards are in place.
- Understand that irrespective of the direct effects of climate change on levels of production, the cattle industry is likely to be affected by related economic and legislative changes from outside.
- Be prepared for change by implementing an adaptive management approach that is sensitive to variations in climate and external market forces.

Sources

Australian Government Department of Climate Change
www.greenhouse.gov.au/inventory

The Cooperative Research Centre for Greenhouse Accounting www.greenhouse.crc.org.au

Related topic

Weather and Climate
Distance to Water

In the relatively large paddocks of the Katherine region, a marked decrease in the amount of pasture can usually be observed as you travel closer to watering points (known as a grazing gradient). While cattle can physically walk up to 10km from water, most grazing occurs within 3km of water.

Carrying capacity and land condition

In large paddocks with sparsely-placed water points, grazing pressure around water is generally very high but there may be large areas distant from water where very little or no grazing occurs. As you move closer to water points utilisation rates increase and pasture cover, yield and condition decrease. In smaller paddocks in the VRD (34km²), 80% of cattle activity occurs within 2kms of water.

It is critical therefore to consider the area within a reasonable distance from water when calculating the carrying capacity of a paddock. If paddocks are stocked simply according to paddock size (rather than to the area within an appropriate distance from water), areas close to water will be over-grazed while remaining parts of the paddock will be under-utilised.

Animal production

Apart from reducing land condition, overstocking watering points forces cattle to walk long distances out to feed, increasing their energy expenditure. In extensive grazing systems, the energy required for walking can represent a significant proportion of the nutrients ingested. The impact of this additional energy cost is often underestimated, especially dry season animal performance when pasture typically provides less than maintenance nutrient requirements. Examples of the increases in energy expenditure with the distance walked are shown in Table 1.

The associated loss of condition of breeders can affect production parameters such as weaning percentage.

Table 1. Relationship between distance walked and energy expenditure (DAWA, 2005)

<table>
<thead>
<tr>
<th>Distance walked (km/day)</th>
<th>Increase in energy expenditure (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (penned animal)</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>+3%</td>
</tr>
<tr>
<td>6</td>
<td>+22%</td>
</tr>
<tr>
<td>9</td>
<td>+33%</td>
</tr>
</tbody>
</table>
Planning for infrastructure development

According to the Pastoral Survey 2004, 73% of producers in the Katherine region thought an ideal distance for cattle to walk out from waters was between three and five km: a trade off between productivity and costs when planning water point development.

The Mt Sanford trial found production increased significantly when cattle were in paddocks small enough to limit the grazing radius to two km. This concept was incorporated into the Pigeon Hole trial which investigated the cost-benefit ratios of improved production versus increased infrastructure and management costs of smaller paddocks. Software such as BreedCowDynama is available to help weigh up the costs of infrastructure investment versus the improved production.

There are mixed feelings among pastoralists as to whether increasing the number of water points within a paddock will effectively move cattle around a paddock, because cattle tend to have preferred areas. A combination of burning, supplement and correct handling/tailing to settle cattle onto new areas can help prevent them from returning to their preferred camps on the old water point. 7.

Some pastoralists believe fences are the only way to keep cattle on new water points and effectively improve evenness of grazing. This was confirmed in the Pigeon Hole project where a key recommendation was for enough watering points to achieve a grazing radius of no more than about 2.5km and reduced paddock sizes (to 30–40km²) or less. However, a Rockhampton Downs trial has shown that cattle can be trained to move between waters that are switched on and off on a rotational basis, and this may be an alternative approach to achieve more even grazing in very large paddocks while also giving areas of country a spell from grazing.

Biodiversity

The rapid increase in infrastructure development in the Katherine region will affect some species of native plants and animals which are very sensitive to disturbance such as grazing pressure and development of new water points. These sorts of species are referred to as ‘decreasers’, and examples include fitches and some tussock grasses. Other native plants and animals increase in abundance with grazing disturbance, and others are relatively insensitive.

When planning grazing management there are opportunities for areas away from watering points to be identified and managed as conservation areas. The Biograze project recommended that across a region, 10% of sensitive or fragile landscapes and 5% of more resilient land types, be managed to minimise or exclude grazing. Conserved areas could be spread across a region so a single landholder would not be expected to bear the economic burden of conservation of a particular land type.

SUMMARY OF BEST PRACTICE

• Consider the area within a reasonable distance from water when calculating carrying capacity, not paddock size alone.
• Research has shown that to optimise evenness of use, distance between water points should not exceed 4–5km.

Sources


WA Dept of Planning and Infrastructure (2005), The Grazing of Cattle in the Southern Pastoral Areas of Western Australia – Best management Practice.

Further information

Biograze www.savanna.cdu.edu.au

Breedcow and Dynama www2.dpi.qld.gov.au/breedcowdynama/

MLA EDGEnetwork® Grazing Land Management courses. Contact Pastoral Production Extension Officer DRDPIFR Katherine, Ph: (08) 8973 9739.

The Pigeon Hole Project www.mla.com.au

Related topics

Environmental Management System

An Environmental Management System (EMS) is a tool for identifying, documenting and managing the impacts of an organisation’s activities on the environment. It provides a structured approach to planning and implementing environment protection measures. Just as a financial management system monitors expenditure and income and enables regular checks of a company’s financial performance, an EMS monitors environmental performance.

An EMS integrates environmental management into a business’s daily operations, long-term planning and other quality management systems.

What is ISO 14001?

ISO stands for International Organisation for Standardisation. The formal title of ISO 14001 is Environmental Management Systems - Specification With Guidance For Use. Certification to ISO 14001 is the most formal of EMS. It is intended to provide organisations with the elements of an effective environmental management system.

On an international scale, ISO 14001 aims to support environmental protection and prevention of pollution in balance with socioeconomic needs. Verified implementation of this standard can be used by businesses to assure stakeholders, markets, administrations and interested parties that an appropriate environmental management system is in place.

How does an EMS work?

An EMS is based on a ‘plan-do-check-review’ cycle and aims to achieve continual improvement in environmental, production and marketing performance. An EMS provides a structured and formal process for businesses to:

• assess their potential and real environmental impacts
• identify legal requirements and obligations relating to environmental management
• develop goals
• develop action plans for activities with a significant impact on the environment or which incur legal responsibilities
• monitor the success of strategies developed to address issues
• review the competence of their system, allowing for continual improvement.

An EMS can include best management practices and codes of practice and may be readily integrated with other existing activities such as quality assurance schemes. Under an EMS, diverse management issues can be drawn together under a common approach.

An EMS is not a standard to which businesses must adhere, but rather a system of continual improvement which allows the individual to identify relevant issues and set individual environmental targets.
Benefits of an EMS

There are many potential benefits of implementing an EMS:
• improved natural resource condition
• retained or improved access to natural resource base
• enhanced image of primary producers as responsible land managers
• regulatory relief
• cost saving through improved production efficiencies
• improved business planning
• market advantages
• increased access to government funding for on-ground natural resource management
• benefits from integrating EMS with other management systems to form whole of property management system
• recognition and certification of responsible land management through accreditation.

Level of implementation

There are many degrees to which an EMS can be developed. It can be a simple plan of environmental management for use within the business, it may be externally audited (2nd or 3rd party) or it may even be certified to ISO 14001 or to specific customer and/or industry requirements.

An EMS can be implemented to whatever level the landholder desires. Certification to ISO14001 is a complex and time-consuming procedure requiring high levels of documentation, reporting and external auditing. To reduce costs, producers can implement an EMS to ISO14001 standards but not seek accreditation. Alternatively, if producers simply wish to gain the benefits of improved environmental management and business planning they can implement an EMS like a property management plan which doesn’t involve detailed documentation and reporting.

Limitations of EMS — is it worthwhile?

The reasons for low adoption rates of EMS in the Katherine region, and the pastoral industry as a whole, include:
• complexity and time-consuming task of ISO14001
• lack of EMS frameworks relevant to the northern extensive pastoral industry
• lack of market benefits to the northern beef industry
• lack of clear and quantifiable benefits for producers.

Support available

The Department of Agriculture, WA has developed a comprehensive guide for pastoralists wishing to implement an ISO14001-standard EMS. The Centralian Land Management Association has developed a simpler customised EMS template for the central Australian region, which is still relevant to northern cattle operations. Many consultants are available to help land managers develop and implement an EMS for their station.

Sources

Australian Government Department of Agriculture, Fisheries and Forestry www.daffa.gov.au
Environmental Management Systems (in Agriculture) Association www.ems.asn.au

Further information

The Australian Landcare Management System www.alms.org.au
Centralian Land Management Association, Alice Springs Ph: (08) 8953 4230. www.clma.com.au
NSW Department of Primary Industries www.agric.nsw.gov.au
Rural Industries Research and Development Corporation www.rirdc.gov.au

Related topics

Biodiversity Conservation on Pastoral Lands, Carrying Capacity, Fire Management, Grazing Strategies, Land Condition, Native Tree and Shrub Management, Rangeland Monitoring, Weed Management.
The landscapes of northern Australia have evolved with fire. Many animals and plants have lifecycles and habits that either cope with fire or depend on fire to regenerate. Since the introduction of cattle grazing the frequency and nature of fires has changed. Valued pastoral country tends to be protected from fire or burnt sparingly, while less valuable country is often allowed to burn.

The use of fire in the landscape
Before humans, fires were mainly caused by lightning in the late dry season. Since human occupation, Aboriginal people have burnt the landscape for many different purposes.

Fire is a useful management tool on pastoral lands. Strategic burning is carried out for several reasons.

Wildfire prevention and control
The adoption of a strategic and controlled burning program will break-up the country and assist in the prevention of large wildfires. Burning during the late wet season or early dry season creates cool and patchy fires that assist in reducing fuel build-up and preventing wildfire spread. In the event of advancing wildfires, backburning from strategic firebreaks is often the only control option.

Manipulating cattle distribution
Cattle are attracted to areas that have been burned. Burning a long way from water or in less preferred land types encourages their use by cattle. Burning also reduces patch grazing in pastures because cattle graze the new shoots more evenly.

Improving pasture quality
Fire removes old and rank low-quality grass and promotes green, nutritious regrowth. Fire can promote better weight gain in cattle by improving pasture quality.

Modifying pasture composition
The proportion of annual sorghum can be greatly decreased if it is burnt before it sets seed. More palatable plants can benefit from fire because cattle are less selective when grazing regrowth. Fire has been used to reduce wiregrass in Mitchell grass pastures and to reduce the proportion of black spear grass in kangaroo grass-black spear grass pastures.

Managing native trees and shrubs
Most trees and shrubs are sensitive to fire when they are less than two metres high. A lack of fire can lead to an increase in woody plants, increasing mustering costs and reducing pasture growth and carrying capacity. Periodic hot fires can help keep woody plants in balance. The type of country and seasons (fuel load) will determine how often a hot fire can be generated without having an adverse effect on pastures.

Weed management
Fire can be used as part of an integrated weed management strategy. Rubber vine and mesquite *Prosopis pallida*, are vulnerable to fire. Other species sensitive to fire include prickly acacia, parkinsonia, rubber bush and bellyache bush.
Establishing and maintaining sown pastures

Fire can be used to create a favourable seedbed for sowing legumes by removing litter and reducing competition from native grasses. Fire can also be used to maintain a good balance of grass and sown legume.

Biodiversity conservation

A range of different fire frequencies, intensities and timing of burns may help conserve biodiversity.

Effects of fire on country

Time of year

Burning during the wet season or early dry creates cooler, more patchy fires which are good for promoting better pasture quality, reducing wildfire frequency and promoting biodiversity. Burning during the late dry creates very intense, hot fires which are best for controlling woody plants but can reduce biodiversity if they are too frequent and extensive. Late dry fires also increase soil erosion and water run-off in the following wet because of the lack of soil cover.

Frequency of burning

Burning too frequently can lead to an increase in annuals, overgrazing, reduced soil cover and loss of biodiversity.

Vegetation

Vegetation in very poor condition with annual pastures should not be burnt as this can kill annuals, resulting in bare ground. Woody plants respond differently to fire depending on whether they are killed or re-sprout after fire. Re-sprouting plants are very fire resistant but fire can be used to reduce their cover and competition with pasture. Woody plants that are susceptible to fire, such as Acacia species, are often killed but fire can promote germination of new plants. These species can be managed by having consecutive fires to kill the next generation before they set seed.

How to burn

The optimal fire management depends on the vegetation type, season and management goal. Recommended fire frequency to control woody plants (without damaging pastures) for high rainfall areas (>700mm) is two to five years, for medium rainfall areas (400–700mm) four to seven years and low rainfall areas (<400mm) six to 15 years.

Pre-fire management

Grazing must be managed to ensure there is at least 1,500kg/ha of fuel and 50% cover to carry a fire. Depending on the condition of your pasture and stocking rates, spelling may be needed to allow fuel to build up. Ensure fire breaks are in place and that you have the appropriate fire permits. Burning conditions needed depend on the management objective (Table 1).

Post-fire management

Ideally, paddocks should be spelled after fire to allow pasture to regenerate. If only part of a paddock has been burnt make sure that cattle numbers are adjusted to prevent overgrazing of the freshly burnt area.

Table 1. Burning conditions required for various management objectives (adapted from Dyer et al., 2001)

<table>
<thead>
<tr>
<th>Management objective</th>
<th>Fire intensity</th>
<th>Fuel load (kg DM/ha)</th>
<th>Season of burn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintaining woody vegetation structure</td>
<td>Moderate – High</td>
<td>2,000–3,000</td>
<td>April – October</td>
</tr>
<tr>
<td>Change woody vegetation structure, control exotic weeds</td>
<td>High – Very high</td>
<td>2,500–4,500</td>
<td>August – October</td>
</tr>
<tr>
<td>Hazard reduction – reducing risk of wildfire</td>
<td>Low – Moderate</td>
<td>&gt;1,500–2,000</td>
<td>March – June</td>
</tr>
<tr>
<td>Remove old rank pasture, modify grazing distribution</td>
<td>Low – Moderate</td>
<td>&gt;1,500</td>
<td>November – December</td>
</tr>
</tbody>
</table>

SUMMARY OF BEST PRACTICE

- Fire is an important management tool on pastoral enterprises.
- Consult research information for fire frequency and intensity recommendations for your area and type of country.
- Design a fire regime to suit your country type and management goals.
Source

Further information


MLA EDGEnetwork® Grazing Land Management course.
Contact Grazing Land Management Officer
DRDPIFR Katherine, Ph: (08) 8973 9739.

North Australian Fire Information www.firenorth.org.au

Partridge, I (1999), Managing Grazing in Northern Australia: A grazier’s guide, Queensland DPI&F.

Related topics
Biodiversity Conservation on Pastoral Land, Land Condition, Native Tree and Shrub Management, Rangeland Monitoring.
Chapter Five: Land Management

Grazing Strategies

Continuous grazing is the most common grazing strategy in the Katherine region with one-third of producers using it as their only strategy. Other strategies include rotational grazing (18% of properties), continuous grazing with opportunistic spelling (25%) or some other combination of these (20%) (Pastoral Industry Survey, 2004).

Continuous grazing

Continuous grazing refers to having the cattle running in paddocks continuously over time with no, or only infrequent, spells from grazing. Where cattle numbers in a paddock vary little from month to month, or from year to year, it is referred to as continuous set-stocking. Continuous set-stocking, or an approximation of it, is the most common management system used in the region. As with any grazing method, the stocking rate used is the major factor determining animal production and condition of the pasture.

Benefits of set stocked continuous grazing

- Simple to apply and therefore the management input required is low.
- Animal production and land condition can be as good as other grazing methods as long as stocking rate is appropriate and the paddock size, mix of land types and distribution of water points encourages relatively even grazing.

Disadvantages of set stocked continuous grazing

- There is an increased potential for areas to be overgrazed through cattle returning year after year to preferred patches.
- Depending on how conservative the stocking rate is, there is potential for overgrazing in some years and undergrazing in others. Undergrazing can result in increased fire risk and missing the opportunity to increase production.

A set stocked continuous grazing stocking strategy requires a conservative level of utilisation (via stocking rate used) to minimise decline of preferred species, and preferred land types. The table below outline the average utilisation rates that can be safely applied to different land types. Stocking rates should be based on how much pasture grows in 50% of years. The risks to pasture condition and animal production from continuous stocking can be reduced by incorporating:

- forage budgeting once or twice a year, and appropriate adjustments in stock numbers, to ensure adequate pasture for stock and adequate residual cover of pasture at the end of the dry season to prevent soil erosion.
- wet season spelling, preferably at least once every 3–4 years.
- rotational burning to reduce over-grazing of preferred patches, e.g. in large paddocks, burning at least 25% of the paddock every 4–5 years.

<table>
<thead>
<tr>
<th>Safe utilisation rates for Katherine region country</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tropical tall grass</td>
<td>10–15%</td>
</tr>
<tr>
<td>Mid grasses and arid short grasses (red soil)</td>
<td>15%</td>
</tr>
<tr>
<td>Black soil</td>
<td>20–25%</td>
</tr>
</tbody>
</table>
Grazing Strategies

Rotational grazing

Under rotational grazing, cattle are moved to allow resting of pasture during critical growing phases. A rotational grazing system can be as complex as developing a full cell-grazing enterprise or simply involve three or four paddocks.

Benefits of rotational grazing

- To keep forage in vegetative (growing) stages and reduce selection of preferred species from being grazed out.
- Improvement in land condition by allowing perennial pastures to replenish root reserves and be better able to withstand grazing.

Disadvantages of rotational grazing

- The short growing season in the Katherine region provides less opportunity to capitalise on rotational grazing to pay for the infrastructure required for a more intensive system.
- Because pasture growth is limited by water for much of the year, it is not possible to keep plants in a vegetative (growing) state.
- It is often extremely difficult to move stock during the wet season.
- Although rotational grazing may be useful for improving land condition, it can have an adverse effect on individual animal production because it limits selection of only the preferred species or parts of plants to maximise diet quality.
- Rotational systems require more careful management and monitoring of pastures and animals.

Test any rotational system against the effect it will have on the three principles of grazing management: What is the effect on land condition? What is the effect on the evenness of grazing? What is the effect on diet quality? If you know what you are trying to achieve with a rotational system, you can then decide at what level you should implement it. For advice, contact DRDPIFR Pastoral Production, Katherine.

Wet season spelling

Wet season spelling involves locking up paddocks during the growing season to allow plants to replenish root reserves and set seed.

Advantages of wet season spelling

- Allows pastures to rest, prevents overgrazing of preferred species and allows pastures to set seed.
- It is easier to implement over a whole property system than more intensive rotational systems.

Disadvantages of wet season spelling

- Cattle have to be moved into new paddocks potentially overstocking and unsettling them.
- Cattle may need to be agisted, or extra numbers sold to allow resting of paddocks to avoid overstocking the remaining paddocks.
- A higher level of management is required to monitor which paddocks require spelling and moving of cattle.

The best time to spell pastures is early in the growing season when plants are replenishing their root reserves. The first six to eight weeks are critical for protecting root reserves. A full wet season rest allows pastures the opportunity to set seed. A practical method of achieving this is not to return cattle to a spelled paddock after the second-round muster.

Prioritise paddocks for spelling according to land condition. Spelling will help improve pasture condition in poorer paddocks or it will allow enough fuel to accumulate for woody vegetation management burns.

To maximise spelling benefits it is important to aim for end of dry season yield and cover targets.

SUMMARY OF BEST PRACTICE

- Continuous grazing
  Ensure any continuous grazing strategy has a conservative stocking rate to prevent patch grazing or decline of preferred species, which can cause a loss of land condition in the paddock. Base stocking rates on safe utilisation rates for average pasture growth, or end of season yield and cover targets.

- Rotational grazing
  Consider the effects of a rotational grazing on land condition, the evenness of grazing and diet quality and therefore animal production. Seek advice from DRDPIFR Pastoral Production Division, Katherine.

- Wet season spelling
  Spell pastures early in the growing season. Remove animals at the second-round muster and return at the following first-round muster. A full wet season rest allows pastures the opportunity to set seed. Prioritise paddocks for spelling. Do not overgraze other paddocks to achieve spelling. End of dry season targets for yield and cover are still important for stocking paddocks during the dry season.

Source


Further information

DRDPIFR Rangeland Management course.
Contact Pastoral Production Extension Officer
DRDPIFR Katherine, Ph: (08) 8973 9739.

MLA EDGEnetwork® Grazing Land Management courses.
Contact Grazing Land Management Officer
DRDPIFR Katherine, Ph: (08) 8973 9739.

Partridge, I. (1999), Managing Grazing in Northern Australia: A grazier’s guide. Queensland DPI&F.
Rangelands Australia, Ph: (07) 5460 1660. www.rangelands-australia.com.au

Resource Consulting Services Grazing for Profit Schools, Ph: (07) 3869 3044. www.rcs.au.com

Related topics

Carrying Capacity, Land Condition.
Buying hay

Hay producers in the Katherine area have agreed to use a locally-developed voluntary vendor declaration (VVD) form to provide buyers with a formal description of the hay for sale as a demonstration of local hay producers’ commitment to satisfy the requirements of the NT Weed Management Act (2001). All buyers can use this information when purchasing hay, particularly those implementing a quality assurance program such as Cattlecare®.

The VVD form:
- is voluntarily supplied by a grower to a prospective buyer
- contains information describing the hay offered for sale including where and when it was produced
- provides information about weed management practices used
- gives details of chemicals applied to the crop during the season.

(see Further Information)

Quality

If, as a hay purchaser, you are concerned about the quality of hay, inspect the paddock for weeds before the hay-baling. Avoid broadleaves Senna, Sida and Crotalaria species, grader grass (Themeda quadrivalvis) and mission grass (Pennisetum species).

The best way to assess hay quality is through a feed test performed by an independent registered feed testing agency (e.g. Feed Test Australia). Ask potential suppliers for a copy of the results from feed-tested hay. If they haven’t tested the hay, request a small sample (about a handful) for sending away and testing, costing about $50. Testing is worthwhile because it will allow you to judge the quality of the hay and hence the type of stock it can be fed to for best results.

The Australian Fodder Industry Association (AFIA) has adopted national grades for legume, pasture and cereal hays and silages (see Tables 1 and 2). The grades relate fodder quality to livestock performance where the best quality is A1.

The main indicators used to grade hay are dry matter digestibility (DMD percentage), metabolisable energy (ME)(MJ/kg DM) and crude protein (CP percentage). Energy and protein are the main nutrients required for animal production and digestibility is a measure of the availability of these nutrients in hay or silage. Young growing animals and breeders with calves at foot require the best quality feeds (e.g. pasture/legume hays B2, B1, A2, A1) whereas the lower grades, such as cereal hays <C3, may provide cattle held in yards with minimum requirements for maintaining body weight.
Hay: Buying and Producing

Katherine region hay

A number of pasture, forage legume and grass cultivars are grown for hay in the Katherine region. Hay is mostly grown during the wet season but there are some irrigated crops, mainly of Finecut Rhodes grass. Several types of bales are produced: small square, round (various sizes) and large square (various sizes). Weights range from 15kg for poorly-made small square bales to 700kg for some of the large squares. Hay is generally not cut until after Easter, as it often rains when the moon is full over Easter.

Transport efficiency

With the vast distances hay has to be transported to stations in the Northern Territory, freight cost is critical in assessing hay purchases. For example, loosely-baled round bales may only load 9–12 tonnes (t) per trailer, whereas large square bales may load 18–22t per trailer, effectively halving the freight cost. The buyer’s ability to handle the product and transport cost will be important factors in the decision making process. Hay should be purchased by weight rather than by bale, where possible. Bales can vary by up to 100% (150 to 300kg for round bales, 300 to 600kg for large, square bales).

Legume hay

Legume hay is generally higher in protein than grasses. The crude protein of Katherine region legume hay is typically 9–14%. The main legume hay cultivar is Cavalcade centro. Hay has been made from a range of other legumes including verano, lablab and cowpea. The yield expected from a well-grown legume hay crop is 5–8t/ha.

Grass hay

The crude protein in grass hay ranges from 4–12%, depending on the amount and timing of applied nitrogen (and/or the residual nitrogen in the soil from a previous legume crop). The main grass hay crop is Jarra finger grass. Hay is also made from Finecut Rhodes grass, sabi grass, forage sorghums and pearl millet. The yield expected from a well-grown grass hay crop is 10–12t/ha.

Native grass hay

Some properties on the Barkly Tableland and in the Victoria River District native grass hay is made on some properties with large, open areas of grasses on black soils. Most native grass hay is made from Flinders grass and sometimes from Mitchell grass, depending on the season. Quality is generally low with crude proteins 4–6%.

Silage

Good quality silage can be made from irrigated maize or forage sorghum.

### Tables 1 and 2: Australian Fodder Industry Association (AFIA) grades for fodder (Adapted from AFIA).

<table>
<thead>
<tr>
<th>DMD (%)</th>
<th>ME (M/kg DM)</th>
<th>CP (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 53</td>
<td>&lt; 7.4</td>
<td>D1</td>
</tr>
<tr>
<td>53–59</td>
<td>7.4–8.4</td>
<td>C1</td>
</tr>
<tr>
<td>60–66</td>
<td>8.7–9.5</td>
<td>B1</td>
</tr>
<tr>
<td>&gt; 66</td>
<td>&gt; 9.5</td>
<td>A1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DMD (%)</th>
<th>ME (M/kg DM)</th>
<th>CP (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 53</td>
<td>&lt; 7.4</td>
<td>D1</td>
</tr>
<tr>
<td>53–59</td>
<td>7.4–8.4</td>
<td>C1</td>
</tr>
<tr>
<td>60–66</td>
<td>8.7–9.5</td>
<td>B1</td>
</tr>
<tr>
<td>&gt; 66</td>
<td>&gt; 9.5</td>
<td>A1</td>
</tr>
</tbody>
</table>
Chapter Five: Land Management

SUMMARY OF BEST PRACTICE

• Do not cut wet season hay until after Easter.
• Purchase hay from growers who are able to guarantee its quality and ensure it is weed free.
• Feed hay bought from off the property in a restricted area and check carefully for weed growth.
• Have hay tested for quality.
• Grow Jarra finger grass for a grass hay.
• Grow cavalcade for legume hay.

Sources
Northern Territory Agricultural Association
www.ntaga.org.au

Further information
Australian Fodder Industry Association, Fodder Vendor Declaration Form. www.afia.org.au

Related topics
Beef Cattle Management Throughout Dry Periods, Improved Pastures for the Katherine Region, Native Pastures of the Katherine Region, Weed Management.
Chapter Five: Land Management

Introduced Pastures for the Katherine Region

Most beef in the Katherine region is produced on native pastures. Production is variable, due mainly to the length of the wet season. Except for a brief period at the beginning of the wet season, the nutritional value of the pastures is generally low. Introduced legumes, grasses or a mixture of both can have a role in increasing pastoral production.

On larger, more extensive properties, beef production can be improved by introducing tropical pasture legumes (augmentation) into native pastures. Legumes suitable for this purpose are Caribbean stylos (Amiga and Verano) and the Shrubby stylos (Seca and Siran). They can be established into native pastures by sowing seed into the ash after a burn, followed by wet season grazing to reduce competition from perennial grasses. On extensive grazing properties, fully improved pastures would generally only be sown for a specific purpose such as a bull paddock, a weaner paddock, for hay production or to prevent erosion in laneways and holding paddocks.

On smaller, more intensive properties, fully improved pastures of legumes, grasses or a mixture of both can be established for grazing or hay production.

The species of improved pasture to use depends on rainfall. Improved pastures will not reliably establish where annual rainfall is under 600mm per year. Both the reliability of establishment and the production from improved pastures increase with increasing rainfall from the southern Katherine region, to the north. The Agnote Pasture Species Sowing Guide for the Top End, and the individual Agnotes for each pasture species or cultivar give the most suitable rainfall ranges for each species.

Grasses

Introduced grasses will not generally establish successfully without some form of cultivation. It is recommended that advice from DRDPIFR be sought prior to establishing an introduced pasture. The most successful introduced grasses are palatable, digestible, drought-tolerant and can withstand heavy grazing.

The most commonly used species are buffel grass (Cenchrus ciliaris), sabi grass (Urochloa mosambicensis) and Indian bluegrass (Bothriochloa pertusa). More recently Jarra and Strickland finger grasses (Digitaria milanjiana) are showing promise. Some Jarra grass hay is produced in the region.

Legumes

The recommended legumes for grazing are Verano and Amiga stylos (Stylosanthes hamata); and Seca and Siran stylos (S. scabra). These are often used together.

The main legumes suitable for making hay are Cavalcade and Bundey (Centrosema pascuorum) and Milgarra blue pea (Clitoria ternatea). These have all been used for hay production in the region.

Leucaena (Leucaena leucocephala) is a high quality shrub legume which is suitable for fattening cattle. Growing leucaena is a specialist enterprise most suitable for producers with a farming background. Irrigation is needed to keep leucaena productive in the Katherine region.

When grazing cattle on improved pastures it is important to ensure that phosphorus levels are adequate, as cattle are only able to respond to the increased protein of these pastures if they have adequate phosphorus in their diet.
The value of improved pastures

Direct benefits of fully improved pastures include improved carry capacity (10–15 times the carrying capacity of native pasture), increased growth rates, increased pregnancy rates and increased branding rates.

Indirect benefits of improved pastures include quieter stock, fewer deaths, easier mustering and earlier marketing of steers.

Disadvantages of improved pastures include high initial development costs to clear and develop land, a risk of soil erosion during establishment, the area improved will be out of production for at least the first wet season and most of the first dry season and there are annual or regular maintenance costs for fertiliser and herbicides.

SUMMARY OF BEST PRACTICE

- On larger extensive properties, use legume augmentation or sow special purpose pastures.
- On smaller properties, consider use of fully improved pastures.
- Use adapted pasture cultivars.

Source


Further information

Contact Pastoral Extension Officer Katherine Ph: (08) 8973 9739.

Cameron, A.G. (2003), Pasture Species Sowing Guide for the Top End, Agnote 544 No. E5, DPIFM.

Cameron, A.G. (2002), The Value of Improved Pastures, Agnote 297 No. E32, DPIFM.

Cameron, A.G. (2003), Pasture establishment, Agnote 564 No. E97, DPIFM.


MLA EDGEnetwork® Grazing Land Management courses. Contact Grazing Land Management Officer DRDPFIR Katherine, Ph: (08) 8973 9739.

MLA Leucaena code www.mla.com.au


Related topics

Grazing Strategies, Hay: Buying and Producing, Weaning.
Land Condition

Land condition is the capacity of land to respond to rain and produce useful forage and is a measure of how well the grazing land is capturing energy and cycling nutrients and water. It is also a measure of how well the grazing ecosystem is functioning. Understanding and evaluating land condition is important when managing pastoral land for a sustainable future.

Land condition is measured by three criteria

- **Soil condition**: the capacity of soil to absorb and store rainwater, to store and recycle nutrients, to provide a proper environment for seed germination and plant growth, and to resist erosion.
- **Pasture condition**: the capacity of the pasture to capture solar energy and convert it to palatable green leaf, to use rainwater efficiently, to conserve soil condition and to cycle nutrients.
- **Woodland condition**: the capacity of the woodland to grow pasture, to cycle nutrients and to regulate ground water.

Pasture condition assessment is based on the density and vigour of perennial, productive and palatable grasses (3P). Assessment of annuals is less useful as these fluctuate seasonally.

**ABCD land condition framework**

Land condition can be classified into four main categories, known as the ‘ABCD’ land condition framework.

**‘A’ condition (Good condition)**

Good or ‘A’ condition has all the following features:

- good coverage of perennial grasses dominated by perennial, productive and palatable (3P) grass species for that land type
- little bare ground (<30% in general)
- few weeds and no significant infestations
- good soil condition, no erosion and good soil surface condition
- no sign or only early signs of woody thickening

**‘B’ condition (Fair condition)**

Fair or ‘B’ condition has at least one or more of the following features, otherwise similar to ‘A’ condition:

- some decline of 3P grasses with increases in other species (less favoured grasses and weeds) and/or bare ground (generally 30–60% bare ground)
- some decline in soil condition with some signs of previous erosion and/or current susceptibility to erosion is a concern
- some thickening in density of woody plants.
‘C’ condition (Poor condition)
Poor or ‘C’ condition has one or more of the following features, otherwise similar to ‘B’ condition:
• general decline of 3P grasses, large amounts of less favoured species and/or >60% bare ground
• obvious signs of past erosion and/or erosion risk currently high
• general thickening in density of woody plants.

‘D’ condition (Very poor condition)
Very poor or ‘D’ condition has one or more of the following features:
• general lack of any perennial grasses or forbs
• severe erosion or scalding, resulting in a hostile environment for plant growth
• woody plants or weeds cover most of the area.

Land condition:

Degradation of grazing lands is the loss of land condition. In the early stages of degradation, the condition of land is responsive to a change in management. Degradation is judged to be severe if it is irreversible over a reasonable time scale and/or is expensive to rehabilitate.
As demonstrated in the ABCD land condition framework diagram above, the susceptibility of land to change in condition, and the ease with which changes can be reversed, depends on land condition. The long-term cost of losing land condition is very high. The further land condition slips, the more energy and resources have to be invested to get it back. A reduction in land condition will reduce carrying capacity and consequently affect long-term productivity. For example, letting land condition slip from A to B will reduce carrying capacity by 25%, A to C by 50% and A to D by 75% or more.

Land in condition A is relatively stable. Land that is trending towards B can be fairly quickly reverted to A by a change in management. However, land in condition B is susceptible to a rapid decline to condition C. Also, reversing this change may require a major change in management and will take time to achieve. Land in condition C is very susceptible to rapid deterioration to condition D. Land in condition D will not revert to C by simply changing management; at least not in any time frame of practical interest to grazing land management. Reverting land in condition D back to C requires significant investment (time and money) into mechanical rehabilitation and even this may still be unsuccessful if soil condition is irreparable. Activities required to facilitate a shift back to condition C from D might include reseeding, earthworks and fertilisation.

It is important to distinguish cosmetic changes in land condition from real changes. For example, well-managed grazing land in condition A may appear to change to condition B during a run of dry years, but in reality maintains a good density of perennial plants and quickly resumes the ‘ideal’ look of A condition with one good wet season.

Conversely, another common misreading is that land in condition C is okay because it manages to produce green cover during a run of wet years. The reality is that if perennial grass density remains low, even with some recovery of perennial grasses, soil organic matter and biological activity; they take much longer to recover.

Land condition must be assessed according to what the land type looks like in A condition, not against what other more productive land types look like.

SUMMARY OF BEST PRACTICE

- Land condition can be assessed using the ABCD framework.
- Country should be managed to maintain or revert to condition A using stocking rates, fire and weed control.
- Understanding the characteristics of the land type is essential to assessing land condition.

Source

Further information
MLA (2006), Grazing Land Management: Sustainable and productive natural resource management, MLA, Sydney.
MLA EDGEnetwork® Grazing Land Management course. Contact Pastoral Production Extension Officer DRDPIFR Katherine, Ph: (08) 8973 9739.

Related topics
Biodiversity Conservation on Pastoral Lands, Fire Management, Native Tree and Shrub Management, Native Pastures of the Katherine Region, Tree Clearing on Pastoral Land, Weed Management.
In northern Australia woody cover and density have increased on many valuable pastoral land types that were previously open grasslands, such as the alluvial and basalt black soil plains and watercourses. A study in the VRD and Kimberley found that on average woody cover had increased between the 1940s and 1990s by 150%. For black soil types in the VRD the increase was up to 300%. Some land types less valuable for grazing have decreased in woody cover, possibly to the detriment of biodiversity.

**Why has woody cover changed?**

Woody cover and density are naturally higher in higher rainfall areas and lower on clay soils. In any given region there can be woody thickening during higher rainfall periods and thinning during drought. Fire helps to manage the tree–grass balance by killing woody plants or reducing their size. The exclusion of fire may lead to woody thickening.

Reasons for the increase in woody cover in the Katherine region are still uncertain but are thought to be a combination of higher than average rainfall since the 1970s, the deliberate exclusion of fire from productive black soil land types and the effect of grazing on fire frequency. Grazing is associated with decreased fire frequency, intensity and continuity through decreased fuel loads and control and prevention measures. It is also possible that higher CO₂ levels in the atmosphere have contributed to increasing woody cover.

Repeated late dry season burns may result in decreased woody cover.

---

**Native Tree and Shrub Management**

Trees and shrubs are important in the savanna rangelands, contributing to water and nutrient cycles, preventing erosion and salinity, storing carbon and enhancing soil condition. Trees also provide shade and topfeed for cattle and habitat for biodiversity. Tree and shrub density and cover fluctuate with climate patterns, fire regimes and grazing.
Increasing tree and shrub cover over 30 years at VRRS (Kidman Springs)

Effect of woody thickening and thinning

Where woody thickening has occurred, mustering costs are increased by up to 30%. Pasture growth may be limited because woody plants compete with pasture for water and nutrients. Land condition and carrying capacity can decline and there is a loss of habitat for species that require open grasslands.

Management options for woody thickening

The most economic and environmentally sustainable way to control woody thickening is with fire. Traditionally pastoralists have been reluctant to burn black soils but research at VRRS (Kidman Springs) has demonstrated the beneficial effects of applying fire to reduce woody thickening. Recommendations for fire regimes to manage woody thickening were developed (see Fire Management). In general, hotter fires later in the dry season are the most effective for controlling woody thickening. Regular early dry-season burns may also help to reduce woody thickening. These recommendations were prepared before the emergence of climate change as a national issue. It is possible that changes may be made in the future in line with climate change policies.

Tree clearing on pastoral leases requires approval from the Pastoral Land Board and can be uneconomic in this region due to the unreliability of pasture response, the extensive nature of the properties and the costs of controlling regrowth (see Tree Clearing on Pastoral Land).

Summary of best practice

- Fire is the best tool to manage woody plants.
- Burning in the late dry season or at regular intervals can control woody plants.

Sources


Lewis, D. (2002), Slower Than the Eye Can See: Environmental change in northern Australia’s cattle lands, Tropical Savannas CRC.

MLA EDGEnetwork® Grazing Land Management course. Contact Pastoral Production Extension Officer DRDPIfR Katherine, Ph: (08) 8973 9739.

Further information

Partridge, I. (1999), Managing Grazing in Northern Australia: A grazier’s guide, Queensland DPI&F.

Related topics

Native Pastures of the Katherine Region

Native pastures are the most valuable asset on extensive pastoral properties in the Katherine region. These pastures consist of a variety of species depending on soil type, topography and rainfall. Managing native pastures for sustainable long-term production requires an understanding of their growth phases and ecology.

Characteristics of native pastures

Pasture species are described as being either annual or perennial.

Perennial grasses live for more than one year, and start re-growing each wet season from the energy and nutrients stored in the root system until there is sufficient leaf growth. It is important to allow perennial grasses to seed every few years to ensure new seedlings are recruited to maintain the population. Perennial grasses are the most stable component of the pasture and provide the bulk of feed throughout the dry season.

Annual grasses are those which have to re-establish from seed every year. Whilst cattle production on annual-dominated pastures can be higher in the short-term, annual species tend to disappear during the dry season leaving bare ground.

Legumes are pastures which are able to fix nitrogen due to a symbiotic relationship with bacteria. They have a relatively high protein content and are extremely important from a diet quality point of view. Management of pastures should aim to maintain these preferred plants.

Pasture species in the Katherine region have evolved to be extremely efficient at capturing water and sunlight to facilitate rapid growth over the very short growing season. A downside of this characteristic (for cattle production) is that the plants are also very efficient at relocating nutrients from aboveground leaves and stems into the roots at the end of the growing season. The standing dry matter then tends to be of low quality. Quality is reduced even further when, at the end of the growing season, the plant becomes dormant and approximately 60% of it will be made up of low digestibility structural material such as lignin and cellulose.

Palatability

Annual grasses tend to be more palatable than perennials as they are shorter; have less indigestible material and have more concentrated nutrients. Palatability between perennial grasses varies according to factors such as their leaf:stem ratio, phase of growth, physical characteristics of leaves (sharp, hairy etc) and nutritive value. Native pastures need to be managed to maintain a high component of 3P grasses (palatable, productive, perennial) for optimum long-term cattle production.

Phases of pasture growth

The life cycle of a native perennial pasture plant in the Katherine region can be described in four phases. Figure 1 illustrates the changes in digestibility and metabolisable energy of pastures occurring across the four phases of growth.
Phase 1 (Crude protein content 10–16%)  
The plants in Phase 1 have the highest palatability and nutrient content of all the phases, however production is limited due to low yields. Plant growth is occurring from the nutrients stored in the roots from the previous growing season and is therefore the most vulnerable to grazing in this phase. Repeatedly grazing plants down at this phase will deplete the root reserves before the plant has sufficient leaf area to photosynthesise to produce energy for growth and replenishing root reserves. Spellling pasture during Phase 1 to prevent overgrazing of individual plants can be beneficial for both the pastures and production.

Phase 2 (Crude protein content 8–10 %)  
Yield is rapidly increasing in this phase and while not as good as in Phase 1, pasture quality is still high. This high quantity and quality mean Phase 2 is good for cattle production. The plant is actively replacing nutrients to its root system as well as producing a high proportion of leaf in this stage, making it a good time to get maximum benefit from spelling.

Phase 3 (Crude protein content 6–8%)  
Quality is rapidly declining in this phase making feed quality lower. Green leaf area index is in steep decline. Plants are setting seeds and replenishing root reserves. Nutrients are rapidly being transferred from the leaves and stems to the roots and for seed set. Yield is high but digestibility is decreasing rapidly. Plants have less susceptibility to grazing than the previous two phases, but spelling or reduced grazing may be desirable to allow seed set.

Phase 4 (Crude protein 2–6%)  
Plants in Phase 4 have low digestibility and nutrient levels. Cattle are often physically unable to eat the amount of grass required to gain sufficient energy and protein requirements and will require supplementation. The plant is dormant, with nutrients and energy stored in the roots. This means the plant is tolerant of fire or heavy grazing, but cover levels should be maintained to prevent erosion when the first rains come. Mitchell grass plants have been shown to respond better to rain if at least 20cm of standing dry matter is left.

Figure 1. Changes in digestibility and metabolisable energy of pastures over time (MLA 2003)
Pasture production across the Katherine region

The amount of dry matter or bulk produced, even on similar land types, varies considerably across the Katherine region due to the north-south rainfall gradient (Table 1). The variability in rainfall and pasture growth is greatest in southern areas. Southern areas can expect significantly less pasture growth in lower than average rainfall years.

Table 1 shows the differences in annual dry matter growth on two soil types for three locations in the Victoria River District (VRD) of the Katherine region for various rainfall percentiles. These figures were developed using a pasture growth model called GRASP which is calibrated for the Katherine region. Rainfall percentiles consider the percentage chance of receiving better than average rainfall. For example a 30 percentile indicates that in 7 out of 10 years on a northern VRD red soil you can expect at least 1,900kg/ha growth.

The quality of pasture also varies according to the rainfall gradient. In higher rainfall areas north of Mataranka, plant growth tends to be limited by nutrients rather than moisture. Under these conditions nutrients are diluted in structural plant material and a large quantity of low quality dry matter is produced. In the southern half of the region, pastures tend to be of higher quality because growth is usually limited by lack of moisture before the nutrients run out. High rainfall years in southern areas of the region may result in a ‘protein drought’. The northern part of the region tends to have a protein drought every year.

<table>
<thead>
<tr>
<th>Location</th>
<th>Median rainfall (mm)</th>
<th>Soil type</th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
<th>90</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern VRD</td>
<td>777</td>
<td>Red</td>
<td>1650</td>
<td>1800</td>
<td>1900</td>
<td>1950</td>
<td>1950</td>
<td>2000</td>
<td>2000</td>
<td>2050</td>
<td>2100</td>
<td>2100</td>
<td>2300</td>
</tr>
<tr>
<td>Central VRD</td>
<td>618</td>
<td>Red</td>
<td>1100</td>
<td>1800</td>
<td>1900</td>
<td>2000</td>
<td>2050</td>
<td>2050</td>
<td>2100</td>
<td>2100</td>
<td>2150</td>
<td>2200</td>
<td>2350</td>
</tr>
<tr>
<td>Southern VRD</td>
<td>411</td>
<td>Red</td>
<td>233</td>
<td>795</td>
<td>1016</td>
<td>1260</td>
<td>1484</td>
<td>1673</td>
<td>1862</td>
<td>2029</td>
<td>2165</td>
<td>2224</td>
<td>2462</td>
</tr>
<tr>
<td>Northern VRD</td>
<td>777</td>
<td>Alluvial</td>
<td>1100</td>
<td>1850</td>
<td>2000</td>
<td>2200</td>
<td>2450</td>
<td>2500</td>
<td>2600</td>
<td>2650</td>
<td>2700</td>
<td>2750</td>
<td>2950</td>
</tr>
<tr>
<td>Central VRD</td>
<td>618</td>
<td>Alluvial</td>
<td>600</td>
<td>1200</td>
<td>1400</td>
<td>1700</td>
<td>1850</td>
<td>2050</td>
<td>2250</td>
<td>2550</td>
<td>2750</td>
<td>2800</td>
<td>3350</td>
</tr>
<tr>
<td>Southern VRD</td>
<td>411</td>
<td>Alluvial</td>
<td>100</td>
<td>450</td>
<td>550</td>
<td>800</td>
<td>1000</td>
<td>1150</td>
<td>1360</td>
<td>1500</td>
<td>1700</td>
<td>2200</td>
<td>3150</td>
</tr>
</tbody>
</table>

Table 1. Dry matter growth (kg/ha) on two soil types for three locations in the VRD according to rainfall percentiles

Native pasture species

It is important from a biodiversity and animal production point of view to maintain a wide variety of species in a pasture community. Widespread perennials include black speargrass (*Heteropogon contortus*), kangaroo grass (*Themeda triandra*) and bluegrasses (*Dichanthium* spp.) in the north graduating to Mitchell grasses (*Astrebla* spp.) and limestone grasses (*Enneapogon* spp.) in the south. Spinifex (*Triodia* and *Plectrachne* spp.), whitegrass (*Sehima nervosum*), ribbongrass (*Chrysopogon fallax*) and feathertop (*Aristida* spp.) can be found throughout the region.

Palatable annual grasses include the sorghums (*Sarga* spp.) in the north changing to native couch (*Brachyachne convergens*) and Flinders grasses (*Iseilema* spp.) in the south.

Learning to identify key pasture species will enable better prediction of diet quality and monitoring of land condition. There are several excellent pasture identification books and courses relevant to the Katherine region (see Further information).

**SUMMARY OF BEST PRACTICE**

- Be able to identify key pasture species.
- Protect pastures in Phase 1 of growth from heavy grazing.
- Allow perennial grasses to seed periodically.
- Maintain 3P grasses for sustainable production.

Sources

MLA (2003), EDGEnetwork® Grazing Land Management: Technical manual, MLA, Sydney

MLA (2003), Nutrition EDGE®: Workshop notes, MLA, Sydney

Further information

MLA EDGEnetwork® Grazing Land Management course. Contact Pastoral Production Extension Officer DRDPIFR Katherine, Ph: (08) 8973 9739.

MLA EDGEnetwork® Nutrition EDGE. Contact Pastoral Production Extension Officer DRDPIFR Katherine, Ph: (08) 8973 9739.


Milson, J (2000), Pasture plants of north-west Queensland, Department of Primary Industries, Natural Resources and Mines, Brisbane.

Petheram, R and Kok, B (2003), Plants of the Kimberley region of Western Australia, University of Western Australia Press, Crawley.

MLA (2006), Grazing Land Management: Sustainable and productive natural resource management, MLA, Sydney.

Related topics

Chapter Five: Land Management

Rangeland Monitoring

Monitoring or regular observations of the pasture resource are an integral component of pastoral land management. The information gathered from monitoring, such as how the rangelands respond to the pressures placed on them, will help to make informed management decisions.

Monitoring programs can help to answer questions such as:

- How many head can I carry with existing and available feed?
- Should I start to sell stock or buy feed?
- How will my management changes affect this paddock?
- Is my management causing an increase in unwanted grasses and weeds?
- Is woody growth increasing?
- Is pasture condition improving or declining?

It is a good idea to assess the general condition of paddocks on a regular basis.

Information from monitoring can provide base information on:

- pasture condition
- early warning signs of issues such as feed gaps, weed invasions, woody increase and erosion risk
- data to help you make better management decisions
- a means of measuring change over time
- information for future reference
- a better understanding of the whole grazing system.

Visual comparison from previous assessments can show pasture condition trends. Sites should be reviewed at key times for decision-making and at least annually. Monitoring can also feed into environmental management systems (refer topic Environmental Management Systems).

Monitoring site location

Monitoring sites should be in the major vegetation types in each paddock. The location should take into account the typically grazed areas in relation to watering points, allowing for preferentially grazed species. Sites are usually placed at an intermediate distance from water. Sometimes sites may be located in special interest areas. Sites should be marked with brightly painted pickets to ensure high visibility.

Monitoring time

In the Katherine region, perennial and annual species ratios can be determined by monitoring at the end of the growing season. Monitoring at the end of the wet season ensures information is timely for use in management decisions.

Monitoring techniques

Photographic monitoring provides an objective record of vegetation change. Rainfall data and grazing information for the year relating to the sites photographed should also be recorded to assist in analysis.

Two photos can be taken from different angles. All monitoring photos should be clearly marked with a site name and date.
Records management

Use recording sheets to log data from each site. Ensure each recording sheet has the date, property name, paddock name, site number, a brief description of the land type and any comments which may be useful. You may also wish to note whether grazing has occurred and details of stock movements. Photos should be marked clearly with site identification and date.

Data can be collected on palm top computers and downloaded.

Standing feed estimates

Standing feed can be estimated with the use of photo standards. The North Australian Grassland Fuel Guide (Johnson, 2002) and the Queensland Department of Primary Industries and Fisheries provide photo standards and the corresponding pasture yields on a CD-ROM. With some training and practice you can quickly become proficient at estimations. Attending an MLA Grazing Land Management or NutritionEDGE® course will provide training and advice on how to make standing feed estimates. Software is available to assist with record keeping.

2000–3000 kg/ha fuel is able to carry a medium to hot intensity fire, ideal for burning to maintain pasture condition.

Examples of photo standards: 2,000kg/ha (left), 2,400kg/ha (right).

Sources
Forge, K. (1997), Grass CHECK: Grazier rangeland assessment for self sustainability, Queensland DPI&F.

Queensland Department of Natural Resources and Water (2006), Land Management: Key types of photographs. www.nrw.qld.gov.au

WA Dept of Planning and Infrastructure (2005), The Grazing of Cattle in the Northern Pastoral Areas of Western Australia: Best management practice 2005.

Further information


MLA EDGEnetwork® Grazing Land Management courses. Contact Pastoral Production Extension Officer DRDPIF FR Katherine, Ph: (08) 8973 9739.


Related topics

SUMMARY OF BEST PRACTICE

- Monitoring or regular observations of the pasture resource are an integral component of pastoral land management.
- Choose a monitoring site which represents the major vegetation types in the paddock, and which is an intermediate distance from watering points.
- Keep good records including photos and rainfall and grazing information.
Tree Clearing on Pastoral Land

Tree clearing on pastoral land is mainly undertaken for infrastructure development and for the establishment of improved pastures. Improved pastures may be sown to increase carrying capacity in special use areas (e.g. laneways, holding paddocks), for hay production or to compete with weeds or increaser species.

There is a legal obligation to formally apply to the Pastoral Land Board for approval for the following clearing operations:

- clearing for cropping or pasture improvement
- clearing for other purposes including but not limited to
  - pushing or chaining non-preferred shrub or tree species
  - maintaining or clearing regrowth from previous broadscale clearing operations where such clearing was not approved by the Pastoral Land Board since 1992 or was not carried out in accordance with the approval issued by the Board.

A Land Clearing Permit is not required to clear land for the purposes of:

- making fixed improvements (infrastructure)
- selectively removing noxious weeds
- removing woody weeds over an area of less than 10 hectares in areas surrounding fixed improvements such as yards, holding paddocks and laneways
- maintaining or clearing regrowth from previous broadscale clearing operations provided such clearing was subject to the written approval of the Pastoral Land Board since 1992 and was carried out in accordance with the approval issued by the board.

All clearing, however, must abide by the Land Clearing Guidelines (see DNRETAS website). These guidelines have been adopted by the Pastoral Land Board as the technical guidelines to apply to all clearing on pastoral land.

If in doubt as to whether or not approval is required, check with DNRETAS or the Pastoral Land Board.
The approval process

Planning
Planning is the most important step in developing a clearing proposal. The risk of soil erosion and other land degradation problems can be minimised by sound planning. An appropriate plan will protect fixed improvements, reduce maintenance costs and maximise efficiency.

When developing a land clearing plan, focus on:

- the desired result
- plan components such as site selection, timing of clearing, clearing method, erosion control and environmental protection, ongoing management of regrowth
- the availability of advice and assistance
- fire management
- biodiversity considerations (variety and variability of plants, animals and other living organisms and the ecosystems in which they occur.

Application form
Once a plan has been developed, an application form must be submitted to the Pastoral Land Board to obtain formal approval to clear. Clearing must not commence until formal approval, in the form of a Land Clearing Permit, is granted. Application forms are available from DNRETAS or on their website (see Further information).

Property management plan
In addition to the application form, a property management plan for land clearing is required. This will provide details such as an overview of the proposed clearing and its place in whole property management, costs and benefits of the development, details of proposed clearing and ongoing resource management. A template and more details for the property management plan are also available from DNRETAS.

The Land Clearing Permit issued for a clearing development will refer to the approved property management plan as a condition of the approval and will require development and ongoing management to be undertaken in accordance with the plan.

Lodging the application
All required details must be completed on the approved forms and all relevant supporting information attached. An application fee will be charged ($120 in 2008). If the application is approved, a Pastoral Land Clearing Permit will be issued which will list any conditions applying to the approval. A clearing plan showing the areas approved for clearing will be provided. If an application is refused, the notice of refusal will list all reasons for the refusal.

SUMMARY OF BEST PRACTICE

- Be certain whether or not proposed clearing requires approval. Penalties apply for illegal clearing operations.
- Plan clearing operations carefully.
- Use DNRETAS expertise and website to assist with preparation of clearing plans, property plans and application forms.

Sources

Further information
Land Clearing Guidelines, Application Form
www.nt.gov.au/nreta/
Pastoral Land Board – How to lodge a clearing application, Ph: (08) 8999 4667.
Pastoral Land Management Officer, DNRETAS Katherine, Ph: (08) 8973 8122.

Related topics
Paddock Design, Introduced Pastures for the Katherine Region, Native Tree and Shrub Management, Weed Management.
On pastoral land, weeds compete with native pastures resulting in:
- decreased animal production
- altered fire regimes
- altered run-off and stream flow processes
- restricted access
- injury and/or toxicity to animals or humans
- reduced biodiversity of native grasslands.

Characteristics of weeds
- very competitive
- produce large quantities of seed
- have excellent seed dispersal abilities
- develop long-term seed banks
- often unpalatable or poisonous to stock.

High priority weeds in the Katherine region
As identified in the Katherine Regional Weed Management Strategy and Action Plan 2005–2010, high priority weeds include:

**Existing threats**
- **Mimosa** (*Mimosa pigra*)
- **Bellyache Bush** (*Jatropha gossypifolia*)
  (in certain catchments)
- **Prickly acacia** (*Acacia nilotica*)
- **Chinee apple** (*Ziziphus mauritiana*)
- **Mesquite** (*Prosopis pallida*)
- **Mission grass** (*Pennisetum polystachion*)
- **Devils claw** (*Martynia annua*)
- **Barleria** (*Barleria prionitis*)
- **Ornamental rubber vine** (*Cryptostegia madagascariensis*)
- **Lantana** (*Lantana camara*)
- **Lions tail** (*Leonitis nepetifolia*)
- **Parkinsonia** (*Parkinsonia aculeata*)
  (in certain catchments)

**Future threats**
- **Parthenium** (*Parthenium hysterophorus*)
- **Rubber vine** (*Cryptostegia grandiflora*)
- **Pond apple** (*Annona glabra*)
Management and control of weeds

Weed management requires integrated weed management practices:

- Clean all vehicles and equipment before entering clean areas or leaving weed-infested areas.
- Restrict service vehicles from travelling throughout properties.
- Learn to identify priority weeds within your region.
- Ensure all station personnel can recognise priority weeds and are vigilant.
- Learn to operate weed control equipment and follow manufacturers’ instructions when using herbicides.

- Carry weed control equipment in your vehicle, and DON’T drive past a lone weed, but destroy it there and then.
- Purchase clean hay with voluntary hay vendor declarations.
- Only feed out hay in areas that can be readily monitored and are away from watercourses.
- Unload new stock in a designated holding paddock to enable early detection of weed introductions.
- Incorporate a program of monitoring clean areas into normal station operations.

A package of best weed management practices should include a combination of control methods such as those shown in Table 1.

### Table 1. Methods used to control weeds

<table>
<thead>
<tr>
<th>Control method</th>
<th>Examples include:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical</td>
<td>Handpulling, grubbing, slashing, cultivation, chaining, felling and mowing.</td>
</tr>
<tr>
<td>Land management</td>
<td>Reduce grazing intensity, revegetation, quarantine, fire, hygiene; report weeds, control feral animals and manipulate environmental stress factors.</td>
</tr>
<tr>
<td>Chemical</td>
<td>Foliar spraying, rope wick applicators, basal bark application, cut stump, stem injection and soil application.</td>
</tr>
<tr>
<td>Biological</td>
<td>Importation of host-specific natural enemies of the weed.</td>
</tr>
<tr>
<td></td>
<td>There are four stages in a biological program:</td>
</tr>
<tr>
<td></td>
<td>1. overseas exploration</td>
</tr>
<tr>
<td></td>
<td>2. quarantine testing</td>
</tr>
<tr>
<td></td>
<td>3. mass rearing and field release</td>
</tr>
<tr>
<td></td>
<td>4. monitoring.</td>
</tr>
</tbody>
</table>

From Smith (2002).

**SUMMARY OF BEST PRACTICE**

- Prevention is the key.
- Develop an integrated property weed management plan that incorporates a combination of control methods to combat existing weed incursions.

**Sources**


**Further information**

CRC Australian Weed Management www.weeds.crc.org.au
Katherine Weed Management www.katherineweeds.nt.gov.au
DNRETAS Weed Management Branch, Randazzo Building, Katherine NT. Ph: (08) 8973 8107.
Weeds Australia (weed identification, reporting and management) www.weeds.org.au
NRETA (2007), Weed ID Deck, Katherine region, NRETA.
MLA EDGENetwork® Grazing Land Management courses. Contact Pastoral Production Extension Officer DRDPIFR Katherine, Ph: (08) 8973 9739.

**Related topics**

Biodiversity Conservation on Pastoral Lands, Fire Management, Land Condition, Poisonous Plants, Tree Clearing on Pastoral Land.
Chapter Six: Other

Contents

1. Employment 196
2. Feral Animals (Large) 203
3. Financial Health Indicators 205
4. Live Cattle Export Industry 209
5. Macropods 211
6. Selling Options 214
7. Succession Planning 217
8. Weather and Climate Information 219
9. Wild Dog Control 222
10. Working Dogs 224
Employment

An employer has many legal and moral obligations relating to:

• determining whether workers are contractors or employees
• pay as you go (PAYG) withholding, fringe benefits tax (FBT), eligible termination payments
• superannuation
• occupational health and safety (OH&S)
• insurances – public liability, third party, workers compensation
• industrial relations and award conditions
• record keeping

Legislation and employer obligations are always changing. The information provided is for general information only and is not intended to replace legal or professional advice or information provided directly from relevant government agencies. Up-to-date, accurate information on employer tax and superannuation obligations is available at www.ato.gov.au/businesses/. OH&S and workers compensation obligations are dictated by State and Territory legislation.

Contractor or employee?

It is important to ascertain whether someone hired to work on a property is technically an employee or a contractor. If, in the eyes of the ATO, a hired person should be an employee, then the employer is liable for superannuation, workers compensation and pay as you go (PAYG) taxation. An ABN alone is not sufficient to classify a person as a contractor. If you can control the way work is done, where it is done and when it is done, then the worker is probably an employee, although more indicators may be required. Direction about whether or not a worker is an employee or an independent contractor has mainly evolved in the courts. The Multi-indicia Test (previously known as the Control Test) can be assisted by answering a series of questions to help determine whether or not a person should be an employee or a contractor. The test was developed through legal decisions.

State workers compensation laws and the ATO define ‘employee’ differently, so be very clear about the obligations you have in relation to a ‘contractor’. The situation is further complicated if the ‘contractor’ has employees. You are entitled to ask a contractor for documentary proof of workers compensation cover, public liability insurance, and timesheets of his employees (to ensure PAYG is being withheld). You can also ask that the ‘contractor’s’ superannuation contributions for his employees be made on your behalf as well, to ensure your compliance if there is uncertainty about his contractor status.
Questions to help decide the ‘multi-indicia test’ (NFF)

<table>
<thead>
<tr>
<th>QUESTION</th>
<th>YES / NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>If you answer ‘no’ to most of these questions, then the person is more likely to be an employee and should be employed as such.</td>
<td></td>
</tr>
<tr>
<td>1. The person is being employed to achieve an end result. When the job is done, they will leave.</td>
<td></td>
</tr>
<tr>
<td>2. The person is paid for doing the job, rather than by the hour.</td>
<td></td>
</tr>
<tr>
<td>3. The person can decide how to perform the job so long as the job gets done.</td>
<td></td>
</tr>
<tr>
<td>4. There is no obligation to accept work and the person can reject work if they wish.</td>
<td></td>
</tr>
<tr>
<td>5. The person can determine when they do the work so long as the work gets done.</td>
<td></td>
</tr>
<tr>
<td>6. The person is responsible for any mistakes made and must fix them at their own expense.</td>
<td></td>
</tr>
<tr>
<td>7. The person can delegate some or all of the work to another person so long as the job gets done.</td>
<td></td>
</tr>
<tr>
<td>8. The person can employ workers to perform the work.</td>
<td></td>
</tr>
<tr>
<td>9. The person provides their own tools and machinery and is responsible for their upkeep / fuel etc.</td>
<td></td>
</tr>
<tr>
<td>10. The person is paid on the basis of invoices not wages.</td>
<td></td>
</tr>
<tr>
<td>11. Holiday, sick pay and other entitlements are not paid by you.</td>
<td></td>
</tr>
<tr>
<td>12. The person pays their own tax.</td>
<td></td>
</tr>
<tr>
<td>13. The person has an ABN number.</td>
<td></td>
</tr>
<tr>
<td>14. The person pays their own accident and public liability insurance.</td>
<td></td>
</tr>
<tr>
<td>15. The person works for other people as well as you.</td>
<td></td>
</tr>
<tr>
<td>16. The person says they are an independent contractor and advertises this fact.</td>
<td></td>
</tr>
</tbody>
</table>

The Independent Contractors Act 2006 and the Workplace Relations Legislation Amendment (Independent Contractors) Act 2006 came into effect on 1st March 2007. These laws protect genuine employees from ‘sham’ contracting arrangements and (among other things) make it illegal for an employer to misrepresent an employment relationship. The Office of Workplace Services and the Australian Building and Construction Commissioner have the power to prosecute employers who break this law. Fines can be up to $33,000.

Superannuation

Generally, if an employee is aged between 18 and 70 years old and earns more than $450 (before tax) in a calendar month, he is covered under superannuation guarantee legislation. Employees aged under 18 but working more than 30 hours per week are subject to superannuation guarantee legislation. There are some exceptions. This legislation obliges the employer to pay superannuation contributions on behalf of the employee, and to advise the employee of contributions made. The contribution or ‘charge percentage’ is 9% (2008) of ordinary time earnings and is payable to an approved superannuation fund at least four times a year. Superannuation guarantee contributions are costs borne by the employer and are not deducted from employees’ earnings. Employees may choose to make ‘personal contributions’ from their earnings.

Choice of superannuation fund

Certain employees have the right to choose which superannuation fund or retirement savings account will receive their superannuation guarantee contributions. An employer’s obligation is to:

- establish the employee’s eligibility for choice of superannuation
- if eligible, provide the employee with a ‘Standard choice form’ from the Australian Tax Office (ATO)
- act on the employee’s choice by contributing the superannuation contributions to the chosen fund in accordance with your obligations under the legislation.

All Northern Territory employees have a choice of superannuation fund and must complete the ATO form called ‘Choice of superannuation fund: Standard choice form’ on commencement of employment.

Under the Northern Territory Cattle Industry Award, employers and employees may agree that superannuation contributions be paid into any compliant fund. In default of any agreement, contributions may be paid into the Australian Primary Industry Superannuation Fund (currently known as Prime Super).
Pay as you go (PAYG), fringe benefits tax, eligible termination payments

An employer is obliged to withhold ‘pay as you go’ tax from employees’ earnings and remit the amounts withheld to the ATO. Employers must register to pay PAYG withholding, determine the status of their employees (employee or contractor) and work out what types of payments you need to withhold from. PAYG is withheld from payments to employees, payments to directors, payments to a business that doesn’t quote its ABN, some contractors and from eligible termination payments. PAYG may or may not be required to be withheld from allowances. The ATO specifies which allowances are subject to PAYG withholding e.g. PAYG is withheld from a First Aid allowance, but not from travel allowances, up to a reasonable amount. Annual rulings are made as to what a ‘reasonable amount’ of an allowance is.

To calculate how much PAYG to withhold for an employee, use the PAYG withholding tax tables (ATO), in conjunction with information contained on the Tax file number (TFN) declaration form and sometimes a Withholding declaration as well. All employees should fill out a Tax file number (TFN) declaration form (to be forwarded to the ATO). Should employees wish to vary PAYG withheld amounts to offset other benefits, then a withholding declaration should also be completed and retained by the employer.

Fringe benefits tax (FBT) has to be paid on certain benefits employers provide to their employees or their employees’ associates in place of salary or wages. Common situations incurring FBT liability are the provision of a car to an employee for private use, paying for expenses incurred by employees or provision of entertainment by way of food, drink or recreation. If employees are provided with fringe benefits, then the employer must register for FBT, calculate the taxable value of the benefits provided, pay FBT to the ATO and keep special FBT records. Some benefits are exempt such as mobile phones, protective clothing, tools of trade or portable computers where the items are used mainly for work. The ATO has a detailed publication on FBT for small business.

Eligible termination payments (ETPs) are made in instances of bona fide redundancy or early retirement under an approved scheme. ETPs receive special tax treatment with tax-free limits, special rates of taxation and superannuation benefits. Further information can be found under the superannuation section of the ATO website.

Insurances

Legislation applying to the insurance industry is highly regulated, both through government legislation and through codes of practice set down by insurance bodies. From December 2001, all companies who have not put in place sound risk management programs face federal criminal penalties if found to be negligent.

Public liability insurance

Public liability insurance is compulsory for all businesses. It covers your legal liability for compensation to any member of the public, who is not your employee or family member, who suffers injury, damage to property or death due to your business operations, whether at your premises or not.

The level of insurance necessary for public liability is generally increasing due to the increasing levels of litigation and the time and costs of taking claims through courts (resulting in higher amounts being awarded to successful claimants). Professional advice should be sought when setting the indemnity limit for your public liability cover. You will need to assess the particular risks that apply to your business and identify the probable amount of any claim. Annual review of your indemnity limit is good practice in our increasingly litigious society.

A typical indemnity limit in the pastoral industry would be $10 million. This is the usual level of indemnity required if your business wants to enter into a Northern Territory Government contract. This level of cover may attract a premium in the order of $600/annum (2007).

Third party insurance

Businesses using vehicles for work purposes must have third party insurance. In the Northern Territory, third party insurance is a compulsory component of vehicle registration costs. The Territory Insurance Office (TIO) is the only approved third party insurer in the Northern Territory. Third party insurance provides cover for personal injury to third parties in an accident where the driver of your motor vehicle is at fault. It does not cover injuries to the driver of your vehicle, if he or she was at fault, or damage to the third party’s property or vehicle. Third parties include all other road uses such as drivers, passengers, pedestrians, cyclists, motorcyclists and pillion passengers as well as passengers in your vehicle. Owners of vehicles registered in a jurisdiction other than the Northern Territory may be required to show proof of third party insurance and if necessary, pay a compulsory third party insurance premium to TIO through the Motor Vehicle Registry.

Workers compensation insurance

Under the Work Health Act of the Northern Territory, all employers must hold a workers compensation insurance policy to cover all of their employees. The policy must be with an insurance company approved by NT WorkSafe. Workers compensation premiums in the pastoral industry
can be from 5–15% of gross wages paid in a financial year, varying with the insurance company used, claims history and number of employees. Gross payments for wage and salary earners, family members and company directors include wages, overtime, salaries, bonuses, allowances, commission and all other remuneration paid, including payments for holidays, sickness and long service leave.

Workers compensation insurance premiums can be a significant cost in a pastoral enterprise so shopping around can be very worthwhile. Attention to OH&S issues on properties (and consequent reductions in the number and size of claims) will help minimise workers compensation premiums for the industry as a whole.

When a worker is injured and seeks to make a workers’ compensation claim, an employer should:

• Make a compensation claim form available to the worker.
• Forward the worker’s claim form to the insurer within three working days of receiving it from the worker.
• If the insurer accepts liability for the workers claim, then weekly payments of compensation must be made by the employer commencing within three working days of the decision to accept the claim. These benefits are payable from the date of first incapacity.
• If the insurer defers liability, weekly payments of compensation must commence within three working days of that decision. These payments are to commence with one week’s pay and continue for up to eight weeks within which time the insurer will either accept or reject liability. If the claim is subsequently accepted, compensation owing must be offset by any amounts paid during the period of deferral. If the claim is rejected, the deferral payment will cease. This payment is not recoverable from the injured worker.
• Take all reasonable steps to provide the injured worker with suitable employment and so far as is practicable, participate in efforts to retrain the worker.
• The employer must assist with any rehabilitation program and take all reasonable steps to provide suitable employment.

Employers must ensure, as far as reasonably practicable, that they provide:

• a safe working environment
• safe systems of work
• safe plant, equipment and substances
• adequate training, information and supervision
• adequate monitoring of work conditions
• reasonable safety policies and procedures.

One approach to OH&S is to:

• Spot the hazard.
• Assess the risk.
• Fix the problem.
• Evaluate the results.

An Occupational Health and Safety Management System (OHSMS) is a set of plans, actions and procedures, actively endorsed by the employer, to systematically manage health and safety in the workplace. The Northern Territory Cattlemen’s Association has developed an Operations Manual specifically for the pastoral industry which uses an integrated business management approach to meeting OHS compliance.
Industrial relations and award conditions

In March 2006, the Workplace Relations Amendment (Work Choices) Act came into effect. Known as WorkChoices, these amendments to the Workplace Relations Act 1996 allow greater flexibility in the workplace for both employers and employees. In the Northern Territory, all businesses employing people are covered by WorkChoices. In states other than Victoria, the application of WorkChoices may vary according to your business structure and State or Federal awards.

With the Federal Labor Party’s winning government in November 2007, industrial relations law in Australia will change, but the changes will not be immediate and are likely to be phased in over some years.

The NT Cattle Industry Award, a federally-registered award, will continue to apply until 31st December 2009 and a new modernised agricultural award will commence on 1st January 2010. A workplace agreement can be put in place of an award at any time. Some terms of the award may be overridden by the terms of the current Australian Fair Pay and Conditions Standard (AFPCS) if the terms of the latter are more generous.

WorkChoices provides five AFPCS minimum conditions applying to all employers in the Northern Territory relating to:

- **Wages** – minimum wage of $12.75/hour; basic rates of pay and casual loadings, default casual loading of 20%, disability rates, rates for training and rates for junior employees.
- **Maximum ordinary hours of work** – not more than a 38 hour week, which can be averaged over periods of time up to 12 months, employers can require employees to work ‘reasonable’ additional hours (‘reasonable’ requiring consideration of families and personal circumstances, OH&S risks, need and operational requirements of the business). Note: the 40 hour week in the NT Cattle Industry Award is preserved for now (August 2007).
- **Annual leave** – four weeks per year accruing every four weeks on a pro rata basis at a rate of pay not less than usual rate of pay, can be refused if business will be affected, employers can require employees to take leave during shutdowns (again, ‘reasonable’ applies).
- **Personal/carers leave** (including compassionate leave) – replaces sick/carers leave, 10 days per year, cumulative, two days unpaid carers leave if paid leave used up, plus two days paid compassionate leave for funerals and attending sick or dying relatives.
- **Parental leave** – up to 52 weeks of unpaid leave for employees who have worked for the employer for at least 12 months and who have a reasonable expectation of returning to work.

- **Public holidays**

New National Employment Standards will come into operation on 1st January 2010, the same date as new awards come into operation. They will be similar to and expand upon the current AFPCS and will include:

- Extension of parental leave from 12 to 24 months (employer can refuse only on reasonable business grounds).
- Parents have a right to request flexible hours, job location and duties until the child reaches school age.
- Entitlement to leave for prescribed community services (e.g. paid leave for jury service, unpaid leave for emergency services).
- Guaranteed public holiday penalty rates as set out in the applicable award.
- Employers must provide all new employees with a Fair Work Information Statement (FWIS).
- Nationally consistent long-service leave entitlements.

Other components of WorkChoices (and Labor’s transition bill and policy platform) include:

- Minimum entitlements – meal breaks, public holidays, equal pay for equal work.
- Establishment of the Australian Fair Pay Commission to set minimum wages and casual loadings (set to be replaced by Fair Work Australia on 1st January 2010).
- Simplification and rationalisation of awards (now referred to as modernisation).
- Providing for six types of workplace agreements including Australian Workplace Agreements (AWAs) between an employer and a single employee, Employee Collective Agreements between an employer and two or more employees and Union Collective Agreements (AWAs will be phased out in the transition bill which was expected to be passed before Easter 2007. The existence of at least one AWA with any employee on 1st December 2007 will enable a business to access Individual Transitional Employment Agreements (ITEAs) for new and existing employees under an expired AWA until 31st December 2009 (subject to a ‘better off overall test’ against the relevant award).
- Record keeping requirements.
- Establishment of the Workplace Authority and the Fairness Test (to be replaced by ‘better off overall test’ similar to old no-disadvantage test).
- Model dispute resolution process.
- Unfair dismissal (with some exemptions for small business and different types of terminations).
- Unlawful termination provisions.
Record keeping

In relation to employees, the ATO requires that the following records must be kept for five years:
- tax file number declarations and withholding declarations
- worker payment records
- PAYG payment summaries
- annual reports
- superannuation records
- records of any fringe benefits provided.

Records of all sales and purchases and payments to other businesses also need to be kept for five years.

Workplace Relations Regulations 2006 requires all employers to make records relating to employees and to keep those records for at least seven years. Employment records must contain a considerable amount of information. Records of hours of work and overtime if paid are particularly important. Employees can refer to payslips going back six years.

A documented OHSMS allows an employer to prove compliance with the Work Health Act. Documentation of employee injuries and circumstances can be important for worker’s compensation determinations and legal investigations.

Records of interactions with employees (warnings, requests, briefings, trainings, transgressions etc) may be as simple as diary entries and could become very important in the event of injury, litigation or dismissal.

Traineeships and apprenticeships

There are opportunities to engage trainees or apprentices (terms used interchangeably) in the pastoral industry.

Australian Apprenticeships

Australian Apprenticeships is the name of the Federal Government’s scheme for providing nationally accredited and recognised qualifications from Certificate II to Diploma and Advanced Diploma levels. Students work and are paid while in training. The rates of pay vary depending upon the industry, the year level, the qualification and whether industry or national awards are used. In the NT pastoral industry the minimum rates are based on the National Training Wage Award 2000. An Australian Apprenticeship Centre or Industry Association should be able to provide or assist in finding more detail.

Employers can find and hire an Australian apprentice independently or may choose to engage a Group Training organisation to act as the primary employer and manage the training, employment and reporting obligations. Group Training Northern Territory (GTNT), a private not-for-profit organisation, has a broad range of private and public sector contracts to deliver a professional and quality service to employers and their employees engaged in Vocational Education and Training (VET) pathways.

GTNT charges employers from $50/month/apprentice to manage, coordinate and administer the Registered Training Organisation and the Federal and NT Government paper work relating to apprenticeships. The Federal Government can pay the employer up to $1,250 upon employment of an apprentice and may offer further incentives on the employee’s completion of a qualification (in the order of $1,200 for Certificate II). Eligibility conditions apply e.g. in some instances, employees must have been employed for less than three months for the employer to be eligible for incentives.

Indigenous apprenticeships

STEP (Structured Training and Employment Program) is a Federal Government initiative aimed at providing funding assistance to employ indigenous Australians. Funding may be available to assist with training, including apprenticeships and traineeships, on-the-job training, school-based apprenticeships, mentoring and employment costs. The key criterion for this funding is that the apprentice’s job must be ongoing after the funding period has finished. The funding can cover training, mentoring and employment costs.

GTNT has won several STEP contracts with the Department of Education, Employment and Workplace Relations (DEEWR) across the NT, including a contract to support the Indigenous Pastoral Project (IPP). GTNT, through the IPP, has an agreement with the NTCA, the Northern Land Council, and DRDPIFR to promote and facilitate the training and employment of Indigenous people. This arrangement is called the Indigenous Training Scheme (ITS). Collectively, these agencies work to identify prospective trainees, organise pre-employment training, arrange work placements and offer post-placement training and mentoring.

The NTCA and Katherine Rural Campus of the Charles Darwin University (CDU) have developed a qualification tailored to meet the needs of both employers and employees while recognising the practicalities of work on cattle stations. The six week pre-employment training comprises a selection of units from the Certificate II in Rural Production, Agriculture or Beef Cattle Production at the Katherine Rural Campus. At the bare minimum, OH&S and First Aid units are completed. When placed with an employer, participants then sign up for an ‘apprenticeship’ and to complete a Certificate II as part of the outcomes required under STEP. While not always possible, the Registered Training Organisation, in this case CDU, can access ‘User Choice’ funding to pay trainers to deliver units at the employee’s place of work. Ideally 25% of the units of a Certificate II would be completed in the pre-employment phase, and the remaining 75% whilst on the job within the next 12 months.
The NTCA employment coordinator (funded by DEEWR) aims to support existing employment and career development projects (including the Indigenous Training Scheme) by promoting opportunities in the pastoral industry. The NTCA is exploring an eight week course, with an opportunity during the course to assess participants’ genuine desire to be in the cattle industry, and provision of an NTCA representative to verify that participants’ have mastered or are mastering the skills required by the industry.

For employers, head stockmen and trainee supervisors and trainers, the NTCA and a training provider have developed a course around the issues and constraints which both employers and employees face. The course provides an opportunity to review practical approaches and attitudes towards working across cultures.

If you would like to know more or to express interest in hosting an employee, NTCA, NLC and GTNT contacts are supplied (see Further information).

**SUMMARY OF BEST PRACTICE**

- Know your legal and moral obligations.
- Keep up-to-date with changes to legislation.
- Know details of records to be kept and for how long.
- Maintain a paper trail.

---

**Sources and further information**

Australian Government, Australian Tax Office  

Australian Government, Australian Tax Office  

Australian Government Workplace Authority  
www.oea.gov.au

National Farmers’ Federation (date unknown),  
*Independent Contractors’ Kit for Farmers*, NFF.  
www.nff.org.au

Australian Government Workplace  
www.workplace.gov.au


www.worksafe.nt.gov.au


**Sources and further information on apprenticeships**

Australian Government STEP  

Australian Government Australian Apprenticeships  
www.australianapprenticeships.gov.au

DRDPIFR Katherine, Senior Indigenous Pastoral Development Officer, Ph: (08) 8973 9739.

Group Training Northern Territory, Ph: (08) 8980 0625

Jon Harris, Ph: 0400 278 925, Email: jon.harris@gtnt.com.au

NLC, Mick Armstrong, Ph: 0427348915,  
Email: mick.armstrong@nlc.org.au

NTCA Employment Coordinator, Tony Freshwater,  
Ph: 0428 580060, Email: tony.freshwater@nt.gov.au
Feral vertebrates are widespread throughout much of the Northern Territory. Of particular concern are horses and donkeys throughout the Katherine region, buffaloes in the north-east areas and camels in south-west areas. Wild pigs are, or are becoming a significant problem in many areas.

Feral animals pose a serious environmental and agricultural threat and have been associated with:

- declines in the abundance, extent and diversity of native plant communities due to trampling and ingestion of seedlings
- increased soil erosion and sedimentation of natural waterways and water bodies as a result of trampling and reduced vegetative cover
- competition with native vertebrate species for feed and habitat
- consumption of seedlings and plant materials, reducing the capacity of the ecosystem to regenerate
- increased spread and establishment of weeds
- decreased abundance and diversity of aquatic and terrestrial invertebrates
- decreased pastoral productivity due to competition for feed and degradation
- damage to fences and floodgates.

Control

Aerial platform shooting of large vertebrates from a helicopter has proven to be the most ethical, environmental, economical and labour-efficient method of removing feral animals. Aerial shooting is target-specific so there is little or no effect on non-target species or the environment. The shooting technique used by the Northern Territory Government is endorsed by the Australian Government (Department of Environment and Heritage) as the most humane method for reducing the numbers of feral animals. This technique involves shooting the animals using the ‘double tap’ method, which requires that two shots be fired at the heart and lungs in rapid succession. This results in a quick death, with minimal stress and suffering.

Parks and Wildlife sometimes use radio telemetry to rapidly locate animals during shooting operations. This procedure involves capturing an individual and fitting a collar installed with a radio transmitter. The animal is subsequently released to join another herd. Approximately one month later, a shooter will track the animal and shoot all the animals in the herd except for the collared ‘Judas’ animal. This procedure can be repeated in the following months as the collared animal relocates to a new herd.

The Victoria River District is a ‘pest declaration area’, proclaimed under the Territory Parks and Wildlife Act and the Pastoral Lands Act. As a result of this legislation, landholders are required, by law, to remove feral animals from their properties. Landholders in this region are encouraged to submit feral animal removal tallies to the Parks and Wildlife Office in Katherine so feral numbers can be monitored.

While other areas in the Katherine region, such as the Roper River catchment, have not been proclaimed as pest declaration areas, buffaloes, donkeys and horses occur in significant numbers. Landholders in these areas would also reap economic and environmental benefits from the removal of ferals.
Method

The Parks and Wildlife Service can provide trained aerial platform shooters to undertake large scale shooting operations. Ammunition and helicopter costs must be paid by the requesting landholder. Landholders are encouraged to contact their nearest Parks and Wildlife office to provide details of the extent of the required operation and to organise a shooting operation on their property. Where possible, landholders should provide Parks and Wildlife with several weeks notice prior to shooting. A mutually convenient time for shooting will then be arranged. Landholders are strongly encouraged to synchronise shooting with neighbouring landholders in order to increase the effectiveness of the operation.

Landholders should keep records of the date and location of the shoot and the numbers of feral animals removed during the shooting operation.

Where to shoot

To reduce the time and costs associated with this type of operation, landholders should provide details of those areas requiring the most intensive shooting operations.

When to shoot

Shooting operations are most effective in the dry season, when many of the smaller water bodies have dried up, causing feral animals to concentrate in areas with permanent water.

Warning

Aerial platform shooting can be dangerous. Landholders should inform neighbouring landholders of expected flight paths and areas where the operation will be carried out. In areas with an indigenous community landholders should inform the community of the operation.

SUMMARY OF BEST PRACTICE

- Control of feral animals will reduce their effect on the environment and increase pastoral productivity.
- Aerial control by shooting is the most appropriate method of control on a large scale.
- Aerial shooting can be carried out by trained Parks and Wildlife personnel.
- Efficiencies will be greatest if areas to be shot are prioritised and if shoots are scheduled for the late dry season when feral animals are concentrated on permanent waters.

Sources and further information

Financial Health Indicators

Many producers regard ‘lifestyle’ as a prime motivation for being in a pastoral business. The reality is that a competitive business environment dictates cattle producers need to concentrate on financial fundamentals just like any other business.

Understanding of your financial situation in relation to accepted risk and profitability benchmarks is a basic requirement of managers of rural businesses. It helps identify opportunities for improvements in efficiency and where to invest within or outside the business.

Where to start...

The most readily available information is in the accounts prepared by the accountant for tax purposes. However, tax accounts are drawn up to satisfy legal requirements rather than for management purposes, so some numbers need to be teased out.

The main shortcoming of tax accounts is in the presentation of livestock values in the livestock trading accounts and the value of property in balance sheets. Also the depreciation schedule may not reflect the market value of plant and equipment.

The best way to bring these items into the real world is to adjust the taxation accounts using current (conservative) market values. In this way meaningful information can be gained about how the business is trading.

Once accounts are adjusted to reflect real values, the following financial health indicators can be calculated from your profit and loss and balance sheet statements.

Key financial indicators

Operating profit

Operating profit is also known as Earnings Before Interest and Tax (EBIT) and is the amount of cash generated by the business before the purchase or sale of capital items. Usually, wages for partners or directors are not included in this figure.

EBIT can be calculated as the earnings of the business (after direct overheads are taken out) before the deduction of interest and taxes.

Net profit

Net profit is the year-by-year indicator of the ongoing profitability of the business. Net profit is a wealth concept not a cash concept and is what accountants use when preparing taxation accounts. It includes such things as the increased value of a cattle herd and takes into account the asset value decline as a result of depreciation.

Net profit is the starting point in the calculation of return on capital.

Equity

Equity (or net worth) equals the total value of the business less total liabilities (debts). Net worth increases each year by the amount of net profit, less the amount of drawings. Net worth will also change by the amount of any asset revaluations.

Equity can be expressed as an absolute amount in dollars (total value of assets less total liabilities) or as a percentage ($ equity divided by total value of assets multiplied by 100).
Return on total capital

Percent return on total capital indicates how well the business has performed financially, relative to alternative uses for the same capital if invested elsewhere.

To calculate return on total capital, start with the profit and loss (P&L) statement. If this is profit and loss calculated for tax purposes, adjustments may be necessary to make it represent the ‘true’ situation. Further adjustments required for the return on capital calculation include:

1. Livestock trading accounts calculated for tax purposes generally use inventory values that do not reflect the true value of those cattle. Recalculate livestock trading account as value of sales, less cost of purchases, plus value of closing inventory, minus value of opening inventory. Value of opening and closing inventory should be based on realistic per head values of cattle, not tax values. Use the same values for each class of cattle (or for the whole mob) for opening and closing inventory value.

2. The P&L calculation will include a deduction for interest paid. If the return on capital is to be the return on the whole of the capital (including the borrowed part), then the interest deduction should be removed.

3. For family businesses, there may be some unpaid labour going into the business. If not dealt with, the calculation will be a return on capital and unpaid labour. To calculate a return on capital only, the value of unpaid labour must be deducted.

4. Check asset values to ensure they are current and realistic.

5. Divide this adjusted profit by the total value of assets and express as a percentage. This is the percentage return on total capital.

Summary — take net profit for tax, alter livestock trading accounts by using realistic inventory values, add interest paid back in, deduct the value of unpaid labour, and divide by total value of assets.

This is the return on ALL the capital – equity plus the borrowed portion. Return on capital calculated this way represents only the working return and does not include the capital gain on land or cattle price appreciation. This can be calculated separately to ensure a fair comparison with other forms of investment that might not include a capital growth component.

Return on equity

Return on equity is another measure of capital use efficiency. It is calculated as return on total capital (as above) less interest (i.e. take interest back out again), divided by the $ value of your equity (where equity = total value of assets less total debts), expressed as a percentage. If return on total capital exceeds percentage interest cost, return on equity will be higher than return on total capital, and vice versa.

Operating costs as a percentage of income

This provides an indication of the level of costs in relation to income. An acceptable figure is 65% or less. If this ratio is high, increasing turnover may not significantly add to profitability and the challenge may be to lower costs rather than expand the business.

\[
\text{Operating costs as a % of income} = \frac{\text{Operating costs}}{\text{total income}} \times 100
\]

Finance costs as a percentage of income

This will give you an idea of how sensitive your business is to interest rate changes. A strong indicator means you will be less affected by interest rate changes. Finance costs should not be consistently higher than 20% of income.

\[
\text{Finance costs as a % of income} = \frac{\text{Finance costs}}{\text{total income}} \times 100
\]

Loan to value ratio (LVR)

Of great importance to banks is the ratio of secured debt to the value of security (e.g. land). On a pastoral property, the LVR should be below 50%. This is important because in times of financial stress the liquidity for ongoing trading will most probably come from a bank. Banks get edgy about lending to a rural property with an LVR above 60%.

\[
\text{Loan to value ratio} = \frac{\text{Amount of secured debt}}{\text{value of security given to the bank}} \times 100
\]

Interest cover

This is a measure of the earnings before interest and tax (EBIT) divided by the interest expense. It is a useful indication of whether the profitability of the business justifies the interest expense. In a developing (growing) business this ratio can be quite low but in a static and well-established business, it should settle down with an EBIT being about three times the interest expense.

\[
\text{Interest cover} = \frac{\text{EBIT}}{\text{interest}}
\]

Gross margin

Gross margin (GM) for the cattle enterprise is calculated as cattle trading account less variable costs (defined as one more animal, one more unit of cost) and is usually expressed per head or per adult equivalent (AE) or per square kilometre or sometimes as a return on the value of the animals. GM may be calculated for the property as a whole, or as a series of GMs for multiple enterprises on the same property. GM/AE or GM/km² are handy measures of livestock production efficiency.

\[
\text{Total GM for all enterprises less fixed costs} = \frac{\text{Net income}}{\text{Net income}}
\]
Cost of production

Cost of production is a key factor affecting the profitability of beef-producing businesses. Calculating your cost of production is an important step in assessing herd performance and a first step to making change.

Cost of production (CoP), measured in cents per kilogram, is an indication of the outlay required to produce each kilogram of beef.

By industry standards, if you have a cost of production of less than $1.00/kg liveweight, you are performing better than the average beef producer. As shown in the diagram below, the most efficient producers have a regular cost of production of below 78¢ – a good goal for any producer interested in wealth creation.

A cost of production of between $1.00 and $1.50 would suggest significant room for improvement. If your cost of production is more than $1.50, the future of your business may be at risk.

You can calculate your own cost of production by downloading the software and factsheet from the MLA site (see Further information). Be aware that CoP can vary greatly between years due to a range of circumstances.

<table>
<thead>
<tr>
<th>The most efficient one third of farms produced beef for between $0.52 and $0.78/kg liveweight</th>
<th>The middle group of farms produced beef for between $0.78 and $1.05/kg liveweight</th>
<th>The least efficient one third of farms produced beef for between $1.05 and $4.95/kg liveweight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lowest cost of production $0.52 liveweight</td>
<td>$0.78/kg liveweight</td>
<td>$1.05/kg liveweight</td>
</tr>
<tr>
<td>Highest cost of production $4.95 liveweight</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

These include but are not limited to:

- greater or less than expected rainfall
- changes to herd management or structure, such as age of turn-off
- greater than normal expenses, such as capital development or pasture establishment.

As a general rule, the more variable the rainfall for your location, the more years you should use to calculate your average CoP (MLA, 2005).

If you require assistance with calculating your CoP, contact the Pastoral Extension Officer at Katherine Research Station.

Breedcow and Dynama

Breedcow and Dynama software can be used to determine comparative profitability of different production options using gross margins, and to make projections of net income, cash flow and net worth from each plan for up to 10 years. Other functions include monthly cash flow budgeting, projections of taxable profit on livestock trading and investment analysis.

Applying the financial indicators against your investment options leads to informed decisions. For example, using the investment analysis component of Breedcow and Dynama output to compare whether the return on that new bore is going to be better than a unit in Darwin.
SUMMARY OF BEST PRACTICE

- Use financial key indicators to:
  - assess the viability of your business
  - determine the sensitivity of your business to external factors such as interest rates
  - monitor costs of production
  - evaluate investment options
  - evaluate management changes
  - investigate scenarios (vary production, management strategies, costs, interest)
  - compare your business to industry benchmarks.

Sources

David Harris, Agripartners Pty Ltd, Adelaide.
WE (Bill) Holmes, Principal Agricultural Economist, QDPI&F, Townsville.

Further information

Pastoral Production Extension Officer, DRDPIFR, Katherine
Ph: (08) 8973 9739.
AgriPartners Pty Ltd, Rural Capital Specialists, Ph: (08) 8363 4035, www.agripartners.com.au
Breedcow and Dynama herd budgeting software, Bill Holmes QDPI&F Townsville, Ph: (07) 4722 2663, www2.dpi.qld.gov.au/breedcowdynama/
Resource Consulting Services: Benchmarking, business development and financial analysis consulting services, Ph: (07) 3869 3044. www.rcs.com.au

Related topic

Selling Options
Chapter Six: Other

Live Cattle Export Industry

The Northern Territory is the largest supplier of live cattle and buffaloes to South-East Asia. Most of the cattle are Brahmans and are well adapted to local conditions. About 40% of the turn-off of Territory cattle is destined for the live export market and 37% of Australian live cattle exports are shipped through the Port of Darwin. Indonesia has the greatest market share, followed by the Philippines, Brunei and Malaysia (Figure 1).

The main cattle classes exported are feeder steers/spayed heifers (±350 kg liveweight (LW)) for offshore feedlot operations, slaughter stock (>400 kg LW), pregnancy tested in-calf (PTIC) breeders and bulls. Other livestock exported through the Port of Darwin include goats, camels and horses.

The livestock ships that operate in South-East Asia generally carry 800–2500 head of cattle and take three to five days to reach destination ports from Darwin. Their operations are governed by strict marine orders. Larger ships carrying more than 10,000 head deliver to several destinations in one trip.

The industry is supported by the Northern Territory Livestock Exporters Association (NTLEA) which was established in 1980 and represents about 20 industry members who are exporters. The Livestock Export Accreditation Program (LEAP) is a quality assurance program that ensures exporters comply with animal welfare standards.

A history

The first shipments of cattle from Darwin were sent to Hong Kong in 1885. Thereafter, 2,000 head of cattle a year were shipped to Jakarta and Singapore using a specially commissioned steamer, ‘The Darwin’, was capable of carrying 250 live cattle. In the 1920s cattle were exported to Manila but the trade fizzled out during the Great Depression of the 1930s. With the emergence of road transport to southern states in the 1950s and the establishment of meat works to
supply US and Japanese markets in the 1960s, shipments of cattle only continued intermittently and on a small scale.

The 1970s oil crisis brought an end to the boom in the meat trade. Live exports to South-East Asia re-emerged as an import market, albeit on a relatively small scale. It was not until the early 1990s that the trade really started to grow and become a significant alternative market for NT cattle, reaching almost 500,000 head a year. The South-East Asian economic crisis of 1997 resulted in a sharp decline in the trade.

Today, the NT exports more than 200,000 live cattle a year, a trade valued at about $150 million or 1.7% of gross state product. The industry’s value is probably twice this figure if agistment and transport of Queensland cattle shipped through the Port of Darwin and other services associated with the industry are taken into account. The NT live cattle export trade today is a highly professional industry that leads Australia in terms of standards.

**Importing and exporting procedures**

1. South-East Asian importers place orders with one or more licensed exporters and receive a quote that includes purchase cost, insurance, and freight to port of disembarkation, or landed price. The order specifies the type of cattle and other livestock required and the time of shipment. The importer then arranges an Irrevocable Documentary Letter of Credit from his bank and an Import Permit to be sent (by fax) to the nominated exporter prior to shipment.

2. The exporter submits a Notice of Intention and Consignment Risk Management Plan to the Australian Quarantine and Inspection Service (AQIS) for approval to proceed with the order. He then sources and selects the stock for export, sometimes with the help of the importer’s ‘selector’. The selected cattle are transported to an export quarantine facility where they are introduced to ship rations and prepared for export according to the requirements of the Australian Standard for Export of Livestock. This includes treatments to comply with the health protocols of the importing country which are undertaken by an AQIS-accredited veterinarian. There are different protocols for different classes of livestock such as breeders, feeder and slaughter animals.

3. AQIS then assesses the documentation and inspects the consignment before granting ‘Permission to Leave for Loading’ onto the ship. During transport to the ship, the truckloads of cattle pass over a weighbridge to obtain the total weight of the consignment, and after the consignment is loaded onto the vessel, the exporter applies to AQIS for an Export Permit and Health Certificates.

4. Loading is governed by strict regulations defining the amount of space required per animal class of a given weight.

**Discharge**

When the shipment arrives at the destination port, the cattle are off-loaded and the consignment re-weighed (optional) en route to the quarantine holding area near the port or at the feedlot. The cattle are usually held in quarantine for 14 to 28 days according to the laws of the importing country.

Cattle usually maintain or increase bodyweight during the voyage to destinations within South-East Asia and mortalities are negligible (less than 0.5%).

**National animal welfare standards**

There are five animal welfare standards to be met in the live export of cattle, as listed below. For details on the requirements for each standard visit the DAFF website (see Further information).

- **Standard 1 – Sourcing and on-farm preparation of livestock**
- **Standard 2 – Land transport of livestock**
- **Standard 3 – Management of livestock in registered premises**
- **Standard 4 – Vessel preparation and loading**
- **Standard 5 – Onboard management of livestock**

**Future**

The live export trade is likely to continue to increase as the demand for beef increases in South-East Asia. It is quite likely that the Northern Territory pastoral industry will not have the capacity to meet future demand. However, this prospect is overshadowed by animal welfare groups who are determined to try to shut down the industry even though pastoralists and exporters already comply with some of the strictest animal welfare regulations in the world.

**Source**

Northern Territory Livestock Exporters Association Inc.
www.ntlea.com.au

**Further information**

Australian Government Department of Agriculture Food and Forestry www.daff.gov.au/livestockexportstandards
Livecorp www.livecorp.com.au
Northern Territory Cattlemen’s Association www.ntca.org.au
Meat and Livestock Australia www.mla.com.au

**Related topic**

Selling Options
Macropods

Of the 50 species of macropod found in Australia, 10 species occur in the wild in the Northern Territory, nine of which occur in the Katherine region (Table 1).

Table 1. Macropod species of the Katherine region, and their conservation status in the Northern Territory and Australia

<table>
<thead>
<tr>
<th>Species</th>
<th>IUCN red list category</th>
<th>% decline</th>
<th>Northern Territory</th>
<th>Australia</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAMILY MACROPODIDAE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Lagorchestes conspicillatus leichardti</em>—</td>
<td>LR-nt</td>
<td>10–50</td>
<td>LR-nt</td>
<td>Moderately common</td>
</tr>
<tr>
<td>Spectacled Hare-wallaby (mainland)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Macropus agilis</em>— Agile Wallaby</td>
<td>LR-lc</td>
<td>&lt;10</td>
<td>LR-lc</td>
<td>Abundant</td>
</tr>
<tr>
<td><em>Macropus antilopinus</em>— Antilopine Wallaroo</td>
<td>LR-lc</td>
<td>&lt;10</td>
<td>LR-lc</td>
<td>Usually common</td>
</tr>
<tr>
<td><em>Macropus bernardus</em>— Black Wallaroo</td>
<td>LR-nt</td>
<td>&lt;10</td>
<td>DD</td>
<td>Common, restricted</td>
</tr>
<tr>
<td><em>Macropus robustus</em>— Euro</td>
<td>LR-lc</td>
<td>Increased</td>
<td>LR-lc</td>
<td>Abundant</td>
</tr>
<tr>
<td><em>Macropus rufus</em>— Red Kangaroo</td>
<td>LR-lc</td>
<td>Increased</td>
<td>LR-lc</td>
<td>Abundant</td>
</tr>
<tr>
<td><em>Onychogalea unguifera</em>— Northern Nailtail Wallaby</td>
<td>LR-lc</td>
<td>&lt;10</td>
<td>LR-nt</td>
<td>Common</td>
</tr>
<tr>
<td><em>Petrogale brachyotis</em>— Short-eared Rock-wallaby</td>
<td>LR-lc</td>
<td>&lt;10</td>
<td>LR-lc</td>
<td>Mostly common</td>
</tr>
<tr>
<td><em>Petrogale concinna</em>— Nabarlek</td>
<td>LR-nt</td>
<td>50–90</td>
<td>LR-nt</td>
<td>Rare, limited</td>
</tr>
</tbody>
</table>

1 Status under schedules of the Territory Parks and Wildlife Conservation Act 2006.
2 Status according to Strahan (2002).
LR-nt = Lower Risk—near threatened; LR-lc = Lower Risk—least concern; DD = Data Deficient.

There have been no attempts to systematically survey the distribution and abundance of macropod species across the Northern Territory, with the exception of the red kangaroo.

Some monitoring of red kangaroo numbers has been carried out by the Parks and Wildlife Service of the Northern Territory (PWSNT) in response to concerns raised by some pastoralists over high densities. Concerns have also been raised over agile wallaby numbers which are the dominant macropod species found in the Katherine region. Permits have periodically been granted to landholders for the non-commercial destruction (shoot-and-let-lie) of red kangaroos in central Australia and agile wallabies in the Top End.

At present, there is no commercial harvest of kangaroos or wallabies permitted in the Northern Territory.
The agile wallaby in the Katherine region

The agile wallaby is perceived by many landholders in the Katherine region to be a significant pest, particularly in riparian areas. Agile wallabies occur in very high densities along some stretches of the Victoria, Baines, Katherine and Roper Rivers and tributaries. In these areas, decreased grass cover, increased erosion and the spread of weeds are (rightly or wrongly) attributed to the wallaby. In places, burning of pastures and subsequent green pick, along with a run of favourable seasons, are thought to have contributed to substantial population increases (Sally Sullivan pers. comm., 2008).

Under the Territory Parks and Wildlife Conservation Act 2006 (TPWC Act), macropods are classified as protected wildlife throughout the Northern Territory. The TPWC Act prohibits the taking, interference with, possession, control or movement of protected wildlife unless authority to do so is granted. Provisions for the killing of protected wildlife are provided for in the Act. Authorisation to take or interfere with protected wildlife is by permit issued by the Director of Parks and Wildlife. The Director may apply terms, conditions or limitations to the permit to regulate the non-commercial destruction of kangaroos or wallabies.

Non-commercial destruction

Determining wallaby densities and level of impact

Requests for the non-commercial destruction of wallabies for damage mitigation purposes are assessed on a case by case basis to determine whether there is a wallaby problem that warrants management action. In most cases, the preferred management action is destruction rather than translocation, based on animal welfare concerns (stress and risk of injury to animals) and the logistics of translocation.

Applications for the non-commercial destruction of wallabies are independently assessed by authorised PWSNT officers. The assessment process may involve:

- the consideration of property size and characteristics
- number of previous permits issued and compliance with the conditions of these permits
- nature of wallaby populations on the property and neighbouring properties including estimated population densities
- recent climatic conditions.

Permits

A person wishing to kill a species of protected wildlife cannot do so unless he or she has been granted a permit, or is a nominee under a permit granted to another person. The permit process in the Northern Territory as it relates to the non-commercial destruction of kangaroos and wallabies is summarised in Figure 1.

Permit to take protected wildlife

A permit to take protected wildlife may be issued for the removal of problem animals e.g. non-commercial destruction of wallabies. Written permission of the landholder or relevant lands authority must be obtained prior to applying for a permit.

The landholder must provide a reason destruction by listing the unwanted impact/s of wallabies on their property.

A permit for non-commercial destruction (shoot-and-let-lie) of wallabies is subject to conditions. The permit applicant or nominated kangaroo shooter must:

- hold a current firearms licence
- have successfully completed approved firearms accuracy accreditation
- shoot wallabies in accordance with the Code of Practice for the Humane Shooting of Kangaroos (EA, 1990)
- carry their permit with them at all times while operating in the field and provide the permit to any authorised officer on request
- provide returns to the PWSNT in the prescribed format within 21 days of expiry of the permit stating the number of animals destroyed on permit.

A permit may be revoked if PWSNT gains information indicating that conservation management measures may be required to protect a wallaby population.
Chapter Six: Other

Figure 1. Permit procedure in the Northern Territory for the non-commercial destruction of kangaroos and wallabies

Landholder applies to PWSNT for a permit authorising the person of person’s nominee to take protected wildlife under Division 6, Section 55 of the TPWC Act. Landholder nominates licenced shooter to take kangaroos / wallabies.

PWSNT officers assess permit application and perceived kangaroo / wallaby problem.

- Permit issued by an authorised PWSNT officer.
- Licensed shooter shoots kangaroos / wallabies in accordance with the Code of Practice for the Humane Shooting of Kangaroos.
- Kangaroo shooter must hold a current Firearms Licence pursuant to the Firearms Act 1997, and only use prescribed firearms and firearm / ammunition combinations set out in Schedule 1 of the Code of Practice for the Humane Shooting of Kangaroos.
- Returns to PWSNT within 21 days of expiry of the permit.

Code of Practice for the Humane Shooting of Kangaroos

At present, shooting is the most economical, humane and cost-effective way to cull kangaroos and wallabies. The current nationally-endorsed Code of Practice for the Humane Shooting of Kangaroos sets an achievable standard of humane conduct and is the minimum required of persons shooting kangaroos and wallabies (EA, 1990). This Code is currently being revised and the third edition will be known as the National Code of Practice for the Humane Shooting of Kangaroos and Wallabies.

SUMMARY OF BEST PRACTICE

- Know your macropods.
- Where a case exists, apply for a permit for destruction of protected wildlife.
- Adhere to the most recent version of the Code of Practice for the Humane Shooting of Kangaroos.

Sources


Further information


Related topic

Feral Animals (Large)
Selling Options

In the Katherine region, most cattle are sold out of the paddock into the live export trade. Other selling options, depending on location, prices and seasons, may include forward contracts, over-the-hooks sales to an abattoir and online or saleyard auctions.

Paddock sales
Stock are inspected on the vendor’s property by the buyer and are sold straight out of the paddock, with the price generally negotiated on a cents per kilogram basis with or without an agent. This is the most common method of sale to the live export industry in the Katherine region.

Advantages
• minimal selling costs and minimal transport and handling
• NLIS tags may not be required for cattle going directly to live export
• buyers know in advance the number and class of stock to be delivered
• weighing point, delivery point and curfew negotiable
• most agents in the NT sell del credere (payment guaranteed)

Disadvantages
• limited competition and carcase feedback
• potential for rejection at point of delivery for out-of-specification animals if paddock inspection is not thorough

Forward contracts
A standard forward contract is a contractual agreement between you (the producer) and a buyer to supply a given product at a given time for a given price. The contract includes the details:
• number of cattle to be delivered
• specifications of the contract cattle
• pregnancy status of female cattle accompanied by a certification from an accredited pregnancy tester
• date of delivery
• pricing arrangements

Advantages
• provides a guaranteed price, eliminating the risk of price fluctuations
• enables you to confidently plan your cattle supply program and husbandry requirements
• allows implementation of appropriate feeding and grazing management strategies
• a guaranteed return can assist with negotiating loans and managing finances
• buyers can guarantee continuity of supply and maintain the reputation and integrity of their product brands
• buyers can clearly communicate their precise requirements to both producers and agents
Disadvantages
• requires a high degree of control over the production system to supply the specified product at the specified time
• may have to forego opportunities to sell at higher prices
• may have to source cattle from elsewhere if there is a shortfall in the required number of cattle specified in the contract

Over-the-hooks
The closest large operating abattoirs for the Katherine region are located in Townsville QLD (2000km) and Naracourte SA (3000km). Transport costs and a competitive live export market tend to deter producers in the Katherine region from selling to an abattoir.

Over-the-hook sales, based on predetermined weight and grade prices, will incur lower selling costs and allow the seller to establish the total sale price before cattle leave the lot. Stock may be sold with or without an agent and are delivered directly to the abattoir. Change of ownership takes place at the abattoir scales with the terms of sale varying between abattoirs. Generally the producer pays for transport to the abattoir and the transaction levy. The producer is not paid for condemned carcases or bruise trim.

Actual carcase weight measured at the abattoir can vary depending on the carcase trim used, and whether a hot or cold weight is used. The carcase is weighed at the end of the chain while it is still ‘hot’. If the abattoir trades on cold weight, 3% is deducted from the hot carcase weight to provide the cold weight. The actual deduction for shrinkage varies from 2–4% to account for the water weight loss during cooling.

All AUSMEAT accredited abattoirs are required to pay on hot weight and AUSMEAT standard carcase trim and must also provide carcase feedback. For abattoirs that are not AUSMEAT accredited, the vendor should check the conditions under which they will be trading. Stock are sold on an agreed $/hd, ¢/kg liveweight or ¢/kg carcase weight or on a grid. Sales are weekly and bids can be taken by telephone or computer nationally. Transport costs are paid by the buyer and transit insurance is provided by AuctionsPlus.

Advantages
• subjective appearance (e.g. coat colour) values do not affect the price received
• producers receive clear market and price signals relating to carcase quality and are provided with feedback
• minimal transport and handling
• female carcases of the same quality as male carcases can achieve the same price/kg

Disadvantage
• availability and seasonality of abattoirs

Saleyard auction
Presently, the live export market out-competes the auction system for store cattle in the Katherine region. In auctions, cattle are sold on a cents per kg ($/kg) liveweight basis, or on $/animal for store sales. Occasionally, bulls or a conglomeration of small lots of cattle are sold through saleyard auctions.

Advantages
• wide competition and accessibility
• all stock types and lots of any size can be sold
• vendors can set a reserve price and can compare quality and price
• payment is guaranteed by the agents

Disadvantages
• transport costs, saleyard dues and weighing fees must be paid
• possibility of buyer collusion and no negotiation between buyers and vendors
• limited feedback for the vendor, no carcase feedback
• meat quality can be reduced by stress caused by transport and handling

AuctionsPlus (formerly CALM)
AuctionsPlus, formerly CALM (Computer Aided Livestock Marketing), is an electronic method of sale by description. AuctionsPlus combines the best features of the saleyard system while allowing direct consignment to the buyer. The sale is on-property, with animal details recorded in a computer. The animals are assessed prior to the sale by an accredited AuctionsPlus assessor who describes the cattle to the buyers. Cattle can be sold on the basis of $/hd, $/kg liveweight or ¢/kg carcase weight or on a grid. Sales are weekly and bids can be taken by telephone or computer nationally. Transport costs are paid by the buyer and transit insurance is provided by AuctionsPlus.

Advantages
• suits geographically isolated producers
• large range of buying and selling options
• producers can set a reserve price with nationwide competition
• no transport costs for producers
• payment is guaranteed
• feedback is provided to producers for $/kg and grid sales
• minimal transport and handling damage

Disadvantages
• buyers have to adjust to using a computer and not viewing live animals
• vendors and buyers need to have confidence in the CALM assessors
Selling Options

Sources
VDPI (1996), Marketing Options for Beef Cattle, Agriculture Notes AG0575, Victorian Department of Primary Industries.
QDPI www2.dpi.qld.gov.au/beef/
AuctionsPlus www.auctionsplus.com.au

Related topics
Financial Health Indicators, Live Cattle Export Industry.
Succession Planning

Whether you are running a family-owned business or employed in one, succession and transition management is an important strategic area that must always be on the radar screen.

Succession is far more than the transfer of assets when the business owners retire or pass away. It is an evolving process ensuring the continuation of a business down the generations or through layers of management. It involves choosing and grooming the successor(s), planning for the future, coping with the transition, communicating the change to the family and the business and letting go gracefully. Succession planning is the most critical task for any business owner wishing his or her business to confront the future. Effective succession planning depends on open communication, goodwill, respect and a desire to keep relationships strong among all family members.

The topic of family farm business management is complex, comprehensive and often confronting. Succession planning is the transition of management, leadership and ownership and needs to happen in that order for effective business transfer from one generation to the next. This process can take five to 20 years and needs to be planned early.

Families often feel very isolated when starting to develop their succession and transition plan. They are often embarrassed to talk about their issues because others pretend everything is okay or maybe they don’t communicate effectively enough to even be aware that it isn’t okay. This is normal in all families.

Although the solutions for families are tailored to their needs, often the themes that are addressed are shared by many other families. Family members are the only ones who can take responsibility for this and, in doing so, effectively work through the process of succession planning and people management.

Today is as good a time as any to start planning. Families who choose to line up and face this, whatever it involves, are courageous. They will have greater opportunities available to them in passing their family farm and farm business on to the next generation.

It is important to provide the platform for communication. Engage a professional and experienced family business specialist. As an outsider they can easily ask the hard questions and manage the answers. Remember, there is not one set of answers that works for every family. The role of the professional is to allow the family to communicate together in a way they have never done before with the intention of progressing the business and developing a plan that meets the diverse needs of all.

There are many dynamics at play that need to be managed and understood when developing plans for the future. For example, values of each family member, attributes of each generation, personality types, preferred roles and areas of responsibilities, experience and education. Clearly defining the asset base is important and consideration needs to be given to the viability of the current business to fund all family members. The legal, financial, business and people implications of succession need to be factored in. It is
then very easy to move into the detail and solution end of how the transition plan will evolve. It is also important to remember there are many options for a family farm business to choose from and agree to. Families should avoid looking at their neighbour’s succession plan because the dynamics are likely to be very different. Plans must be unique to match each individual family situation.

It is essential to ensure each family member is in the right frame of mind to address succession. However probably the most critical thing is JUST DO IT! There is a very positive correlation between addressing this area of need to an increased bottom line and increased level of happiness, family harmony and spirit of motivation that has often been the missing link in family farms. Don’t fear it; it is a positive and refreshing step to ensure families remain the stewards of our land.

Further information

ProAGtive
Sarah Roche, Ph: (02) 6946 2020,
Email: sarah@proagtive.com.au
Isobel Knight, Ph: (02) 6769 1415,
Email: isobel@proagtive.com.au
Website www.proagtive.com.au

High Resolutions
Lyn Sykes, Ph: (07) 31291754.
Website www.highresolutions.com.au/lyn

Resource Consulting Services, Family Facilitation,
Ph: (07) 3869 3044. www.rcs.au.com

Related topic
Financial Health Indicators
Weather and Climate Information

There is a predictable nature to some of the variability that exists within the weather and climate regime of the Katherine region, and the Bureau of Meteorology produces a number of products that describe this.

Description of the climate

The climate of the Katherine region comprises a dry season, followed by a transition through a build-up period (around September to December) where showers and storms are the primary weather element. The behaviour of the tropical summer monsoon is variable from year-to-year, but normally accounts for the bulk of annual rainfall. Typically ‘bursts’ of the monsoon-related rainfall last a few days to a week or more, interspersed with ‘breaks’ with less rainfall. Transition to the following dry season occurs around March/April. Occasionally, significant rainfall occurs in mid- to late April, usually associated with late-season tropical low pressure systems moving inland.

Climate prediction

The Bureau of Meteorology is becoming more skilled at predicting the start of the wet season and fluctuations within it, but the end of the wet season remains unpredictable. The main factor affecting the early wet season is the El Niño Southern Oscillation which is related to temperatures and currents in the Pacific Ocean. In La Niña years, the wet season starts earlier and total wet season rainfall tends to be somewhat higher.

Land managers have long recognised that the wet season tends to have monsoonal bursts lasting up to two weeks followed by drier periods of 3–4 weeks (‘the 40-day wave’). The Bureau is now better able to predict the timing of these monsoonal bursts through the Madden-Julian Oscillation (MJO). The impact of the MJO phases and current MJO phase can be checked on a website (see Further information). The Katherine region experiences enhanced wet season rainfall when the MJO is active in our region, during MJO phases 4–7. Pastoralists and farmers are increasingly following the MJO predictions to plan wet season operations.

Rainfall in the late wet season is often associated with tropical low pressure systems including cyclones, which are notoriously unpredictable.

Climate statistics

The climate statistics in Tables 1, 2 and 3 are derived from data collected from the Katherine Aviation Museum weather station. They provide a guide to typical conditions and the level of variability to expect.
### Table 1. Temperature statistics for Katherine Aviation Museum (1942–2007) (Bureau of Meteorology).

<table>
<thead>
<tr>
<th>Month</th>
<th>Mean daily max temp (°C)</th>
<th>Highest temp (°C)</th>
<th>Lowest max temp (°C)</th>
<th>Mean number of days over 30°C</th>
<th>Mean number of days over 35°C</th>
<th>Mean daily min temp (°C)</th>
<th>Lowest min temp (°C)</th>
<th>Highest min temp (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>34.8</td>
<td>40.9</td>
<td>24.2</td>
<td>29.1</td>
<td>17.5</td>
<td>24.2</td>
<td>19.0</td>
<td>28.0</td>
</tr>
<tr>
<td>February</td>
<td>34.2</td>
<td>39.0</td>
<td>23.8</td>
<td>26.9</td>
<td>11.8</td>
<td>24.0</td>
<td>18.7</td>
<td>27.2</td>
</tr>
<tr>
<td>March</td>
<td>34.4</td>
<td>39.8</td>
<td>26.0</td>
<td>30.1</td>
<td>14.0</td>
<td>23.1</td>
<td>15.5</td>
<td>26.4</td>
</tr>
<tr>
<td>April</td>
<td>34.2</td>
<td>38.3</td>
<td>26.0</td>
<td>29.3</td>
<td>9.3</td>
<td>21.0</td>
<td>9.8</td>
<td>26.6</td>
</tr>
<tr>
<td>May</td>
<td>32.2</td>
<td>36.5</td>
<td>23.3</td>
<td>25.8</td>
<td>1.6</td>
<td>16.8</td>
<td>6.3</td>
<td>25.0</td>
</tr>
<tr>
<td>June</td>
<td>30.3</td>
<td>36.1</td>
<td>23.2</td>
<td>18.2</td>
<td>0.4</td>
<td>13.9</td>
<td>3.8</td>
<td>23.5</td>
</tr>
<tr>
<td>July</td>
<td>30.5</td>
<td>36.0</td>
<td>23.8</td>
<td>19.3</td>
<td>0.3</td>
<td>12.9</td>
<td>4.2</td>
<td>23.5</td>
</tr>
<tr>
<td>August</td>
<td>32.4</td>
<td>37.7</td>
<td>23.5</td>
<td>27.5</td>
<td>3.7</td>
<td>14.7</td>
<td>4.0</td>
<td>24.9</td>
</tr>
<tr>
<td>September</td>
<td>35.8</td>
<td>40.5</td>
<td>25.5</td>
<td>29.6</td>
<td>20.6</td>
<td>20.0</td>
<td>8.2</td>
<td>28.3</td>
</tr>
<tr>
<td>October</td>
<td>37.7</td>
<td>41.6</td>
<td>29.0</td>
<td>30.5</td>
<td>28.6</td>
<td>23.8</td>
<td>13.3</td>
<td>28.0</td>
</tr>
<tr>
<td>November</td>
<td>37.5</td>
<td>43.1</td>
<td>27.5</td>
<td>29.6</td>
<td>26.6</td>
<td>24.8</td>
<td>14.5</td>
<td>28.9</td>
</tr>
<tr>
<td>December</td>
<td>36.0</td>
<td>41.4</td>
<td>26.8</td>
<td>29.7</td>
<td>22.1</td>
<td>24.6</td>
<td>19.3</td>
<td>28.4</td>
</tr>
</tbody>
</table>

### Table 2. Temperature, humidity and cloud cover statistics for Katherine Aviation Museum (1942–2007) (Bureau of Meteorology).

<table>
<thead>
<tr>
<th>Month</th>
<th>Mean daily terrestrial min (°C)</th>
<th>Lowest daily terrestrial min (°C)</th>
<th>Mean 9am temp (°C)</th>
<th>Mean 3pm temp (°C)</th>
<th>Mean 9am relative humidity (%)</th>
<th>Mean 3pm relative humidity (%)</th>
<th>Mean 9am cloud cover (Eighths)</th>
<th>Mean 3pm cloud cover (Eighths)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>23.4</td>
<td>17.9</td>
<td>27.6</td>
<td>33.2</td>
<td>79.8</td>
<td>56.2</td>
<td>5.9</td>
<td>5.8</td>
</tr>
<tr>
<td>February</td>
<td>23.5</td>
<td>20.4</td>
<td>26.9</td>
<td>32.5</td>
<td>83.3</td>
<td>58.6</td>
<td>6.1</td>
<td>6.1</td>
</tr>
<tr>
<td>March</td>
<td>22.5</td>
<td>14.3</td>
<td>26.9</td>
<td>33.1</td>
<td>79.0</td>
<td>50.3</td>
<td>4.8</td>
<td>5.3</td>
</tr>
<tr>
<td>April</td>
<td>19.9</td>
<td>7.1</td>
<td>25.8</td>
<td>33.2</td>
<td>70.1</td>
<td>38.6</td>
<td>3.5</td>
<td>4.3</td>
</tr>
<tr>
<td>May</td>
<td>14.5</td>
<td>4.5</td>
<td>22.6</td>
<td>31.3</td>
<td>63.0</td>
<td>33.0</td>
<td>2.2</td>
<td>3.0</td>
</tr>
<tr>
<td>June</td>
<td>11.5</td>
<td>0.6</td>
<td>19.8</td>
<td>29.4</td>
<td>59.8</td>
<td>30.1</td>
<td>2.0</td>
<td>2.3</td>
</tr>
<tr>
<td>July</td>
<td>10.9</td>
<td>1.4</td>
<td>19.4</td>
<td>29.5</td>
<td>58.6</td>
<td>29.1</td>
<td>1.8</td>
<td>1.9</td>
</tr>
<tr>
<td>August</td>
<td>12.1</td>
<td>2.4</td>
<td>21.6</td>
<td>31.5</td>
<td>54.8</td>
<td>24.7</td>
<td>1.5</td>
<td>1.9</td>
</tr>
<tr>
<td>September</td>
<td>18.5</td>
<td>5.8</td>
<td>26.2</td>
<td>34.9</td>
<td>55.7</td>
<td>24.5</td>
<td>1.8</td>
<td>2.5</td>
</tr>
<tr>
<td>October</td>
<td>22.5</td>
<td>11.8</td>
<td>29.1</td>
<td>36.5</td>
<td>58.0</td>
<td>28.0</td>
<td>2.5</td>
<td>3.8</td>
</tr>
<tr>
<td>November</td>
<td>23.4</td>
<td>12.3</td>
<td>29.3</td>
<td>35.9</td>
<td>66.1</td>
<td>37.2</td>
<td>3.9</td>
<td>5.0</td>
</tr>
<tr>
<td>December</td>
<td>23.5</td>
<td>16.3</td>
<td>28.5</td>
<td>34.4</td>
<td>74.4</td>
<td>48.3</td>
<td>5.3</td>
<td>5.5</td>
</tr>
</tbody>
</table>

### Table 3. Rainfall statistics for Katherine Aviation Museum (1942–2007) (Bureau of Meteorology).

<table>
<thead>
<tr>
<th>Month</th>
<th>Mean monthly rainfall (mm)</th>
<th>Highest monthly rainfall (mm)</th>
<th>Lowest monthly rainfall (mm)</th>
<th>Mean number of rain days</th>
<th>Highest number of rain days</th>
<th>Lowest number of rain days</th>
<th>Mean daily pan evap (mm)</th>
<th>Mean number of days with thunder</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>273</td>
<td>914</td>
<td>71</td>
<td>17.8</td>
<td>26</td>
<td>8</td>
<td>5.3</td>
<td>11.9</td>
</tr>
<tr>
<td>February</td>
<td>245</td>
<td>445</td>
<td>59</td>
<td>17.4</td>
<td>27</td>
<td>9</td>
<td>5.5</td>
<td>9.3</td>
</tr>
<tr>
<td>March</td>
<td>199</td>
<td>565</td>
<td>1</td>
<td>13.4</td>
<td>25</td>
<td>1</td>
<td>5.7</td>
<td>6.7</td>
</tr>
<tr>
<td>April</td>
<td>42</td>
<td>213</td>
<td>0</td>
<td>3.9</td>
<td>15</td>
<td>0</td>
<td>6.3</td>
<td>1.5</td>
</tr>
<tr>
<td>May</td>
<td>6</td>
<td>88</td>
<td>0</td>
<td>0.9</td>
<td>6</td>
<td>0</td>
<td>5.6</td>
<td>0.3</td>
</tr>
<tr>
<td>June</td>
<td>0</td>
<td>6</td>
<td>0</td>
<td>0.2</td>
<td>1</td>
<td>0</td>
<td>4.7</td>
<td>0.0</td>
</tr>
<tr>
<td>July</td>
<td>1</td>
<td>38</td>
<td>0</td>
<td>0.1</td>
<td>3</td>
<td>0</td>
<td>5.3</td>
<td>0.0</td>
</tr>
<tr>
<td>August</td>
<td>1</td>
<td>20</td>
<td>0</td>
<td>0.1</td>
<td>2</td>
<td>0</td>
<td>6.3</td>
<td>0.0</td>
</tr>
<tr>
<td>September</td>
<td>7</td>
<td>75</td>
<td>0</td>
<td>0.7</td>
<td>3</td>
<td>0</td>
<td>7.5</td>
<td>0.3</td>
</tr>
<tr>
<td>October</td>
<td>36</td>
<td>124</td>
<td>0</td>
<td>3.8</td>
<td>14</td>
<td>0</td>
<td>7.4</td>
<td>2.5</td>
</tr>
<tr>
<td>November</td>
<td>89</td>
<td>239</td>
<td>3</td>
<td>9.5</td>
<td>15</td>
<td>1</td>
<td>7.2</td>
<td>9.0</td>
</tr>
<tr>
<td>December</td>
<td>208</td>
<td>531</td>
<td>45</td>
<td>14.6</td>
<td>24</td>
<td>6</td>
<td>6.1</td>
<td>11.4</td>
</tr>
</tbody>
</table>
Weather bureau products

Observations and analyses
Weather maps showing the current synoptic pattern and satellite images of cloud features are available from the Bureau’s website. The weather radar loop from the radar dome located near Tindal RAAF Base is also freely accessible. The horizontal range of the radar is about 250km. Interpretation of radar imagery can be complex and links are provided to assist. Nevertheless, if the radar coverage includes your country, it makes a great ‘now-casting’ tool.

Forecasts for the next couple of days are also available through the Bureau’s website as well as traditional broadcast outlets.

Several climate-related products are available that describe the nature of the environment, as well as longer term outlooks. Maps of rainfall, temperature and evaporation distribution (to name just a few) can be found. A technical description of climate systems affecting northern Australia is provided in the Weekly Tropical Climate Note. The Seasonal Climate Outlook provides advice on probabilities above or below typical rainfall and temperature. All of these tools can assist decision making.

Information from other sources

NAMS
The National Agricultural Monitoring System is a website (www.nams.gov.au) which contains a large range of climatic information and the ability to draw up reports for specified large or small areas over a range of timescales. A monthly climate and agricultural update for the NT is also produced. Of main interest to NT producers will be maps of rainfall distribution over the last one, three, 12 and 24 months, modelled pasture growth, vegetation greenness from satellites and the rainfall outlook.

Rainman
Rainman is a computer program devised by Queensland DPI that contains historical rainfall data from across northern Australia, which can be interpreted in many ways. Of particular interest is the facility to be able to compare current rainfall with all the previous history from that site, and to work out the chances of getting at least a specified amount of rainfall in a particular place over a particular period. Where a selected location is not close to a historical rainfall station, it is possible to estimate by projecting the average rainfall and its variability, through the data-drill facility. DPIFM Katherine can use the Rainman program to analyse historical rainfall data on request.

SUMMARY OF BEST PRACTICE

- Understand that while the seasonal cycle is broadly reliable, there is year-to-year and intra-seasonal variability, some of which is predictable. Intra-seasonal variability is most evident in the burst-break cycle of the summer monsoon.
- Use the Bureau of Meteorology’s Seasonal Climate Outlook to monitor the El Niño Southern Oscillation (ENSO) phenomenon. Most predictability exists in the late dry season and early wet season rainfall. Year-to-year variability is largely a result of the ENSO phenomenon.
- When using the Seasonal Climate Outlook, be sure to investigate the confidence in the outlook for your region, accessed by clicking on the appropriate link on the web page.
- Use the Bureau’s Weekly Tropical Climate Note to monitor the Madden-Julian Oscillation (MJO). The Madden-Julian Oscillation gives some predictability, particularly in relation to the timing of monsoonal bursts and breaks.

Further information

Daily weather forecasts, recent observations from all weather stations, weather charts, radar and satellite imagery
www.bom.gov.au/weather/nt/

Climate statistics from sites in the Katherine region, maps of recent rainfall and a wide range of climate-related products

The Weekly Tropical Climate Note, describing El Niño Southern Oscillation (ENSO) and Intra-seasonal variability associated with the Madden-Julian Oscillation

Bureau of Meteorology ENSO Wrap-up

The Rainfall Seasonal Climate Outlook

The Temperature Seasonal Climate Outlook

Seasonal Climate Outlook accuracy assessments
www.bom.gov.au/silo/

Maps describing climate change and variability
www.bom.gov.au/silo/

Madden Julian Oscillation description and current impacts

Related topics
Climate Change, Carrying Capacity.
Wild Dog Control

In the Northern Territory, the term ‘wild dog’ is used to collectively describe dingoes, feral domestic dogs and their hybrids. Wild dogs are known predators of livestock and can cause significant economic losses to pastoral production through mortalities and maiming (making stock unfit for the export market). Cattle are most vulnerable to wild dog attack as calves and weaners. Protective behaviour by cows can be enough to deter attacks on calves although much depends on the health, condition and protectiveness of the cows.

Control

Sodium monofluoroacetate (1080) is the only poison registered in the NT for the control of wild dogs. Only 0.3mg of 1080 is needed per kg bodyweight to kill a dog. Dingoes are a native species and are protected under the Territory Parks and Wildlife Act (2000) making it an offence to possess, interfere with or kill dingoes without authorisation.

Method

The Parks and Wildlife Service provide a 1080 baiting service to landholders outside municipal areas. To request baiting, landholders must contact their nearest Parks and Wildlife office and provide details of the nature and extent of the problem. This will help staff determine the numbers of baits required. Where possible, pastoralists should provide Parks and Wildlife with several weeks’ notice prior to baiting. A mutually convenient time for baiting will then be arranged. Landholders are strongly encouraged to synchronise baiting with neighbouring landholders to increase the effectiveness of the operation.

Landholders must supply the bait meat (horse, donkey, camel or beef) and bins for the poisoned bait. Baits should be of beer-can size (400–500g), preferably prepared the day before and cured overnight on mesh racks. Curing allows a dry skin to form around the bait and prevent leakage of 1080 solution. An authorised Parks and Wildlife officer will inject baits with 1.5mL of 1080 solution, which delivers 6mg of pure 1080 bait. People handling poison baits must wear impervious (e.g. rubber) gloves and protective clothing to avoid skin contact.

Where to bait

Baits should be strategically placed on pads, around water points and along station tracks or fence lines. No more than 30 baits should be placed at any one water point. Baits should be placed on the ground, preferably under bushes to minimise consumption by other wildlife. Ground baiting is more effective than aerial baiting because baits can be strategically placed in specific locations where wild dogs are most problematic.
When to bait

In the Katherine region, wild dog damage is greatest during calving or when calves have just been weaned. Baits should be put out in the late afternoon to minimise consumption by birds such as crows and hawks. If required, Parks and Wildlife recommends a maximum of two baiting events a year for optimal results. These should coincide with the four times of the year when dingoes are most vulnerable:

- April to May (mating)
- July to August (whelping)
- October to November (pups moving about for the first time)
- January to February (pups receiving hunting training)

Most baiting is undertaken in the dry season when properties are accessible and because baits are affected by both heat and rainfall.

Warning

It is the responsibility of landholders to communicate their intention to bait to all persons who might be affected. This includes every resident and/or occupier of the area to be baited (including indigenous residents) and all neighbours within a 3km radius of baiting. Five days notice must be given either verbally or in writing. At the time of baiting, the landholder must display secure signs on all public roads throughout the baited area. These signs are supplied by Parks and Wildlife and should be maintained for a minimum of 28 days after baiting.

Signs must state:

- 1080 baits have been laid
- the date baits were laid.

Baits must not be laid within:

- the municipal boundaries of a town
- 3km of a community or outstation
- 1km of any other dwelling
- 20m of a permanent watercourse
- 5m of a boundary fence
- 250m of the edge of a formed public roadway
- 500m of main roads and highways.

SUMMARY OF BEST PRACTICE

- Contact your nearest Parks and Wildlife Service office to discuss wild dog problems and with 1080 baiting requests.
- Synchronise baiting programs with neighbours.
- Time baiting to maximise effectiveness.
- Handle baits appropriately.
- Notify all residents, occupiers and neighbours of land to be baited.
- Display baiting signs provided.
- Adhere to restrictions on where baits can be laid.

Sources


Further information

Working Dogs

Using working dogs to aid in handling cattle can significantly reduce labour costs and mustering times. The following points need to be considered to get the maximum benefit from using dogs for cattle work.

- **Use dogs that have a natural instinct to cover, hold and block.** This comes from genetics. Suitable breeds are generally collie and kelpie type dogs. These dogs are naturally forceful and have mob respect. They know when to apply pressure and when to give relief.

- **Tie or cage dogs at all times** unless you are training them, working them or giving them a supervised fun run.

- **Develop a good rapport with the dog** through voice and body language, in recreational situations as well as work.

- **Have enough dogs** to cover all points of the mob and to create force or flow without the use of heel bite. Heel bite can create panic and can trigger individual cattle attempting to escape from a mob. You need to have multiple dogs working together independently around a mob, in much the same way as you would place staff. Instead of using extremely aggressive dogs to create flow you may need to have a bigger number of herding type dogs.

- **Seek information** about working herding type dogs and attend a school to receive practical training in how to work with these dogs. You will learn how to prevent situations occurring such as the dog blocking the gate.

- **Take the concepts you and your dogs have learnt** from a school and begin to develop a trainer mob. You must have a trainer mob to create a learner person or learner dog friendly environment. The trainer mob must be easily accessible to facilitate training sessions whenever required. They will need to be broken in to withstand much more pressure than just normally ‘quiet’ cattle.

- **Use correct hand signals.** Never point to where you want a dog to go, always point in the opposite direction to where you want them to go or block them with body language.

- **Learn to read and lead livestock** so that you don’t sabotage the efforts of the dog in bringing them to you.

- **Don’t ‘over-face’ your dogs** to mobs of grown cattle with no dog respect. Over time, through building on the trainer mob and educating weaners, you will eventually have the whole herd accepting dogs. You may decide that some older breeders are not worth the extra work of dog-training and avoid using dogs on those mobs until older breeders go out of the herd and are replaced with younger dog-broken heifers. Having your whole herd gradually broken in as weaners will avoid the need for more drastic measures on older animals such as the use of ‘hanging’ type dogs which will defeat the purpose of calm, quiet stock movement.
• **Get the trainer cattle mob right** and let that attitude of cooperation become infectious through the mob. This trainer mob can then be used as a coacher mob for any recently weaned or purchased cattle when trailing out, as well as to make the training process much easier. Mix the recently weaned or purchased cattle into the trainer mob of cattle; maybe five or 10 at a time.

• **There is a big difference between quiet cattle and properly dog-educated ‘trainer’ cattle** that are able to withstand the pressure placed on them by inexperienced dogs. It is supremely important to give young dogs the chance to have a ‘win’ with these educated trainer cattle as you train them.

• **Initially, the dogs need to learn to bring cattle to you** to develop the dogs’ holding ability and to educate cattle to want to stay in a mob. This does not mean you will always have to work your stock in this fashion, but it’s extremely important for the tuition of the dog, the cattle and the handler. As the dogs become more experienced you can then teach them to work in a ‘droving’ or pushing situation with you at the back or side of the mob.

**Can dogs stand up to the Katherine region conditions?**

Using dogs under Katherine conditions certainly adds to the challenge of using working dogs; however there are many producers in northern Australia who successfully use dogs.

The most important considerations are:

• Have a cattle herd which has been properly dog broken (preferably as weaners) and will quietly come together and stay as a mob.

• Acquire dogs with enough instinct and training to hold and travel with the cattle - escorting them, rather than ‘chasing’ them and wasting energy.

• Have enough dogs to be able to rotate them to allow some to rest and get a drink and still have enough to be able to keep working the mob.

• Use utes or trailers set up with shade and water to rest dogs.

**Further information**


Information on Working Dog and Stockhandling Schools is available from DRDPIFR Katherine, Ph: (08) 8973 9739.

**Related topics**

Dog Health, Stock Handling.
This book summarises current recommended practices for cattle and station management in the Katherine region of the Northern Territory.

The book is designed to be used as a reference, with links to how the reader can research topics in more detail. Further information on all subjects can be obtained from DRDPIFR at Katherine Research Station.

This publication came about through an initiative of the Katherine Pastoral Industry Advisory Committee with funding provided by Meat and Livestock Australia. The information has been compiled from scientific data from the Northern Territory and elsewhere, with input and advice from experienced regional cattlemen.