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North Australia Beef Producer Survey.

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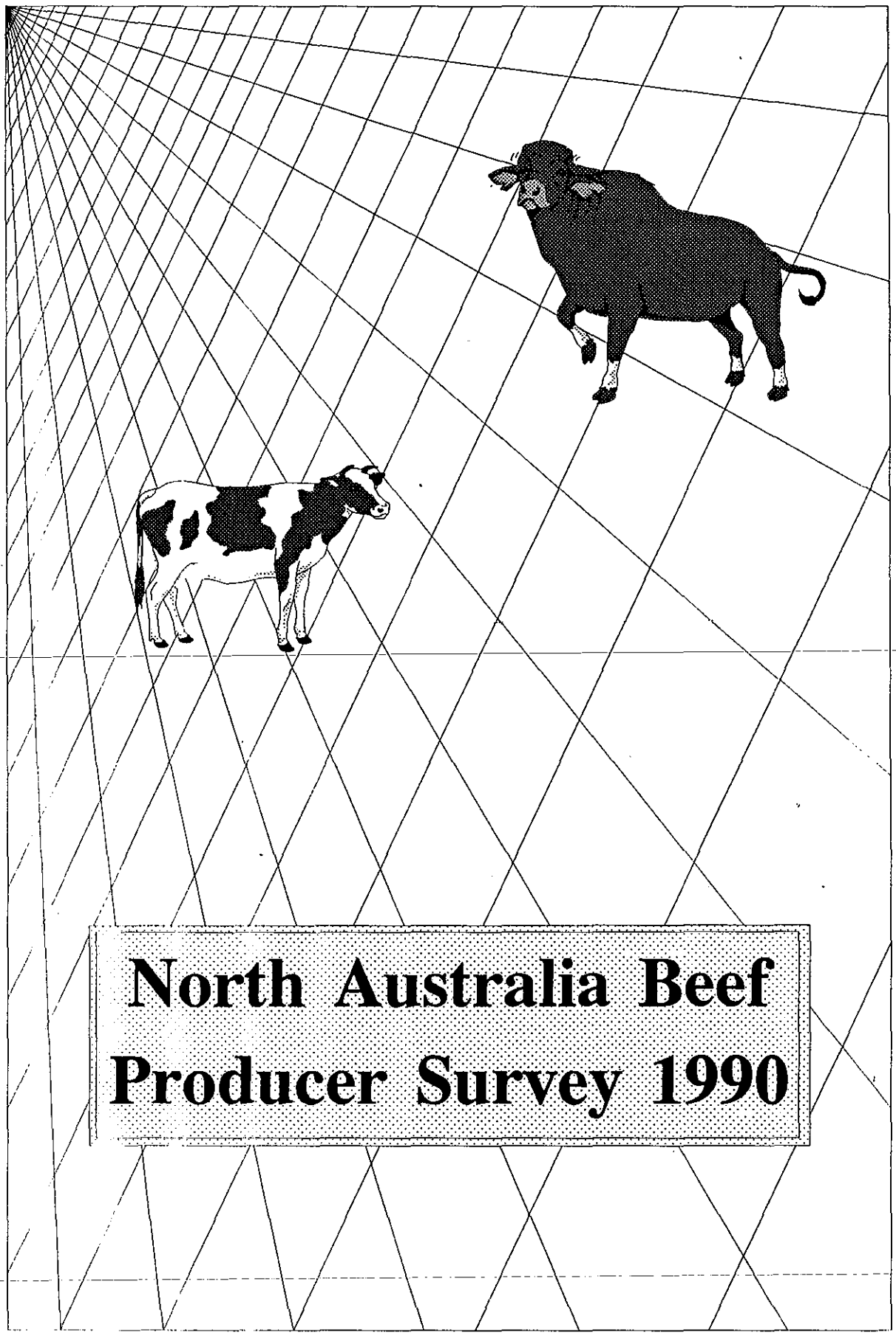

North Australia Beef Producer Survey 1990

Queensland Department of Primary Industries

and

Meat Research Corporation

P.K. O'Rourke, L. Winks and A.M. Kelly

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North Australia Beef Producer Survey 1990

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This study was commissioned and funded by the Meat Research Corporation (MRC), initiated by Ian Sillar, co-ordinated by Ralph Shannon, and conducted by Beef Cattle Husbandry and Biometry Branches of the Queensland Department of Primary Industries (QDPI). Bill Thompson provided the computer program and expertise to assign properties to Production Land Classes (PLCs). Several Departmental officers provided technical and clerical support particularly: Kaye Dennis with computing and data handling; Carol Owen with co-ordination of data coding and entry; Neville Cook with operational aspects; and Mandi Barrett with typing. Several of our colleagues and producers commented on and suggested improvements to the questionnaire and this report. Finally, and most importantly, one-third of the beef producers in northern Australia responded to the questionnaire and provided the essential data which formed the basis of the whole study.

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THE AUSTRALIAN MEAT AND LIVE-STOCK RESEARCH AND DEVELOPMENT CORPORATION

28 May 1991

Dear Valued Beef Producer,

Thank you for your time and effort in completing the **North Australia Beef Producer Survey** late last year. The responses received accounted for approximately 40 percent of cattle numbers in North Australia with good response rates from all geographic regions within the area covered by the North Australia Program (NAP). The Corporation believes that, as a result of this excellent response, the needs of beef producers have been made known.

In your response, you asked to receive a copy of the survey results. Enclosed, please find a summary of the results and limited interpretation of the findings on a regional basis. Officers of the Queensland Department of Primary Industries were commissioned by the Corporation to conduct this survey and compile this summary report. A full report of results and their interpretation is also being prepared by QDPI. Copies of this will be available from the Corporation later in the year.

The survey has indicated the important issues which confront graziers within the NAP target area in managing their operations. The significance of each of the issues to individual properties will vary depending on a range of factors unique to these particular operations.

One of the most significant features emerging from the survey was the overwhelming need to obtain better market information and feedback from the consumer. Considerable work has already occurred in relation to the Japanese market and additional work is currently underway in relation to the other South East Asian markets.

Many of the areas of concern, as indicated in responses to the survey, are under investigation already. Additional funds can now be allocated from an industry wide perspective to maximise the impact which can be achieved with your investment dollars in Research and Development.

Thank you for your participation and interest.

Yours sincerely,

David Skerman
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EXECUTIVE SUMMARY

For the past five years, the Meat Research Corporation (formerly AMLRDC) has been funding a large program known as the North Australia Program (NAP1) to investigate methods of improving beef production in northern Australia. Further research is currently being planned and this will be incorporated in a program known as NAP2.

To obtain baseline information against which the success of this program might be assessed in future years, a survey of beef producers was conducted in December 1990.

The objectives of the survey were:

(i) to provide information on property infrastructure, practices and issues of importance to producers in northern Australia;

(ii) to identify and prioritise issues from the producers' perspective to improve property profitability and for research and development.

This report provides a brief summary of key findings from the survey.

METHODOLOGY

The target population for the survey was all beef enterprises in north Australia which normally carry more than 300 head of cattle. A mail questionnaire was prepared and forwarded to 6 540 beef producers in Queensland (6 112), Northern Territory (233) and the northern part of Western Australia (195).

A total of 2 165 usable replies were received, representing 33 percent of those surveyed. Response rate by State was: Queensland 34 percent, Northern Territory 29 percent and Western Australia 29 percent.

The properties which replied carried 41 percent of the cattle numbers reported by Australian Bureau of Statistics in March 1989 for north Australia.

The information provided in the questionnaire was analysed on the basis of 14 regions which were developed by combining areas with similar production capability. These 14 regions are described as follows and are arranged in order from most intensive to most extensive:

(1) **High rainfall** - coastal strips in Queensland, mainly around Cairns, Mackay and Brisbane.

(2) **Brigalow** - discrete areas in central and southern Queensland inland of the ranges with cleared brigalow scrub.

(3) **Southern speargrass** - sub-coastal and inland strip south from Mackay where speargrass is the dominant species.

(4) **Queensland bluegrass** - inland areas west of the ranges in central and southern Queensland carrying predominantly bluegrasses.

(5) **Southern aristida** - inland areas in central and southern Queensland adjacent to areas of Brigalow and Queensland bluegrass and including the traprock area.

(6) **Southern rolling downs** - inland areas in the Maranoa region of central southern Queensland.

(7) **Northern speargrass** - sub-coastal and inland strip from Cooktown to Mackay with speargrass as the dominant species.

(8) **Central and northern rolling downs** - mitchell grass lands in central and north western areas of Queensland plus the Barkly Tableland.

(9) **Queensland spinifex** - one area in central-west and several in far west and north-west of Queensland including gidgee, some downs and channel pastures as well as spinifex.

(10) **Northern aristida** - inland areas around the southern and eastern sides of the Gulf of Carpentaria.

(11) **Mulga lands** - areas in south-western Queensland carrying mulga.

(12) **Gulf and peninsula** - areas of north-western Queensland bordering the Gulf of Carpentaria and the northern section of Cape York Peninsula.

(13) **Northern Territory and Western Australia spinifex** - southern part of Northern Territory including Tennant Creek and Alice Springs areas and the Pilbara and Carnegie areas of northern Western Australia.

(14) **Territory speargrass** - Top-end, Lower Top-end and Gulf areas in Northern Territory and Kimberley of Western Australia.

RESULTS

Property details

* **Property size** averaged 44 000 hectares but varied widely from an average of 4 000 hectares in the High rainfall region to 370 000 hectares in the Northern Territory and Western Australia spinifex.

* Average **herd size** was 2 000 branded cattle varying from 830 in the Southern aristida to 9 200 in the Territory speargrass.

* Cattle carrying **Zebu blood** predominated as two-thirds of properties carried Zebu infused cattle only and a quarter British only while the remainder carried both. British herds were more prevalent (40 to 50%)

in southern and inland areas of Queensland but represented less than ten percent of northern herds. Level of Zebu infusion was ⅜ to ⅝ on 40 percent of properties and more than ⅝ on 20 percent.

* One third of properties were run in conjunction with another beef property.

Land management

* Seventy percent of producers **preferentially grazed** or **spelled** different paddocks while 80 percent currently managed to encourage regeneration of pasture. However, only 50 percent indicated they considered land management issues as part of their basic management planning. This may reflect a different interpretation of what constitutes land management issues.

* 55 percent of properties had some **improved country** with 60 percent in more intensive areas and only 30 percent in extensive areas. For properties with some improvement, average area improved was 4 000 hectares ranging from 200 hectares in the Gulf and peninsula to 41 000 hectares in the Territory speargrass. This high figure resulted from one property with 300 000 hectares improved.

* 70 percent of properties with improved country had introduced pasture following timber clearing while only 25 percent planted under each of rung, poisoned or untreated timber. This result is largely a reflection of Brigalow development. Timber was cleared or treated to encourage native pastures on 40 percent of properties.

* 40 percent of properties used cropping but this was largely in High rainfall and Brigalow areas.

* Almost half the properties had rung, poisoned or pulled timbered areas in the last two years. This activity was more prevalent in intensive areas in southern Queensland. The treated area on these properties averaged 700 hectares and ranged from 10 hectares in Gulf and peninsula to 2 100 hectares in Mulga lands.

* Half the properties overall sowed improved pastures in the last two years, three quarters of Brigalow properties and one third of properties in extensive areas. Areas sown averaged 400 hectares each year and ranged from 60 hectares in the High rainfall region to 1 350 hectares in Central and northern rolling downs and Queensland spinifex.

* 60 percent of properties which sowed pastures used tropical grasses while 20 percent used tropical legumes. This again reflects the heavy influence of sowings in Brigalow areas. Temperate legumes and forage crops were each used on 10 percent of properties.

* Buffel grass (30%), Rhodes grass (10%), shrubby stylo (10%) and silk sorghum (10%) were the most popular species sown.

* The reasons given for not sowing pastures were inadequate finance (40%), soil and climate unsuitable (40%) and benefits too small (20%).

Weed problems

* Eucalypt **regrowth** was seen as the most problematic plant overall (60%), particularly in southern Queensland (80%). Brigalow regrowth was a major problem in the Brigalow areas and black wattle in the Southern speargrass and Southern aristida. Other problem plants were of regional importance. Most significant were: false sandalwood on Mulga lands and Southern rolling downs; turkey bush on Mulga lands; prickly acacia on Central and northern rolling downs; rubber vine on Northern aristida and Northern speargrass; lantana on High rainfall and Southern speargrass; and pimelea on Southern rolling downs.

Property development

* Most properties in Queensland were fully boundary fenced but in far north Queensland, Northern Territory and the northern part of Western Australia only half the properties had full **boundary fencing.** Many extensive properties also use physical barriers for cattle control. Two-thirds of properties in intensive areas had six to fifteen paddocks while two-thirds of extensive properties had fewer than ten paddocks despite much greater size.

* New fencing was planned on 80 percent of properties over the next two years. Reasons given were: replace old fence (60%), creating a new main paddock (30%), a new lane (20%), new holding paddock (20%) and fencing off problem areas (10%).

* Use of **electric fencing** for stock segregation was widespread: 33 percent of all properties and 50 percent of Brigalow properties.

* Two-thirds of properties were partially dependent on **pumped water** in a normal year while the remainder had equal numbers either fully dependent on or independent of pumped water. This has important implications for the use of self mustering techniques to increase the efficiency of labour usage.

* Windmills (75%) remain the main power source for pumping water while diesel (50%), mains electricity (40%) and petrol (30%) were also important. Despite its relative newness, solar power is already used on five percent of properties. Natural energy sources (windmills and solar power) were used exclusively on 20 percent of properties.

Labour usage

* An average of three permanent employees including the owners/managers were employed on the beef enterprise. This varied from none on some properties in intensive areas to an average of nine on Territory speargrass properties. Half of the properties also employed casual labour for stock work.

* Half the properties overall and two-thirds in extensive areas have reduced the labour input to their beef enterprise in the last five years. They did this by better sub-division (50%), use of labour saving technology (40%), neglecting some jobs (30%) and increased plant/structures (30%). Horses were used as mustering aids on virtually all properties; bikes and laneways each on up to half; helicopters, cattle traps/spears and portable yards each on a quarter; but fixed wing aircraft on fewer than 10 percent of properties.

Cattle enterprise

* Most properties (70%) combined breeding and finishing while 25 percent were breeding only. This increased to 40 percent in more extensive areas. Fewer than five percent of properties were finishing only and most of these were in High rainfall and Brigalow regions.

* **Stud cattle** were bred on 15 percent of properties.

Breeding herd management and productivity

* An average of 940 females per property were **joined** annually in the last three years ranging from 370 in Southern speargrass to 4 800 in Territory speargrass. Breeders represented 47 percent of total branded stock overall. While the general range was 40 to 55 percent, the proportion was 30 percent in Mulga lands and 65 percent in the Gulf and peninsula.

* More than half the properties left bulls in the herd all year and this rose to 90 percent in more extensive areas. Two-thirds of those considered it was not practical to remove them while half considered they achieved higher branding rates. Bull percentage averaged four percent and tended to be higher (5%) in extensive areas.

* In extensive areas 60 percent of properties **mustered** their breeders twice a year while 20 percent mustered only once a year. In intensive areas, 85 percent of producers mustered at least three times per year with 20 percent mustering more than six times.

* **Branding rate** was 63 percent overall, exceeding 70 percent for High rainfall and southern inland Queensland and being less than 55 percent for Gulf and peninsula, Territory speargrass and Northern aristida.

* Virtually all properties **weaned** in some form but only 40 percent down to a minimum under six months or 150 kg. Three quarters of properties commenced weaning in the March to June period with a peak in May (25%). Half the properties had two weanings per year with the remaining properties equally divided between one and three or more weanings.

* 80 percent of properties **segregated** heifer weaners from the breeding herd but the percentage declined to 60 percent for yearlings and 20 percent for two year olds. The level of segregation was lower in more extensive areas.

* **Age at first calving** of heifers was equally divided between two and three years. The incidence of earlier first calving was highest in southern and inland areas of Queensland where there was a predominance of British breed herds.

* While 50 percent of properties retained less than half of their weaner heifers as **breeder replacements**, ten percent retained virtually all. In more extensive areas, 30 percent retained virtually all heifers.

* **Heifers** were **culled** as yearlings on 40 percent of properties, as weaners or two year olds each on 30 percent and after first joining on 20 percent.

* Producers **culled breeders** on a range of criteria. Three-quarters culled on temperament, type/conformation or age; half used a negative pregnancy test or poor quality calf at branding and a quarter used dry at branding or if they were fat. Five percent indicated that they culled on poor Breedplan figures.

* Half of the properties **prevented unwanted pregnancies** with secure fences. These figures were higher (60%) in intensive areas and lower (30%) in extensive areas. Segregation of target groups was used on 40 percent of properties, surgical speying on 30 percent and needle speying on five percent. This figure for needle speying suggests rapid adoption of very new technology.

* 40 percent of properties **culled** less than ten percent of **bulls** annually while this rose to 60 percent of properties in extensive areas. However, 25 percent of properties culled more that 20 percent of their bulls each year. These figures indicate limited scope for genetic improvement in most herds because of the long generation interval.

* 70 percent of properties **bought** some **bulls** at bull sales while 25 percent obtained all from this source. More than half the properties bought some bulls direct from studs while 15 percent bought all their bulls this way. Less than half bred some bull replacements and under five percent bred all their own bulls.

Supplementation

* 20 percent of properties supplemented their weaner, yearling and two year old heifers in normal years and 50 percent did so in dry years.

Phosphorus

* 40 percent of producers considered parts of their properties phosphorus (P) deficient, while 40 percent did not. The remaining 20 percent were unsure. Figures were as high as 70 percent deficient in extensive areas with Territory speargrass, Northern aristida, Gulf and peninsula and Northern speargrass having highest values.

* Within the deficient group, an average of 40 percent considered the whole property P deficient. This level was higher at 60 percent in extensive areas.

* Bone chewing was the **symptom** of P deficiency seen most frequently, 75 percent overall and 95 percent in extensive areas. Soil licking (40%) was the next most common symptom while 'peg leg' (20%) and broken bones (10%) were seen less frequently. Since bone chewing is an early sign of phosphorus deficiency and 'peg leg' is seen only in grossly deficient situations, these results are quite understandable.

* **Phosphorus supplements** were normally fed on a third of properties overall but on more than two-thirds of properties in Territory speargrass, Gulf and peninsula, Northern aristida and Northern speargrass regions. Reasons for not **feeding** were given as: responses too small (20%), too costly (20%) and problems with feeding (10%).

* Half those feeding P fed all year while 10 percent fed only during the wet and 40 percent only during the dry. Reasons for not feeding P in the wet included: not required, poor intakes, and no suitable supplement.

* Of those supplementing with P virtually all fed breeders, 70 percent fed heifers, weaners and bulls and 50 percent fed steers.

* MAP and proprietary mixes were the most common **forms of P** fed. Salt, molasses and urea were most commonly fed in some combination with the P source.

* The main perceived **benefits** of P feeding were improved cow survival, increased branding and improved cow liveweight and condition. Increased weaning weight, higher steer growth and reduced incidence of 'peg leg' were of lesser importance.

Growth stimulants

* Hormonal **growth promotants** were used by 20 percent of producers overall, with highest levels in Northern speargrass (30%). Usage was low in the Mulga lands, Southern aristida, Queensland spinifex and Northern Territory and Western Australia spinifex.

* Less than 10 percent of producers included **rumen modifiers** with their supplements. The main reasons for their exclusion were: no supplementary feeding and not aware of rumen modifiers.

Animal health

* The animal health problem most routinely treated or vaccinated against was **buffalo fly** which was treated by two-thirds of producers. Up to 90 percent of producers in coastal and sub-coastal Queensland routinely treated for buffalo fly.

* While half the producers vaccinated with **5 in 1**, rates were highest in southern Queensland and lowest in extensive areas.

* Within the tick infested area, treatment for **ticks** varied from 80 percent of properties in High rainfall to 20 percent in Northern aristida. A quarter of properties overall vaccinated against tick fever.

* While only a quarter overall treated for **lice**, the figure was 70 percent for Southern aristida and Southern rolling downs.

* Overall 40 percent treated for **worms** with highest levels in intensive areas and lowest in extensive areas.

* Vaccination against **botulism** was practised on 20 percent of properties overall, but the level exceeded 50 percent for Northern aristida, Gulf and peninsula, Territory speargrass and Queensland spinifex.

* **3-day sickness** was treated or vaccinated against by 15 percent of producers.

* Vaccination rates for **vibriosis and leptospirosis** were in the range of 15-20 percent.

* A quarter of producers felt that animal health problems lowered the productivity of their beef herd by a large or moderate amount while a similar number felt that such problems were not important. Only 20 percent planned any changes to their animal health routine in the near future. Most common among the planned changes were treatment for leptospirosis, vibriosis, 3-day sickness and worms.

Marketing

* Number of **cattle sold** annually per property averaged 650, ranging from 300 in Southern speargrass to 2 000 in Northern Territory and Western Australia spinifex. Males were 65 percent of Sales overall with a range from 45 percent in Southern aristida to 80 percent in Mulga lands.

* Overall **turnoff** (sales over number of branded cattle) was 32 percent. Levels exceeded 40 percent in Southern rolling downs, Southern aristida, High rainfall and Mulga lands and were less than 25 percent in Territory speargrass, Northern aristida and Northern speargrass.

Selling ages

* Most **store steers and heifers** (60%) were sold at one to two years of age, while 20 percent were sold before one year old and 20 percent at two to three years.

* Most **prime steers and bullocks** (80%) were sold between two and four years of age. A quarter of the turnoff was aged less than two years in the Queensland bluegrass and Southern rolling downs. More than 70 percent of sales were at three years or younger in Brigalow, Queensland bluegrass, Southern aristida, Southern rolling downs and Central and northern rolling downs. Conversely, less than 40 percent of such sales were at these ages in Southern speargrass, Northern speargrass, Northern aristida, Gulf and peninsula and Territory speargrass. In extensive areas, a quarter of the turnoff was older than four years.

* One third of producers indicated an intention to sell their cattle at younger ages over the next five years. This tendency was strongest in Gulf and peninsula and Territory speargrass regions where turnoff ages are currently the highest.

* Two thirds of **cull cows** were sold at five to ten years of age and a quarter were older than ten years.

* Most **bulls** (70%) were culled at five to ten years while the remainder were equally distributed above or below this age range.

* Overall 40 percent of properties **bought in stores** to finish but this practice was more common in the more intensive areas, particularly Brigalow and less so in extensive areas such as Northern aristida, Gulf and peninsula and Territory speargrass. Two-thirds of those buying steers to finish bought and preferred to buy at one to two years of age.

Selling methods

* The most popular selling methods were via saleyards and direct to works. There was a greater tendency to sell through saleyards in more remote regions and direct to works in more intensive areas.

* One third of properties sold prime steers and bullocks through **saleyards** while up to half sold other classes of stock by this method.

* Almost half the properties sold prime steers and bullocks, cull cows and cull bulls **direct to works.**

* **Paddock sales** accounted for 15 to 20 percent of store steer and heifer sales but low proportions of other classes of stock. Up to 10 percent of properties transferred store steers to a second property.

Access to market outlets

* A quarter of properties were within 100 km of the abattoir they normally used, half were within 100-500 km while the rest were more than 500 km away. In extensive areas almost three-quarters of properties were more than 500 km from the abattoir but in intensive areas fewer than 10 percent were this far away.

* While distances to the normally used saleyards followed a similar pattern, 45 percent of properties were within 100 km and only 15 percent further than 500 km away.

* **Road transport** was the main method of moving turnoff stock, with 85 percent of properties using this method.

* Road or walk in conjunction with **rail** was used by only 10 percent of properties overall, but by a quarter of properties in Central and Northern rolling downs and Queensland spinifex regions.

* More than half the producers said they would persist with current transport methods even if costs increased substantially.

Future prospects

* The issues rated most important to **improve profitability** of the property over the next five to ten years were consistent across regions.

* **Selection of breeding stock** was considered uniformly important with 95 percent of producers identifying superior bull selection and 85 percent selection of breeders on fertility.

* **Marketing issues** were next in importance with 85 percent identifying knowledge of market specifications and 80 percent meatworks feedback.

* Issues with moderate or low importance overall, but high regional significance were:

  - more **sown pasture** in the more intensive areas, Southern rolling downs and Northern aristida;
  - **buffalo fly** control in the High rainfall and Southern speargrass;
  - **timber treatment** in southern inland Queensland; and
  - **phosphorus supplementation** and **botulism vaccination** in northern areas, mainly Northern aristida and Gulf and peninsula.

* At least two-thirds of producers rated as very or moderately important the issues of **labour saving devices, improved financial planning and control, weed control** (including woody weeds), and **more effective use of land by providing more waters.**

* 30 percent considered the use of **decision support packages** important.

Future research and development needs

* 70 percent of respondents provided suggestions for future research and development, with a range from 60 percent in Central and northern rolling downs to 80 percent in the Gulf and peninsula region.

* Responses were categorised into four topic areas:

  - increasing cattle production efficiency;
  - marketing issues;
  - sustainability of the resource; and
  - cost reducing management practices.

* Issues relating to increasing cattle production efficiency were identified by 75 percent of respondents, with a range from 50 percent in Mulga lands to 85 percent in Territory speargrass. The main components within this category were: improved pastures (30%), buffalo fly control (20%), tick control (15%), supplementation (15%) and breeding (10%).

* Marketing issues were identified by 35 percent overall with a narrow range from 25 to 45 percent across regions. Most items were categorised as general marketing with the specific issues of market requirements, government policy, meat processing and transport given approximately equal ratings.

* 30 percent of respondents identified issues relating to sustainability of the resource. The highest incidence was 40 percent in Northern speargrass and Southern rolling downs and the lowest was less than 10

percent in Northern Territory and Western Australia. Weed control was the major issue with 25 percent nominating it as a topic.

* Less than 10 percent of producers nominated issues which could be grouped under the heading of cost reducing management practices.

CONCLUSIONS

* Producers clearly signalled two main areas to improve their future profitability, namely selection of breeding stock and market intelligence. These attitudes signalled a high level of awareness within the industry of the need to be market driven. Improved methods for determining the requirements of particular markets, communicating these to industry and developing efficient production systems to produce the appropriate products must take high priority.

  The recent emphasis on producer feedback on carcases at slaughter is appropriately directed.

* The failure of selection of breeding stock to rate highly as an issue for research and development suggests that producers consider the appropriate tools are already available. A technology transfer exercise may be required to inform industry of available objective selection methods and criteria which can be included.

* While most producers identified superior selection of bulls as being of high priority, results indicate that many bulls remain on the property in excess of five years. If rapid genetic progress is to be made, it is important that producers select superior sires as herd replacements and allow them to remain in the herd for a maximum of four years.

* With the trend for export markets, especially those in Asia, to demand product from younger animals, the industry can take some comfort from the fact that 55 percent of prime steers and bullocks are turned off before three years of age. While one third of producers expressed an intention to sell younger stock over the next five years, a concerted effort will be needed in both store producing and finishing areas if male turnoff is to satisfy the requirements of the lucrative markets in Asia.

* Despite emphasis on direct consignment, sale by description and the benefits of carcase feedback, 35 percent of prime steers and bullocks are still sold through saleyards. The tendency for this practice to be more common in extensive than in intensive areas may reflect the relative accessibility of these outlets. There seems considerable scope for increased efficiency in this area by increasing the percentage of direct sales to works. In addition, producers are obviously foregoing abattoir feedback. Some follow-up studies to determine why producers select particular options could be warranted.

* The heavy reliance on road transport for moving sale cattle endorses the research effort being devoted to improving transport design. In addition, it highlights the impact on production costs within the industry of proposed changes to registration charges for road transports.

* Survey results indicate a willingness by many producers to adopt new technology. Typical examples of new technology adoption are: use of personal computers; solar power for pumping water; chemical speying; and, rumen modifiers.

* One of the most important ways to reduce age of turnoff is introduction of improved pastures. The level of plantings currently underway augers well for future goals of reducing turnoff age.

* While only a quarter of producers employed self mustering systems, more than 85 percent utilised some pumped water. This suggests considerable scope for further adoption of self mustering which would justify continuing its promotion. The expressed importance of labour saving techniques for future profitability would support further research input on this topic.

* Most producers currently treat animals for buffalo fly control despite the absence of any production advantages from research studies on fly control. With the increasing community concern about animal welfare issues and the reduction in value of hides from scarring, it is clear that research into more effective buffalo fly control is warranted.

* Producers continue to treat for control of cattle tick despite the widespread use of adapted cattle. Between 65 and 80 percent of properties in different parts of the tick infested areas run cattle with ⅜ Zebu or greater, but 60 percent of properties dip for tick control. This would suggest that producers might be dipping cattle unnecessarily.

* While phosphorus supplementation and botulism vaccination were considered high priority issues for improving profitability in northern areas, less than 25 percent of producers in these areas identified these issues as needing further research and development.

* Most producers who consider their properties deficient feed phosphorus supplements. However, only half of these actually feed during the wet season when requirement for supplementary phosphorus is greatest. The reasons given for not feeding in the wet indicate that an education campaign is necessary as well as development of more practical feeding systems for the wet season.

* While 70 percent of properties in extensive northern areas are considered phosphorus deficient only 50 percent vaccinate against botulism. Management recommendations are normally to feed phosphorus supplements and vaccinate against botulism in such

situations. This failure to vaccinate in these regions represents a potential area of loss.

* The majority of producers identified land management issues such as weed control, timber treatment and more effective land use as important for future profitability. However, many do not consider the answers are currently available as 30 percent of respondents identified land management issues as needing further research and development, with weed control being most prominent.

* The information obtained from this survey provides a baseline for future comparison and to assess impact of future activities. This is currently the best information on the northern beef industry assembled to date.

1. INTRODUCTION

During the period since 1986, the MRC has been funding a large research and development (R&D) program known as the North Australia Program (NAP1) with the objective of improving beef production in northern Australia. This program involved inputs from the major R&D groups in northern Australia and considerable technology has been developed. One project in NAP1 has focused on technology transfer and adoption of the new technology by beef producers in northern Australia.

As a followup to NAP1, the MRC, in conjunction with Industry and R&D groups, has planned a program which will be known as NAP2. This program's goal is:

To increase the productivity per breeding cow to be achieved by NAP1 by a further 10% by the year 2000. At the same time emphasis is on improving the quality of turnoff by implementing management technologies which are consistent with long term environmental stability.

Specific objectives of NAP2 are:

- to improve the collective economic viability of cattle enterprises in northern Australia by increasing, in a sustainable way, biological efficiency (in term of gross beef turnoff) so that it is ten percent above that otherwise achievable by the year 2000 and by increasing it a further five percent by the year 2005;

- to improve the economic viability of cattle enterprises in northern Australia by reducing net operating costs on adopting properties to 20 percent below that which would otherwise apply by the year 2000, through the development and application of cost reducing technology; and

- to have identified management technologies and validated their implementation by the commercial industry in the major producing regions of northern Australia by the year 2000, while being consistent with sustainable industry profitability and environmental stability.

At present there is an inadequate global picture of the northern beef industry, particularly from the producers' point of view. The report by Holroyd and O'Rourke (1989) summarised and collated research studies on beef cattle production in northern Australia. The quality and quantity of available research information on growth, reproduction and mortality, the size and importance of the beef industry in each region, and the advice of scientists, advisers and producers were used to recommend priorities for future use and collection of basic biological data. However, since this study was based on published research studies, it did not give a resource inventory nor describe current industry practices, problems or issues.

To obtain baseline information on the northern beef industry against which the success of NAP2 might be assessed over time, a survey of beef producers was conducted in December 1990.

The objectives of the survey were:

- to provide information on property infrastructure, practices and issues of importance to beef producers in northern Australia; and

- to identify and prioritise issues from the producers' perspective for improving property profitability and for research and development.

This report presents the results of the survey and represents the most comprehensive statement on the northern beef industry ever compiled. While it lacks input on financial issues, data from this report can be matched with data collected by the Australian Bureau of Agriculture and Resource Economics in their annual financial survey of the industry.

2. METHODOLOGY

The basic methodology was to collect comprehensive information from northern beef producers via a mailed questionnaire. This data was analysed to give both regional and overall summaries of physical resources, management practices, future options and priorities. The major form of summary used the concept of Production Land Classes (PLCs) derived from the vegetation classification of Moore (1970) and Weston *et al.* (1981) to allocate properties with similar land and vegetation resources to a common group. This classification based on PLCs will subsequently form the basis for Research Impact Analysis of research funding proposals by the Corporation. Preliminary results from the study were presented to relevant scientists and other major end users to seek their guidance and comment on the types of analyses and reporting which would be most useful to producers, scientists and the Corporation.

2.1 Planning for the survey

An initial draft of the questionnaire to be mailed to producers was developed by Ian Sillar and distributed for comment. Twenty research and extension officers and producer representatives from Queensland, Northern Territory and Western Australia made contributions which led to improvements in the content and format of the questionnaire. The revised questionnaire was returned to this group for further input. Most of the group requested additional questions or more detailed versions of existing ones while commenting that the questionnaire was already too long and complex. Many valuable comments improved clarity and readability. The final questionnaire (Appendix 1) tended to be a compromise between satisfying the needs of various interest groups and limiting the length to a workable level. It contained questions on 51 issues. Unfortunately time constraints did not permit pilot testing of the questionnaire among typical respondents.

The survey form was introduced by a letter of explanation from the Chairman of MRC (Appendix 1). This outlined the reasons for conducting the survey and stressed the importance of producer participation in planning and priority setting for research and development over the next decade. Although return of the completed survey form could be done anonymously, there was an opportunity for producers to supply their name and address so that they could receive a report on the overall findings from the survey.

The target population for the survey was beef producers in northern Australia with more than 300 meat cattle. This sector was expected to carry at least 90% of the meat cattle population in northern Australia. In conformity with the region for the North Australia Program of MRC, northern Australia included all of Queensland and the Northern Territory and the Kimberley, Pilbara and Carnegie statistical regions of Western Australia. Names and addresses for properties in the target population were obtained from databases and mailing lists maintained by the State Departments in each of the three States. A property was defined as an enterprise conducted as a self-contained

unit and having its own facilities. It could consist of a single or several discrete blocks of land located within reasonable proximity.

2.2 Operational aspects of the survey

Survey forms were mailed to 6 647 producers in Queensland (6 215), Northern Territory (233) and Western Australia (199) during the first week in December 1990. A reminder letter was sent out in mid-January to encourage producers who had not responded to do so. The final date for inclusion of responses in summaries and analyses was 8 March 1991, which allowed three months for completion and returning of questionnaires. Publicity for and promotion of the survey were carried out in the rural press and on radio during December and January. One hundred and three questionnaires from Queensland and four from Western Australia could not be delivered and were returned to us.

Preliminary processing of completed forms involved a check for completeness and consistency of responses, allocation of a serial number for future identification, and coding of vegetation, land type and location. More detailed coding was carried out for the open-ended responses to Questions 7, 9, 10, 11, 12, 37, 47 and 51. In general, the categories for coding were derived from perusal of a sample of responses. Responses to Question 51 (R&D issues) were categorised hierarchically to four major groups and then to sub-groups within each of these. The four major groups were: cost reducing management practices; increasing cattle production efficiency; sustainability of the resource; and marketing. Likewise the species given in response to Questions 10 and 11 (pasture improvement) were primarily categorised into tropical or temperate grasses or legumes and forage crops, and secondarily by species. Up to five issues were coded for Question 51 and two issues for other questions. When a greater number of options was listed, the first mentioned were given priority in the coding.

An address label was typed up where respondents asked to receive a report on the overall findings.

Data entry used a fixed column, space delimited format under program control onto a microcomputer disk. There were 368 fields spread over 12 lines for each record. Data keying, coding and interpretation were verified by a second operator working independently of the first one. The senior author was arbiter for any discrepancies in coding or interpretation of responses. Verification was done by the most experienced two of the nine operators. Data files were transferred from floppy disk to mini-computer for storage and analysis. A final checking of the data for accuracy and consistency was carried out before analyses were commenced.

2.3 Specification of PLCs

PLCs have been established to describe areas with similar land, vegetation and soil types to give a basis to compare and contrast information on other traits. A total of 58 PLCs have been derived from the vegetation classifications of

Weston *et al.* (1981) for Queensland and Moore (1970) for Northern Territory and Western Australia, and from soil types grouped into sands, loams, earths, acid/alkaline duplexes and clays. Details of these 58 PLCs, as derived by Bill Thompson, are explained more fully in Appendix 2.

For analysis and summary of the survey the 58 basic PLCs have been aggregated into 14 regional groups which closely resemble the vegetation classifications of Weston *et al.* (1981) for Queensland and Moore (1970) for other areas. Likewise the regional groups are similar to the ten vegetation zones for Queensland used by Holroyd and O'Rourke (1989). The detail in grouping is much greater for Queensland than for other States (12 v 2 groups) because more mapping information is available for Queensland, the beef industry is much more developed and much larger there, and property development and management styles offer a far greater range there than in other States.

The hierarchical allocation of PLCs to the 14 regional groups, descriptions of the groups and their relationships to the classification of Weston *et al.* (1981) and Moore (1970) are given in Appendix 2. The following list gives a descriptive name for each regional group and a general description of the group's location, which is shown on the map of northern Australia (Figure 1). The regional groups are:

(1) **High Rainfall** - coastal strips in Queensland, mainly around Cairns, Mackay and Brisbane.

(2) **Brigalow** - discrete areas in central and southern Queensland inland of the ranges with cleared brigalow scrub.

(3) **Southern Speargrass** - sub-coastal and inland strip south from Mackay where speargrass is the dominant species.

(4) **Queensland Bluegrass** - inland areas west of the ranges in central and southern Queensland carrying predominantly bluegrasses.

(5) **Southern Aristida** - inland areas in central and southern Queensland adjacent to areas of Brigalow and Queensland bluegrass and including the traprock area.

(6) **Southern Rolling Downs** - inland areas in the Maranoa region of central southern Queensland.

(7) **Central and Northern Rolling Downs** - mitchell grass lands in central and north-western areas of Queensland plus the Barkly Tableland.

(8) **Mulga Lands** - areas in south-western Queensland carrying mulga.

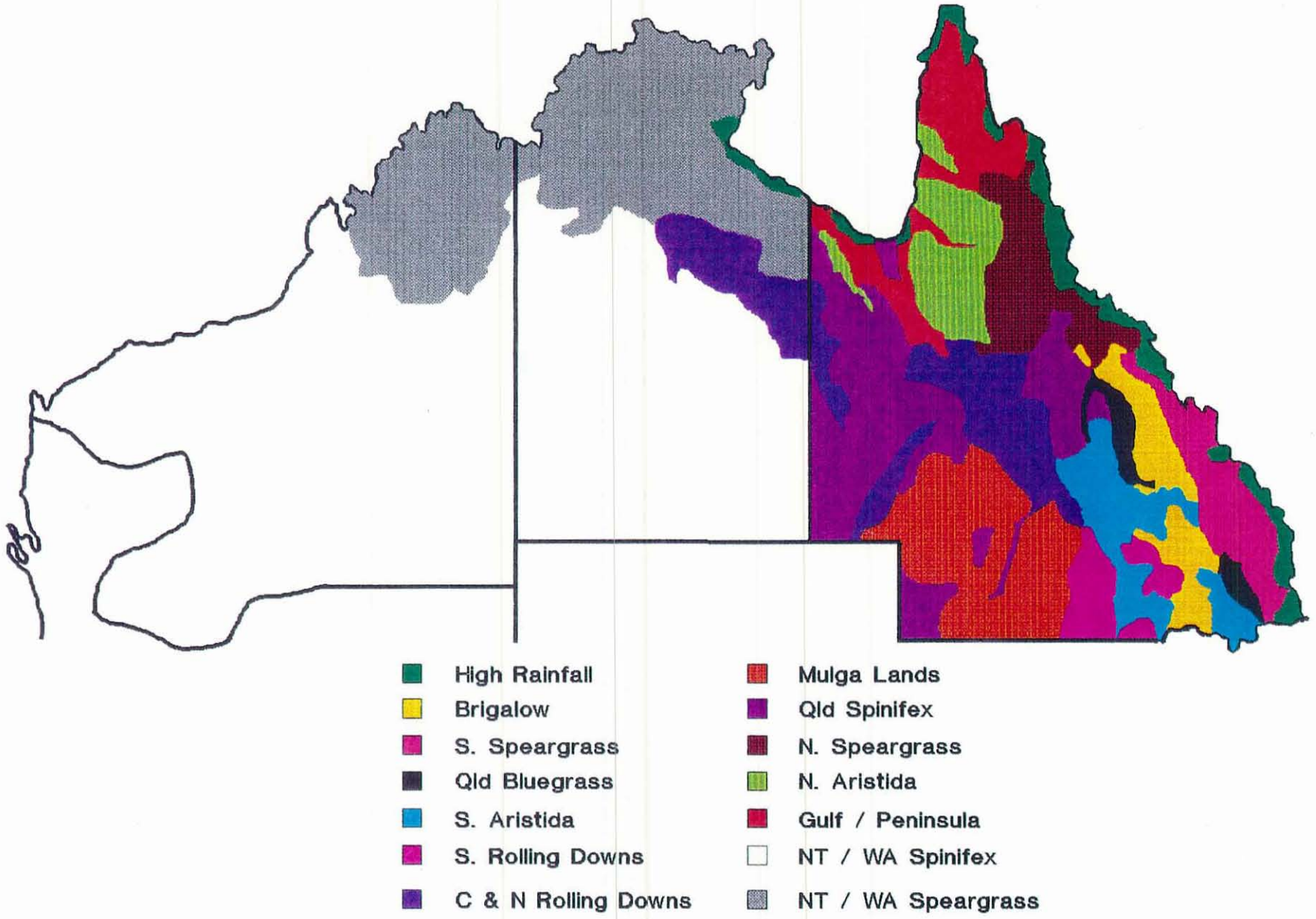

Figure. Regions of north Australia based on Production Land Classes (details in Appendix 2).

(9) **Queensland Spinifex** - one area in central-west and several in far west and north-west of Queensland including gidgee, some downs and channel pastures as well as spinifex.

(10) **Northern Speargrass** - sub-coastal and inland strip from Cooktown to Mackay with speargrass as the dominant species.

(11) **Northern Aristida** - inland areas around the southern and eastern sides of the Gulf of Carpentaria.

(12) **Gulf-Peninsula** - areas of north-western Queensland bordering the Gulf of Carpentaria and the northern section of Cape York Peninsula.

(13) **Northern Territory and Western Australia Spinifex** - southern part of Northern Territory including Tennant Creek and Alice Springs areas and the Pilbara and Carnegie areas of northern Western Australia.

(14) **Northern Territory and Western Australia Speargrass** - Top-end, lower Top-end and Gulf areas in Northern Territory and Kimberley region of Western Australia.

2.4 Data analysis

The main form of summary and data analysis was frequencies by categories and cross-tabulation by regional groups. The computer package SPSS-X was used for these analyses. The main interest in the results was the overall responses to the various issues and their consistency across regional groups and the North Australia Program area. Ranking and relative priority were important for components of the same issue.

2.5 Response rates and their distribution

A total of 2 165 usable replies were received (Table 1), representing 33.4% of those surveyed. Response rate by State was: Queensland 33.8%; Northern Territory 28.8% and Western Australia 29.2%. Response rate was reasonably uniform across the survey area with a range from 28% in south-western Queensland to 40% in central-western Queensland. Based on statistics for March 1989 from Australian Bureau of Statistics, the numbers of cattle were 10.941 million for North Australia, 8.682 million for Queensland, 1.389 million for Northern Territory and 0.870 million for the northern part of Western Australia. The numbers of cattle on properties responding to the survey were 40.6, 39.6, 40.8 and 53.7% of the March 1989 totals for the four regions respectively.

To extrapolate from the one third who responded to the target population it is necessary to assume that non-respondents would have responded in a similar fashion. This assumption is unlikely to be true. It is more likely that respondents were more aware of and interested in the issues examined than

would be the average producer. Likewise respondents answering a specific question are more likely to be those for whom the question is important. Hence, the positive answers to issues examined are likely to be over-stated by a variable and unknown amount. This actual and potential bias is an acknowledged feature of this report. Nevertheless, this study summarises the views of over 2 000 producers who control 4.3 million cattle in northern Australia. It is representative in a geographic sense since the response rate was relatively uniform across regions. Comparisons between the present results and those from similar surveys will be valid in a longitudinal sense since potential biases and under-reporting problems will be similar.

2.6 Results

The survey was detailed and covered a wide range of issues. Hence, the comprehensive presentation of the results for all of these issues is both complex and voluminous. The main presentation of results is in the tables where each issue is presented on an overall basis and for each of the 14 regions. The issues are arranged into eight themes which are presented as separate chapters. The text illustrates the main features of the data and draws attention to its unusual or interesting features. Linkages and relationships between issues are developed and discussed in the relevant chapters.

3. PROPERTY DETAILS

Summaries of data from Questions 2-6, 32-34 and 38-44 (see Appendix 1 for questionnaire) are given here and in Tables 1 to 15. These questions and tables give a summary of general property information on basic statistics, labour usage, property improvements and cattle enterprise.

3.1 Property size

* Average property size varied widely between the 14 regional groups from 3 981 ha in the High Rainfall region up to 368 155 ha in Northern Territory and Western Australia (NT/WA) Spinifex and averaged 43 861 ha (Table 1). Variability within regions was also high with coefficients of variation exceeding 100% for 12 regions and 200% for six regions.

* Generally 90% of the property is utilised but lower percentages are used in NT/WA Spinifex (70%) and NT/WA Speargrass (61%). Hence the area utilised averaged 34 415 ha and followed a similar regional pattern to that for property size (Table 1).

* The percentage distribution of property size shows a predominance of smaller properties in the more intensively developed regions and very large properties in the remote, extensive regions (Table 2). The incidence of properties of greater than 200 000 ha was 79% for NT/WA Spinifex, 56% for NT/WA Speargrass and 22% in each of Gulf-Peninsula and Queensland Spinifex.

3.2 Rainfall

Average annual rainfall was 657 mm overall. It was much higher near the coast and lower as distance from the coast increased (Table 3). Most properties (60%) were in the 500-800 mm rainfall zone, with 20% in the 250-500 mm zone, 15% receiving above 800 mm and four percent lower than 250 mm (Table 3). Diversity of rainfall was most pronounced within regions for Northern Speargrass, Northern Aristida, Gulf-Peninsula and NT/WA Speargrass.

3.3 Cattle numbers and breeds

* The average number of branded cattle run was 2 024 head ranging from 832 in Southern Aristida to 9 158 in NT/WA Speargrass (Table 1). Herd size was lower in the intensive regions and higher in the extensive ones. Herd size exceeded 10 000 head on 27% of properties in NT/WA Speargrass, 20% in Gulf-Peninsula and 10% in NT/WA Spinifex. The regional patterns in herd size parallel those for property size (Table 2). Stocking rate averaged 14.6 ha/head and varied between regions in line with property size and intensity of development (Table 1).

Table 1. Number of respondents, average property size and number of branded cattle.

Region	Number of respondents	Average size of property (ha)	Area utilised (ha)	Average number of branded cattle	Stocking rate (ha/hd)
Overall	2165	43861	34415	2024	14.6
High Rainfall	74	3981	2387	1164	2.8
Brigalow	619	7171	6509	1343	4.8
S. Speargrass	468	4683	4051	937	4.0
Qld Bluegrass	150	8262	7646	1230	5.6
S. Aristida	43	9990	7739	832	9.2
S. Rolling Downs	66	9255	8494	904	9.5
C & N Rolling Downs	184	70302	64704	2889	26.1
Mulga Lands	87	94641	84021	1889	53.5
Qld Spinifex	86	146214	124056	3474	31.6
N. Speargrass	161	29269	24263	2565	8.6
N. Aristida	60	50399	40085	2248	19.4
Gulf-Peninsula	56	143485	120421	6752	25.1
NT/WA Spinifex	71	368155	250345	6720	105.4
NT/WA Speargrass	40	261522	145161	9158	26.5

Table 2. Distribution of property size and number of branded cattle.

Region	Property size (ha)					Number of branded cattle			
	<2 000	2 000 - 5 000	5 000 - 10 000	10 000 - 50 000	>50 000	<500	500 - 1 000	1 000 - 2 000	>2 000
Overall	23	23	15	26	12	28	29	24	19
High Rainfall	73	14	7	4	3	57	21	13	9
Brigalow	27	35	22	16	1	27	30	31	12
S. Speargrass	41	33	15	11	0	38	36	20	6
Qld Bluegrass	36	32	15	15	2	39	35	16	10
S. Aristida	26	26	19	28	2	38	38	21	2
S. Rolling Downs	6	42	28	23	2	24	50	20	6
C & N Rolling Downs	0	3	14	69	14	24	31	23	22
Mulga Lands	0	5	21	47	28	30	42	17	10
Qld Spinifex	3	0	6	49	42	16	32	14	38
N. Speargrass	11	12	11	55	10	17	12	29	43
N. Aristida	0	2	7	68	24	12	16	26	47
Gulf-Peninsula	0	0	4	37	59	5	7	36	51
NT/WA Spinifex	0	0	0	3	97	9	4	15	72
NT/WA Speargrass	0	3	3	28	67	3	8	16	73

Table 3. Average annual rainfall (mm) and distribution of rainfall across regions.

Region	Annual rainfall	<250	250-500	500-600	600-700	700-800	800-1 000	>1 000
Overall	657	4	20	20	32	8	9	6
High Rainfall	1584	0	0	3	3	3	21	70
Brigalow	623	1	5	35	55	4	0	0
S. Speargrass	793	0	2	7	33	19	29	10
Qld Bluegrass	640	0	6	36	42	11	4	1
S. Aristida	640	0	7	33	45	12	2	0
S. Rolling Downs	550	0	21	70	8	2	0	0
C & N Rolling Downs	415	5	87	5	3	0	0	0
Mulga Lands	380	15	72	12	1	0	0	0
Qld Spinifex	366	24	67	9	0	0	0	0
N. Speargrass	718	1	14	16	31	12	17	8
N. Aristida	614	2	25	12	47	12	0	2
Gulf-Peninsula	775	0	21	9	26	9	13	21
NT/WA Spinifex	304	52	39	1	4	3	0	0
NT/WA Seargrass	844	0	13	10	26	8	26	18

* Most properties had Zebu infused cattle only (62%), with 24% having British or European cattle only and 14% having a mixture of the two types. Cattle with nil Zebu content were most prevalent in the southern and inland areas, particularly Queensland Bluegrass, Southern Aristida, Southern Rolling Downs, Mulga Lands and NT/WA Spinifex (Table 4). These same areas tended to have higher proportions of large European blood with the exception of NT/WA Spinifex. Properties in northern coastal areas had very low proportions of British cattle and correspondingly high proportions with higher Zebu content. Overall most Zebu infused herds had approximately half *Bos indicus* with equal proportions having higher or lower Zebu content.

3.4 Enterprise

Breeding and fattening was the main beef enterprise on 71% of properties overall with higher levels in the Queensland Bluegrass (81%) and Brigalow (80%) regions and lower levels in Northern Aristida (42%) and Gulf-Peninsula (48%) (Table 5). Breeding only was the main enterprise on 25% of properties with regional preferences opposite to those for the combined enterprises. Fattening only was comparatively rare (5% overall) with highest rates in High Rainfall (12%) and Brigalow (8%) regions. There was a general tendency for higher levels of breeding and fattening in the more intensive areas of Southern Queensland and higher levels of breeding only in the remote, extensive, northern areas. Stud herds were run on 13% of properties overall but on 24% of NT/WA Speargrass properties.

* The proportion of properties deriving most of their total gross income from beef was 77% overall. It was particularly high for the coastal and remote regions and somewhat lower in inland areas where sheep and grain growing are alternative enterprises (Table 5). The lowest proportions occurred in the sheep areas of Mulga Lands (37%) and Central and Northern Rolling Downs (49%). Almost one third of properties were run in conjunction with another beef property with the highest level in Queensland Spinifex (50%) and Gulf-Peninsula (46%) and lowest in NT/WA Speargrass (15%) (Table 5).

3.5 Labour usage

* An average of three permanent persons, including family and unpaid labour, were employed on the beef enterprise with fewer workers in the more intensive regions and more in the large, extensive regions in Gulf-Peninsula (6.2 workers), NT/WA Spinifex (5.6) and NT/WA Speargrass (8.7) (Table 6). Interestingly, three percent of properties had no permanent workers in the beef enterprise. At the other extreme, two percent of properties overall had more than ten permanent workers with a higher proportion in the remote regions of NT/WA Speargrass (20%), Gulf-Peninsula (13%), Queensland Spinifex (9%) and NT/WA Spinifex (7%). Two permanent workers was most common, except for

Table 4. Proportion (%) of properties with various amounts of Zebu content and those running Large European breeds.

Region	Nil	< 3/8	3/8 to 5/8	> 5/8	Large European
Overall	24	20	38	18	7
High Rainfall	10	23	33	34	0
Brigalow	27	19	37	16	10
S. Speargrass	16	18	43	23	6
Qld Bluegrass	41	20	26	14	12
S. Aristida	40	24	31	5	14
S. Rolling Downs	51	20	25	5	11
C & N Rolling Downs	21	24	40	14	4
Mulga Lands	55	17	26	2	10
Qld Spinifex	14	26	44	16	0
N. Speargrass	4	14	53	29	3
N. Aristida	3	22	55	20	2
Gulf-Peninsula	4	27	42	27	0
NT/WA Spinifex	50	25	17	8	4
NT/WA Speargrass	8	18	39	34	0

Table 5. Proportion (%) of properties with different enterprises, stud herds, main income from beef and run in conjunction with another beef property.

Region	Breeding and fattening	Breeding only	Fattening only	Stud herds	Main income from beef	Run with another property
Overall	71	25	5	13	77	31
High Rainfall	54	34	12	15	74	23
Brigalow	80	12	8	14	79	31
S. Speargrass	71	25	4	15	92	25
Qld Bluegrass	81	15	3	12	67	34
S. Aristida	72	26	2	9	77	33
S. Rolling Downs	63	33	5	9	67	28
C & N Rolling Downs	72	24	4	14	49	38
Mulga Lands	76	23	1	11	37	21
Qld Spinifex	58	39	4	8	79	50
N. Speargrass	59	38	3	10	88	36
N. Aristida	42	58	0	7	90	33
Gulf-Peninsula	48	52	0	4	85	46
NT/WA Spinifex	66	34	0	14	87	27
NT/WA Speargrass	61	37	3	24	85	15

Table 6. Use of permanent workers in the beef enterprise.

Region	Average number of workers	Distribution of the number of permanent workers (%)				
		1	2	3	4	>4
Overall	3.0	17	38	19	11	12
High Rainfall	2.5	18	49	13	8	6
Brigalow	2.6	19	41	20	10	8
S. Speargrass	2.3	22	43	19	8	5
Qld Bluegrass	2.6	16	43	19	8	11
S. Aristida	2.5	16	42	16	12	9
S. Rolling Downs	2.2	14	60	12	11	2
C & N Rolling Downs	3.6	16	42	20	8	14
Mulga Lands	3.1	16	44	19	9	7
Qld Spinifex	4.2	18	27	21	7	24
N. Speargrass	3.0	17	27	22	15	14
N. Aristida	3.4	7	30	21	23	19
Gulf-Peninsula	6.2	13	15	9	19	41
NT/WA Spinifex	5.6	6	13	29	26	27
NT/WA Speargrass	8.7	13	5	5	13	63

the remote regions, with one or three persons equally the next most common. Variability within the region was greatest in Northern Speargrass, Queensland Spinifex, Northern Aristida and Gulf-Peninsula.

* The number of permanent workers also varied with property size. There were one or two workers on 66 percent of small (up to 10 000 ha), 50 percent of medium and 24 percent of large (more than 50 000 ha) properties. Those with four or more workers were 12 percent of small, 27 percent of medium and 56 percent of large properties.

* Casual labour was employed for cattle work on 53% of properties overall but at higher rates in NT/WA Speargrass (83%) and Northern Aristida (73%) (Table 7). Most properties which employed casuals used one or two workers for up to four weeks per year. Properties in the remote regions tended to employ greater numbers of casuals and to retain them for longer periods (Table 7). Properties with none or one permanent worker used more casual labour for cattle work than those with two or more permanent workers (72 v 48%).

* The labour input to the beef enterprise has been reduced in the past five years on 52% of properties overall (Table 8). The proportion was reasonably consistent across regions although higher levels were recorded in extensive areas (61-79%). The reduction was achieved by better subdivision (51% of properties), labour saving technology (44%), neglecting some jobs (31%) and increased plant/structures (28%) (Table 8). All methods were used to varying degrees in all regions. Adoption of labour saving technology had the greatest variability between regions from a low rate of 20% for High Rainfall to more than 60% in extensive regions. Most properties used a combination of methods rather than a single method to achieve economies in labour usage.

3.6 Mustering methods

* Horses were twice as popular as bikes for mustering beef cattle (88% *v* 43% of properties) although the relative popularity of the two methods varied with region (Table 9). Popularity of bikes increased in Mulga Lands and Downs country as well as Spinifex areas and Gulf-Peninsula.

* Usage of laneways was quite widespread (35%) but varied quite markedly. Most frequent usage was in both an extensive (NT/WA Speargrass, 55%) and an intensive (Brigalow, 49%) area.

Cattle traps or spears have become very popular in more extensive areas where more than 40% of properties use this method. Highest level of usage (60-70%) occurs in Northern Territory and Western Australia. Trapping is used sparingly in most intensive regions.

Table 7. Proportion (%) of properties using casual labour and the distribution of number of casual workers and time worked in weeks.

Region	Using casual labour	Number of casual workers				Time worked (weeks)			
		1	2	3	>3	<4	5 - 8	9 - 12	>12
Overall	53	39	32	12	16	57	18	12	14
High Rainfall	43	48	26	19	6	67	15	4	15
Brigalow	50	47	35	9	9	63	18	9	10
S. Speargrass	49	52	30	12	7	61	19	11	10
Qld Bluegrass	42	42	52	2	5	70	16	11	4
S. Aristida	49	52	14	14	19	62	10	5	24
S. Rolling Downs	56	41	30	8	22	54	26	11	9
C & N Rolling Downs	52	33	27	17	23	68	14	10	8
Mulga Lands	57	45	32	11	13	69	20	7	4
Qld Spinifex	62	27	31	23	19	58	12	6	25
N. Speargrass	63	24	36	20	21	49	23	14	14
N. Aristida	73	29	36	14	21	36	24	24	17
Gulf-Peninsula	61	21	21	15	42	33	18	24	24
NT/WA Spinifex	62	11	27	13	49	20	14	34	32
NT/WA Speargrass	83	10	13	13	63	13	16	19	52

Table 8. Proportion (%) of properties reducing labour input in the past five years and how this reduction was achieved.

Region	Reducing labour	How labour was reduced			
		Better subdivision	Labour saving technology	Neglecting some jobs	Increased plant/structures
Overall	52	51	44	31	28
High Rainfall	47	33	20	40	10
Brigalow	50	61	39	29	27
S. Speargrass	48	54	37	34	25
Qld Bluegrass	46	52	33	29	20
S. Aristida	50	48	57	29	38
S. Rolling Downs	50	55	33	36	24
C & N Rolling Downs	49	39	53	27	33
Mulga Lands	48	43	59	25	30
Qld Spinifex	79	58	63	28	33
N. Speargrass	56	53	41	37	31
N. Aristida	61	34	66	46	26
Gulf-Peninsula	63	34	37	29	20
NT/WA Spinifex	68	30	68	27	36
NT/WA Speargrass	69	38	63	25	38

Table 9. Proportion (%) of properties using various mustering aids in the last two years.

Region	Horses	Bikes	Laneways	Cattle traps/spears	Helicopters	Portable yards	Fixed wing aircraft
Overall	88	43	35	20	17	16	7
High Rainfall	92	24	35	4	3	4	0
Brigalow	93	36	49	17	9	7	1
S. Speargrass	98	23	34	5	3	4	0
Qld Bluegrass	86	41	30	9	8	6	1
S. Aristida	93	44	35	14	5	14	5
S. Rolling Downs	79	61	32	15	9	9	0
C & N Rolling Downs	70	84	21	21	21	17	15
Mulga Lands	51	80	26	20	23	28	34
Qld Spinifex	79	74	21	43	40	43	33
N. Speargrass	94	39	35	30	28	26	3
N. Aristida	88	48	10	48	50	25	10
Gulf-Peninsula	93	59	25	52	75	57	16
NT/WA Spinifex	62	52	17	61	49	63	54
NT/WA Speargrass	85	28	55	70	85	63	13

Usage of portable yards is very similar to that for cattle traps, being highest in Northern Territory and Western Australia plus Gulf-Peninsula.

* Helicopters are an integral part of mustering in extensive regions being used on 85% of properties in NT/WA Speargrass and 75% of properties in Gulf-Peninsula. While fixed wing aircraft are used to a limited extent for mustering overall, more than half of the properties in NT/WA Spinifex use aircraft as mustering aids. In Queensland Spinifex and Mulga Lands, one third of properties use fixed wing aircraft.

  It is obvious that most properties used combinations of mustering methods with the highest frequency of combined methods in the extensive region of NT/WA Speargrass.

* Use of horses and laneways is slightly more prevalent on small (up to 10 000 ha) than on large (more than 50 000 ha) properties while use of bikes has the opposite trend. For the other mustering aids, usage increased substantially with property size. Rates for small, medium and large properties were 9, 31 and 52 percent for cattle traps/spears; 3, 28 and 63 percent for helicopters; 4, 23 and 55 percent for portable yards; and 1, 9 and 38 percent for fixed wing aircraft.

* Use of horses increased from 75 to 93 percent and laneways from 28 to 39 percent as mustering frequency increased from once to more than four times per year. There was a corresponding decline in usage for the other mustering aids; from 54 to 31 percent for bikes, 43 to 6 percent for cattle traps/spears, 61 to 1 percent for helicopters, 65 to 3 percent for portable yards and 31 to 0 percent for fixed wing aircraft. Properties with three or more permanent workers tended to make greater use of cattle traps/spears, helicopters, portable yards and fixed wing aircraft to aid in mustering. These statistics reflect the differences between smaller, more intensive properties and large, extensive ones.

* Properties which had reduced the labour input to the beef enterprise in the past five years made greater use of laneways (12%), cattle traps/spears (15%), helicopters (13%), portable yards (12%) and fixed wing aircraft (5%) to aid in mustering. However they made similar use of horses and bikes to those who had not reduced labour input.

3.7 Fencing

The amount and type of fencing represents a major element of property improvement.

* Most properties in southern and central Queensland were fully boundary fenced (81-97%); those in northern Queensland had lower rates (59-77%); and rates were lowest for Northern Territory and Western Australia (34-40%) (Table 10). More small properties (94%)

were fully boundary fenced than medium (84%) and large properties (54%). Likewise properties with one or two permanent workers had higher rates than those with three or more workers reflecting property size. Overall 40% of properties used electric fencing for stock segregation. Regions with high usage were Southern Rolling Downs (63%), Queensland Bluegrass (56%) and Brigalow (56%) and those with low usage were Northern Aristida (15%), Central and Northern Rolling Downs (20%), Northern Speargrass (21%) and Gulf-Peninsula (22%).

* The range, 6-10, was the most common number of main paddocks per property (37%) but proportions were well distributed across the other ranges (Table 10). The overall pattern reflected the distribution for each of the regions with a couple of exceptions. Northern Aristida and NT/WA Spinifex had fewer paddocks and Brigalow and NT/WA Speargrass more than the overall mean figures. Large properties had higher proportions with less than five main paddocks (28%) and with more than 20 paddocks (21%). Well subdivided properties tended to have more permanent workers and less subdivided properties fewer workers.

* Eighty-one percent of properties planned to do some new fencing over the next two years (Table 11). Figures were highest in NT/WA Speargrass (95%) and lowest in High Rainfall (65%), Central and Northern Rolling Downs (65%) and Mulga Lands (69%). The main purpose of new fencing was to replace an old fence (61% overall), except in the more remote, northern areas (23-44%) where creating a new main paddock or holding paddock was the major issue. However, in all regions creation of new paddocks was an important reason for erecting new fence. Fencing off problem areas was much more prevalent in NT/WA Spinifex (30%) and NT/WA Speargrass (30%) (Table 11). Properties with greater numbers of main paddocks were more likely to be planning new fencing over the next two years. Those with minimal subdivision (up to five paddocks) were less likely to replace old fence or to create a new lane but more likely to create a new main paddock or holding paddock.

3.8 Pumped water

* In a normal year, 17% of properties use no pumped water, 67% make partial use and 16% are fully reliant on pumped water (Table 12). However, in a dry year only 12% are still independent, 58% are partially dependent and 30% are fully dependent on pumped water. Regional patterns varied widely, as shown in Table 12. NT/WA Spinifex region used much more pumped water than other regions and High Rainfall used much less. Virtually all properties in the Northern Territory and Western Australia rely on pumped water to some extent even in normal years.

Table 10. Proportion (%) of properties with full boundary fencing, electric fencing and the degree of subdivisional fencing.

Region	Full boundary fencing	Electric fencing	Number of main paddocks on property				
			<5	6 - 10	11 - 15	16 - 20	>20
Overall	86	40	17	37	24	12	10
High Rainfall	85	27	25	35	25	10	4
Brigalow	95	56	8	29	31	18	14
S. Speargrass	89	33	16	44	21	10	8
Qld Bluegrass	93	56	12	39	24	11	14
S. Aristida	86	47	10	50	28	3	10
S. Rolling Downs	95	63	17	56	17	3	6
C & N Rolling Downs	93	20	17	41	20	13	9
Mulga Lands	97	39	17	35	23	13	12
Qld Spinifex	81	31	24	39	20	8	8
N. Speargrass	77	21	24	39	24	8	5
N. Aristida	62	15	40	47	5	2	5
Gulf-Peninsula	59	22	33	35	10	10	13
NT/WA Spinifex	34	38	46	25	16	3	10
NT/WA Speargrass	40	33	22	19	22	14	22

Table 11. Proportion (%) of properties planning new fencing over the next two years and its purpose.

Region	Planning new fencing	Purpose of new fencing				
		Replace old fence	New main paddock	New lane	New holding paddock	Fence off problem areas
Overall	81	61	29	20	20	10
High Rainfall	65	55	19	12	15	7
Brigalow	85	67	33	27	16	7
S. Speargrass	83	76	20	13	12	8
Qld Bluegrass	83	70	24	19	19	10
S. Aristida	84	65	21	26	21	14
S. Rolling Downs	74	55	33	20	21	12
C & N Rolling Downs	65	52	12	16	15	9
Mulga Lands	69	54	29	20	28	7
Qld Spinifex	85	53	30	19	37	9
N. Speargrass	81	51	45	26	32	18
N. Aristida	83	30	38	18	37	13
Gulf-Peninsula	87	44	44	9	31	15
NT/WA Spinifex	80	23	54	13	42	30
NT/WA Speargrass	95	25	65	28	30	30

Table 12. Proportion (%) of properties having various levels of usage of pumped water in normal and dry years.

Region	None		Up to 20%		20 - 50%		50 - 80%		80 - 99%		100%	
	Normal	Dry	Normal	Dry	Normal	Dry	Normal	Dry	Normal	Dry	Normal	Dry
Overall	17	12	16	13	24	16	19	18	8	10	16	30
High Rainfall	42	34	25	24	16	17	8	14	3	2	6	9
Brigalow	7	5	12	8	25	15	23	18	11	13	22	41
S. Speargrass	29	21	23	21	25	21	11	16	4	7	8	15
Qld Bluegrass	12	8	14	11	25	17	23	21	4	8	22	36
S. Aristida	27	20	20	20	7	10	27	12	10	5	10	34
S. Rolling Downs	15	13	13	11	34	13	21	18	2	11	15	35
C & N Rolling Downs	15	13	12	6	21	15	23	13	8	10	21	43
Mulga Lands	32	25	17	15	23	14	18	19	4	10	6	17
Qld Spinifex	12	4	18	9	27	15	22	24	6	9	16	38
N. Speargrass	16	12	22	20	28	17	16	22	7	13	11	16
N. Aristida	15	10	26	25	28	23	19	13	6	4	7	25
Gulf-Peninsula	30	20	13	22	26	6	13	24	11	12	9	14
NT/WA Spinifex	1	2	1	0	13	3	30	9	18	20	37	67
NT/WA Speargrass	3	3	13	6	18	12	29	26	18	21	18	32

* Windmills and/or solar power were the natural sources used exclusively for pumping water on 18% of properties overall (Table 13), with fossil fuels being used exclusively on 24% of properties. However, most properties (58%) used a combination of natural and fossil sources. Windmills (76%) were the most commonly used source of power, particularly in NT/WA Spinifex (96%) and Queensland Spinifex (91%). Solar power is starting to be used (5% overall and 10-30% in the more remote areas) with highest usage in NT/WA Spinifex. Diesel (49%) was the main fossil fuel source, followed by mains electricity (39%) and petrol (28%). While this pattern of usage was quite consistent across regions, major exceptions were NT/WA Spinifex and NT/WA Speargrass where diesel usage was very high and electricity and petrol low (Table 13).

3.9 Stock yards

* Properties in the more intensive regions tended to have fewer sets of permanent yards with drafting facilities than those in the remote regions (Table 14). The overall pattern was 47% with one set of yards, 30% with two sets, 11% with three sets and 12% with more than three sets. NT/WA Spinifex departed most from this pattern with only 11% having one set of yards and 60% having more than three sets. The pattern for large properties was 16 percent with one set, 21 percent with two sets, 16 percent with three sets and 46 percent with more than three sets. Greater proportions of small properties had fewer permanent yards.

* The number of permanent yards increased with the degree of property subdivision with 57 percent of properties with up to ten paddocks having only one set of permanent yards but 35 percent of those with more than 20 paddocks having more than three sets of yards.

* Portable yards were used on 25% of properties overall, on only seven percent in Southern Speargrass but on a high percentage of properties in the extensive regions of NT/WA Speargrass (83%), NT/WA Spinifex (80%), Gulf-Peninsula (78%) and Queensland Spinifex (60%) (Table 14). They were used on 11 percent of small properties, 37 percent of medium sized properties and 74 percent of large properties. There was greater use of portable yards as the number of permanent workers increased from three (26%) to four (34%) and higher numbers (55%). Properties with minimal or excessive subdivision tended to make greater use of portable yards than those with 6 to 20 paddocks (32 v 23%).

3.10 Computers

* Personal computers were used as an aid to property management on 14% of properties overall ranging from low rates in High Rainfall (4%), Northern Aristida (5%) and Gulf-Peninsula (7%) to much higher rates in NT/WA Speargrass (30%) and Mulga Lands (24%) (Table 15). Of those with computers, the packages considered important were

accounting (82%), spreadsheets (64%), word processing (60%) and decision support (22%). It would be unwise to draw too many conclusions from regional differences because of the limited numbers of respondents with computers in some regions.

Table 13. Proportion (%) of properties using various power sources for pumping water.

Region	Natural exclusively	Fossil fuels exclusively	Windmill	Solar power	Diesel	Electricity	Petrol
Overall	18	24	76	5	49	39	28
High Rainfall	13	56	44	0	27	48	27
Brigalow	14	29	71	3	56	48	25
S. Speargrass	26	21	79	2	32	35	34
Qld Bluegrass	25	19	81	2	38	29	31
S. Aristida	10	29	68	5	41	34	44
S. Rolling Downs	10	36	64	3	64	32	24
C & N Rolling Downs	25	15	85	4	37	54	8
Mulga Lands	30	23	77	12	35	41	25
Qld Spinifex	14	9	91	10	63	31	26
N. Speargrass	10	17	83	7	58	39	49
N. Aristida	16	27	71	11	55	25	38
Gulf-Peninsula	8	38	60	12	68	34	32
NT/WA Spinifex	20	4	96	30	75	10	11
NT/WA Speargrass	5	46	51	13	95	15	16

Table 14. Proportion (%) of properties with various numbers of permanent yards and with portable yards.

Region	Number of permanent yards				Portable yards
	1	2	3	>3	
Overall	47	30	11	12	25
High Rainfall	54	24	8	14	14
Brigalow	56	31	8	5	15
S. Speargrass	38	33	16	13	7
Qld Bluegrass	50	34	9	7	13
S. Aristida	47	35	14	5	19
S. Rolling Downs	52	35	11	3	14
C & N Rolling Downs	61	22	5	11	37
Mulga Lands	38	32	17	12	41
Qld Spinifex	38	27	12	22	60
N. Speargrass	43	36	13	9	39
N. Aristida	40	35	13	10	42
Gulf-Peninsula	45	16	15	22	78
NT/WA Spinifex	11	17	9	60	80
NT/WA Speargrass	38	18	13	31	83

Table 15. Proportion (%) of properties using a personal computer and the packages used.

Region	Personal computer	Packages which are important			
		Accounting	Spreadsheets	Word processing	Decision support
Overall	14	82	64	60	22
High Rainfall	4	67	67	0	33
Brigalow	16	90	69	64	31
S. Speargrass	13	75	58	64	19
Qld Bluegrass	15	81	52	57	14
S. Aristida	9	75	75	25	0
S. Rolling Downs	12	100	78	44	33
C & N Rolling Downs	13	83	57	74	17
Mulga Lands	24	81	67	48	14
Qld Spinifex	11	78	67	56	0
N. Speargrass	9	79	50	43	36
N. Aristida	5	100	100	100	0
Gulf-Peninsula	7	50	50	75	0
NT/WA Spinifex	13	67	56	44	11
NT/WA Speargrass	30	69	77	54	15

4. RESOURCE MANAGEMENT

The productivity of a beef enterprise is heavily dependent on the way in which the basic resource is managed. Factors such as the grazing management of native pastures, stocking rates imposed, timber treatment, pasture improvement and control of undesirable weed species have a marked impact on output from the system.

The survey sought to document the current situation in relation to these management practices.

4.1 Land management

This is the decade of Land Care and the management of our land and pasture resource is currently receiving special attention. It is essential that the grazing industry implements grazing management strategies to ensure long term stability of the natural resource while maintaining financial viability.

* The increasing awareness of Land Care issues in the Industry was obvious as more than half of the property owners considered Land Care issues in planning their property management (Table 16). However, the emphasis varied between regions from a low of 28% in Northern Aristida to a high of 68% in NT/WA Spinifex.

  If the future of our grazing resources is to be assured an education program is needed to encourage the remaining producers to think 'SUSTAINABILITY' when managing their properties.

* Interestingly, 71% of producers preferentially graze or spell paddocks with the figure as high as 83% in Brigalow and Southern Rolling Downs (Table 16). Even in the Northern Aristida, where the incidence was lowest, 45% of properties employed these practices. In light of the answer to the previous question, it would seem that some of the reasons for spelling etc were related to animal nutritional needs rather than the well being of the pasture and land.

* An even higher percentage of producers (82%) managed country to encourage regeneration of pastures, which is much higher than the 53% who let land management issues affect basic management planning. This suggests that, in many cases, practices might be implemented which are considered desirable even though they are not specifically targeted at Land Care. Management for regeneration of pasture was highest (92%) in Brigalow and lowest (62%) in Northern Aristida. The consistency of the pattern of attitudes to these land management issues across regions may be a function of level of property subdivision and ability to control stock but levels are high even in NT/WA Speargrass which is very extensive.

Table 16. Proportion (%) of properties using various land management practices.

Region	Land management issues as part of planning	Preferentially graze or spell paddocks	Manage to encourage regeneration of pastures
Overall	53	71	82
High Rainfall	42	68	83
Brigalow	60	83	92
S. Speargrass	46	58	75
Qld Bluegrass	56	79	81
S. Aristida	59	70	84
S. Rolling Downs	52	83	85
C & N Rolling Downs	57	70	78
Mulga Lands	63	77	80
Qld Spinifex	48	79	88
N. Speargrass	48	57	75
N. Aristida	28	45	62
Gulf-Peninsula	45	69	75
NT/WA Spinifex	68	70	87
NT/WA Speargrass	58	79	87

4.2 Land improvement

One of the most controversial issues at present is the killing of trees either by ringbarking/poisoning or by clearing. This results from concerns about the 'Greenhouse Effect' and the reduced stability of the soil when trees are killed. The survey addressed questions to this issue and to the follow-up action in terms of pasture improvement.

* Clearing of timber was the most popular approach used to improve land with 69% clearing and introducing pasture while 42% cleared and allowed native pasture to regenerate (Table 17). This pattern was reasonably consistent within regions, but the level of clearing practised in individual regions varied enormously. While 89% of producers in Brigalow areas cleared timber and planted pasture, the figure was only nine percent for NT/WA Spinifex. Corresponding figures for these two regions for clearing and allowing native pasture to regenerate were 50% and 13%.

  Average area cleared and sown to pasture was 2 097 ha while the figure for area cleared and left in native pasture was 2 671 ha (Table 18). There was huge variation between regions as well as within regions. The levels for regions where most treatment has been done were NT/WA Speargrass (9 906; 56 893 ha), NT/WA Spinifex (28 360; 7 633 ha) and Queensland Spinifex (3 808; 16 892 ha).

* Only 12% of properties treated timber by ringbarking or poisoning and introduced pasture while 38% treated timber in this way and allowed native pasture to remain (Table 17). Ringbarking or poisoning of timber with no further input was most popular in Southern Speargrass, Southern Rolling Downs and Southern Aristida where two-thirds of properties were involved.

  Area treated reflected the percentage of properties implementing the practices with mean figures of 805 ha treated and sown with improved pasture and 2 670 ha treated and left in native pasture (Table 18). In some extensive regions large areas were treated with 399 360 ha treated and left as native pasture on a single property in NT/WA Speargrass while 263 125 ha were treated on three properties in Gulf-Peninsula. In Central and Northern Rolling Downs, an average of 7 200 ha were treated and oversown while 8 385 ha had timber treated only.

* Introduction of pasture into uncleared country (under trees) was practised by only 13% of properties but by more than 30% in the Northern Speargrass, Northern Aristida and NT/WA Spinifex (Table 17). The higher incidence in these areas would be a function of the ability of perennial stylos to establish and produce well under trees and the promotion of this technology.

Table 17. Proportion (%) of properties with various types of land management.

Region	Timber cleared/ introduced pasture	Timber cleared/native pasture	Timber treated/ introduced pasture	Timber treated /native pasture	Timber uncleared/ introduced pasture	Timber cleared/ crop
Overall	69	42	12	38	13	41
High Rainfall	72	51	12	25	7	25
Brigalow	89	50	13	30	11	63
S. Speargrass	64	42	14	66	8	30
Qld Bluegrass	66	47	8	43	10	64
S. Aristida	60	44	26	58	5	44
S. Rolling Downs	77	54	17	65	14	63
C & N Rolling Downs	41	18	2	8	10	4
Mulga Lands	55	37	12	27	12	32
Qld Spinifex	53	26	2	2	16	0
N. Speargrass	54	31	13	27	38	20
N. Aristida	35	16	0	3	38	11
Gulf-Peninsula	37	11	11	11	22	11
NT/WA Spinifex	9	13	0	0	30	4
NT/WA Speargrass	50	45	0	5	23	50

Table 18. Average area (ha) subjected to various types of land improvement.

Region	Timber cleared/ introduced pasture	Timber cleared/native pasture	Timber treated/ introduced pasture	Timber treated /native pasture	Timber uncleared/ introduced pasture	Timber cleared/crop
Overall	2097	2671	805	2670	1704	515
High Rainfall	773	433	239	372	122	165
Brigalow	2777	1418	794	1271	740	619
S. Speargrass	614	799	689	1785	615	185
Qld Bluegrass	1264	1531	256	1360	1387	674
S. Aristida	1106	1362	953	1923	1680	469
S. Rolling Downs	1328	1841	578	1829	1822	581
C & N Rolling Downs	4813	6011	7200	8385	5022	142
Mulga Lands	3710	7074	2771	3360	1823	441
Qld Spinifex	3808	16892	2000	800	1664	0
N. Speargrass	691	2866	492	2284	2302	136
N. Aristida	4025	4254	0	1000	2663	25
Gulf-Peninsula	768	197	40	87708	737	179
NT/WA Spinifex	28360	7633	0	0	8566	100
NT/WA Speargrass	9906	56893	0	399360	1120	1285

Average area improved was 1 704 ha with highest levels in NT/WA Spinifex (8 566 ha) and Central and Northern Rolling Downs (5 022 ha) (Table 18).

* Clearing of country and planting crop was practised on 41% of properties (Table 17). The incidence was closely related to fertility and stability of soil types and rainfall with levels in excess of 60% in Brigalow, Queensland Bluegrass and Southern Rolling Downs and 11% or less in Northern Aristida, Gulf-Peninsula, Central and Northern Rolling Downs, NT/WA Spinifex and Queensland Spinifex.

Average area under crop was 515 ha with a range from 1 285 ha in NT/WA Speargrass to Nil in Queensland Spinifex and 25 ha in Northern Aristida (Table 18).

* An indication of current attitudes to timber treatment was shown by the fact that 46% of properties treated timbered areas during the last two years, the average area treated being 722 ha (Table 19). Highest incidence of treatment occurred in Southern Rolling Downs, Southern Speargrass and Southern Aristida where more than 60% of properties treated some country. However, largest mean area treated was in Mulga Lands (2 076 ha), Central and Northern Rolling Downs (1 808 ha), Queensland Spinifex (1 774 ha) and NT/WA Speargrass (1 723 ha).

* Implementation of pasture improvement has proceeded at a high level with 54% of properties sowing pastures in the last two years (Table 19). Three-quarters of properties in Brigalow areas sowed pasture while only 20% sowed pastures in Central and Northern Rolling Downs.

Average area sown annually during 1989 and 1990 was slightly more than 400 ha. Greatest areas sown were in Central and Northern Rolling Downs, Queensland Spinifex and NT/WA Speargrass with an average annual sowing in excess of 1 000 ha.

Inadequate finance (41%) and soil and climate unsuitable (39%) were the most common reasons given for not sowing pastures during the past two years while limited benefits (19%) was the next most popular (Table 20). In NT/WA Speargrass, Northern Aristida, Gulf-Peninsula and Northern Speargrass, inadequate finance was a limiting factor for at least 60% of properties. However, in Mulga Lands, Queensland Spinifex and NT/WA Spinifex, soil and climate unsuitability was the critical problem.

Surprisingly, only 13% of properties indicated that a lack of suitable species was the problem, with the highest levels occurring in Queensland Bluegrass (25%), Southern Rolling Downs (20%) and Mulga Lands (20%).

Ten percent of properties indicated that they had not sown pastures

Table 19. Proportion (%) of properties treating timber and sowing pastures in the past two years and with introduced plants spreading naturally and average areas (ha) of timber treated and sown to pasture.

Region	Timber treated	Area of timber treated	Pasture sown	Area sown to pasture	Spreading naturally
Overall	46	722	54	419	52
High Rainfall	37	175	50	61	44
Brigalow	53	835	75	447	55
S. Speargrass	65	379	51	149	45
Qld Bluegrass	50	583	60	368	44
S. Aristida	63	759	63	157	51
S. Rolling Downs	69	750	70	400	63
C & N Rolling Downs	20	1808	20	1338	42
Mulga Lands	40	2076	31	805	46
Qld Spinifex	23	1774	27	1357	46
N. Speargrass	34	320	55	372	63
N. Aristida	17	1082	53	702	57
Gulf-Peninsula	19	14	35	167	55
NT/WA Spinifex	9	726	32	414	87
NT/WA Speargrass	18	1723	45	1011	57

Table 20. Reasons for not sowing pastures in past two years (percentage of properties).

Region	Inadequate finance	Soil and climate unsuitable	Benefits too small	No suitable pasture plants	Property fully developed	More profitable investments	Other
Overall	41	39	19	13	10	9	20
High Rainfall	43	16	24	0	19	16	30
Brigalow	40	23	8	9	20	11	25
S. Speargrass	42	40	27	11	11	8	18
Qld Bluegrass	41	34	15	25	10	11	23
S. Aristida	53	18	24	12	6	12	24
S. Rolling Downs	45	15	10	20	5	10	30
C & N Rolling Downs	20	49	30	17	10	7	17
Mulga Lands	19	66	14	20	3	7	20
Qld Spinifex	42	64	22	13	11	9	16
N. Speargrass	59	29	14	10	3	14	23
N. Aristida	74	29	10	10	0	6	13
Gulf-Peninsula	62	35	15	12	3	9	18
NT/WA Spinifex	32	64	17	11	2	9	15
NT/WA Speargrass	83	22	22	11	0	11	6

because the property was fully developed. This applied to 20% of properties in High Rainfall and Brigalow areas.

More profitable investments was given as the reason on nine percent of properties overall.

* Tropical grasses were the most popular option (46%) for pasture introduction during the past two years, followed by tropical legumes (27%) and temperate legumes (10%) (Table 21). Tropical grass was introduced to more than 67% of properties in NT/WA Spinifex, Queensland Spinifex and Central and Northern Rolling Downs. On the other hand, tropical legumes were introduced to more than 70% of properties in NT/WA Speargrass, Northern Speargrass, Gulf-Peninsula and Northern Aristida. Temperate legumes were planted on 32% of properties in Southern Aristida.

* Approximately half of the properties planted buffel grass with levels exceeding 90% in Queensland Spinifex and Central and Northern Rolling Downs (Table 22). Rhodes grass was planted on 16% of properties with the highest level of 40% in Southern Speargrass.

  Shrubby stylo (14%) was the most common legume sown, followed by Lucerne (7%) and Caribbean stylo (5%) (Table 23), reflecting the better adaptation of shrubby stylo to a range of environmental conditions. Highest regional frequencies of plantings of both stylos were in Northern Speargrass, Gulf-Peninsula, Northern Aristida and NT/WA Speargrass.

  Lucerne was planted on 26% of properties in Southern Aristida.

* Summer forages were planted on 15% of properties (Table 21) with highest levels in Southern Rolling Downs and Mulga Lands. Silk sorghum was the most popular (Table 23).

* Just over half of the properties had useful introduced plants spreading naturally with the figure being reasonably uniform across regions (Table 24). However, NT/WA Spinifex tended to be an exception with 87% recording the natural spread of useful introduced plants.

  Tropical grasses (57%) were the most common species spreading naturally followed by tropical legumes (29%) and temperate legumes (13%). However, there was substantial variation between regions. Tropical legumes were the dominant species in Northern Aristida (64%), Northern Speargrass (63%), High Rainfall (56%), Southern Speargrass (53%), Gulf-Peninsula (52%) and NT/WA Speargrass (50%). Shrubby stylo and Caribbean stylo were the dominant legume species while buffel grass was the predominant introduced grass.

Table 21. Proportion (%) of properties sowing various forage types in past two years.

Region	Tropical grass	Tropical legume	Temperate grass	Temperate legume	Summer forage
Overall	46	27	1	10	15
High Rainfall	52	39	2	5	2
Brigalow	55	13	0	11	21
S. Speargrass	38	42	1	12	7
Qld Bluegrass	42	14	2	20	22
S. Aristida	29	19	7	32	12
S. Rolling Downs	49	3	3	13	32
C & N Rolling Downs	67	19	0	0	15
Mulga Lands	45	0	0	16	39
Qld Spinifex	75	18	0	0	8
N. Speargrass	21	74	0	1	5
N. Aristida	24	70	0	0	6
Gulf-Peninsula	23	73	0	0	4
NT/WA Spinifex	85	15	0	0	0
NT/WA Speargrass	20	78	0	0	3

Table 22. Proportion (%) of properties sowing various tropical grasses in past two years.

Region	Buffel grass	Green panic	Purple pigeon grass	Rhodes grass
Overall	49	7	8	16
High Rainfall	2	2	0	26
Brigalow	64	11	14	12
S. Speargrass	22	8	3	40
Qld Bluegrass	46	8	4	27
S. Aristida	39	5	8	9
S. Rolling Downs	70	1	10	7
C & N Rolling Downs	91	0	9	2
Mulga Lands	74	0	0	0
Qld Spinifex	95	0	0	0
N. Speargrass	20	0	3	2
N. Aristida	41	0	0	0
Gulf-Peninsula	27	0	0	3
NT/WA Spinifex	79	0	12	0
NT/WA Speargrass	45	0	0	0

Table 23. Proportion (%) of properties sowing various other species in past two years.

Region	Caribbean stylo	Shrubby stylo	Lucerne	Silk sorghum
Overall	5	14	7	11
High Rainfall	4	9	0	2
Brigalow	0	8	7	16
S. Speargrass	0	15	9	3
Qld Bluegrass	0	11	15	20
S. Aristida	2	5	27	5
S. Rolling Downs	0	0	8	28
C & N Rolling Downs	2	11	2	13
Mulga Lands	0	0	3	26
Qld Spinifex	5	10	0	8
N. Speargrass	35	58	1	2
N. Aristida	30	35	4	0
Gulf-Peninsula	24	42	0	0
NT/WA Spinifex	12	0	0	0
NT/WA Speargrass	38	22	0	3

Table 24. Proportion (%) of properties with various pasture types and individual species spreading naturally.

Region	Tropical grass	Tropical legume	Temperate legume	Buffel grass	Green panic	Rhodes grass	Caribbean stylo	Shrubby stylo
Overall	57	29	13	57	5	6	6	15
High Rainfall	26	56	15	0	0	4	7	19
Brigalow	67	14	17	78	11	5	1	8
S. Speargrass	27	53	19	13	5	14	1	14
Qld Bluegrass	57	17	24	52	3	16	0	10
S. Aristida	73	5	18	68	9	18	0	5
S. Rolling Downs	74	3	23	89	3	6	0	0
C & N Rolling Downs	87	12	0	91	0	0	1	7
Mulga Lands	76	3	19	95	0	0	0	0
Qld Spinifex	82	16	0	89	0	3	5	13
N. Speargrass	37	63	0	24	0	1	23	54
N. Aristida	27	64	9	30	0	0	33	61
Gulf-Peninsula	38	52	7	34	0	0	28	31
NT/WA Spinifex	95	5	0	95	0	0	5	0
NT/WA Speargrass	50	50	0	35	0	0	25	5

4.3 Woody weeds

Many undesirable woody species are spreading in various regions in northern Australia and the survey endeavoured to quantify the extent of spread of these plants.

* Eucalypt regrowth (57%) is the most common problem tree species followed by black wattle (34%), Brigalow regrowth (33%) and False Sandalwood (22%) (Table 25). The magnitude of the problem varied markedly between regions.

  Prickly acacia occurred as a significant problem on 46% of properties in Central and Northern Rolling Downs and 25% of properties in Gulf-Peninsula indicating the extent of its spread.

* The most common problem shrub species were Lantana (21%), Rubber Vine (18%) and Turkey Bush (17%) (Table 26). There was wide variation between regions with extremes being Lantana on 61% of properties in High Rainfall, Rubber Vine on 71% of properties in Northern Speargrass and Turkey Bush on 51% of properties in Mulga Land.

* Parthenium (17%) and Pimelea (8%) were the most common herbaceous plants seen as problems in northern Australia (Table 27). More than one-third of properties in Brigalow and Queensland Bluegrass saw Parthenium as a serious problem while more than one-third in Southern Rolling Downs, Mulga Lands and Queensland Spinifex saw Pimelea in this way.

Table 25. Proportion (%) of properties where various trees occur as a moderate or major problem.

Region	Eucalypt regrowth	Black wattle	Brigalow regrowth	False Sandalwood	Tea tree regrowth	Prickly acacia	Gidgee regrowth
Overall	57	34	33	22	14	13	7
High Rainfall	46	29	0	0	45	2	0
Brigalow	61	37	75	31	9	8	4
S. Speargrass	79	51	14	4	19	11	2
Qld Bluegrass	71	39	29	24	7	7	2
S. Aristida	81	53	28	31	15	3	8
S. Rolling Downs	86	39	43	67	0	4	0
C & N Rolling Downs	10	4	11	19	1	46	27
Mulga Lands	56	17	29	56	4	13	19
Qld Spinifex	36	11	15	37	5	10	30
N. Speargrass	52	30	6	10	33	11	4
N. Aristida	39	36	6	21	37	4	14
Gulf-Peninsula	32	16	0	2	43	25	10
NT/WA Spinifex	14	5	0	0	11	18	4
NT/WA Speargrass	36	24	3	3	15	15	0

Table 26. Proportion (%) of properties where various shrubs occur as a moderate or major problem.

Region	Lantana	Rubber vine	Turkey bush	Mimosa	Parkinsonia	Groundsel	Heart leaf	Quilpie mesquite
Overall	21	18	17	10	10	8	5	1
High Rainfall	61	11	5	5	0	31	3	0
Brigalow	5	8	21	8	8	2	2	1
S. Speargrass	56	23	8	5	2	23	2	1
Qld Bluegrass	18	13	15	11	7	10	2	0
S. Aristida	10	3	15	5	5	3	5	3
S. Rolling Downs	0	0	22	6	0	0	0	0
C & N Rolling Downs	0	12	10	17	25	0	1	3
Mulga Lands	1	1	51	8	5	1	5	4
Qld Spinifex	0	3	27	14	18	0	19	0
N. Speargrass	36	71	21	18	16	0	28	1
N. Aristida	2	57	14	8	6	0	22	0
Gulf-Peninsula	4	37	10	22	20	0	0	0
NT/WA Spinifex	0	2	7	11	23	0	2	0
NT/WA Speargrass	0	3	6	32	35	0	0	3

Table 27. Proportion (%) of properties where various herbaceous plants occur as a moderate or major problem.

Region	Parthenium	Pimelea	Giant rats tail grass
Overall	17	8	3
High Rainfall	3	0	9
Brigalow	33	4	2
S. Speargrass	10	1	8
Qld Bluegrass	36	5	2
S. Aristida	21	23	5
S. Rolling Downs	6	53	0
C & N Rolling Downs	1	9	1
Mulga Lands	3	41	3
Qld Spinifex	4	33	1
N. Speargrass	19	0	4
N. Aristida	10	0	0
Gulf-Peninsula	0	0	0
NT/WA Spinifex	0	2	0
NT/WA Speargrass	0	0	0

5. BREEDING HERD MANAGEMENT AND PRODUCTIVITY

The productivity of a beef enterprise is very heavily dependent on the performance of the breeding herd. If the herd is to produce at a satisfactory level, it is important that branding and weaning rates are high, breeder survival is high and heifers conceive at an early age. The productivity and mortality of breeder herds is also influenced by heifer replacement policy, culling policy for breeders and mustering frequency.

The extent to which satisfactory results are achieved depends on the nutritional plane (class of country) and the breeder management strategies employed. Research undertaken during the past thirty years has produced recommendations for appropriate breeder management in the various ecological areas in northern Australia.

Holroyd and O'Rourke (1989) collated basic biological data on beef cattle production in northern Australia and listed results from observations on breeding herds. This survey addressed a range of issues related to breeder herd management and productivity and information obtained can be compared with ABS survey data and that of Holroyd and O'Rourke (1989).

5.1 Reproductive performance

* Overall 94% of properties run breeders with only High Rainfall areas and Brigalow properties falling below 90% (Table 28). This reflects a higher incidence of specialist growing and fattening operations in these areas.

* An average of 941 breeders were joined annually but numbers varied widely in the different regions. There were three distinct size groupings, the more intensive areas joining 368-577 breeders, the intermediate group 1 136-1 595 and the extensive group 3 619-4 820.

* Overall, breeders constituted 46.5% of the total herd with values for individual regions varying from 30.5% to 67.2%. The highest value occurred in Gulf-Peninsula reflecting a low branding percentage and the sale of steers by two years of age on 50% of properties. (See Table 58.)

* The average branding percentage of 63.2% agrees closely with the 65% reported in the annual ABS survey. As indicated earlier, the lowest figure of 48.3% from Gulf-Peninsula reflects a combination of extensive areas, limited breeder management and inadequate nutrition. At the other end of the scale, Queensland Bluegrass produced a figure of 78.0% reflecting smaller properties, good stock control and management and better nutritional levels. Interestingly, Southern Speargrass, Southern Aristida, Southern Rolling Downs and Mulga Lands had branding percentages at least as good as Brigalow country.

Table 28. Proportion (%) of properties running breeders, numbers joined, breeder proportion (%) in herd, number of calves branded and branding percentage.

Region	Properties running breeders	Number of breeders joined	Breeders as proportion of total herd	Number of calves branded	Branding percentage
Overall	94	941	46.5	595	63.2
High Rainfall	89	462	39.7	286	61.9
Brigalow	89	564	42.0	385	68.3
S. Speargrass	95	368	39.3	253	68.8
Qld Bluegrass	97	509	41.4	397	78.0
S. Aristida	100	421	50.6	302	71.7
S. Rolling Downs	95	500	55.3	365	73.0
C & N Rolling Downs	92	1595	55.2	933	58.5
Mulga Lands	99	577	30.5	416	72.1
Qld Spinifex	93	1585	45.6	963	60.8
N. Speargrass	97	1252	48.8	755	60.3
N. Aristida	98	1136	50.5	590	51.9
Gulf-Peninsula	100	4537	67.2	2192	48.3
NT/WA Spinifex	97	3619	53.9	2031	56.1
NT/WA Speargrass	95	4820	52.6	2493	51.7

5.2 Bull management

As bulls have such a large impact on the genetic makeup of the herd, bull management strategies are crucial in determining production levels and rate of genetic progress.

* Overall bull percentage in breeding herds was 4.3% with a wide variation from 3.3% in Southern Aristida to 4.9% in NT/WA Speargrass (Table 29). In many of the extensive areas, these figures are likely to understate the true figure as significant numbers of feral or 'mickey' bulls would exist. Overall, the levels are much higher than is normally recommended as necessary for a successful mating outcome and indicate the scope for economising on bull purchases if adequate testing is carried out for bull soundness prior to purchasing/joining.

* More than half (57%) the properties left bulls in the herd all year with the values generally exceeding 90% in more extensive regions (Table 29). Even in the most intensive areas, the figure did not drop below 25%. The proportion varied with property size; 42 percent of properties smaller than 10 000 ha left bulls in the herd, as did 72 percent of properties of 10 000 to 50 000 ha and 92 percent of larger properties. When bulls were taken out of the breeding herd, 86 percent of properties had one or two weaning rounds, compared with 63 percent when bulls were with the breeders throughout the year.

  Impracticality of removing bulls and higher branding percentages were both prominent reasons for allowing bulls to remain in the herd. The trend was for impracticality to increase in importance as properties became more extensive and higher branding rate to assume the dominant position in more closely controlled areas. Results at Swan's Lagoon (Anon 1991) would tend to support this claim as all-year joining produces more calves than restricted (3 month) joining. However, unless other management strategies, for example, early weaning and strategic supplementation, are imposed, breeder mortality can be a problem.

* Where joining was controlled, the average length of joining period was 6.7 months (Table 30). This was particularly uniform across regions with a range of 6.0 to 7.7 months. However, there was wide variation in the times chosen for joining. In the more extensive, northern areas, bulls tended to be placed in the herd in the December-March period and removed in May-July. In more southern areas and more favoured environments, entry was advanced to peak in October-November with removal in March-April. However, timing was less distinct in the favoured areas as a result of better conditions overall. Quite pronounced wet and dry seasons coupled with limited mustering rounds reduce flexibility in northern areas.

Table 29. Proportion (%) of bulls in breeding herd, remaining in herd all year and reasons for remaining in herd all year.

Region	Bulls in breeding herd	Bulls remaining in herd	Reasons for bulls remaining in herd		
			Practicality	Higher branding	Both reasons
Overall	4.3	57	46	29	20
High Rainfall	3.7	63	41	27	24
Brigalow	3.7	39	36	40	19
S. Speargrass	3.8	43	28	43	22
Qld Bluegrass	4.3	48	45	41	11
S. Aristida	3.3	33	25	38	31
S. Rolling Downs	3.6	25	18	24	18
C & N Rolling Downs	4.2	78	45	27	21
Mulga Lands	3.8	66	52	20	20
Qld Spinifex	3.8	96	47	27	23
N. Speargrass	4.1	87	54	20	23
N. Aristida	4.8	91	71	12	12
Gulf-Peninsula	4.1	94	54	12	25
NT/WA Spinifex	4.7	96	82	6	9
NT/WA Speargrass	4.9	75	71	4	25

Table 30. Time of year when properties remove and return bulls to the breeding herd.

Region	Number of properties	Length of joining (months)	Percentage of properties removing bulls in					Percentage of properties returning bulls in				
			Jan-Feb	Mar	Apr	May	Jun-Jul	Sep	Oct	Nov	Dec	Jan-Mar
Overall	865	6.7	13	23	22	19	14	10	31	32	14	10
High Rainfall	23	6.6	26	22	9	9	9	13	29	21	0	25
Brigalow	329	6.7	16	23	23	21	13	11	39	33	12	3
S. Speargrass	251	6.6	8	30	29	18	11	12	31	36	16	4
Qld Bluegrass	75	7.0	24	24	20	15	7	9	36	26	16	7
S. Aristida	29	6.6	14	21	14	17	17	7	38	34	10	7
S. Rolling Downs	47	6.6	11	28	15	19	21	9	26	47	13	4
C & N Rolling Downs	39	6.5	8	5	8	18	15	0	5	10	18	41
Mulga Lands	27	6.8	11	15	15	22	30	4	7	46	21	21
Qld Spinifex	3	6.7	0	0	0	33	67	0	0	0	33	67
N. Speargrass	20	6.6	15	5	10	15	25	0	0	10	5	80
N. Aristida	5	7.2	0	0	0	20	40	0	0	0	20	60
Gulf-Peninsula	3	6.0	0	0	0	0	33	0	0	0	0	75
NT/WA Spinifex	3	7.7	0	0	0	0	33	0	0	0	0	67
NT/WA Speargrass	11	6.9	0	9	9	36	27	0	0	9	45	45

* Only 24% of properties culled more than 20% of bulls annually while 39% culled fewer than 10% (Table 31). This policy indicates a long generation interval and limited scope for genetic improvement. While the trend was for a greater culling pressure in more intensive areas, the pattern was similar in all regions. There is substantial scope for improvement in bull culling policy across the whole of northern Australia with bulls being culled younger.

* There was substantial variation in sources of replacement bulls (Table 31). Overall four percent of properties bred all of their replacements, the figure peaking at 17% in NT/WA Speargrass. By contrast, 40% of properties bred some of their replacements with a peak of 63% again in NT/WA Speargrass. Purchases from sales figured more prominently than directly from studs overall.

5.3 Weaning management

The practice of weaning has been recommended for several decades as a means of reducing stress on breeding females. The survey aimed to determine what weaning strategies were being implemented in the industry.

* There was a high incidence of weaning in all regions with 95% of properties overall practising some form of weaning (Table 32). NT/WA Spinifex returned the lowest incidence of 78%. It is significant that, in no region, did all properties wean. The benefits of weaning are well documented and communicated widely, yet some producers have not adopted it. However, this is an extremely high adoption rate for any management practice. The question remains, how effectively is the practice being implemented?

* In the more intensive regions only 19 percent of properties weaned at every muster but 70 percent did so in the extensive regions reflecting the numbers of musters carried out in the different regions.

* Approximately half of the properties weaned twice per year with the remainder split equally between once and three times or more (Table 32). Twice yearly weaning predominated in more extensive areas and on large properties reflecting the fact that two mustering rounds were practised annually. Most of the remaining properties in these areas weaned only once per year. The incidence of three or more weaning rounds per year varied from 11 percent for properties of greater than 50 000 ha to 27 percent for smaller properties. In more intensive areas, there was a higher incidence of once a year weaning (31 v 19%) but in this case it could reflect a high incidence of controlled mating and condensed calving period (narrow spread).

  Overall there was a tendency for properties to commence weaning in May. However, all months from January to August figured prominently.

Table 31. Proportion (%) of properties with varying bull culling rates and using different sources of replacements.

Region	Annual culling rate			Replacements bred			Replacements from sales			Replacements from studs		
	<10%	11-20%	>20%	None	Some	All	None	Some	All	None	Some	All
Overall	39	37	24	56	40	4	30	46	24	47	38	15
High Rainfall	40	30	30	69	29	2	23	45	32	44	46	10
Brigalow	33	37	30	58	39	3	24	47	29	54	34	12
S. Speargrass	29	37	34	62	33	5	23	48	29	51	37	12
Qld Bluegrass	31	42	27	63	36	1	28	44	28	44	36	20
S. Aristida	44	39	17	62	36	2	31	45	24	40	39	21
S. Rolling Downs	35	47	18	62	38	0	23	51	26	46	39	15
C & N Rolling Downs	44	39	17	65	31	4	45	36	19	39	32	29
Mulga Lands	43	36	21	69	26	5	39	31	30	43	33	24
Qld Spinifex	61	25	14	45	47	8	37	53	10	33	55	12
N. Speargrass	44	44	12	41	51	8	33	50	17	46	45	9
N. Aristida	69	20	11	41	55	4	34	51	15	42	43	15
Gulf-Peninsula	56	37	7	37	55	8	46	41	13	49	39	12
NT/WA Spinifex	63	28	9	35	59	6	54	43	3	23	58	19
NT/WA Speargrass	67	23	10	20	63	17	50	47	3	46	37	17

APPENDIX 1

North Australian Beef Producer Survey 1990

Questionnaire

THE AUSTRALIAN MEAT AND LIVE-STOCK RESEARCH AND DEVELOPMENT CORPORATION

20 November 1990

Dear Valued Beef Producer

Thank you in anticipation of your response to this **North Australia Beef Producer Survey.**

In analysing recent progress in AMLRDC funded projects under the North Australia Program, and making plans for future work in this area (to be called NAP2), the AMLRDC needs YOUR input.

Over the past 6-8 months, AMLRDC personnel and consultants have had many discussions with scientists, extension officers and groups of producers towards defining future R&D needs and priorities for the next 5-10 years in northern Australia.

Three broad areas have been identified from these discussions and are:

* *Cost reducing management practices*

  Aimed at minimising the cost per kg of saleable product.

* *Increasing cattle production efficiency*

  This work area would encompass quantity and quality aspects and subsequently better returns to the industry.

* *Sustainability of the resource for future generations to ensure ongoing industry profitability.*

Your input in this survey will ensure that we know your point of view and can seek to address your area of R&D needs. Please take the time to answer and return this survey as it is only through knowing all needs that the best decisions can be made in allocating industry funds to R&D Projects.

We would encourage your prompt attention to the information sought in the questionnaire as by doing so, you will be having a direct input into developing technologies relevant to the future of your industry.

Further, your response before **21 December 1990** will ensure that analysis of the results can occur in January and funds can begin to be allocated some short time afterwards. Slow responses to this survey will delay commencement of valuable projects and application of essential new technology to your operation.

Once again our thanks for your participation.

Yours sincerely

Nigel Monteith
CHAIRMAN

Level 16, 219 Elizabeth Street, Sydney NSW 2000 • PO Box A498 Sydney South NSW 2000

NORTH AUSTRALIA BEEF PRODUCER SURVEY 1990

Background Information

1. *The following list shows a number of beef producing regions. Indicate the region this property is in by marking one of the following boxes.*

<u>Queensland</u>

High rainfall - coastal strips south from Cairns, around Mackay and around Brisbane. ☐

Northern spear grass - coastal and inland strip from Cooktown to Marlborough. ☐

Southern spear grass - coastal and inland strip south from Marlborough to the New South Wales border. ☐

Bluegrass - inland area west of the ranges and south from Mackay. ☐

Mulga - south-western areas. ☐

Mitchell grass downs - central and north western areas. ☐

Spinifex - several areas in the far west and the central west. ☐

Gulf lowlands - north-western areas bordering Gulf of Carpenteria. ☐

Peninsula - northern section of Cape York Peninsula. ☐

Brigalow - discrete areas inland of the ranges and south from Mackay with cleared brigalow scrub. ☐

<u>Northern Territory</u>

Darwin and gulf regions. ☐

Barkly Tableland. ☐

Victoria River district. ☐

Alice Springs region. ☐

<u>Western Australia</u>

East Kimberley. ☐

West Kimberley. ☐

Pilbara. ☐

In which shire or statistical local area is the property located? .....

.....

What is the nearest town to this property? .....

2. *What is the area of this property? (Specify in one of these units).*

..... acres ..... hectares ..... sq. miles ..... sq. kms

What percentage of this property is utilised .....%

3. *How many branded cattle do you run in an average year? (State numbers at end of March).*

(No.) .....

What is the main type of cattle that you have?

Tick one or more

Zebu up to 3/8	☐	British	☐
Zebu 3/8 to 5/8	☐	Large European	☐
Zebu more than 5/8	☐	Other (specify)	☐

.....

4. *What proportion of total gross income derived from this property comes from beef?*

Less than 1/3 ☐ 1/3 to 2/3 ☐ over 2/3 ☐

5. *What is your average annual rainfall?*

..... (mm) ..... (inches)

6. *Is this property run in conjunction with another beef property(s)?*

Yes ☐ No ☐

What beef enterprise is conducted on this other property(s)?

Describe:

.....

.....

.....

7. *Do you preferentially graze or spell different paddocks?*

Yes ☐ No ☐

Do you currently manage areas to encourage regeneration of pastures?

Yes ☐ No ☐

Do land management issues affect your basic management planning?

Yes ☐ No ☐

If yes, please describe in what way

. . . . . .

. . . . . .

. . . . . .

8. *Indicate the approximate areas of* ***improved country*** *on the property (use same units as Question 2).*

		Area
Cropped		.....
Timber cleared	- introduced pasture	.....
	- native pasture	.....
Rung or poisoned	- introduced pasture	.....
	- native pasture	.....
Timber undersown with improved pasture		.....
Total area of treated country		.....

Have you rung/poisoned/pulled any timbered areas on the property in the last 2 years?

Yes ☐ No ☐

If yes, what area was involved ..... ha.

Future Prospects

9. *Rate the importance of the following options to improve the profitability of this property over the next 5-10 years. (Place a number in the blank beside each statement.)*

1 = Very important
2 = Moderately important
3 = Slightly important
4 = Not important

More sown pasture .....
Weed control, including woody weeds .....
Timber treatment .....
Supplementation:
  Phosphorus .....
  Protein/Energy .....
  Other minerals .....
Growth promotants .....
Rumen modifiers .....
Worm control .....
Tick control .....
Buffalo fly control .....
Botulism control .....
Three day sickness vaccine .....
Selection of breeders on fertility .....
Superior bull selection .....
Prevention of out of season calving .....

More efficient mustering:
  laneways, small paddocks .....
Labour saving devices .....
Energy sources for power .....
Enterprises requiring less labour (for example, fattening) .....
More effective land use:
  More waters .....
  More fences .....
Control of poisonous plants .....
Reduced stocking rate .....
Improved financial planning and control .....
Buy more land .....
Use of decision support packages .....
Performance recording .....
Meatworks feedback .....
Market specifications .....

Please list other options you see important. .....
.....
.....

Pasture and Weeds

10. Have you sown any pastures in the last two years on this property?

Yes ☐ ↓

What area?

1990 ..... (ha)

1989 ..... (ha)

What species?

1990 .....

. . . . . .

1989 .....

. . . . . .

No ☐ ↓

What were your reasons for not planting pastures? Tick one or more

Soil and climate unsuitable ☐

Property fully improved ☐

Inadequate finance ☐

Benefits too small ☐

No suitable pasture plants ☐

More profitable investments ☐

Other (specify) .....

11. Are there any useful introduced plants spreading naturally on the property?

Yes ☐ No ☐

List the plant(s) . . . . . .

12. Indicate how severe the following plants are on this property. (Place a number in the blank beside each weed).

1 Does not occur; 2 Occurs but not a problem; 3 Occurs and a moderate problem; 4 Occurs and a major problem

Brigalow Regrowth	☐	Prickly Acacia	☐
Black Wattle	☐	Rubber Vine	☐
Tea Tree Regrowth	☐	Parkinsonia	☐
Eucalypt Regrowth	☐	Quilpie Mesquite	☐
Gidgee Regrowth	☐	Groundsel	☐
False Sandalwood	☐	Lantana	☐
Turkey Bush	☐	Mimosa	☐
Heart Leaf	☐	Parthenium	☐
Giant Rats Tail Grass	☐	Pimelea	☐

Other problem plants (specify) . . . . . ☐

. . . . . ☐

Marketing

*13. What are the **main** beef enterprises on this property?*

Tick one or more

Breeding stores	☐
Breeding and fattening local trade steers	☐
Breeding and fattening bullocks	☐
Buying stores and fattening on pasture/crop	☐
Buying stores and fattening in feedlot	☐
Breeding stud cattle	☐

Other (specify) .....

14. Indicate the numbers of cattle sold (or transferred) from this property in the last 2 years.

	Male	Female
1989	.....	.....
1990	.....	.....

15. Indicate the average age when the following classes of stock are sold. (Place a number in the blank beside each livestock type).

Up to 1 year	= 1	4 - 5 years	= 5
1 - 2 years	= 2	5 - 10 years	= 6
2 - 3 years	= 3	over 10 years	= 7
3 - 4 years	= 4	not sold	= 0

Heifers ..... Store steers .....

Cull cows ..... Prime steers and bullocks .....

Cull bulls .....

16. *Indicate if you intend to change your age of turnoff in the next 5 years?*

Yes - to younger turnoff ☐

Yes - to older turnoff ☐

No change ☐

17. *Do you buy stores to fatten on this property?*

Always ☐ Sometimes ☐ Never ☐

At what age do you normally buy?

up to 1 year ☐ 2 - 3 years ☐

1 - 2 years ☐ 3 - 4 years ☐

At what age do you prefer to buy?

up to 1 year ☐ 2 - 3 years ☐

1 - 2 years ☐ 3 - 4 years ☐

18. *Indicate the **main** selling method used for each of the following classes of stock. (Place a number in the blank beside each livestock type).*

Direct to works	= 1	CALM	= 5
Direct to butchers	= 2	Transfer to other property	= 6
Saleyards	= 3	Live export	= 7
Paddock sales	= 4	Not sold	= 0

Heifers ..... Store steers .....

Cull cows ..... Prime steers and bullocks .....

Cull bulls .....

19. *Indicate the distances from the property to the meatworks and the saleyards you normally use? Tick one box in each row.*

	under 50km	50-100km	100-500km	500-1000km	over 1000km
Meat-works					
Saleyards					

20. *Indicate the **percentages** of sale cattle moved by the following transport methods?*

Road transport ..... %

Road and rail ..... %

Walk and rail ..... %

Walk to destination ..... %

Other (specify) ..... %

.....

21. *If transport costs increased by, say 25 percent over costs in January 1990, what would be your plans to cope?*

No change ☐ Alter transport methods ☐

Review cattle enterprise ☐ Review property viability ☐

Breeder Productivity and Management

22. *Do you run beef **breeders** on the property?*

Yes ☐ No ☐

Go to Q 32 ←

23. *Indicate the number of females joined in the last 3 years.*

	1988	1989	1990
Cows	.....	.....	.....
Heifers	.....	.....	.....

Indicate the number of calves branded in the last 2 years.

No. 9s ..... No. 0s .....

24. *How many working age bulls do you run?* .....

What percentage of your bulls do you cull each year? .....%

What percentage of your bull replacements come from the following sources?

Breed own	..... %	Buy direct from studs	..... %
Buy at bull sales	..... %	Other (specify)	..... %

25. *Do you normally take the bulls out of the breeding herd?*

Yes ☐

In what month are they normally taken out?

. . . . . .

In what month are they normally put back?

. . . . . .

No ☐

Why do you leave the bulls in all year? Tick one or more boxes

- Not practical to remove ☐
- Higher branding rate ☐
- Other (specify) ☐

. . . . . .

26. *Do you wean?*

Yes ☐ No ☐

Go to Q 27 ←

How many weanings do you normally have a year? .....

In which month is your first weaning normally? .....

What weight/age do you normally wean down to? (kg) .....

(mths).....

In a bad season, do you wean earlier than normal?

Yes ☐ No ☐

27. *At what age do most of your heifers have their first calf?*

2 year old ☐ 3 year old ☐ 4 year old ☐

28. *Indicate whether the following classes of heifers are run with the breeder herd*

Tick each row

	Yes	No
Weaner heifers	☐	☐
Yearling heifers	☐	☐
2 year old heifers	☐	☐

Indicate whether heifers are supplementary fed in a normal year and a dry year.

	Normal year		Dry year	
	Yes	No	Yes	No
Weaner heifers	☐	☐	☐	☐
Yearling heifers	☐	☐	☐	☐
2 year old heifers	☐	☐	☐	☐

At what age do you normally cull heifers?

Weaners	☐	After first joining	☐
Yearlings	☐	Not culled	☐
Two year olds	☐		

What percentage of your weaner heifers are retained as breeder herd replacements?

..... %

29. *For what reasons do you cull breeders? (Tick one or more).*

Do not cull	☐
Age (over ..... years)	☐
Negative pregnancy test	☐
If they are fat	☐
Poor quality calf at branding	☐
Poor Breedplan figures	☐
Dry at branding	☐
Temperament	☐
Type/conformation	☐
Other (specify)	☐

30. *How many times is the breeder herd normally mustered per year?* .....

31. *How do you prevent unwanted pregnancies?*

Do not attempt to	☐	Use of needle speying	☐
Use of secure fences	☐	Use of surgical speying	☐
Segregation of target groups	☐	Other (specify)	☐

Labour

32. *How many permanent persons work in the beef enterprise on this property (including family and unpaid labour)?*

. . . . . .

Do you normally employ casual labour for cattle work?

Yes ☐ No ☐

Average number of casuals per year .....

Average weeks per worker .....

33. *Have you reduced the labour input to your beef enterprise in the last 5 years on this property?*

Yes ☐ No ☐

If yes, how?

Neglecting some jobs ☐ Better subdivision ☐

Labour saving technology ☐ Increased plant/structures ☐

Others (specify) ..... ☐

34. *Which of the following mustering aids have you used on this property in the last 2 years? Tick one or more.*

Horses ☐ Cattle traps/spears ☐

Bikes ☐ Laneways ☐

Helicopters ☐ Portable yards ☐

Fixed wing aircraft ☐ Other (specify) ..... ☐

Animal Health

35. *What animal health problems do you routinely treat or vaccinate against?*

Tick appropriate boxes

Worms	☐	Cattle tick	☐
Redwater/tick fever	☐	Buffalo fly	☐
Lice	☐	Leptospirosis	☐
Vibriosis	☐	3-Day sickness	☐
Botulism	☐	Diseases covered by 5-in-1	☐
Liverfluke	☐	Other (specify)	☐

What diseases/parasites/pests are you aware of in your herd which you do not treat for? (list)

.....

.....

.....

36. *To what extent do **animal health problems** lower the productivity of your beef herd?*

Large amount	☐	Minor amount	☐
Moderate amount	☐	Not important	☐

37. *Do you plan any changes to your animal health routine in the near future?*

Yes	☐	No	☐

If yes, what do you plan to change?(please indicate)

.....

.....

Improvements

38. Is the property fully boundary fenced?

Yes ☐ No ☐

How many main paddocks make up this property? .....

39. Are you planning any new fencing over the next 2 years?

Yes ☐ No ☐

The new fencing will:

Tick one or more

Replace old fence ☐ Create new holding paddock ☐

Create a new main paddock ☐ Fence off problem areas ☐

Create a new lane ☐ Other (specify) ☐

.....

40. Do you use electric fencing for stock segregation?

Yes ☐ No ☐

41. What percentage of your herd uses pumped water?

In a normal year ..... %

In a dry year ..... %

What power sources are used for pumping water on your property?

Diesel ☐ Windmill ☐

Petrol ☐ Solar power ☐

Mains electricity ☐

42. *How many permanent cattle yards with drafting facilities are on the property?*

.....

43. *Do you have a set of portable yards?*

Yes ☐ No ☐

44. *Do you use a personal computer as an aid to property management?*

Yes ☐ No ☐

If yes, which of the following packages are important?

Word processing ☐ Decision support ☐

Accounting ☐ Other (specify) ☐

Spreadsheets ☐ .....

Mineral Supplementation

45. *Do you consider any parts of your property phosphorus deficient?*

Yes ☐ No ☐ Unsure ☐

If yes, what proportion of property .....%

46. *Which of these symptoms of P deficiency have you seen in the last 2 years on this property?*

Tick appropriate boxes

Bone chewing ☐ Broken bones ☐

Soil licking ☐ Other (specify) ☐

Peg leg ☐ .....

47. *Do you normally feed phosphorus supplements on this property?*

Yes ☐

No ☐

Why not?

Tick one or more

- Not P deficient ☐
- Responses too small ☐
- Too costly ☐
- Problems in feeding ☐
- Other (specify) ..... ☐

How long have you fed phosphorus ..... (years)?

What form of P did you normally feed and how much was fed?

Tick one or more

		g/hd/day	OR	tonnes/year
MAP	☐	.....		.....
DAP	☐	.....		.....
Superphosphate	☐	.....		.....
Dicalcium phosphate	☐	.....		.....
Proprietary mix	☐	.....		.....
Other (specify)	☐	.....		.....

What classes of cattle do you supplement with P?

Tick one or more

Breeders	☐	Heifers	☐
Weaners	☐	Steers	☐
Bulls	☐	Others (specify)	☐

What extra information on P feeding do you need?

. . . . . .

. . . . . .

. . . . . .

. . . . . .

48. *In normal seasons what other supplements (apart from P) do you feed on this property?*

Tick as appropriate

Sulphur	☐	Grain	☐
Salt	☐	Hay	☐
Calcium	☐	Cottonseed	☐
Urea	☐	Cottonseed meal	☐
Molasses	☐	Meat meal	☐
Proprietary mixes	☐	Other (specify)	☐

Promotants and Modifiers

49. *Do you use hormonal growth promotants?*

Yes	☐	No	☐

If yes, what promotant do you use?

Tick one or more

Compudose	☐	Synovex	☐
Ralgro	☐	Other (specify)	☐

When do you feed P?

Tick one or more boxes

All year	☐	Early dry	☐
Wet	☐	Late dry	☐

If cattle are not fed in the wet, why don't you feed in the wet?

Cattle too spread out	☐	No suitable supplements	☐
Cattle won't eat it	☐	Cannot deliver it	☐
Not required	☐	Other (specify)	☐
Feed spoils	☐		

How do you feed phosphorus?

Tick one or more

In water	☐	With urea/salt	☐
With salt	☐	With urea/salt/protein meal	☐
With molasses	☐	Other (specify)	☐

What is the main benefit of P feeding on this property?

Higher steer growth	☐
Improved cow survival	☐
Increased branding	☐
Improved cow liveweight and condition	☐
Increased weaning weights	☐
Reduced incidence of peg leg	☐
Other (specify)	☐

50. *Do you feed rumen modifiers with supplements?*

Yes ☐

What products do you use?

Tick one or more

- Avotan ☐
- Bovatec ☐
- Rumensin ☐
- Other (specify) ..... ☐

No ☐

Why don't you use modifiers?

- Do not supplementary feed ☐
- Have not heard about it ☐
- Benefits too low ☐
- Unnatural ☐
- Other (specify) ..... ☐

To what classes of cattle do you feed rumen modifiers?

- Weaners ☐
- Young steers ☐
- Fattening steers/bullocks ☐
- Replacement heifers ☐
- Cull cows ☐
- Other (specify) ..... ☐

51. *On what issues would you like research and development to be concentrated over the next 5 to 10 years?*

List most important aspects first

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

Thank you for participating in this survey. We appreciate your time. Would you like to receive a brief report on the overall findings of this survey? If so, please give

Name: .....

Address: .....

.....

.....

.....

APPENDIX 2

Production Land Classes for North Australia Project

W.P. Thompson
Resource Planning Services

Development of Production Land Classes

Research Impact Analysis (RIA) was developed to assist in evaluating the impact of proposed research on the pastoral sector. In developing RIA, the main physical resources of pastures and soils on which the pastoral industry is dependent had to be defined. An initial starting point was the review of submissions to the MRC to determine the basis on which varying types of research projects assessed these parameters.

In general, three types of spatial descriptions were evident.

1. *Native Pasture Types based on Weston et al. (1981)*

   These invariably used various levels of Weston's groupings. Gross areas were often given, cattle populations of the Local Government Areas (LGA's) in which the groups fell were occasionally given and in a few rare cases the net grazing area after allowance for cropping was estimated. In general the tendency was to use Weston's groupings as *de facto* industry production zones (as in Brigalow Lands etc). This approach was particularly common in pasture research projects. As Weston's work does not cover Northern Territory or Western Australia, there was no ready estimate of 'impact' areas in these States.

2. *Broad Geographic (Ecological) Zonal Types*

   These have never been defined for the North Australia Program (NAP); however, terms such as Far North Queensland, Gulf Lowlands, Kimberleys etc were used. These terms have a broadly accepted meaning to the industry as well as many in the pasture and cattle husbandry community where they are consistently in colloquial use. The lack of defined characteristics limits the utility of this approach to those who have personal knowledge of these areas.

3. *Non-Spatial Descriptions*

   These invariably relate to specific soil factors (for example, phosphorus, soil texture). The extent to which Weston's map is an acceptable *de facto* aggregated soils map determines whether spatial limits can be identified.

The difficulty with using Weston's units directly in RIA is that the pasture groups even at their lowest level of aggregation (29 units) cover a wide range of soil variables. Rather than revert to a regional type of system, a matrix was constructed of each of Weston's pasture groups and soils. Soils were grouped into sands, loams, earths, acid/alkaline duplexes and clays. Each of the main soil units that occurred in conjunction with a particular pasture group was included in the matrix. This resulted in 50 soil/pasture groupings which were termed Production Land Classes (PLC). The PLCs were digitised and used as a layer over LGA boundaries.

The need to quantify impacts of research across the whole NAP area in terms of impact area and livestock requires that the physical resource units be related to statistical units from the Australian Bureau of Statistics (ABS). Each LGA was characterised by the two

most common PLCs in that LGA (Statistical Local Area [SLA] were used in Northern Territory). Those PLCs that occurred as either dominant or subdominant in the NAP LGAs were retained in the nomenclature system. Those occurring as minor were amalgamated into the nearest like PLC as in effect they play no role in RIA. The resultant PLCs were then aggregated into PLC Groups.

For Northern Territory and Western Australia, the Grazing Land Map of Australia by Moore (1970) was used in lieu of Weston's pasture groupings and the small scale summary map of 'Soils of Australia' (Isbell 1983) was used to generate six additional PLCs. The difference in PLC numbers for both areas in part reflects the lack of any data of an accuracy equivalent to that of Weston's for Northern Territory and Western Australia.

Processing of Results from the Producer Survey

The replies from the producer survey were converted into DB3P files by Queensland Department of Primary Industries (QDPI). The file containing answers to the first five questions was used to determine where the respondent was located, the PLC, PLC Group, Stocking Rate, Property Size and Rainfall. The procedure to do this was semi automated as follows:

a) A program was written that converted the QDPI one-off LGA code to the standard ABS code and automatically down loaded the name of the area and the correct ABS code to the database. This required a 'lookup' table. The RIA master file was used as the 'lookup' table. The resultant file is called RIASUR1.dbf.

b) Rainfall was converted to millimetres by another program.

c) A three stage process was then used to assign a PLC code to each response in RIASUR1.dbf. Initially a simple program was used to assign the PLC code from shires consisting of only one PLC to all responses from those shires. The master RIA file was used as the 'lookup' table for this. Some 150 records were classified this way. RIASUR1 database was then exported to MAPINFO, geocoded on the LGA number from (a) above to the master RIA file. In effect this assigns a grid reference to the centroid of each LGA and attaches responses to that reference. The resultant response map was then overlaid with maps of the production land classes and 'lookup' tables developed for the answer to Question 1 in the survey, LGA and resultant PLC. A simple program was then executed to add the PLC code to the database.

d) A simple program was then executed to add the PLC group code to RIASUR1. It is this code that should be used when analysing the database.

e) A program was written to convert property size responses and cattle numbers to a Stocking Rate figure. The same program automatically deleted the 'no response' records from the database and checked for incorrect EDP results. These were then corrected.

Table 32. Proportion (%) of properties weaning, frequency of weaning and time of first weaning.

Region	Properties weaning	Frequency of weanings per year				Month of first weaning					
		Once	Twice	3 times	>3 times	Jan-Feb	Mar	Apr	May	June	Jul-Aug
Overall	95	27	48	18	8	9	14	19	26	16	10
High Rainfall	94	9	35	24	33	13	17	13	23	10	10
Brigalow	98	34	42	20	5	9	13	16	26	21	10
S. Speargrass	97	22	46	22	10	11	10	18	30	14	10
Qld Bluegrass	94	42	36	12	10	10	7	16	33	18	12
S. Aristida	98	40	49	9	3	3	8	19	31	22	8
S. Rolling Downs	98	55	43	3	0	5	5	9	24	33	19
C & N Rolling Downs	91	14	64	17	5	8	22	25	23	9	4
Mulga Lands	90	44	53	3	0	10	19	14	17	14	11
Qld Spinifex	90	12	68	17	2	14	31	22	16	3	7
N. Speargrass	98	9	46	26	19	11	22	24	19	9	10
N. Aristida	98	3	69	19	9	4	14	25	31	14	8
Gulf-Peninsula	89	23	57	17	3	5	14	19	33	17	7
NT/WA Spinifex	78	32	59	3	5	0	19	31	10	17	14
NT/WA Speargrass	92	36	60	4	0	0	16	28	34	9	6

* Many property owners are still setting a minimum weaning weight of 150 kg although 17% are prepared to wean calves down to less than 100 kg liveweight (Table 33). More than half the producers in Gulf-Peninsula and NT/WA Speargrass adopt the policy of weaning down to less than 100 kg reflecting the importance of minimising lactational stress on breeders in these harsh environments plus the risk that these animals might not be mustered at the following round. As would be expected, producers in more intensive areas tended to set higher minimum weights because of reduced stress on breeders and mating policies practised.

* The minimum weaning ages quoted seemed to be in conflict in some respects with data for minimum weaning weights. While 17% of producers indicated they would wean down to less than 100 kg, only seven percent said they would wean down to less than four months of age. It is possible that the ability of producers to estimate age and weight may differ. However, the two populations supplying information for these two issues were different as there were 1 658 replies on minimum age but only 510 replies for minimum weight. In NT/WA Speargrass, half of the producers weaned to less than 100 kg but only four percent weaned under four months of age. There is obviously a need to conduct an education program for producers to indicate relationships between weights and ages of calves.

* The majority (86%) of producers indicated a willingness to wean earlier than normal in a bad season, with the results being relatively uniform throughout.

5.4 Heifer management

* Approximately half of the producers segregated heifers from the breeding herd until two years of age while 14% put them back into the breeding herd following weaning (Table 34). This pattern was fairly consistent across regions although more properties introduced weaner heifers to the breeding herd in extensive areas. This may reflect a lack of adequate subdivision on these properties to permit effective stock control. Properties with more than 10 main paddocks had higher rates for heifer segregation from the breeder herd than those with fewer paddocks. Differences were 26 percent for weaners, 19 percent for yearlings and 17 percent for two year olds.

* Properties were equally split in terms of age at first calving being two or three years. However, there was considerable variation between regions with no consistent pattern. Brigalow and Downs country showed predominantly two year old calving as did Mulga and NT/WA Spinifex. However, High Rainfall and Speargrass regions practised predominantly three year old calving. Calving practice was related to Zebu content in the herd. The proportion with first calving at two years declined from 60 percent in herds with no Zebu content to 52 percent for low, 48

Table 33. Proportion (%) of properties weaning by minimum weight or age and proportion (%) weaning early in a bad season.

Region	Minimum weight (kg) *			Minimum age (months) **				Wean early in bad season
	<100	101-150	151-200	<4	4	5	6	
Overall	17	26	38	7	14	16	29	86
High Rainfall	15	15	45	4	4	13	32	70
Brigalow	11	19	44	5	14	16	28	88
S. Speargrass	11	26	48	4	10	16	32	86
Qld Bluegrass	9	29	26	3	15	12	20	87
S. Aristida	20	33	27	3	17	22	22	88
S. Rolling Downs	8	15	50	6	8	10	30	83
C & N Rolling Downs	20	24	34	9	22	20	26	89
Mulga Lands	17	33	50	7	23	17	27	84
Qld Spinifex	14	50	21	10	11	16	32	90
N. Speargrass	35	35	23	11	17	22	32	87
N. Aristida	44	33	22	22	22	18	28	88
Gulf-Peninsula	53	33	13	23	14	9	37	81
NT/WA Spinifex	28	33	39	9	14	9	33	83
NT/WA Speargrass	50	41	9	4	19	33	33	76

* 510 responses
** 1658 responses

Table 34. Age at which heifers join the breeding herd, calve first and are normally culled and percentage retained as breeders.

Region	Age when first run with breeders			Age at first calving		Retained as breeders (%)	Age when heifers normally culled				
	Weaner	Yearling	2 year old	2 year old	3 year old		Weaner	Yearling	2 year old	Post-join	Not culled
Overall	14	20	48	51	48	59	27	43	34	20	10
High Rainfall	20	12	53	35	65	59	24	31	44	16	10
Brigalow	9	26	44	66	34	48	31	54	32	19	3
S. Speargrass	6	11	69	23	76	57	24	39	42	21	6
Qld Bluegrass	14	13	54	59	41	49	40	49	28	21	2
S. Aristida	14	29	45	50	50	54	40	45	31	17	5
S. Rolling Downs	5	22	40	71	29	48	37	48	24	34	2
C & N Rolling Downs	14	26	45	69	31	69	18	40	33	29	9
Mulga Lands	17	18	43	65	35	67	27	55	38	15	8
Qld Spinifex	26	22	37	56	43	67	34	39	30	11	12
N. Speargrass	18	25	43	34	64	71	19	30	36	21	19
N. Aristida	35	29	29	38	59	79	20	9	43	20	33
Gulf-Peninsula	32	25	25	45	51	81	12	31	17	13	50
NT/WA Spinifex	45	27	27	78	22	74	20	55	25	9	20
NT/WA Speargrass	24	19	32	49	49	89	9	14	29	9	54

percent for half and 44 percent for high Zebu content.

* Percentage of heifers retained as breeders averaged 59% with wide variation from 48% to 89% (Table 34). The percentage retained was inversely related to branding percentages with highest percentages in regions with lowest branding percentages. Average branding percentages were 82 percent when less than 25 percent of weaners were retained, 77 percent with 26 to 50 percent retained, 73 percent with 51 to 75 percent; 70 percent with 76 to 90 percent and 64 percent with greater than 90 percent of heifers retained. When more than 80% of heifer progeny must be retained as breeders, there is limited scope for selection. In more favoured areas such as Brigalow and Queensland Bluegrass where only half of the heifers need to be retained to maintain numbers, there is much greater scope for selection on various traits.

  Overall, ten percent of properties did not cull heifers, the figure rising to half in the extensive areas in Gulf-Peninsula and NT/WA Speargrass. In all regions, some properties did not cull heifers but retained all for breeding. This results in a higher percentage of vulnerable animals (first-calf cows) in the herd each year.

* Heifers were culled at all ages from weaning to two year old with a tendency for a peak as yearlings. Twenty percent of properties culled following joining. In some cases, properties culled progressively at a number of ages.

5.5 Breeder culling

* Overall, 97% of properties culled breeders but as many as 16% of properties in extensive areas did not cull cows (Table 35). This highlights the high loss of breeding females which occurs on many properties in harsher environments in northern Australia. Since sale of culled females represents a direct increase in property returns, there is substantial scope for improving profitability of these properties by addressing this issue. Improved management to minimise breeder losses should result in a profitable outcome for the individual property owner and the nation.

* Temperament, age and type/conformation were the most common (70-80%) reasons for culling breeders, while half of the properties culled on the basis of a poor quality calf or a negative pregnancy test. One quarter of properties culled cows which were dry at branding or fat.

  These trends were reasonably uniform across regions. In Gulf-Peninsula and NT/WA Speargrass, twice as many culled on a negative pregnancy test as on a poor calf indicating that any calf was better than no calf.

Table 35. Percentage of properties culling breeders for various reasons.

Region	Temperament	Age	Type/ conformation	Poor quality calf	Negative pregnancy test	Dry at branding	Fat cows	Poor Breedplan figures	Other	No culling
Overall	83	75	71	50	48	29	26	6	13	3
High Rainfall	80	73	64	62	45	15	29	12	15	2
Brigalow	86	78	72	55	59	38	26	6	14	1
S. Speargrass	82	77	68	60	53	22	26	8	12	2
Qld Bluegrass	81	79	69	57	51	34	21	3	14	2
S. Aristida	88	77	81	49	51	42	23	7	14	2
S. Rolling Downs	74	71	73	53	53	32	23	5	16	2
C & N Rolling Downs	88	74	82	33	40	29	24	7	10	2
Mulga Lands	84	76	73	47	39	36	29	6	9	2
Qld Spinifex	76	70	70	40	33	26	39	8	19	4
N. Speargrass	87	77	77	44	32	14	32	6	10	5
N. Aristida	83	67	59	38	29	24	40	7	12	14
Gulf-Peninsula	60	60	55	16	27	18	31	2	11	16
NT/WA Spinifex	86	67	75	30	28	35	16	1	16	3
NT/WA Speargrass	74	66	58	18	34	29	18	3	11	11

Poor BREEDPLAN figures were used for culling on six percent of properties overall with some properties in all regions using this as a criterion. This seems a surprisingly high figure as there are only 250 studs registered with BREEDPLAN in northern Australia.

* The most common age for culling breeders was ten years although five percent of properties retained breeders till they were over ten years of age (Table 36). The trends were quite consistent across regions. Research findings indicate that mortality rates in breeders increase significantly as age increases past eight years so there would be definite benefits in reducing these ages at final culling.

5.6 Preventing unwanted pregnancies

* No attempt was made to prevent unwanted pregnancies on 27% of properties with highest figures (51-68%) in extensive areas (Table 37). These rates were highest (46%) when there were up to five main paddocks and declined as level of subdivision increased, reaching 15 percent when there were more than 15 paddocks.

Where attempts were made, secure fences (51%) and segregation (37%) were the most common methods used. In Southern Rolling Downs, 70% of properties relied on secure fencing, the highest level recorded. Even in NT/WA Speargrass, 43% of properties relied on secure fences and 35% on segregation. Use of these methods increased with the level of subdivision from 33 to 61 percent for secure fences and from 18 to 53 percent for segregation.

However, 29% of properties still employed surgical speying with a range from 12% in NT/WA Spinifex to 44% in the Southern Speargrass (Table 37). Despite the newness of the technology, five percent of properties practised needle speying of females.

5.7 Mustering frequency

* The number of times cattle were handled annually varied dramatically between regions (Table 38). Approximately 50% of properties overall handled stock at least four times annually and only five percent handled stock once. The trend was for the number of musters to decline as the region became more extensive.

* These patterns varied also with property size. Cattle were mustered four or more times on 71 percent of small properties (up to 10 000 ha), on 24 percent of medium sized properties, but on only three percent of large properties (above 50 000 ha). Conversely the herd was mustered once only on one percent of small, five percent of medium and 28 percent of large properties.

Table 36. Percentage of properties culling breeders at various ages.

Region	Culling age				
	<8 years	8 years	9 years	10 years	>10 years
Overall	15	27	15	37	5
High Rainfall	4	23	17	45	11
Brigalow	17	21	16	39	6
S. Speargrass	13	29	14	39	6
Qld Bluegrass	12	39	13	40	4
S. Aristida	14	34	17	34	0
S. Rolling Downs	8	24	29	32	8
C & N Rolling Downs	20	27	12	40	0
Mulga Lands	22	31	20	25	2
Qld Spinifex	20	43	9	26	2
N. Speargrass	12	24	18	40	6
N. Aristida	16	22	24	32	5
Gulf-Peninsula	23	19	19	35	4
NT/WA Spinifex	14	38	7	36	5
NT/WA Speargrass	30	30	9	26	4

Table 37. Percentage of properties using various methods to prevent unwanted pregnancies.

Region	No attempt	Secure fences	Segregation	Surgical speying	Needle speying
Overall	27	51	37	29	5
High Rainfall	27	48	29	20	5
Brigalow	19	61	47	28	6
S. Speargrass	13	62	41	44	6
Qld Bluegrass	16	53	43	23	4
S. Aristida	19	63	58	19	7
S. Rolling Downs	21	70	39	21	0
C & N Rolling Downs	41	41	33	16	5
Mulga Lands	40	51	34	16	5
Qld Spinifex	45	33	15	25	3
N. Speargrass	34	30	20	40	7
N. Aristida	58	18	12	33	5
Gulf-Peninsula	68	13	9	21	2
NT/WA Spinifex	58	26	15	12	3
NT/WA Speargrass	51	43	35	16	3

Table 38. Percentage of properties using various frequencies of mustering each year.

Region	Mustering frequency				
	Once	Twice	3 times	4 times	>4 times
Overall	5	28	18	18	31
High Rainfall	0	3	8	17	71
Brigalow	1	17	24	25	33
S. Speargrass	0	4	8	21	67
Qld Bluegrass	1	18	22	21	39
S. Aristida	2	33	26	19	21
S. Rolling Downs	3	43	18	18	17
C & N Rolling Downs	4	65	22	7	2
Mulga Lands	13	67	12	4	5
Qld Spinifex	9	61	17	8	5
N. Speargrass	4	26	28	27	16
N. Aristida	5	58	27	7	2
Gulf-Peninsula	26	55	13	6	0
NT/WA Spinifex	39	52	4	3	1
NT/WA Speargrass	42	47	8	3	0

* Properties using casual labour for cattle work tended to muster less frequently than those who used permanent workers only. Fully boundary fenced properties mustered more frequently than those not fully fenced with 53 v 23 percent mustering four or more times.

* Properties with either minimal (one to five paddocks) or excessive (more than 20 paddocks) subdivision tended to have higher frequencies of one or two musters and lower frequencies of four or more musters. There was a similar trend for properties having three or more permanent yards. Use of portable yards declined with frequency of mustering from 75 percent for once, 44 percent for twice, 27 percent for three times, 17 percent for four times and seven percent for more than four musters.

* In extensive areas in the Gulf, Northern Territory and Western Australia, 26-42% of properties had only a single muster each year, while 8-19% mustered more than twice. In the closer-settled, intensive areas, as many as 70% mustered more than four times a year while 39% of properties in High Rainfall mustered more than six times a year. There may be scope for self-mustering systems to be used to a greater extent in these areas where mustering obviously consumes a significant part of the labour available.

6. SUPPLEMENTATION STRATEGIES

Under the climatic conditions in northern Australia, grazing livestock are faced with widely fluctuating nutritional regimes. The highly seasonal rainfall pattern and the inherently lowly fertile soils result in available forage being low in nitrogen for much of the year and low in phosphorus on many soil types throughout the year.

Research studies have identified nutrients which should be supplied to grazing beef cattle in the range of situations and these recommendations have been adopted to varying degrees. The survey aimed to quantify the extent of supplementary feeding, the classes of stock being fed and the types of supplements being used.

6.1 Heifer supplementation

Heifers represent the future breeding stock for the herd and special treatment is required to ensure that they reach sexual maturity at an early age and can continue to reproduce at a satisfactory level.

* Overall, 25% of properties supplemented weaner heifers in a normal year, with 17% supplementing yearlings and two year olds (Table 39). There was extremely wide variation between regions with fewer than ten percent of properties in Brigalow, Mulga and Southern Rolling Downs feeding. By contrast, more than 60% of properties in Northern Aristida and NT/WA Speargrass fed all age groups. These differing practices are largely a reflection of the different nutritional levels provided by pastures in the winter-spring period in the various regions.

  This is supported by the fact that more than half of the properties overall supplement all age groups in dry years. While the incidence of feeding increases in dry years in all regions, the magnitude of the increase is much greater in the better developed, intensive areas than in the harsher, extensive areas. It is significant to note that, even in dry years, almost half of the properties do not feed heifers at all.

6.2 Phosphorus supplementation

Much of northern Australia is low in available soil phosphorus as is the pasture which grows on the soils. Animals grazing on these pastures select a diet which is deficient in phosphorus. Research has shown that supplementing with phosphorus, especially during the period of positive weight change, will result in enhanced animal performance.

The survey sought to determine producers' opinions of the phosphorus status of their properties, their policy regarding phosphorus supplementation, classes of animals fed, time of feeding and perceived benefits.

Regional Group Number: 12

Regional Group Name: Gulf-Peninsula (includes Weston's: Bluegrass - Browntop, Schizachyrium and Native Sorghum).

Constituent PLC Numbers: 48 49 50

PLC Descriptions:

48. Bluegrass-Browntop on clay complexes.
49. Schizachyrium on complexes of sands, earths and duplexes.
50. Native Sorghum on earths, loams and duplexes.

Regional Group Number: 13

Regional Group Name: Northern Territory and Western Australia Spinifex (comprises the Triodia Plechtrane pastures and Acacia Shortgrass of Moore).

Constituent PLC Numbers: 52 53 56 57

PLC Descriptions:

52. Dominantly red sands with Spinifex.
53. Dominantly red earths and sands with Spinifex.
56. Eragrostis and Acacia on shallow loams and red brown earths.
57. Dominantly gravels and sands with Spinifex.

Regional Group Number: 14

Regional Group Name: Northern Territory and Western Australia Speargrass (comprises the Speargrass/Native Sorghum/Themeda and Aristida/Bothriochloa pastures of Moore and is possibly a higher level aggregation of related Weston groups and hence Queensland PLCs).

Constituent PLC Numbers: 54 55 58

PLC Descriptions:

54. Speargrass/Themeda/Sorghum dominantly on light textured soils (sands and earths).
55. Speargrass/Themeda/Sorghum dominantly on mixed duplexes and earths.
58. Aristida/Bothriochloa on earths, sands and duplexes.

References

ISBELL, R.F. (1983). Kimberley-Arnhem-Cape York (III). In 'Soils: An Australian Viewpoint'. CSIRO Division of Soils, Melbourne.

MOORE, R.M. (1970). Grazing lands of Australia (map). In 'Australian Grasslands'. Ed. R.M. Moore. Australian National University Press, Canberra.

WESTON, E.J., HARBISON, J., LESLIE, J.K., ROSENTHAL, K.M. and MAYER, R.J. (1981). Assessment of the agricultural and pastoral potential of Queensland. Agriculture Branch Technical Report No. 27. Queensland Department of Primary Industries, Brisbane.

Table 48. Proportion (%) of properties feeding various supplements other than phosphorus.

Region	Hay	Molasses	Grain	Salt	Urea	Cottonseed meal	Cotton seed	Meat meal	Sulphur	Calcium	Proprietary mixes
Overall	47	43	17	37	37	19	8	11	18	15	18
High Rainfall	44	71	10	50	17	17	0	21	10	12	19
Brigalow	52	31	27	15	24	5	7	4	6	8	18
S. Speargrass	60	45	17	25	26	27	8	7	9	8	11
Qld Bluegrass	52	29	21	11	30	11	7	0	10	12	22
S. Aristida	48	32	23	52	32	6	10	0	26	23	13
S. Rolling Downs	48	16	32	44	24	12	8	0	20	8	20
C & N Rolling Downs	25	35	3	38	52	8	3	15	13	8	13
Mulga Lands	43	46	6	34	34	17	14	6	17	11	23
Qld Spinifex	26	37	4	65	50	13	7	13	24	37	24
N. Speargrass	45	63	12	59	56	41	10	23	38	21	16
N. Aristida	37	63	16	71	55	39	12	24	45	29	10
Gulf-Peninsula	35	49	12	58	53	28	14	19	35	26	33
NT/WA Spinifex	33	38	5	40	58	5	5	8	25	30	35
NT/WA Speargrass	47	28	25	75	72	3	3	34	44	41	47

* The association between calcium and phosphorus in the nutrition of livestock is well recognised but it has generally been believed that there was adequate calcium in available forages in northern Australia to avoid deficiency. However 15% of producers are feeding calcium and the level rises to more than 20% in a number of regions. The need for calcium in phosphorus supplements, especially for breeders, is an issue that needs to be resolved. Research currently underway at University of Queensland (J. Ternouth, pers comm.) may throw some light on this issue.

* Proprietary mixes remain popular with many producers in all regions with 18% of producers throughout the survey area using them to some degree (Table 48). The incidence was highest in NT/WA Speargrass, NT/WA Spinifex and Gulf-Peninsula. This may reflect usage of proprietary blocks because of ease of management and freight advantages.

* Properties feeding phosphorus supplements fed most other supplements at higher rates (10 to 37%) than those who did not. The exceptions were hay (21%) and grain (11%) which were fed more frequently on properties not feeding phosphorus.

6.4 Growth stimulants

* Hormonal growth promotants (HGPs) are used across all regions with an overall usage rate of 18% of properties (Table 49). This rate was slightly higher for properties which breed and fatten bullocks (21%) and those which buy stores to fatten (26%). Highest usage rates occurred in north Queensland regions and Brigalow areas. This could be a reflection of research conducted by QDPI in conjunction with commercial firms in these regions and promotion of the products by both groups. In contrast, usage in Southern Aristida, Queensland Spinifex, Mulga Lands and NT/WA Spinifex was well below average. This might be influenced by many factors including limited numbers of observations in these areas and possible market outlets requiring HGP free animals.

Compudose (65%) was the most commonly used implant followed by Ralgro (52%), and Synovex (19%). Highest usage of Compudose occurred in the more extensive regions which might be a function of the lower frequency of mustering and longer pay-out period than other products.

Sixty-seven percent of producers who actually use implants used only one type, while 32% used combinations of implants.

Table 49. Proportion (%) of properties using hormonal growth promotants and promotant used.

Region	Usage	Promotant used		
		Compudose	Ralgro	Synovex
Overall	18	65	52	19
High Rainfall	17	69	46	8
Brigalow	21	61	52	22
S. Speargrass	15	48	62	21
Qld Bluegrass	17	48	67	41
S. Aristida	7	50	75	25
S. Rolling Downs	16	55	73	18
C & N Rolling Downs	18	85	58	3
Mulga Lands	5	33	67	0
Qld Spinifex	7	80	40	0
N. Speargrass	29	91	33	14
N. Aristida	20	46	62	8
Gulf-Peninsula	23	100	8	17
NT/WA Spinifex	9	100	50	17
NT/WA Speargrass	13	83	17	0

* Overall, usage of rumen modifiers was low (8%) (Table 50), although many producers in Northern Aristida, Northern Speargrass, Gulf-Peninsula and NT/WA Speargrass used these additives. This higher level of usage would possibly be a function of research conducted at Swan's Lagoon and promotion of the results throughout northern regions.

Avotan (31%), Rumensin (61%) and Bovatec (5%) were used. Usage varied widely across regions which might reflect the level of activity by the relevant companies.

A number of reasons were advanced for not feeding rumen modifiers, the most frequent being the absence of a supplementation program (48%) and therefore no delivery system (Table 50). Twenty percent of producers had not heard of rumen modifiers while 18% considered benefits were too low. It was significant that 11% did not use them because they were unnatural which may be a sign of the changing attitudes towards use of chemicals and the increasing interest in organic products.

Weaners were the most common cattle class to be fed rumen modifiers with 57% of properties feeding this class (Table 51). However, prime steers (37%), young steers (26%), replacement heifers (19%) and even cull cows (11%) were fed. The higher incidence of weaner feeding could be a reflection of extension messages which have emphasised benefits in liveweight change as well as control of coccidiosis (Rumensin).

Table 50. Proportion (%) of properties using rumen modifiers with supplements, product used and reasons for not using modifiers.

Region	Usage	Modifier used		Reasons for not using modifiers			
		Avotan	Rumensin	Do not supplement	Have not heard of it	Benefits too low	Unnatural
Overall	8	31	61	48	20	18	11
High Rainfall	7	33	33	42	18	27	13
Brigalow	7	24	60	67	13	14	9
S. Speargrass	8	53	47	40	20	20	18
Qld Bluegrass	9	13	73	57	14	19	14
S. Aristida	5	0	50	33	30	26	7
S. Rolling Downs	9	60	40	39	33	15	15
C & N Rolling Downs	5	11	100	64	17	13	3
Mulga Lands	1	100	0	42	28	17	9
Qld Spinifex	8	17	83	43	22	17	13
N. Speargrass	15	43	61	18	20	27	16
N. Aristida	23	15	69	14	40	29	6
Gulf-Peninsula	13	0	100	26	34	11	3
NT/WA Spinifex	5	33	33	29	38	22	7
NT/WA Speargrass	14	40	60	19	54	19	4

Table 51. Proportion (%) of properties feeding rumen modifiers who feed various classes of cattle.

Region	Weaners	Prime steers	Young steers	Replacement heifers	Cull cows
Overall	57	37	26	19	11
High Rainfall	80	0	20	20	0
Brigalow	22	64	20	9	9
S. Speargrass	57	37	26	14	9
Qld Bluegrass	47	33	33	13	7
S. Aristida	33	100	33	0	0
S. Rolling Downs	60	60	40	40	20
C & N Rolling Downs	70	10	40	20	20
Mulga Lands	50	0	0	0	0
Qld Spinifex	100	14	29	29	14
N. Speargrass	88	29	21	29	21
N. Aristida	79	21	36	29	14
Gulf-Peninsula	86	14	14	14	0
NT/WA Spinifex	60	20	40	20	20
NT/WA Speargrass	60	20	40	60	0

7. ANIMAL HEALTH

For animals to be highly productive, it is essential that they be healthy, that is, free from parasites and disease. Beef cattle in northern Australia are affected by a range of conditions including external and internal parasites, reproductive diseases plus clostridial and viral diseases.

The survey set out to determine if producers considered that diseases were affecting the productivity of their herds and their policy in relation to disease control.

7.1 Effects on production

* Only 24% of producers considered that diseases affected the productivity of their herds to a significant degree (Table 52) while a further 52% felt that effects were minor. The remaining 24% considered disease was not an issue at all.

* The incidence seeing disease as a major problem was well above average (39-46%) in Northern Aristida, NT/WA Speargrass and Gulf-Peninsula but was well below the average (14-17%) in Central and Northern Rolling Downs, NT/WA Spinifex and Queensland Bluegrass.

* Producers who treated or vaccinated against various diseases were more likely to consider that animal health problems lowered productivity by a large or moderate amount. The most pronounced differences were for buffalo fly (11%), cattle tick (16%), redwater/tick fever (9%), worms (10%), leptospirosis (14%), vibriosis (14%) and botulism (14%).

* Most respondents (81%) planned to continue with their current disease control strategies in the near future (Table 52). Those planning changes to their program were lowest (12-15%) in Southern Aristida, Queensland Bluegrass, High Rainfall and Central and Northern Rolling Downs and highest (28-30%) in Gulf-Peninsula, NT/WA Speargrass and Northern Aristida. A higher proportion of producers who considered that animal health problems lower productivity plan changes to their animal health routine in the near future (29 v 16%).

7.2 External parasites

The major external parasites affecting cattle in the survey area are buffalo fly, cattle tick and lice. Since the tick fever organism is transmitted by the cattle tick, it is considered under this heading also.

* Two-thirds of producers in the survey area treated routinely for buffalo fly (Table 53) indicating the wide geographic spread of this pest and the concern it causes producers. Highest incidence (84-91%) occurred in the eastern coastal regions of Queensland (High Rainfall, Southern Speargrass and Northern Speargrass) while the lowest incidence (7-

Table 52. Proportion (%) of properties considering animal health problems lower productivity and proportion (%) planning changes to their animal health routine.

Region	Lowered productivity		Planning changes to health routine
	Large/moderate amount	Minor amount	
Overall	24	52	19
High Rainfall	23	56	14
Brigalow	23	55	23
S. Speargrass	28	53	18
Qld Bluegrass	17	61	13
S. Aristida	28	53	12
S. Rolling Downs	20	59	24
C & N Rolling Downs	14	46	15
Mulga Lands	19	45	18
Qld Spinifex	22	52	16
N. Speargrass	23	51	19
N. Aristida	46	29	28
Gulf-Peninsula	39	46	30
NT/WA Spinifex	17	46	19
NT/WA Speargrass	41	46	29

Table 53. Proportion (%) of properties routinely treating for external parasites or aware of their presence but not treating.

Region	Buffalo fly		Cattle tick		Lice		Redwater/tick fever	
	Treated	Aware/ untreated	Treated	Aware/ untreated	Treated	Aware/ untreated	Treated	Aware/ untreated
Overall	67	5	43	6	27	4	28	0.4
High Rainfall	91	4	78	5	1	0	28	1
Brigalow	75	4	42	8	31	4	36	0
S. Speargrass	87	6	73	7	15	2	52	0
Qld Bluegrass	67	3	42	3	43	4	31	1
S. Aristida	54	7	28	2	67	5	26	0
S. Rolling Downs	47	2	3	2	76	6	0	0
C & N Rolling Downs	47	12	5	3	29	8	8	1
Mulga Lands	12	3	0	0	43	3	0	0
Qld Spinifex	36	5	6	0	27	3	8	0
N. Speargrass	84	7	62	8	9	1	12	1
N. Aristida	60	12	18	3	25	3	5	0
Gulf-Peninsula	59	7	61	9	9	9	11	0
NT/WA Spinifex	7	11	11	6	25	11	1	0
NT/WA Speargrass	50	13	68	15	8	0	3	0

12%) occurred in the drier, inland areas especially in the southern part of the survey area (NT/WA Spinifex and Mulga Lands). Producers with some Zebu content had higher treatment rates than those running British cattle (72 v 52%) reflecting the geographical distribution of the different genotypes and the buffalo fly. Treatment rates increased with the number of musters from 28 percent for once, to 45 percent for twice and up to 86 percent for more than four musters.

This treatment level occurs despite the fact that research results indicate limited production benefit from treating beef cattle to control buffalo fly.

Overall, five percent of properties knew buffalo fly was present but failed to treat for it. Only four regions (NT/WA Speargrass, NT/WA Spinifex, Northern Aristida and Central and Northern Rolling Downs) recorded figures considerably above the average (11-13%). It is not clear why they choose not to treat and limited questions in the questionnaire did not allow this information to be obtained.

* The proportion of properties treating for cattle tick was much lower (43%) (Table 53). However, there was much greater variation in treatment levels across regions because of the climatic and artificial limitations on the spread of the tick. The highest incidence of treatment was in High Rainfall (78%) while all coastal and sub-coastal regions (Southern Speargrass, Northern Speargrass, NT/WA Speargrass and Gulf-Peninsula) recorded in excess of 60%. In regions west and south of the tick line in Queensland, fewer than six percent treated for ticks. For properties in regions infested with cattle tick, treatment was higher for properties with low (64%) and half (63%) Zebu content than for those with nil (43%) and high (44%) Zebu content. The level of treatment for cattle tick increased with the number of times the herd was mustered per year from 28 percent up to 67 percent for more than four times.

Only six percent of properties overall knew ticks were present but failed to treat, the highest figure being 15% in NT/WA Speargrass. These are surprisingly low figures given that 56% of properties run cattle with more than ⅜ Zebu infusion.

* Stock were treated for control of lice as a routine procedure on 27% of properties with highest figures in Southern Rolling Downs (76%) and Southern Aristida (67%) (Table 53). Incidence exceeded 25% in all regions except High Rainfall, Northern Speargrass, Southern Speargrass, Gulf-Peninsula and NT/WA Speargrass where fewer than 15% treated for lice.

Only four percent of properties failed to treat for lice when they knew lice were present. Highest values were in NT/WA Spinifex, Gulf-Peninsula and Central and Northern Rolling Downs (8-11%).

Table 39. Proportion (%) of properties supplementing various heifer age groups in normal and dry years.

Region	Supplementing in a normal year			Supplementing in a dry year		
	Weaners	Yearlings	2 year olds	Weaners	Yearlings	2 year olds
Overall	25	17	17	57	50	51
High Rainfall	35	28	19	58	51	45
Brigalow	10	4	3	43	36	39
S. Speargrass	28	15	17	59	45	49
Qld Bluegrass	17	12	8	53	49	49
S. Aristida	23	18	16	54	51	60
S. Rolling Downs	8	5	5	51	49	49
C & N Rolling Downs	14	10	11	56	51	53
Mulga Lands	10	5	6	60	56	59
Qld Spinifex	31	26	28	60	57	57
N. Speargrass	64	48	50	88	80	81
N. Aristida	74	63	60	90	90	86
Gulf-Peninsula	48	41	45	73	67	67
NT/WA Spinifex	25	21	21	43	38	35
NT/WA Speargrass	64	61	62	72	67	63

6.2.1 *Phosphorus status*

* Forty-two percent of producers considered their properties were phosphorus deficient while 19% were unsure (Table 40). As was to be expected, the proportions varied in the different regions because of the differences in phosphorus status of the soils. It is significant that in all regions, at least 19% of producers considered they had some phosphorus deficient soils on their properties. There is an obvious need for an educational program for producers as, in some regions, up to 42% of property owners were unsure whether or not their properties contained areas of phosphorus deficiency.

  The percentages of phosphorus deficient country on individual properties varied markedly both between and within regions. In High Rainfall, Northern Aristida, Gulf-Peninsula, Northern Territory and Western Australia, 60-77% of properties were considered totally deficient, with an overall figure of 42%.

* Various symptoms of phosphorus deficiency in livestock were observed with bone chewing (75%) and soil licking (42%) being the most common (Table 41). Peg leg (18%) and broken bones (11%) were seen less frequently. These symptoms were observed more frequently on properties which were phosphorus deficient, particularly bone chewing (80 v 61%) and peg leg (21 v 5%). Since bone chewing and soil licking are early symptoms of phosphorus deficiency in cattle and peg leg and broken bones occur in the more advanced stages of deficiency, these results are to be expected.

  Incidence of symptoms was higher in areas of lower soil phosphorus status and this was particularly so with the advanced symptoms of peg leg and broken bones.

6.2.2 *Attitude to feeding*

* Phosphorus supplements were fed routinely on 32% of properties overall (Table 42) which contrasts with the 42% of properties which were considered deficient. In fact, phosphorus supplements were fed on 66 percent of properties considered phosphorus deficient, on 15 percent where phosphorus status was unclear and on only two percent of properties considered not deficient. Further to this, supplements were fed on 77 percent of fully deficient properties and on 59 percent of partially deficient ones.

  Overall 57% of producers indicated they did not feed phosphorus because their properties were not deficient, which agrees closely with the previous question where 39% said their properties were not deficient and 19% were unsure. However, within some regions there was quite poor agreement. For example, in Gulf-Peninsula, 79% replied that properties were deficient while 47% indicated they did not

Table 40. Percentage of properties considered phosphorus deficient and, if deficient, proportion (%) affected.

Region	Not deficient	Unsure	Deficient	If deficient, proportion affected				
				<25	25-50	50-75	75-99	100
Overall	39	19	42	18	20	8	11	42
High Rainfall	19	25	56	8	15	3	10	64
Brigalow	62	18	19	43	28	11	9	9
S. Speargrass	31	23	46	20	20	7	16	37
Qld Bluegrass	46	21	33	15	34	9	11	32
S. Aristida	37	16	47	17	22	6	17	39
S. Rolling Downs	37	42	22	23	31	15	8	23
C & N Rolling Downs	63	14	23	21	23	13	5	38
Mulga Lands	26	25	49	24	22	15	10	29
Qld Spinifex	20	12	69	13	20	5	18	44
N. Speargrass	14	13	74	11	16	7	14	52
N. Aristida	7	10	83	2	10	14	2	71
Gulf-Peninsula	13	9	79	5	16	7	7	65
NT/WA Spinifex	14	20	66	11	18	4	7	60
NT/WA Speargrass	3	10	88	3	14	6	0	77

Table 41. Proportion (%) of phosphorus deficient properties observing various symptoms of deficiency.

Region	Bone chewing	Soil licking	Peg leg	Broken bones
Overall	75	42	18	11
High Rainfall	66	27	20	14
Brigalow	59	39	12	6
S. Speargrass	59	47	12	10
Qld Bluegrass	67	37	6	7
S. Aristida	50	72	11	11
S. Rolling Downs	61	72	6	6
C & N Rolling Downs	96	26	20	7
Mulga Lands	93	50	15	4
Qld Spinifex	99	36	18	10
N. Speargrass	77	48	20	14
N. Aristida	91	47	33	21
Gulf-Peninsula	100	38	36	28
NT/WA Spinifex	98	16	24	11
NT/WA Speargrass	92	61	45	21

Table 42. Proportion (%) of properties normally feeding phosphorus supplements, average number of years feeding and reasons for not feeding.

Region	Feeding phosphorus	Years of feeding	Reasons for not feeding phosphorus			
			Not deficient	Responses too small	Too costly	Problems in feeding
Overall	32	10	57	22	18	13
High Rainfall	47	12	21	24	39	30
Brigalow	10	11	70	20	9	9
S. Speargrass	33	10	44	24	28	14
Qld Bluegrass	21	12	64	25	11	12
S. Aristida	43	12	47	16	32	21
S. Rolling Downs	8	12	40	38	14	8
C & N Rolling Downs	22	9	77	15	7	5
Mulga Lands	33	16	53	18	16	13
Qld Spinifex	57	12	44	22	28	25
N. Speargrass	65	10	30	35	30	23
N. Aristida	73	8	20	7	87	27
Gulf-Peninsula	75	6	47	12	41	24
NT/WA Spinifex	48	7	32	29	26	42
NT/WA Speargrass	77	4	13	13	50	38

feed because properties were not deficient.

Additional reasons for not feeding phosphorus were - responses too small (22%), too costly (18%) and problems in feeding (13%). The relative importance of the different reasons varied between regions. High cost was the outstanding reason in Northern Aristida (87%), with individual regions giving a prevalence of 30-50%. While some properties in all regions recorded problems in feeding, incidence exceeded 20% in eight of the 14 regions, highest levels being recorded in Northern Territory and Western Australia.

It is obvious that reducing cost of phosphorus supplements and developing more effective delivery systems are significant issues for research and development (R&D). Despite these findings, more than 70% of properties in some northern regions feed phosphorus. The issue then is not to convince people to feed phosphorus but rather one of how well it is being done.

* On average, properties have been feeding supplements for ten years (Table 42). While there was some variation between regions, only Mulga Lands, Gulf-Peninsula, NT/WA Spinifex and NT/WA Speargrass deviated substantially from the mean. The longer average feeding period (16 years) in Mulga Lands would reflect the extension program mounted by the Queensland Department of Primary Industries (QDPI) following research by QDPI staff in the region in the early 1970s. By contrast, adoption of phosphorus feeding in far northern parts of Australia would reflect the generally recent adoption of technology in these extensive areas.

6.2.3 Classes of stock fed

* Virtually all properties which supplement with phosphorus (94%) feed their breeders (Table 43) indicating that they have identified this group as the most important class of animal. Incidence of feeding was lower in other animal classes with heifers being fed in 71% of cases.

The pattern of feeding across classes was reasonably similar across regions although some variation did occur. High Rainfall areas and Gulf-Peninsula had the highest feeding levels across all cattle classes.

The incidence of feeding indicates that, where producers identified phosphorus deficiency as an issue, they generally related it to the whole herd. However, they had rightly identified that breeding females are the most susceptible unit and fed a higher proportion of breeders and heifers.

* The proportion of properties feeding each of these classes was slightly higher if feeding was all year round (2 to 7%) and somewhat lower if feeding was in the wet (0 to 15%) or dry (5 to 11%) season only.

Table 43. Proportion (%) of properties supplementing with phosphorus who feed various classes of stock.

Region	Breeders	Heifers	Bulls	Weaners	Steers
Overall	94	71	66	65	49
High Rainfall	97	86	83	83	72
Brigalow	85	52	37	35	26
S. Speargrass	91	63	51	57	41
Qld Bluegrass	91	66	59	56	41
S. Aristida	95	79	68	68	47
S. Rolling Downs	100	67	78	56	56
C & N Rolling Downs	93	64	69	60	36
Mulga Lands	100	53	75	67	39
Qld Spinifex	100	76	82	70	48
N. Speargrass	95	88	76	81	65
N. Aristida	100	77	75	73	59
Gulf-Peninsula	98	90	86	79	67
NT/WA Spinifex	94	77	77	83	63
NT/WA Speargrass	84	74	77	77	68

6.2.4 *Time of feeding*

* Of those feeding phosphorus, almost half fed all year round, while nine percent fed in the wet season only (Table 44). The remaining 43% fed only during the dry season. The patterns were reasonably consistent across regions, although more than 20% in Southern Rolling Downs, Gulf-Peninsula and NT/WA Speargrass fed only during the wet season. Since the major benefits accrue from feeding during the period of positive weight change, there is a need to modify the feeding strategies to get greater emphasis on wet season feeding.

  The main reason given by producers who did not feed during the wet season was that phosphorus was not required (48%) (Table 44). Other key reasons were that animals would not eat it (32%) or animals too spread out (20%), while inability to deliver (24%) and spoilage (15%) rated highly as well.

  There is an obvious need for an education program to inform industry of the need for phosphorus during the wet season. Effective delivery systems must either be developed or ones being practised successfully by some producers need to be demonstrated more widely.

  Significantly, in the northern regions of Northern Aristida, Gulf-Peninsula and NT/WA Speargrass, most producers realised phosphorus was needed in the wet but highlighted delivery problems and spread of cattle as key concerns in implementing an effective feeding program.

6.2.5 *Phosphorus sources*

* Mono-ammonium phosphate (MAP) (55%) was the most common phosphorus source being used, with proprietary mixes (31%) being the second most popular (Table 45).

  Usage of MAP was highest in Northern Aristida (84%) and Queensland Spinifex (79%). Proprietary mixes were used more frequently in the Gulf-Peninsula, NT/WA Spinifex and NT/WA Speargrass (42-57%) than in other areas.

  In some regions more than 20% of producers used diammonium phosphate or superphosphate.

  Dicalcium phosphate (DCP) was being used on five percent of properties with the highest level of 14% in Northern Aristida. This is a function of the recommendation by QDPI during 1990 that producers cease using MAP and change to DCP to avoid problems with cadmium and fluorine contamination.

Table 44. Proportion (%) of properties feeding phosphorus who feed at various times of the year and reasons for not feeding in the wet season.

Region	All year	Wet season only	Dry season only	Reasons for not feeding in the wet season				
				Too spread out	Will not eat it	Not required	Feed spoils	Cannot deliver it
Overall	47	9	43	20	32	48	15	24
High Rainfall	50	6	44	0	33	52	22	15
Brigalow	43	7	51	8	29	61	10	8
S. Speargrass	50	7	42	12	32	52	13	15
Qld Bluegrass	50	6	44	13	38	63	13	19
S. Aristida	59	12	29	18	36	73	0	0
S. Rolling Downs	20	20	60	21	29	50	0	7
C & N Rolling Downs	35	9	57	16	44	51	4	20
Mulga Lands	39	3	58	20	33	70	13	10
Qld Spinifex	60	2	38	36	33	24	30	39
N. Speargrass	52	11	37	22	32	34	26	46
N. Aristida	47	18	36	45	32	23	32	55
Gulf-Peninsula	38	24	38	58	29	17	21	63
NT/WA Spinifex	50	3	47	33	33	50	6	28
NT/WA Speargrass	42	23	35	50	10	15	20	65

Table 45. Proportion (%) of properties supplementing with phosphorus who use various sources of phosphorus.

Region	MAP	Proprietary mix	DAP	Superphosphate	Dicalcium phosphate
Overall	55	31	7	11	5
High Rainfall	38	8	14	30	5
Brigalow	45	33	3	1	8
S. Speargrass	58	30	5	13	6
Qld Bluegrass	29	29	6	9	6
S. Aristida	15	35	0	15	0
S. Rolling Downs	38	13	0	25	0
C & N Rolling Downs	71	17	7	10	2
Mulga Lands	63	31	0	11	0
Qld Spinifex	79	31	2	4	4
N. Speargrass	61	33	13	16	6
N. Aristida	84	27	23	14	14
Gulf-Peninsula	63	42	7	5	2
NT/WA Spinifex	24	48	6	3	0
NT/WA Speargrass	33	57	10	13	3

* There was no single feeding system which was more popular than others (Table 46). Combinations with salt and molasses were used widely while mixtures with salt and nitrogen sources were also popular. The popularity of salt and molasses as carriers varied across regions with no consistent pattern. One might expect usage of molasses to be highest on the coast and in close proximity to sugar mills. This tended to be so with High Rainfall and Southern Speargrass.

6.2.6 *Perceived benefits of feeding*

* Producers perceived many benefits from phosphorus feeding, the most important (75%) being increased cow survival (Table 47). Improved branding rates (63%) and better cow liveweight and condition (62%) also figured prominently. This is in keeping with the high incidence of breeder supplementation highlighted earlier. These benefits are easily identified and are visible.

  Increased weaning weights were identified to a lesser extent (39%) as was reduced incidence of peg-leg (26%). Since peg leg is a symptom of advanced phosphorus deficiency, it is not surprising that it figured less prominently.

  Surprisingly, only 29% of producers identified increased steer growth as a benefit while 49% actually fed steers.

* Producers who supplemented breeders had higher rates of perceived benefits of phosphorus feeding than those who did not. Differences were 31 percent for increased cow survival, 51 percent for increasing branding, 38 percent for improved cow liveweight and condition, 22 percent for increased weaning weights and 13 percent for reduced incidence of peg leg. Patterns were similar when heifers were supplemented with differences of 18, 23, 20, 31 and 11 percent, respectively. Benefits in terms of higher steers growth were perceived by 29 percent more producers who supplemented weaners and by 45 percent more who supplemented steers.

  The importance of various benefits was reasonably consistent across regions although reduced incidence of peg leg featured more prominently in areas of more severe deficiency. In Southern Rolling Downs and Mulga Lands much more emphasis was given to increased breeder survival than to increased brandings. This may result from observations by QDPI in Mulga areas in the early 70s which failed to show responses in branding rates to phosphorus feeding.

  Increased steer growth was considered of very little importance in Mulga Lands even though 39% of producers fed steers. This suggests that steers are being fed for other reasons, possibly that they are not segregated from breeders.

Table 46. Proportion (%) of properties feeding phosphorus who use various combinations for feeding.

Region	With salt	With molasses	With urea/salt	With urea/salt/ protein meal	In other ways
Overall	34	35	22	25	34
High Rainfall	29	59	21	9	21
Brigalow	21	22	16	8	56
S. Speargrass	28	54	9	19	36
Qld Bluegrass	28	19	13	22	41
S. Aristida	41	12	6	24	47
S. Rolling Downs	56	11	33	11	11
C & N Rolling Downs	34	32	30	39	25
Mulga Lands	34	34	16	18	42
Qld Spinifex	46	32	42	24	24
N. Speargrass	37	29	34	37	30
N. Aristida	57	30	25	39	25
Gulf-Peninsula	67	43	26	21	19
NT/WA Spinifex	10	17	33	47	40
NT/WA Speargrass	21	10	31	41	31

Table 47. Percentage of properties identifying various perceived benefits of phosphorus feeding.

Region	Cow survival	Branding	Cow liveweight and condition	Weaning weights	Steer growth	Incidence of peg leg
Overall	75	63	62	39	29	26
High Rainfall	67	76	64	52	39	15
Brigalow	58	44	42	21	23	6
S. Speargrass	72	63	59	33	32	17
Qld Bluegrass	61	52	61	48	21	18
S. Aristida	60	67	67	47	27	0
S. Rolling Downs	78	22	67	33	22	11
C & N Rolling Downs	73	62	53	33	16	29
Mulga Lands	67	31	67	31	5	26
Qld Spinifex	83	63	69	33	19	48
N. Speargrass	83	73	66	48	40	32
N. Aristida	81	83	69	57	38	52
Gulf-Peninsula	86	80	61	39	30	43
NT/WA Spinifex	94	61	76	45	33	30
NT/WA Speargrass	81	69	72	44	44	34

6.3 Other supplements

A wide range of supplements other than phosphorus were fed to cattle across the survey area (Table 48).

* Hay (47%) and molasses (43%) were used most frequently while grain was used in only 17% of cases.

* Salt (37%) was used extensively either as a carrier for other supplements or as a supplement in its own right. Significantly, usage of salt was low on Brigalow country and Queensland Bluegrass where experience has shown that acceptance by stock of supplements containing salt is often low.

* Usage of nitrogen supplements was quite widespread with both non-protein nitrogen (urea) and true protein sources (cottonseed, cottonseed meal and meat meal) figuring prominently (Table 48). Urea usage was greater in more extensive, northern regions than in the more intensive areas reflecting better economic benefits from urea feeding in these areas. Whole cottonseed has increased in popularity as a result of experiences in recent droughts and was used by 14% of properties in some regions. Usage of protein meals varied widely in different regions. Cottonseed meal was used extensively in Southern and Northern Speargrass, Northern Aristida and Gulf-Peninsula. This is probably a reflection of research conducted in the Burnett region (Alexander, Sullivan and Stokoe 1970) and at Swan's Lagoon (Lindsay and Loxton 1981) and promoted by QDPI staff through producer demonstrations, field days and media releases.

  In NT/WA Speargrass, meat meal is preferred, probably because of a combination of availability and price.

* Both sulphur and calcium are used quite extensively (Table 48). Sulphur usage would be related to the use of urea to correct nitrogen deficiency and the need to maintain an acceptable N:S ratio in the supplement. Where molasses is used as the carrier, sulphur is not a problem, but where salt is the carrier, sulphur should be added. The frequency of sulphur usage suggests that this recommendation has been widely adopted. The higher incidence of urea and sulphur feeding in northern regions would tend to support this hypothesis.

  However, there are other possible reasons for feeding sulphur. Some producers believe that feeding sulphur helps in tick control. Responses to sulphur feeding on basalt areas have also been recorded and sulphur feeding is recommended.

Description of Production Land Classes

Each of the resultant 50 PLCs is described below. The PLCs are grouped into aggregate units. The constituent pasture groups from Weston's and Moore's work are also given.

Regional Group Number: 1

Regional Group Name: High Rainfall (As a group these are equivalent to Weston's: a - Rainforest; b - Littoral; c - Heath and Blady Grass).

Constituent PLC Numbers: 1 2 3 4 5 6 7 8

PLC Descriptions:

1. Rainforests on complexes of duplexes.
   These are podsolic soils under largely cleared rain forests developed on metamorphic geology.
2. Rainforests on weathered clays and loams.
   These mainly cleared rainforests are developed from predominantly basalts and related geology.
3. Rainforests on earths.
4. Littoral and Coastal Vegetation on non cracking clays and sands.
5. Blady grass on sands.
6. Blady grass on loams and earths.
7. Blady grass on sands and earths.
8. Blady grass on earths.

Regional Group Number: 2

Regional Group Name: Brigalow (equivalent to the clay dominant areas of Weston's: Brigalow Pastures and Aristida communities where Brigalow, Aristida and Cypress communities are complex).

Constituent PLC Numbers: 19 28 29

PLC Descriptions:

19. Brigalow Pastures on clay and duplexes.
28. Mixed Aristida/Eragrostis on duplexes with clay (Brigalow and Cypress areas).
29. Aristida/Eragrostis on Cypress pine duplex.

Regional Group Number: 3

Regional Group Name: Southern Speargrass (equivalent to Weston's: Black Speargrass south of Mackay).

Constituent PLC Numbers: 13 14 15 16

PLC Descriptions:

13. Speargrass on duplexes and loams - Central Queensland.
14. Speargrass on sands and earths - near Coastal Areas.
15. Speargrass on earths and duplexes - South Inland.
16. Speargrass on loams and duplexes - Border Area and Ranges/Foothills.

Regional Group Number: 4

Regional Group Name: Queensland Bluegrass (equivalent to Weston's).

Constituent PLC Numbers: 17 18

PLC Descriptions:

17. Bluegrass on clays and loams - Central Queensland.
18. Bluegrass on clays - Southern Queensland.

Regional Group Number: 5

Regional Group Name: Southern Aristida (equivalent to an association of all Weston's: Aristida groups and Bothriochloa groups).

Constituent PLC Numbers: 21 22 23 26 30

PLC Descriptions:

21. Aristida and Chrysopogon on friable acid duplexes and sands.
22. Aristida, Eragrostis and others on sands and duplexes.
23. Bothriochloa, Aristida, Eragrostis and others on earths and sands.
26. Bothriochloa, Chloris, Aristida, Eragrostis and others on earths and sands.
30. Bothriochloa, Stipa, Danthonia, Aristida and Eragrostis on sands and acid duplexes (Southern Traprock).

Regional Group Number: 6

Regional Group Name: Southern Rolling Downs (a subdivision of Weston's: p - Rolling Downs).

Constituent PLC Numbers: 37

PLC Descriptions:

37. Rolling Downs with clays and duplexes.

Regional Group Number: 7

Regional Group Name: Central and Northern Rolling Downs (a subdivision of Weston's: p - Rolling Downs).

Constituent PLC Numbers: 38 39

PLC Descriptions:

38. Rolling Downs on clays and earths.
39. Rolling Downs on clays.

Regional Group Number: 8

Regional Group Name: Mulga Lands (equivalent to Weston's: Mulga groups).

Constituent PLC Numbers: 33 35 36

PLC Descriptions:

33. Soft and Hard Mulga lands on earths.
35. Residual Mulga on earths and duplexes.
36. Mixed Mulga on loams and earths (33 and 35).

Regional Group Number: 9

Regional Group Name: Queensland Spinifex (a subdivision of Weston's: p - Rolling Downs and includes Weston's: q - Stony Downs and variable areas of Bluegrass - Browntop, Channel Pastures, Gidgee in Western Queensland and Spinifex Lands, equivalent to Weston's: s - Central; t - Western; u - North West Spinifex).

Constituent PLC Numbers: 32 40 41 43 45 46 51

PLC Descriptions:

32. Gidgee on loams and earths.
40. Complex of Rolling Downs and Bluegrass-Browntop on clays.
41. Complex of Rolling Downs and Spinifex on clays and earths.
43. Central Spinifex on sands and earths (Central Queensland 'Desert').
45. Western Spinifex.
46. North West Spinifex on sands and earths.
51. Ashy Downs and Channel Pastures.

Regional Group Number: 10

Regional Group Name: Northern Speargrass (equivalent to Weston's: Black Speargrass north of Mackay).

Constituent PLC Numbers: 9 10 11 12

PLC Descriptions:

9. Speargrass on loams - mainly Far North Queensland.
10. Speargrass on sands and earths - Far North Inland.
11. Speargrass on sands and alkaline duplexes - Upper Burdekin.
12. Speargrass on alkaline and acid duplexes - Bowen Coastal.

Regional Group Number: 11

Regional Group Name: Northern Aristida (equivalent to Weston's: d - Aristida - Chrysopogon).

Constituent PLC Numbers: 20

PLC Descriptions:

20. Aristida - Chrysopogon pastures on earths and sands.

* Vaccination against tick fever, commonly known as Redwater, was practised by 28% of producers with the highest incidence being 52% in Southern Speargrass (Table 53). West and south of the tick line very few producers vaccinated cattle against this parasite.

  Significantly, virtually all producers treated for this disease when they knew it was present. The organism is endemic in the tick infested area of northern Australia but a large percentage of owners do not vaccinate against tick fever. This suggests that they are unaware their cattle are vulnerable to an attack of tick fever.

7.3 Internal parasites

Many different species of helminths can infest grazing beef cattle in northern Australia especially prior to two years of age. The survey questionnaire was designed to establish producer attitudes to control of worms and flukes.

* Worms were the internal parasite of most concern to producers with 39% of properties imposing routine control programs (Table 54). Incidence of treatment was closely related to rainfall levels with 72% of properties treating in High Rainfall and 64% in Southern Speargrass while fewer than 15% treated in Central and Northern Rolling Downs and NT/WA Spinifex.

  A low percentage (5%) of producers failed to treat for worms even though they knew worms were present. The peak level was 13% in Gulf-Peninsula.

* Liverfluke is obviously not viewed as a problem in northern Australia as only High Rainfall (11%) and Southern Aristida (14%) recorded a significant percentage of properties treating for liverfluke control (Table 54). Virtually all properties who were conscious of the presence of liverfluke imposed some control program.

7.4 Reproductive diseases

The impact of reproductive diseases on overall branding rate of herds in northern Australia is unclear. Many believe that adequate nutrition and management are the keys to successful reproductive rates.

Leptospirosis and vibriosis are diseases which can affect the outcome of a mating program and vaccination strategies have been developed. In the survey, we aimed to quantify the incidence of properties which implemented a vaccination program to control these diseases.

* Nineteen percent of properties vaccinated breeders against leptospirosis with incidence being much higher in the more intensive regions (Table 55). At least 30% of properties in Southern Rolling Downs, Brigalow and Southern Aristida treated, while fewer than seven percent of

Table 54. Proportion (%) of properties routinely treating for internal parasites or aware of their presence but not treating.

Region	Worms		Liverfluke	
	Treated	Aware/ untreated	Treated	Aware/ untreated
Overall	39	5	2	0.3
High Rainfall	72	3	11	0
Brigalow	35	4	0	0
S. Speargrass	64	4	4	1
Qld Bluegrass	45	2	1	0
S. Aristida	54	7	14	2
S. Rolling Downs	27	8	0	0
C & N Rolling Downs	13	4	0	0
Mulga Lands	16	5	0	0
Qld Spinifex	19	2	0	0
N. Speargrass	41	9	0	0
N. Aristida	17	5	0	0
Gulf-Peninsula	18	13	0	0
NT/WA Spinifex	10	7	0	0
NT/WA Speargrass	33	3	0	0

Table 55. Proportion (%) of properties routinely treating for reproductive diseases or aware of their presence but not treating.

Region	Leptospirosis		Vibriosis	
	Treated	Aware/ untreated	Treated	Aware/ untreated
Overall	19	3	16	1
High Rainfall	14	1	8	3
Brigalow	31	3	19	0
S. Speargrass	20	2	19	0
Qld Bluegrass	25	3	14	0
S. Aristida	30	0	23	2
S. Rolling Downs	35	3	20	0
C & N Rolling Downs	7	4	14	3
Mulga Lands	20	3	15	2
Qld Spinifex	5	1	12	1
N. Speargrass	5	2	13	3
N. Aristida	7	5	13	8
Gulf-Peninsula	0	7	16	2
NT/WA Spinifex	0	0	1	0
NT/WA Speargrass	3	3	8	5

properties in extensive regions did so.

Very few producers (3%) indicated they were aware of the presence of the disease but failed to treat for it. Leptospirosis is endemic in beef herds in northern Australia (Holroyd 1977), so an education program may be warranted to inform producers of the potential risks of outbreaks.

* Percentage of properties vaccinating against vibriosis was much more uniform with few regions deviating from the overall mean of 16% (Table 55). Those with a low incidence of treatment were NT/WA Spinifex (1%), High Rainfall (8%) and NT/WA Speargrass (8%).

Only one percent of producers were aware of the presence of vibriosis in their herds but failed to vaccinate, although the figure was eight percent in Northern Aristida.

7.5 Clostridials

* The risk from Clostridial diseases is obviously well recognised in some regions as 49% of properties overall routinely vaccinated with 5-in-1 (Table 56). However, variation between regions was extremely high. Highest incidence (65-80%) occurred in Southern Speargrass, Queensland Bluegrass, Southern Aristida and Brigalow. At the other extreme, fewer than five percent of properties in NT/WA Spinifex, Gulf-Peninsula, Northern Aristida and Central and Northern Rolling Downs vaccinated.

Virtually all producers who recognise that the diseases covered by 5-in-1 exist in their area implement a vaccination program.

* Vaccination against botulism was practised widely in extensive regions with highest levels in Northern Aristida (75%), Gulf-Peninsula (71%), NT/WA Speargrass (65%) and Queensland Spinifex (52%) (Table 56). Overall, very few producers considered (<1%) botulism was present but failed to vaccinate, although figures were higher (8-10%) in NT/WA Speargrass and NT/WA Spinifex. Vaccination rates were higher (46 v 25%) on properties where bone chewing was observed as a symptom of phosphorus deficiency.

Incidence of botulism is closely associated with phosphorus deficiency. In this survey 61 percent of producers who indicated their properties were phosphorus deficient did not vaccinate against botulism. There is an obvious need for an increase in the usage of botulism vaccine. Among properties which were phosphorus deficient, the proportion vaccinating increased from 20 to 50 percent as the part of the property affected increased from less than a quarter to the whole property. Producers who fed phosphorus supplements were more likely to vaccinate against botulism than those who did not (45 v 7%).

Table 56. Proportion (%) of properties routinely treating for clostridial and viral diseases or aware of their presence but not treating.

Region	Covered by 5-in-1		Botulism		3-day sickness	
	Treated	Aware/ untreated	Treated	Aware/ untreated	Treated	Aware/ untreated
Overall	49	0.2	19	1	14	12
High Rainfall	50	1	32	1	19	18
Brigalow	65	0	3	0	21	11
S. Speargrass	80	0	14	1	19	14
Qld Bluegrass	69	0	5	0	15	10
S. Aristida	67	0	0	0	7	9
S. Rolling Downs	52	0	0	0	8	2
C & N Rolling Downs	3	1	22	1	6	16
Mulga Lands	12	0	2	1	10	6
Qld Spinifex	12	0	52	1	7	16
N. Speargrass	26	0	42	1	7	16
N. Aristida	3	0	75	2	8	15
Gulf-Peninsula	2	0	71	2	4	11
NT/WA Spinifex	1	0	30	8	0	1
NT/WA Speargrass	18	0	65	10	8	8

7.6 Viral diseases

The principal viral disease addressed in the survey was Bovine Ephemeral Fever or 3-day sickness.

* Fourteen percent of producers vaccinated against 3-day sickness with highest levels (19-21%) in Brigalow, High Rainfall and Southern Speargrass (Table 56). However 10 of the 14 regions had an incidence of 10% or less.

  Twelve percent of producers were aware of the presence of the disease but did not vaccinate. This was reasonably uniform across regions although NT/WA Spinifex and Southern Rolling Downs differed markedly from the mean. Ephemeral fever is endemic in northern Australia and it is remarkable that so few people are aware of its presence. The highest incidence of producers aware of its existence was only 37% in the High Rainfall region.

8. MARKETING

One of the most important but often not recognised operations in the management of a beef enterprise is the marketing of the turnoff. On many properties, general management of the enterprise can be of a high standard but poor marketing strategies result in a less than optimal financial outcome.

The survey sought to obtain information on production statistics as well as marketing practices in the various regions.

Responses were analysed initially by property to give proportions of producers following various marketing strategies. The figures were then weighted by numbers of stock on each property to give proportions of stock being marketed in different ways.

8.1 Turnoff data

* Annual turnoff of stock throughout the survey area averaged 646 head, with a wide range from 290 in Southern Speargrass to 1 965 in NT/WA Spinifex (Table 57). These two regions had similar turnoff percentages (turnoff as a percentage of total branded cattle) which were similar to the mean for all properties (32%).

* There was wide variation in turnoff rates between regions with a range of 17% (NT/WA Speargrass) to 47% (Southern Aristida/Southern Rolling Downs). The figure for NT/WA Speargrass is an extremely low figure reflecting low branding rates, high breeder mortality and sale of prime steers at older ages (65% greater than three years). By contrast, Southern Aristida and Southern Rolling Downs had much higher branding rates, lower breeder mortality and the majority of properties sold steers at less than three years.

  As would be expected, turnoff rates were higher in more favoured regions and lower in the more extensive areas. Turnoff from the Mulga region was high.

* Males comprised 64% of sales overall with a range of 45% in Southern Aristida to 81% in Mulga Lands. The extremely low figure for Southern Aristida suggests that a sampling error may have occurred. In this region, female turnoff varied dramatically between properties as did property size. Differences in the sample of properties replying to the various questions may have produced an anomalous result.

8.2 Age at sale

* Eighty one percent of properties sold store steers, a surprisingly high figure overall (Table 58). The most common age to sell store steers was one to two years with 45% of properties selling at that age. While this trend was common to all regions, the percentage of properties

Table 57. Average number of cattle sold, turnoff as percentage of herd size and male percentage of sales.

Region	Number of cattle sold	Turnoff percentage	Male percentage of sales
Overall	646	32	64
High Rainfall	507	44	79
Brigalow	512	38	65
S. Speargrass	290	31	61
Qld Bluegrass	447	36	62
S. Aristida	387	47	45
S. Rolling Downs	421	47	61
C & N Rolling Downs	1063	37	58
Mulga Lands	797	42	81
Qld Spinifex	1150	33	67
N. Speargrass	629	25	67
N. Aristida	522	23	66
Gulf-Peninsula	1878	28	68
NT/WA Spinifex	1965	29	58
NT/WA Speargrass	1596	17	61

Table 58. Percentage of properties using various ages at sale for store steers and prime steers and intending to change to younger turnoff.

Region	Age at sale for store steers				Age at sale for prime steers				Planning younger turnoff
	Not sold	<1 year	1-2 years	2-3 years	<2 years	2-3 years	3-4 years	>4 years	
Overall	19	14	45	20	11	41	33	7	29
High Rainfall	19	21	51	9	10	29	33	6	13
Brigalow	30	11	45	13	12	57	24	2	33
S. Speargrass	25	17	33	22	6	27	49	10	35
Qld Bluegrass	24	14	49	12	28	42	23	2	22
S. Aristida	21	6	58	12	16	54	16	3	29
S. Rolling Downs	6	26	55	13	22	55	10	2	19
C & N Rolling Downs	13	15	48	24	12	54	26	1	17
Mulga Lands	5	17	61	18	21	44	29	3	25
Qld Spinifex	11	18	46	23	1	43	38	6	31
N. Speargrass	14	9	44	30	2	19	48	19	28
N. Aristida	12	12	37	37	0	11	41	24	24
Gulf-Peninsula	10	6	44	27	0	21	28	36	42
NT/WA Spinifex	6	17	56	22	7	32	37	18	30
NT/WA Speargrass	13	0	47	38	3	19	42	23	41

selling two to three year old steers was greater in the extensive northern areas than in the more intensive areas. Properties without any improved country sold a greater proportion (30 v 17%) of two to three year old steers than those with some improved country.

Retaining steers to older ages of turnoff reduces the number of breeders which must be carried to maintain a constant grazing pressure. This reduces the drought risk on the property and the susceptibility to adverse seasonal events.

* The spread of age at sale of prime steers highlighted the problems faced by the North Australian Beef Industry in producing a consistent, tender product (Table 58). Only eleven percent of properties turned off prime steers at less than two years, the age identified by meat quality experts (Shorthose and Harris 1990) as heralding the rapid increase in connective tissue toughness. Most properties (74%) sold prime steers at two to four years with seven percent selling at older ages still. For properties without any improved country, 13 percent of turn off of prime steers was aged more than four years.

As might have been anticipated, very few properties in the extensive regions and Southern Speargrass sold at less than two years. The percentages of properties in these regions selling at more than four years was also higher than the mean reflecting overall nutritional levels available in these regions and the extended period needed to reach target carcase weights of 300 kg which are sought for the Japanese market. This was most pronounced in the Gulf-Peninsula where no properties sold prime steers under two years and 36% sold at more than four years.

* In line with a desired reduction in age at slaughter to meet market requirements, especially in domestic markets and premium export markets in the Asia-Pacific Region, 29% of producers indicated an intention to turn animals off at younger ages (Table 58). In Gulf-Peninsula and NT/WA Speargrass, the figure was more than 40%. This will result in an increase in breeder numbers on these properties and suggests that producers have accepted that technology exists for them to effectively manage the increased breeder numbers while increasing net income.

In High Rainfall, Southern Rolling Downs and Central and Northern Rolling Downs regions, percentage of producers intending to reduce age of turnoff (13-19%) was well below the mean figure. In these regions, the majority of producers were already turning off steers, either store or prime, by three years of age.

* Producers who currently turn off prime steers and store steers at higher ages were more inclined to change to younger ages at turnoff. These rates were 15 percent for turnoff by two years of age, 28 percent by three years, 43 percent by four years and 48 percent at more than four years for prime steers and 10 percent for turnoff by one year, 28 percent by two years, 32 percent by three years and 58 percent for greater than three years for store steers. There was a similar but less pronounced trend for turnoff of heifers but no pattern across ages at turnoff for cull cows and cull bulls.

* Ninety-three percent of properties sold heifers, although the figures were much lower in extensive areas such as NT/WA Speargrass (48%), Northern Aristida (57%) and Gulf-Peninsula (59%) (Table 59). Even in Northern Speargrass only 80% of properties sold heifers.

  Most properties (56%) sold heifers as yearlings with the remainder of properties being divided equally between younger and older ages. This pattern tended to be consistent across regions.

* Cull cows were sold at a range of ages but the most common was five to ten years (Table 59). Twenty-four percent indicated they sold at more than ten years of age. This compares with the culling information from an earlier question where only five percent said they culled at more than 10 years. One possible explanation is that many cows which are culled from the breeding herd at ten years are retained for sale the following year after either calving and weaning their calf or fattening during the next wet season after weaning.

  Again the pattern was quite consistent across regions although some regions (Central and Northern Rolling Downs, Mulga Lands and NT/WA Spinifex) tended to sell more young cows (less than five years) and fewer old cows (greater than ten years).

  There were some regions where anomalies existed between age at culling of cows and age at sale of cows. In the High Rainfall region four percent of producers indicated they culled cows before eight years but ten percent said they sold their cull cows at less than five years.

* Cull bulls were sold at a range of ages but five to ten years was the most common (72%) age group (Table 59). Sixteen percent of properties sold cull bulls at less than five years of age. As was indicated earlier, accelerating turnover of bulls allied with adequate objective selection criteria would enhance the rate of genetic progress and possibly branding rates in the northern beef herd.

* Sales for each class of stock were also weighted by the number of cattle on the property to indicate the volume of sales for various ages. On this basis, the proportion of store steers sold at up to one year decreased from 14 to 8 percent and the proportion sold at one to two

Table 59. Percentage of properties using various ages at sale for cull heifers, cull cows and cull bulls.

Region	Age at sale for heifers				Age at sale for cull cows			Age at sale for cull bulls		
	Not sold	<1 year	1-2 years	2-3 years	<5 years	5-10 years	>10 years	<5 years	5-10 years	>10 years
Overall	7	17	56	18	9	67	24	16	72	10
High Rainfall	6	13	60	19	10	63	27	22	67	9
Brigalow	2	19	64	14	6	69	24	20	70	8
S. Speargrass	4	14	46	32	5	71	23	14	77	7
Qld Bluegrass	1	23	60	16	3	68	28	12	73	12
S. Aristida	0	31	56	13	6	67	28	9	82	9
S. Rolling Downs	2	23	70	5	2	62	36	13	78	9
C & N Rolling Downs	8	21	54	17	24	59	16	17	74	6
Mulga Lands	10	15	73	1	22	66	13	22	66	12
Qld Spinifex	13	14	58	16	12	68	20	13	76	10
N. Speargrass	20	7	48	20	5	62	31	12	70	17
N. Aristida	43	17	29	12	8	60	31	12	70	18
Gulf-Peninsula	41	9	47	3	7	58	31	9	70	19
NT/WA Spinifex	11	31	53	4	17	66	17	18	65	17
NT/WA Speargrass	52	0	33	14	13	63	25	17	69	14

years increased from 45 to 54 percent. These increases for the one to two years class were most apparent for Queensland Bluegrass (49 to 69%), Central and Northern Rolling Downs (48 to 70%), Gulf-Peninsula (44 to 69%) and NT/WA Spinifex (56 to 72%) but were balanced by decreases for High Rainfall (51 to 33%), Queensland Spinifex (46 to 36%) and Northern Aristida (37 to 24%).

* The weighted proportions for ages at sale for prime steers changed from 11 to 5 percent for less than two years, 41 to 29 percent for two to three years , 33 to 43 percent for three to four years and 7 to 14 percent for greater than four years. Hence the trend was for a greater volume of turnoff of prime steers at higher ages. The regions contributing most to this changed emphasis for the three to four years class were High Rainfall (33 to 53%), Queensland Bluegrass (23 to 38%), Queensland Spinifex (38 to 65%), Gulf-Peninsula (28 to 46%) and NT/WA Spinifex (37 to 59%). The change for Mulga Lands (29 to 15%) opposed this pattern.

* Changes in the age distribution at turnoff were less pronounced for the remaining classes of stock. For heifers the changes with weighting for volume were 7 to 13 percent for not sold, 17 to 12 percent for less than one year, 56 to 53 percent for one to two years and 18 to 19 percent for two to three years. Changes to regional patterns were most pronounced for Mulga Lands, Queensland Spinifex and Gulf-Peninsula.

* For cull cows the changes were 9 to 6 percent for up to five years, 67 to 66 percent for five to 10 years and 24 to 27 percent for greater than 10 years. The regions most affected were High Rainfall with lowered ages and Central and Northern Rolling Downs, Mulga Lands, NT/WA Spinifex and NT/WA Speargrass with higher ages at turnoff. Patterns were similar for cull bulls with changes of 16 to 9 percent for up to five years, 72 to 75 percent for five to 10 years and 10 to 15 percent for greater than 10 years. For Northern Speargrass and NT/WA Spinifex there were higher proportions turned off at greater than 10 years while this proportion was lower for Mulga Lands, Gulf-Peninsula and NT/WA Speargrass.

8.3 Purchasing stores

* The movement of store cattle throughout northern Australia was highlighted by the 43% of properties who purchased store cattle (Table 60). While there was considerable variation between regions, at least 12% of properties in all regions bought stores. Properties using hormonal growth promotants were more likely to purchase steers for fattening (53 v 40%).

As would be expected, the percentages were much higher in intensive areas which support higher steer growth rates, for example, Brigalow, Queensland Bluegrass and Central and Northern Rolling Downs, than

Table 60. Percentage of properties buying store cattle and ages at purchase.

Region	Buying store cattle	Age purchase at		
		<1 year	1-2 years	2-3 years
Overall	43	14	64	19
High Rainfall	44	6	59	34
Brigalow	56	13	69	15
S. Speargrass	41	14	57	26
Qld Bluegrass	50	12	68	18
S. Aristida	28	46	46	8
S. Rolling Downs	45	17	63	17
C & N Rolling Downs	48	11	70	17
Mulga Lands	30	17	67	17
Qld Spinifex	36	21	50	21
N. Speargrass	24	16	61	18
N. Aristida	12	14	86	0
Gulf-Peninsula	14	17	67	17
NT/WA Spinifex	39	24	44	24
NT/WA Speargrass	15	0	44	56

in extensive areas where growth rates are lower, for example, Northern Aristida, Gulf-Peninsula and NT/WA Speargrass.

The most common age for purchasing stores was as yearlings (64%) although 14% of properties bought them at less than one year old. While this trend was fairly consistent, almost half of those buying stores in Southern Aristida bought at less than one year old reflecting the prominence of special weaner sales held in this region. If producers are to achieve turnoff weights for Asian markets by a maximum of 30 months, it is important that every effort be made to increase the percentage of properties buying in stores for finishing at younger ages.

While only 15% of producers in NT/WA Speargrass buy store cattle, 56% of these buy at two to three years. This would be governed by availability of stores at younger ages and the difficulty in finishing young animals in this environment. At least a quarter of properties buying stores in High Rainfall, Southern Speargrass and NT/WA Spinifex, did so at two to three years. There is a need to examine the feasibility of reducing the age at purchase of these stock.

In contrast with the above, 12% of properties in Northern Aristida buy stores but none does so at more than two years.

8.4 Selling methods

Producers have a wide range of options for selling stock including via saleyards, paddock sales, direct to slaughter and via CALM. The survey sought to determine the usage of these different methods for various classes of stock.

* Virtually all properties (93%) sold prime steers indicating that only a very small percentage are strictly store producers (Table 61). Incidence of straight store production varied markedly between regions with no consistent pattern. The highest value (23%) occurred in the Northern Aristida region with High Rainfall areas providing the next highest level (18%).

  Direct to slaughter was the most popular method (49%) of selling prime steers, although 33% of properties sold through saleyards. However, these mean values were not representative as enormous regional differences occurred. In the Southern Speargrass where a large number of abattoirs operate, 69% of properties sell direct. However, in the Mulga Lands and Southern Rolling Downs, more than 60% sell via saleyards.

* Properties using hormonal growth promotants made greater use of direct consignment for slaughter (66 v 44%) for prime steers and bullocks and correspondingly less use of saleyards (16 v 37%) for this class of stock.

Table 61. Proportion (%) of properties using various selling methods for prime steers.

Region	Not sold	Direct to works/ butchers	Saleyards	Paddock sales	CALM	Property transfer	Live export
Overall	7	49	33	6	3	1	1
High Rainfall	18	54	23	5	0	0	0
Brigalow	4	55	31	6	4	0	0
S. Speargrass	7	69	21	2	1	1	0
Qld Bluegrass	3	36	46	5	5	2	2
S. Aristida	11	29	45	5	8	3	0
S. Rolling Downs	9	15	60	0	9	7	0
C & N Rolling Downs	6	34	36	22	3	0	0
Mulga Lands	3	19	76	0	1	1	0
Qld Spinifex	11	37	31	15	4	1	0
N. Speargrass	12	52	27	7	1	1	0
N. Aristida	23	41	21	0	10	4	0
Gulf-Peninsula	13	31	35	8	10	2	0
NT/WA Spinifex	6	26	55	8	3	0	2
NT/WA Speargrass	10	55	0	3	6	0	26

Selling through saleyards can provide competition but it does subject animals to greater stress than direct selling and may produce more bruising. CALM, which provides the element of competition plus the benefits of direct consignment, has been poorly accepted with only three percent of properties using this method. Surprisingly, ten percent of properties in the Northern Aristida and Gulf-Peninsula used CALM.

Paddock sales were much more popular in Central and Northern Rolling Downs and Queensland Spinifex than elsewhere. In NT/WA Speargrass, no properties sold through saleyards but 26% sold for live export.

* While 83% of properties sold store steers, the percentages exceeded 90% in extensive regions and tended to be less than 80% in the more intensive regions (Table 62). Saleyards constituted the most preferred selling method (46%) although there was extreme variation in usage across regions. Eighty-six percent of producers in Mulga Lands and two-thirds in Southern Rolling Downs sold through saleyards while, at the other extreme, only three percent of properties in NT/WA Speargrass used saleyards.

Paddock sales were the second most popular option at 20% overall. This method was quite commonly used in Northern Aristida, Northern Speargrass, Central and Northern Rolling Downs and Queensland Bluegrass but was rarely used in Mulga Lands and NT/WA Speargrass.

As with prime steers, only four percent of properties sold stores via CALM, with the highest usage in Northern Aristida (16%) and Gulf-Peninsula (12%).

The ability of NT/WA Speargrass to capitalise on the live feeder steer export market is shown by the 69% of properties using this outlet. By contrast, only six percent of properties in NT/WA Spinifex used this method.

Inter-property transfer of stores was the method of disposal on nine percent of properties overall, but was highest (17-22%) in Gulf-Peninsula, Northern Aristida and Northern Speargrass. In seven of the fourteen regions, at least ten percent of properties transferred stores indicating the extent of networks being setup with breeding units and fattening units which are separated geographically.

* Heifers were sold on 94% of properties (Table 63) while, in an earlier question, ten percent indicated they did not cull heifers. More than one-third of properties in Northern Aristida, Gulf-Peninsula and NT/WA Speargrass did not sell heifers while virtually all properties in Brigalow, Queensland Bluegrass, Southern Aristida and Southern Rolling Downs sold heifers. This reflects the picture with heifer culling in these regions.

Table 62. Proportion (%) of properties using various selling methods for store steers.

Region	Not sold	Direct to works/ butchers	Saleyards	Paddock sales	CALM	Property transfer	Live export
Overall	17	2	46	20	4	9	2
High Rainfall	21	7	43	17	2	10	0
Brigalow	24	2	47	15	4	7	0
S. Speargrass	24	2	49	16	1	8	0
Qld Bluegrass	18	3	42	27	2	8	0
S. Aristida	22	0	47	22	3	6	0
S. Rolling Downs	4	0	67	20	4	4	0
C & N Rolling Downs	9	1	42	28	8	11	1
Mulga Lands	4	0	86	7	1	1	0
Qld Spinifex	9	0	51	21	6	13	0
N. Speargrass	14	3	33	28	6	17	0
N. Aristida	8	4	18	36	16	18	0
Gulf-Peninsula	10	2	39	14	12	22	0
NT/WA Spinifex	10	0	43	25	2	14	6
NT/WA Speargrass	9	3	3	9	3	6	69

Table 63. Proportion (%) of properties using various selling methods for heifers.

Region	Not sold	Direct to works/butchers	Saleyards	Paddock sales	CALM	Property transfer	Live export
Overall	6	22	48	15	3	4	2
High Rainfall	5	24	41	18	0	5	7
Brigalow	2	25	50	14	4	3	1
S. Speargrass	4	38	42	10	0	2	2
Qld Bluegrass	1	20	58	14	4	3	1
S. Aristida	0	11	80	8	0	3	0
S. Rolling Downs	2	7	69	16	3	3	0
C & N Rolling Downs	7	9	46	27	4	6	1
Mulga Lands	3	9	78	6	1	3	0
Qld Spinifex	7	9	57	15	0	10	1
N. Speargrass	14	12	31	25	1	6	12
N. Aristida	39	7	24	15	2	10	2
Gulf-Peninsula	37	5	18	16	16	8	0
NT/WA Spinifex	16	8	38	26	2	10	0
NT/WA Speargrass	39	13	4	9	9	13	13

Almost half of the properties chose to sell through saleyards with direct to slaughter (22%) and paddock sales (15%) being the other major avenues. As with sales of store steers there was considerable variation between regions. Saleyards were most commonly used in Southern Aristida (80%), Mulga Lands (78%) and Southern Rolling Downs (69%). However, they were rarely used in NT/WA Speargrass. This is a similar pattern to that for prime steers and store steers indicating that this selling method is preferred overall rather than choosing a particular selling method for the particular class of cattle.

Usage of paddock sales for heifers in most regions was similar to that for store steers with the exception of Southern Aristida and Queensland Bluegrass, where saleyards were used more frequently for heifers and Northern Aristida where fewer properties sold heifers than sold steers.

In all regions, some properties sold direct to works but incidence was less than ten percent in most regions. A greater percentage of properties in Brigalow, Southern Speargrass and Queensland Bluegrass used this outlet.

Again usage of CALM for this class of animal was low although 16% of properties in the Gulf-Peninsula sold heifers by this method.

Live exports of heifers provided an important outlet for at least 12% of properties in the Northern Speargrass and NT/WA Speargrass and seven percent in the High Rainfall region.

* Ninety-nine percent of properties indicated that they sell cull cows (Table 64). This is similar to the 97% who said they practise culling in their breeder herd. However, the agreement is not so good within the regions. All properties in NT/WA Speargrass sold cull cows but only 89% culled cows. Similar figures for other regions with anomalies were: Gulf-Peninsula (94%, 84%); Northern Aristida (96%, 86%). There has apparently been some problem in interpreting these two questions correctly.

Direct to slaughter (44%) and via saleyards (44%) were equally popular methods of sale for this class of animal. As for the previous classes, saleyards were more popular in Mulga Lands (77%), Southern Rolling Downs (54%), Southern Aristida (68%), Queensland Bluegrass (58%) and Queensland Spinifex (54%) indicating a distinct preference for this selling method.

In contrast, direct to slaughter was the preferred method of sale in NT/WA Speargrass (85%), High Rainfall (64%), Southern Speargrass (58%), Northern Aristida (57%) and Northern Speargrass (52%). Surveys (Ladds *et al.* 1975) have revealed that a high percentage of cows slaughtered in north Queensland are pregnant, which represents a substantial loss to the industry. In addition, research has shown that

Table 64. Proportion (%) of properties using various selling methods for cull cows.

Region	Not sold	Direct to works/ butchers	Saleyards	Paddock sales	CALM	Property transfer	Live export
Overall	1	44	44	8	1	2	0
High Rainfall	0	64	27	6	2	2	0
Brigalow	1	43	48	6	1	1	0
S. Speargrass	1	58	35	4	0	1	0
Qld Bluegrass	1	32	58	7	2	1	0
S. Aristida	3	20	68	8	0	3	0
S. Rolling Downs	0	31	54	8	3	3	0
C & N Rolling Downs	1	37	40	19	2	0	0
Mulga Lands	0	17	77	4	0	2	0
Qld Spinifex	0	32	54	14	0	0	0
N. Speargrass	1	52	36	8	1	2	0
N. Aristida	4	57	25	6	2	6	0
Gulf-Peninsula	6	24	43	18	2	6	0
NT/WA Spinifex	0	22	52	19	0	6	0
NT/WA Speargrass	0	85	0	6	6	0	3

cows are more prone to bruising than steers (Wythes and Shorthose 1984), so that there would be less carcase damage to cows destined for slaughter if they went direct to works rather than via saleyards.

While paddock sales were preferred by only eight percent of properties, the level was much higher (14-19%) in Central and Northern Rolling Downs, Queensland Spinifex, Gulf-Peninsula and NT/WA Spinifex.

Very few properties used other methods of sale as their major option.

* Most properties sold cull bulls, although up to five percent of properties in some regions did not do so (Table 65). Again, direct to slaughter and saleyards were equally popular methods. The pattern in different regions was very similar to that for cull cows.

Paddock sales were significant only in Central and Northern Rolling Downs where 12% of properties preferred this method of disposal.

* Volumes of sales for each class of stock were weighted by the number of cattle on the property to compare with the patterns for various selling methods in Tables 61 to 65. For all classes of stock the use of saleyards decreased in importance by 11 percent for prime steers, 22 percent for store steers, 18 percent for heifers, 16 percent for cull cows and 16 percent for cull bulls. Hence, smaller properties tend to make proportionally greater use of saleyards and larger properties favour other methods of disposal.

* For prime steers there was a slight increase in usage of all other methods to compensate for the lower use of saleyards. Direct consignment to works/butchers increased substantially for Queensland Bluegrass (18%), Central and Northern Rolling Downs (25%), Mulga Lands (47%), Queensland Spinifex (13%), Gulf-Peninsula (15%) and NT/WA Spinifex (24%). There was a large increase in live export for NT/WA Speargrass (18%) indicating the tendency for larger properties to favour this method of selling.

Increases in property transfer (14%) and live export (10%) were the main compensations for lowered usage of saleyards for sale of store steers. The regions with substantial increases in property transfer after weighting by volume were High Rainfall (11%), Central and Northern Rolling Downs (34%), Northern Speargrass (19%) and Gulf-Peninsula (36%). Increased use of live export was evident in NT/WA Spinifex (22%) to go with the already high usage for NT/WA Speargrass.

For heifers, use of paddock sales (7%) and property transfer (5%) increased to compensate for reduced use of saleyards. Paddock sales weighted by volume were higher for High Rainfall (18%), Queensland Bluegrass (13%), Central and Northern Rolling Downs (18%), Gulf-Peninsula (11%) and NT/WA Spinifex (11%). The increase in property

Table 65. Proportion (%) of properties using various selling methods for cull bulls.

Region	Not sold	Direct to works/butchers	Saleyards	Paddock sales	CALM	Property transfer	Live export
Overall	1	49	45	3	1	1	0
High Rainfall	0	66	32	0	2	0	0
Brigalow	2	46	50	2	1	0	0
S. Speargrass	1	64	33	2	0	0	0
Qld Bluegrass	2	31	64	2	1	1	0
S. Aristida	5	19	70	3	0	3	0
S. Rolling Downs	0	44	54	0	0	2	0
C & N Rolling Downs	3	42	42	12	1	1	0
Mulga Lands	0	24	73	0	0	3	0
Qld Spinifex	0	48	46	6	0	0	0
N. Speargrass	1	63	31	4	1	1	0
N. Aristida	2	57	30	6	2	4	0
Gulf-Peninsula	2	30	55	4	4	4	0
NT/WA Spinifex	0	34	63	3	0	0	0
NT/WA Speargrass	0	91	0	3	3	0	3

transfer was most evident in Central and Northern Rolling Downs (14%). There were also increases in direct consignment to works/butchers for Queensland Bluegrass (13%), Mulga Lands (39%) and Gulf-Peninsula (19%).

For cull cows (10%) and cull bulls (16%) sales direct to works/butchers balanced the decline in use of saleyards with weighting by volume. The main regional increases for cull cows were Queensland Bluegrass (18%), Central and Northern Rolling Downs (22%), Mulga Lands (41%), Queensland Spinifex (20%), Gulf-Peninsula (25%) and NT/WA Spinifex (18%). The corresponding regions for cull bulls were Queensland Bluegrass (25%), Central and Northern Rolling Downs (36%), Mulga Lands (38%), Gulf-Peninsula (26%) and NT/WA Spinifex (37%).

8.5 Distance from outlets

One of the factors governing the choice of selling method is the distance from outlets - abattoirs and saleyards. Questions were included in the survey to obtain information on this topic to aid in interpretation of results.

* Approximately half of the respondents to the survey were between 100 km and 500 km from the nearest abattoir, while eight percent were closer than 50 km and seven percent more than 1 000 km away (Table 66).

  While the pattern for distance from saleyards was similar, many more properties were closer to a saleyard than an abattoir. Only 38% were between 100 km and 500 km away while 46% were less than 100 km away.

* As distance from meatworks and saleyards increased, the proportion of properties consigning stock for slaughter decreased. For prime steers, 67 percent were consigned directly from less than 50 kilometres but only 37 percent if the distance exceeded 1 000 kilometres. There was a corresponding increase in use of saleyards and smaller increases for use of paddock sales and CALM.

8.6 Transport methods

Transport costs for livestock constitute a significant percentage of the operating costs on many properties. The methods used can have a significant impact on these costs. There are currently proposals under consideration to increase substantially the registration charges and fuel costs for many livestock transports. The survey aimed to obtain information on methods of transport used and attitudes to an increase in charges for these methods.

Table 66. Proportion (%) of properties at various distances from meatworks and from saleyards.

Region	Distance to meatworks (km)					Distance to saleyards (km)				
	<50	50-100	100-500	500-1000	>1000	<50	50-100	100-500	500-1000	>1000
Overall	8	16	52	17	7	20	26	38	11	5
High Rainfall	25	43	31	1	0	35	41	24	0	0
Brigalow	6	11	72	10	0	25	31	43	1	0
S. Speargrass	14	31	53	2	0	30	37	32	0	0
Qld Bluegrass	7	18	66	8	1	28	37	34	1	0
S. Aristida	16	8	65	11	0	21	21	52	5	0
S. Rolling Downs	19	22	46	13	0	16	24	51	10	0
C & N Rolling Downs	0	0	23	62	15	6	15	29	37	13
Mulga Lands	2	5	32	43	18	1	3	30	54	13
Qld Spinifex	0	1	12	49	38	8	10	36	24	23
N. Speargrass	7	19	64	10	0	14	21	60	4	1
N. Aristida	4	0	44	51	2	4	6	56	35	0
Gulf-Peninsula	6	0	10	36	48	0	6	50	38	6
NT/WA Spinifex	2	2	15	18	64	0	3	18	18	61
NT/WA Speargrass	10	10	48	28	5	11	5	11	47	26

* Road transport was the most common method (93%) used by properties with 87% using road transport exclusively (Table 67).

Road and rail was the preferred method for six percent of properties. In only five regions did the preference for road and rail exceed ten percent. In only two regions, Central and Northern Rolling Downs and Queensland Spinifex, did the exclusive use of road transport drop below 80%. This highlights the reduced reliance by northern beef producers and contrasts with the survey conducted by Daly (1978) where he found that during 1977, 1.6 million head of cattle were moved by rail, which represented 63% of total slaughtering.

Distance to outlets and access to rail obviously play a significant part in the decision making process. However, costs are also important as only 56% of properties would persist with current methods if costs increased substantially. More producers in intensive areas would persist while a greater percentage in extensive areas would look to other alternatives. In terms of main enterprise, 47 percent of breeding only, 58 percent combining breeding and fattening and 67 percent fattening only would persist even if costs increased substantially. The proportion persisting also varied with distance to meatworks from 72 percent for properties within 50 kilometres, 68 percent for 50-100 kilometres, 55 percent for 100-500 kilometres, 37 percent for 500-1 000 kilometres and 36 percent for greater than 1 000 kilometres. Corresponding rates of persistence for distances from saleyards were 62, 59, 56, 40 and 38 percent, respectively.

Unfortunately, the length of the survey questionnaire prevented us from obtaining information on what alternatives might be employed, for example, return to droving, greater use of rail.

Table 67. Average percentage of properties using various transport methods for sale stock, the proportion (%) using road transport exclusively and the proportion (%) persisting with current methods if costs increased substantially.

Region	Average usage of transport methods		Using road exclusively	Persist even with higher costs
	Road	Road and rail		
Overall	93	6	87	56
High Rainfall	95	4	86	71
Brigalow	95	5	91	59
S. Speargrass	97	2	93	67
Qld Bluegrass	87	10	81	64
S. Aristida	97	2	93	60
S. Rolling Downs	100	0	98	63
C & N Rolling Downs	82	15	64	44
Mulga Lands	88	10	85	62
Qld Spinifex	82	14	62	33
N. Speargrass	97	3	91	46
N. Aristida	92	6	84	32
Gulf-Peninsula	90	6	84	17
NT/WA Spinifex	85	15	80	43
NT/WA Speargrass	100	0	100	44

9. FACTORS AFFECTING FUTURE PROFITABILITY

In the questionnaire, producers were asked to rate the importance of a range of options for improving the profitability of their properties over the next five to ten years.

The issues were grouped into the following major areas:

* Sustaining the Resource;
* Increasing Cattle Production Efficiency through Improved Animal Health;
* Increasing Cattle Growth Efficiency;
* Increasing Cattle Breeding Efficiency;
* Planning and Marketing; and
* Cost Reducing Management.

For each issue, responses were examined in two ways. They were initially analysed by regions. Following this, respondents were separated into two groups - those who felt the issue was important for future profitability and those who did not. We then examined how each of these groups responded to other topics in the questionnaire and compared the results using a chi-squared test.

9.1 Sustaining the Resource

* Issues under the theme of Sustaining the Resource which rated the most highly were weed control (including woody weeds) (68%), more effective land use through more waters (66%), more effective land use through more fences (60%), timber treatment (60%), control of poisonous plants (50%), reducing stocking rate (37%) and buying more land (36%) (Table 68).

9.1.1 Weed control

* All regions rated the issue of weed control as important in improving future profitability (Table 68) which is in keeping with the problems experienced with weed species (Tables 25, 26, 27). There was a trend for this issue to be considered more important in more intensive areas and less important in more extensive areas. More than 70 percent of properties in Queensland Bluegrass, Southern Aristida, Mulga Lands, High Rainfall, Brigalow and Northern Speargrass rated this issue as important while levels were only 31 percent for NT/WA Spinifex and 34 percent for Gulf-Peninsula.

* As might be expected, a greater percentage of those respondents considering weed control important (1321 respondents) had indicated various plants were a problem on their properties (Table 69). As an example, 63 percent of respondents who identified weed control as important, had previously indicated that eucalypt regrowth was a

Table 68. Proportion (%) of properties rating issues on Sustaining the Resource as important to improve future profitability

Region	Weed control, inc woody weeds	More effective land use: more waters	More effective land use: more fences	Timber treatment	Control of poisonous plants	Reduced stocking rate	Buying more land
Overall	68	66	60	60	50	37	36
High Rainfall	75	51	48	57	68	28	28
Brigalow	75	66	60	70	47	39	35
S. Speargrass	67	58	53	77	60	39	39
Qld Bluegrass	79	60	54	64	48	38	37
S. Aristida	78	57	57	90	53	30	27
S. Rolling Downs	68	66	57	83	61	40	42
C & N Rolling Downs	63	66	53	25	37	31	42
Mulga Lands	76	74	69	56	47	38	35
Qld Spinifex	46	74	67	43	51	51	35
N. Speargrass	73	69	67	47	67	38	42
N. Aristida	49	85	77	34	45	28	33
Gulf-Peninsula	34	74	64	31	16	23	33
NT/WA Spinifex	31	83	79	4	24	40	17
NT/WA Speargrass	43	85	60	12	31	37	19

Table 69. Difference between properties rating weed control, including woody weeds as important or not important to improve future profitability across response rates (%) to related issues.

Issue	Important	Not important	Chi-squared
Number of respondents	1321	632	
Eucalypt regrowth occurs as a problem	63	46	47.8**
Black wattle occurs as a problem	36	29	10.9**
Brigalow regrowth occurs as a problem	39	22	49.6**
False sandalwood occurs as a problem	25	14	27.9**
Lantana occurs as a problem	23	13	26.6**
Rubber vine occurs as a problem	20	13	11.9**
Turkey bush occurs as a problem	19	12	13.3**
Mimosa occurs as a problem	11	7	5.8*
Parkinsonia occurs as a problem	11	8	4.1*
Groundsel occurs as a problem	9	5	8.1**
Parthenium occurs as a problem	21	12	21.3**
Treated timbered areas in the last two years	51	39	24.8**
Sown any pastures in the last two years	53	43	15.4**
Some improved country - cropping	45	35	13.3**
Some improved country - cleared and introduced pasture	73	64	13.9**
Some improved country - treated and introduced pasture	13	8	6.9*

problem on their properties while only 46 percent of those who indicated weed control was not important had indicated eucalypt regrowth was a problem on their properties, a difference of 17 percent. Differences for other problem species were black wattle (36 v 29%), brigalow regrowth (39 v 22%), false sandalwood (25 v 14%), rubber vine (20 v 13%), turkey bush (19 v 12%), parthenium (21 v 12%), lantana (23 v 13%), mimosa (11 v 7%), parkinsonia (11 v 8%) and groundsel (9 v 5%). Differences for the remaining problem species were very small.

* Similarly, a greater percentage of those considering weed control important had treated timbered areas in the last two years (51 v 39%), sown pastures in the last two years (45 v 35%) and had some improved country (Table 69).

9.1.2 More effective land use through more waters

* The importance placed on the provision of extra waters to improve effectiveness of land use suggests an increasing awareness by industry of the importance of land care and the need to spread cattle more to minimise overgrazing round watering points.

  More than half the properties in all regions rated this issue as important (Table 68) but highest levels occurred in the extensive areas of Northern Aristida (85%), NT/WA Speargrass (85%) and NT/WA Spinifex (83%).

9.1.3 More effective land use through more fences

* While developing additional waters provides the opportunity for cattle to utilise country more uniformly, providing additional fences permits additional control over their grazing behaviour. Additional fences provide the mechanism for more efficient grazing behaviour and better land care as well as the ability to segregate stock better for preferential management.

* It is not surprising that 60 percent of properties overall (1154 respondents) and at least 48 percent in all regions rated this issue highly (Table 68). As with the provision of additional water, the trend was for the issue to be rated more highly in extensive than in intensive areas. Extremes were 79 percent for NT/WA Spinifex and 77 percent for Northern Aristida and 48 percent for High Rainfall.

* A greater percentage of these respondents had reduced labour in the last five years (56 v 46%), achieved this by better subdivision (56 v 45%), used cattle traps/spears (25 v 14%) and portable yards (20 v 11%) to aid in mustering and planned fencing over the next two years (91 v 71%) (Table 70). However, a smaller percentage of them were fully boundary fenced (83 v 89%).

Table 70. Difference between properties rating more effective land use as important or not important to improve future profitability across response rates (%) to related issues.

Issue	Important	Not important	Chi-squared
More waters			
Number of respondents	1271	663	
Reduced labour input in the last five years	56	46	14.6**
Pumped water used by > 50% of herd in a normal year	44	40	2.9
Pumped water used by > 50% of herd in a dry year	61	53	11.5**
Normally feed phosphorus supplements	35	27	11.8**
Have a set of portable yards	29	19	24.2**
More fences			
Number of respondents	1154	780	
Reduced labour input in the last five years	56	46	18.2**
Reduced labour via better subdivision	56	45	10.8**
Cattle traps/spears used to aid in mustering	25	14	39.2**
Portable yards used to aid in mustering	20	11	27.9**
Property fully boundary fenced	83	89	13.2**
Fencing planned over next two years	91	71	127.2**
Fencing planned to replace old fencing	72	81	18.4**
Fencing planned to create a new main paddock	49	18	144.3**
Fencing planned to create a new lane	29	18	22.6**
Fencing planned to create a new holding paddock	32	14	65.2**
Fencing planned to fence off problem areas	17	7	30.2**
Have a set of portable yards	30	21	18.6**

9.1.4 *Timber treatment*

* With the high incidence of properties regarding tree species as a significant problem (Table 25), it was not surprising that 60 percent of properties (1182 producers) (Table 68) regarded timber treatment as important. Unlike previous issues there was extreme variability between regions. The highest level of 90 percent occurred in Southern Aristida while the lowest levels were in NT/WA Spinifex (4%) and NT/WA Speargrass (12%).

* A greater percentage of this group experienced problems with eucalypt regrowth (75 v 33%), black wattle (44 v 19%), brigalow regrowth (43 v 20%) and false sandalwood (28 v 13%) (Table 71). More of them had treated timber in the last two years (64 v 24%) and had sown pastures in the last two years (55 v 41%). A greater percentage of them had improved country especially where timber was treated and native pasture retained (47 v 22%).

9.1.5 *Control of poisonous plants*

* Overall 50 percent of properties indicated that control of poisonous plants was important for improving future profitability (Table 68). Although many producers indicated their properties carried various poisonous plants including lantana, heart leaf, gidgee and pimelea, no individual species was identified as a problem on more than 21 percent of properties (Tables 25, 26 and 27).

* Again there was considerable variation across regions ranging from 68 percent in High Rainfall and 67 percent in Northern Speargrass to 16 percent in Gulf-Peninsula and 24 percent in NT/WA Spinifex.

9.1.6 *Reduced stocking rate*

* Although there is a school of thought that overall stocking rates in many regions of northern Australia are too high, only 37 percent of properties rated reduced stocking rate as being important (Table 68). Ratings were quite uniform across regions with a range from 51 percent in Queensland Spinifex to 23 percent in Gulf-Peninsula and 28 percent in High Rainfall and Northern Aristida.

* One might contrast these ratings with the high ratings given to the issue of more effective land use through increased waters and fences.

* There was no relationship between the importance placed on reduced stocking rate and attitude towards management to encourage regeneration of pastures (85 v 82%), preferentially grazing or spelling of paddocks (72 v 72%), using land management issues as part of planning (56 v 55%) and whether they use all of their property (53 v 55%).

Table 71. Difference between properties rating timber treatment as important or not important to improve future profitability across response rates (%) to related issues.

Issue	Important	Not important	Chi-squared
Number of respondents	1182	783	
Eucalypt regrowth occurs as a problem	75	33	328.6*
Black wattle occurs as a problem	44	19	124.7**
Brigalow regrowth occurs as a problem	43	20	113.0**
False sandalwood occurs as a problem	28	13	53.9**
Treated timbered areas in the last two years	64	24	295.9**
Sown any pasture in the last two years	55	41	33.6**
Some improved country - cleared and introduced pasture	73	62	20.1**
Some improved country - cleared and native pasture	45	38	7.0**
Some improved country - treated and introduced pasture	15	6	26.0**
Some improved country - treated and native pasture	47	22	102.0**
Some improved country - undersown with introduced pasture	11	17	13.2**
Reduced stocking rate to improve future profitability	39	33	7.9**

9.1.7 *Buying more land*

* One possibility for reducing stocking rate on existing land is to buy additional area so stock numbers can be maintained or even increased by spreading them over the total area.

* Overall, 36 percent of properties suggested buying more land was important to improve future profitability (Table 68). This agreed closely with the figure for reducing stocking rate. With the exception of NT/WA Spinifex (17%) and NT/WA Speargrass (19%), ratings were quite uniform across regions, ranging from 42 percent (Southern Rolling Downs, Central and Northern Rolling Downs, Northern Speargrass) to 27 percent in Southern Aristida and 28 percent in High Rainfall.

* A greater percentage of those seeking to buy more land currently utilised all of their property (59 v 53%).

9.2 Increasing Cattle Production Efficiency through Improved Animal Health

* While producers have identified increased production efficiency as being important, animals must be in good health to perform at a high level. Since 76 percent of producers considered that animal health problems lowered productivity of their herds to some extent (Table 52), it was not surprising that many saw animal health issues as important for improving future profitability.

* The important issues for future profitability under this theme were buffalo fly control (68%), tick control (47%), worm control (43%), three-day sickness vaccination (39%) and botulism vaccination (32%) (Table 72).

9.2.1 *Buffalo fly control*

* Overall, 68 percent of properties rated buffalo fly control as important. Understandably there was extreme variation between regions with more than 85 percent of properties in Southern Speargrass and High Rainfall rating it as important compared with less than 15 percent in NT/WA Spinifex and Mulga Lands.

* A much higher percentage of those rating this as an important issue currently treat their cattle to control buffalo fly (89 v 28%) (Table 73).

9.2.2 *Tick control*

* Forty-seven percent of properties rated tick control as important (Table 72). Again, there was wide variation across regions with highest levels in High Rainfall (72%) and Southern Speargrass (71%) and lowest in Mulga Lands (1%), Southern Rolling Downs (10%), Central and

Table 72. Proportion (%) of properties rating issues on Increasing Cattle Production Efficiency via Animal Health as important to improve future profitability

Region	Buffalo fly control	Tick control	Worm control	Three-day sickness vaccine	Botulism control
Overall	68	47	43	39	32
High Rainfall	90	72	75	47	46
Brigalow	74	49	38	50	17
S. Speargrass	85	71	65	41	28
Qld Bluegrass	67	43	45	37	17
S. Aristida	54	29	60	33	8
S. Rolling Downs	49	10	37	36	14
C & N Rolling Downs	52	13	18	24	31
Mulga Lands	9	1	26	19	11
Qld Spinifex	47	18	37	32	58
N. Speargrass	71	62	40	35	53
N. Aristida	73	41	42	29	96
Gulf-Peninsula	64	60	29	34	89
NT/WA Spinifex	15	14	16	9	57
NT/WA Speargrass	58	63	43	32	74

Table 73. Difference between properties rating animal health issues as important or not important to improve future profitability across response rates (%) to related issues.

Issue	Important	Not important	Chi-squared
Buffalo fly control			
Number of respondents	1352	642	
Treat for buffalo fly	89	28	785.8**
Cattle tick control			
Number of respondents	913	1016	
Treat for cattle ticks	83	13	974.6**
Some Zebu content in herd	82	73	23.5**
Worm control			
Number of respondents	832	1093	
Treat for worms	74	15	680.8**
Three-day sickness vaccine			
Number of respondents	743	1172	
Treat or vaccinate for three-day sickness	30	6	203.7**
Botulism control			
Number of respondents	601	1265	
Vaccinate against botulism	58	3	742.3**
Part of property considered phosphorus deficient	70	31	267.3**
Deficient properties with 100% affected	49	36	24.2**
Phosphorus supplementation to improve future profitability	70	23	361.5**

Northern Rolling Downs (13%) and NT/WA Spinifex (14%).

* A much greater percentage of this group overall currently treat their cattle to control ticks (83 v 13%) (Table 73).

* Significantly, in the five regions where more than 60 percent of producers rated this issue as important, more than two-thirds of the properties carried cattle with greater than three-eighth Zebu content. Surprisingly, more of those who considered it important had some Zebu content in their herd (82 v 73%) (Table 73).

9.2.3 *Worm control*

* The overall percentage rating worm control as important (43%) represented a total of 832 respondents. Again, there was wide variation across regions with levels exceeding 60 percent in High Rainfall, Southern Speargrass and Southern Aristida while low levels were recorded in NT/WA Spinifex (16%) and Central and Northern Rolling Downs (18%).

* More of those identifying this issue as important currently treat for worm control (74 v 15%) (Table 73).

9.2.4 *Three-day sickness vaccine*

* The 39 percent of producers who rated use of three-day sickness vaccine as being important far exceeded the combination of 14 percent who currently treated for this disease plus the 12 percent who were aware of its presence but did not treat (Table 56). The highest ratings were in Brigalow (50%) and High Rainfall (47%) with the only regions falling below 20 percent being NT/WA Spinifex (9%) and Mulga Lands (19%).

* As for previous issues, more of the group seeing this as important, currently treat cattle or use the vaccine (30 v 6%) (Table 73).

9.2.5 *Botulism control*

* The overall figure of 32 percent of properties rating botulism control as important was well in excess of the 19 percent who currently vaccinate against botulism (Table 56). As would be expected, this issue rated highly with a greater percentage of producers in the more extensive northern areas (Northern Aristida 96%; Gulf-Peninsula 89%; NT/WA Speargrass 74%). Fewer than 17 percent of producers in Brigalow, Queensland Bluegrass, Southern Aristida, Southern Rolling Downs and Mulga Lands rated this issue highly. This is not surprising in view of the generally good phosphorus status of soils in all except Mulga Lands.

* A greater percentage of those rating botulism control as important currently use botulism vaccine (58 v 3%) (Table 73). A greater percentage have phosphorus deficient properties (70 v 31%) and consider phosphorus supplementation important to improve profitability (70 v 23%) (Table 73).

9.3 Increasing Cattle Growth Efficiency

* With the increasing emphasis in the market place on more tender beef requiring a younger age of turnoff, there is a need to concentrate on mechanisms for increasing growth rates of cattle.

* Producers identified the following issues as important in achieving this goal: more sown pastures (72%), supplementation with protein/energy (41%), phosphorus supplementation (38%), supplying other minerals (24%), rumen modifiers (17%) and growth promotants (17%).

9.3.1 More sown pasture

* The overall figure of 72 percent of properties (1405 respondents) identifying more sown pasture as important for improving growth vindicates the high priority given to this issue by MRC (Table 74). All regions except Central and Northern Rolling Downs (30%) recorded a figure of 46 percent or greater with levels between 84 and 91 percent in Southern Rolling Downs, Brigalow, Northern Aristida and Southern Aristida.

* More of this group identified protein/energy supplementation as important for future profitability (43 v 34%), sowed pasture in the last two years (70 v 24%) and treated timbered areas in the last two years (54 v 29%) (Table 75).

9.3.2 Supplementation with protein/energy

* While 41 percent of producers overall (737 respondents) identified this issue as important, the levels exceeded 70 percent in Gulf-Peninsula, Northern Speargrass, Northern Aristida and NT/WA Speargrass (Table 74). Even in Brigalow lands where the lowest figures occurred, 21 percent of producers identified this issue as important, while all other regions recorded levels in excess of 30 percent.

* A higher percentage of those identifying this issue as important considered reduced stocking rate important to improve future profitability (41 v 33%) (Table 76). This suggests that producers appreciate the impact of supplementation on pasture availability. In addition, more of this group currently feed supplements in normal seasons, and wean down to a minimum age of less than six months (74 v 64%) or less than 150 kilograms liveweight (54 v 37%) (Table 76).

Table 74. Proportion (%) of properties rating issues on Increasing Cattle Growth Efficiency as important to improve future profitability

Region	More sown pasture	Protein/energy supplementation	Phosphorus supplementation	Other minerals supplementation	Rumen modifiers	Growth promotants
Overall	72	41	38	24	17	17
High Rainfall	67	55	69	43	16	25
Brigalow	86	21	14	9	13	17
S. Speargrass	73	44	43	24	14	10
Qld Bluegrass	78	34	20	18	16	19
S. Aristida	91	45	40	26	18	10
S. Rolling Downs	84	32	20	15	13	17
C & N Rolling Downs	30	30	22	14	15	22
Mulga Lands	48	32	41	18	12	10
Qld Spinifex	59	55	57	39	19	13
N. Speargrass	78	75	73	48	33	32
N. Aristida	87	83	91	58	35	22
Gulf-Peninsula	63	71	80	46	36	26
NT/WA Spinifex	46	58	67	48	18	11
NT/WA Speargrass	72	82	90	57	25	11

Table 75. Difference between properties rating more sown pasture as important or not important to improve future profitability across response rates (%) to related issues.

Issue	Important	Not important	Chi-squared
Number of respondents	1405	535	
Protein/energy supplementation to improve future profitability	43	34	11.4**
Sown any pastures in the last two years	70	24	319.4**
Treated timbered areas in the last two years	54	29	88.6**
Some improved country - cropping	47	28	38.6**
Some improved country - cleared and introduced pasture	77	48	115.9**
Some improved country - cleared and native pasture	45	34	14.6**
Some improved country - treated and introduced pasture	12	10	2.0
Some improved country - treated and native pasture	39	34	3.1
Some improved country - undersown with introduced pasture	15	8	11.5**

Table 76. Difference between properties rating supplementation with protein/energy as important or not important to improve future profitability across response rates (%) to related issues.

Issue	Important	Not important	Chi-squared
Number of respondents	737	1075	
Reduced stocking rate to improve future profitability	41	33	11.8**
Hay fed in normal seasons	29	22	12.4**
Molasses fed in normal seasons	38	12	169.0**
Salt fed in normal seasons	34	8	195.4**
Urea fed in normal seasons	36	9	206.8**
Cottonseed meal fed in normal seasons	19	5	100.3**
Meat meal fed in normal seasons	12	2	68.8**
Sulphur fed in normal seasons	20	3	143.6**
Calcium fed in normal seasons	16	3	86.0**
Proprietary mixes fed in normal seasons	16	5	57.3**
Minimum age at weaning < 6 months	74	64	15.6**
Minimum weight at weaning < 150 kilograms	54	37	12.6**

9.3.3 *Phosphorus supplementation*

* An overall 38 percent of producers rated this issue as important, with very wide variation across regions. As would be expected, highest levels occurred in regions of greatest phosphorus deficiency (Northern Aristida 91%; NT/WA Speargrass 90%; Gulf-Peninsula 80%; Northern Speargrass 73%; High Rainfall 69%) while lowest values occurred in areas of higher soil phosphorus status (Brigalow 14%; Queensland Bluegrass 20%; Southern Rolling Downs 20%; Central and Northern Rolling Downs 22%).

* A greater percentage of the 710 properties rating phosphorus supplementation as important vaccinate against botulism (43 v 6%), have some phosphorus deficient country (84 v 19%), normally feed phosphorus (73 v 9%), and wean down to less than six months (73 v 64%) or less than 150 kilograms (59 v 37%) (Table 77).

9.3.4 *Supplying other minerals*

* While 24 percent of properties overall rated the supply of other minerals as important, there was wide variation between regions. Highest levels (39-58%) occurred in northern areas including High Rainfall while all remaining regions recorded 26 percent or less with the lowest figure of nine percent being in the Brigalow region.

* More of the 418 properties rating feeding of other minerals as important currently feed other supplements, such as molasses (41 v 17%), salt (44 v 11%), urea (38 v 14%), sulphur (26 v 5%) and calcium (22 v 4%) in normal years (Table 77).

9.3.5 *Rumen modifiers*

* Only eight percent of producers currently use rumen modifiers (Table 50), but 17 percent indicated their use would be important for the future (Table 74). Levels increased as regions became harsher with 12 to 18 percent in more favoured areas compared with 18 to 36 percent in more extensive, harsher northern regions.

* More of this group currently feed rumen modifiers (31 v 5%) and wean to a minimum age of less than six months (80 v 66%) or less than 150 kilograms (53 v 41%) (Table 78).

9.3.6 *Growth promotants*

* The overall rating for future growth promotant usage of 17 percent agrees very closely with the current usage level of 18 percent (Table 49). Highest values were recorded in Northern Speargrass (32%), Gulf-Peninsula (26%) and High Rainfall (25%), while lowest values were 10 to 11 percent for Southern Speargrass, Southern Aristida, Mulga Lands,

Table 77. Difference between properties rating supplementation with minerals as important or not important to improve future profitability across response rates (%) to related issues.

Issue	Important	Not important	Chi-squared
Phosphorus			
Number of respondents	710	1146	
Vaccinate against botulism	43	6	365.5**
Part of property considered phosphorus deficient	84	19	764.6**
Deficient properties with 100% affected	51	23	124.1**
Normally feed phosphorus supplements	73	9	802.9**
Minimum age at weaning < 6 months	73	64	13.4**
Minimum weight at weaning < 150 kilograms	59	37	21.3**
Other minerals			
Number of respondents	418	1349	
Hay fed in normal seasons	28	23	3.5
Molasses fed in normal seasons	41	17	109.5**
Salt fed in normal seasons	44	11	223.2**
Urea fed in normal seasons	38	14	117.4**
Cottonseed meal fed in normal seasons	20	7	57.8**
Meat meal fed in normal seasons	13	4	50.1**
Sulphur fed in normal seasons	26	5	163.6**
Calcium fed in normal seasons	22	4	135.4**
Proprietary mixes fed in normal seasons	22	6	94.9**
Minimum age at weaning < 6 months	70	67	1.1
Minimum weight at weaning < 150 kilograms	58	41	10.0**

Table 78. Difference between properties rating growth promotants and rumen modifiers as important or not important to improve future profitability across response rates (%) to related issues.

Issue	Important	Not important	Chi-squared
Growth promotants			
Number of respondents	311	1520	
Use of hormonal growth promotants	74	9	673.8**
Minimum age at weaning < 6 months	75	67	6.4*
Minimum weight at weaning < 150 kilograms	47	44	0.4
Rumen modifiers			
Number of respondents	305	1482	
Feed rumen modifiers	31	5	190.2**
Minimum age at weaning < 6 months	80	66	19.1**
Minimum weight at weaning < 150 kilograms	53	41	4.4*

NT/WA Spinifex and NT/WA Speargrass.

* More of the group rating growth promotants as important currently use promotants (74 v 9%) (Table 78) indicating that most producers intend to continue current practices.

9.4 Increasing Cattle Breeding Efficiency

* If the increased growth rates mentioned in the previous section are to be maximised, it is important that appropriate selection procedures are used to choose replacement stock. In addition, turning off slaughter stock at younger ages puts increased pressure on the breeding herd necessitating improved reproductive performance.

* These factors are reflected in the issues identified by producers under this theme, namely superior bull selection (93%), selection of breeders on fertility (87%), prevention of out of season calving (48%) and performance recording (43%) (Table 79).

9.4.1 Superior bull selection

* Overall 93 percent of producers (1848 respondents) indicated that superior bull selection was important for the future with very little variation across regions (89-98%). This highlights the importance producers place on choosing replacement sires. However, since only 43 percent considered performance recording important, many obviously intend to continue to select these sires subjectively. Until the policy of the 76 percent of producers who cull less that 20 percent of their bulls annually changes (Table 31), the full impact of superior bull selection will not be realised even if objective selection methods are used.

* More of those identifying this issue as important culled more than 10 percent of bulls annually (62 v 47%) (Table 80). However, attitudes to this issue were not related to the source of replacement sires.

9.4.2 Selection of breeders on fertility

* A surprisingly high 87 percent of respondents identified selection of breeders on fertility as an important issue for the future. This contrasts with the current policies (Table 35) where 48 percent cull on negative pregnancy test and 29 percent on a cow being dry at branding. There was a high level of uniformity in the rankings with a range from 75 percent (Gulf-Peninsula) to 93 percent (Southern Aristida).

* Selection of breeders on fertility was closely related to superior bull selection as 99 percent of the 1685 respondents who considered breeder selection important also considered bull selection important (Table 80). A higher percentage of people identifying selection of breeders on fertility as important culled breeders for various traits, such as

Table 79. Proportion (%) of properties rating issues on Increasing Cattle Breeding Efficiency as important to improve future profitability

Region	Superior bull selection	Selection of breeders on fertility	Prevention of out of season calving	Performance recording
Overall	93	87	48	43
High Rainfall	90	84	41	48
Brigalow	91	87	55	42
S. Speargrass	93	88	51	44
Qld Bluegrass	94	89	55	43
S. Aristida	95	93	62	40
S. Rolling Downs	90	92	63	46
C & N Rolling Downs	96	88	39	42
Mulga Lands	96	90	47	45
Qld Spinifex	92	88	19	43
N. Speargrass	92	80	32	38
N. Aristida	98	79	42	32
Gulf-Peninsula	89	75	35	34
NT/WA Spinifex	97	90	42	42
NT/WA Speargrass	90	82	50	53

Table 80. Difference between properties rating selection of breeding stock as important or not important to improve future profitability across response rates (%) to related issues.

Issue	Important	Not important	Chi-squared
Superior bull selection			
Number of respondents	1848	142	
Culling more than 10% of bulls per year	62	47	6.4*
Some replacement bulls bred	44	45	0.1
Some replacement bulls from sales	70	63	2.4
Some replacement bulls direct from studs	54	49	1.9
Bulls remaining in herd all year	55	63	2.1
Selection of breeders on fertility			
Number of respondents	1685	257	
Superior bull selection to improve future profitability	99	55	644.5**
Culling on temperament	84	54	126.8**
Culling on age	76	53	59.3**
Culling on type/conformation	73	43	92.7**
Culling on poor quality calf at branding	52	25	65.7**
Culling on negative pregnancy test	52	15	126.6**
Culling if dry at branding	30	16	21.1**
Breeder herd mustered > 2 times per year	69	56	13.8**
Enterprise breeding and fattening	73	64	125.4**
Enterprise - breeding only	25	19	
Enterprise - fattening only	2	17	

temperament (84 v 54%), age (76 v 53%), type/conformation (73 v 43%), poor quality calf at branding (52 v 25%), negative pregnancy test (52 v 15%), and dry at branding (30 v 16%).

In addition, more of this group mustered the breeder herd more than twice per year (69 v 56%).

9.4.3 *Prevention of out of season calving*

* Almost half of the respondents (48%) indicated the importance for the future of preventing out of season calves. This agrees closely with the 43 percent who currently remove bulls from their herds for certain periods of the year (Table 29). Highest figures were recorded in Southern Aristida (62%) and Southern Rolling Downs (63%) and the lowest figure in Queensland Spinifex (19%).

* Of the 919 respondents who considered this issue important, only 25 percent allowed their bulls to remain in the herd all year compared with 82 percent of those not considering it important. Fewer of this group made no attempt to prevent unwanted pregnancies (12 v 31%) while more used secure fences (65 v 40%) or segregation (48 v 30%) to prevent unwanted pregnancies (Table 81).

9.4.4 *Performance recording*

* As mentioned earlier, only 43 percent of respondents considered performance recording was important for the future. This result indicates there is still considerable work to be done if industry is to accept the benefits of performance recording on a broad scale. Responses were very uniform across regions with a range of only 32 percent (Northern Aristida) to 53 percent (NT/WA Speargrass), suggesting that the concept has been promoted equally well across all of northern Australia with a similar level of acceptance of the technology throughout.

* A greater percentage of those considering performance recording important used personal computers in property management (21 v 10%), bred stud cattle (19 v 9%) and culled on a poor quality calf at branding (53 v 43%), a negative pregnancy test (58 v 39%) or poor Breedplan figures (9 v 4%) (Table 81).

9.5 Planning and Marketing

* For the north Australian beef industry to survive and prosper into the 21st Century, it is important that it be market driven. Beef producers need to be aware of market requirements and plan their enterprises to target these markets. There is a high level of realisation of this need as indicated by the responses to particular issues under this theme. Issues rated most highly were knowledge of market specifications (84%),

Table 81. Difference between properties rating breeder management and recording as important or not important to improve future profitability across response rates (%) to related issues.

Issue	Important	Not important	Chi-squared
Prevention of out of season calving			
Number of respondents	919	1003	
Bulls remaining in herd all year	25	82	572.3**
No attempt to prevent unwanted pregnancies	12	31	95.1**
Use of secure fences to prevent unwanted pregnancies	65	40	114.3**
Segregation to prevent unwanted pregnancies	48	30	58.5**
Performance recording			
Number of respondents	792	1074	
Use of a personal computer to aid property management	21	10	42.3**
Breeding stud cattle	19	9	39.0**
Bulls remaining in herd all year	48	60	26.3**
Culling on temperament	81	78	1.6
Culling on age	73	71	0.3
Culling on type/conformation	71	67	3.6
Culling on poor quality calf at branding	53	43	18.5**
Culling on negative pregnancy test	58	39	68.5**
Culling if dry at branding	30	27	2.8
Culling if they are fat	21	26	6.1*
Culling on poor Breedplan figures	9	4	23.3**

meatworks feedback (80%), improved financial planning and control (71%) and use of decision support packages (30%) (Table 82).

9.5.1 *Knowledge of market specifications*

* The high rating given to being better informed about the requirements of the markets they supply by 84 percent of producers provides an ideal opening for the development of mechanisms to ensure that this happens. The attitude was very uniform across regions with the range being 77 to 88 percent with the exception of Northern Aristida (64%).

* This issue was related to selling method as more of the group considering knowledge of market specifications important (1608 respondents) sold prime steers and bullocks direct to works (48 v 35%) (Table 83). Similarly, more of those considering it important were in a breeding and fattening enterprise (73 v 61%) while fewer are in breeding only (22 v 35%). There is some cause for concern that many store producers are apparently not concerned about the markets for which their animals will be finished.

9.5.2 *Meatworks feedback*

* Eighty percent of respondents identified meatworks feedback as being important for the future. If this is to be achieved it will require a marked change in selling methods, especially for prime steers, as only 52 percent of respondents currently sell prime steers direct to slaughter or via CALM. It is important that the CALM selling system continues to be fostered as it can provide the combination of competition, reduced handling and stress, plus meatworks feedback.

* Responses were quite uniform across regions with a range from 69 to 85 percent.

* A greater percentage of the 1549 respondents who considered meatworks feedback important sold prime steers and bullocks direct to works (50 v 29%) (Table 83) and were involved in breeding and fattening operations (74 v 60%).

9.5.3 *Improved financial planning and control*

* Overall, 71 percent of respondents identified improved financial planning and control as being important for the future with a range across regions of only 66 to 81 percent.

* A greater percentage of the group identifying this issue as important (1352 respondents) had reduced labour input in the last five years (55 v 46%), planned additional fencing over the next two years (85 v 75%) and used personal computers (16 v 10%) (Table 84).

Table 82. Proportion (%) of properties rating issues on Planning and Marketing as important to improve future profitability

Region	Market specifications	Meatworks feedback	Improved financial planning and control	Use of decision support packages
Overall	84	80	71	30
High Rainfall	83	75	66	22
Brigalow	88	85	73	29
S. Speargrass	86	84	67	27
Qld Bluegrass	86	79	70	27
S. Aristida	88	80	71	29
S. Rolling Downs	85	75	65	38
C & N Rolling Downs	82	78	71	34
Mulga Lands	82	72	69	36
Qld Spinifex	82	78	79	37
N. Speargrass	80	74	71	31
N. Aristida	64	68	81	41
Gulf-Peninsula	77	75	79	27
NT/WA Spinifex	78	75	69	26
NT/WA Speargrass	81	76	73	27

Table 83. Difference between properties rating marketing issues as important or not important to improve future profitability across response rates (%) to related issues.

Issue	Important	Not important	Chi-squared
Market specifications			
Number of respondents	1608	298	
Prime steers and bullocks sold at 3 years or younger	63	58	0.8
Prime steers and bullocks sold direct to works	48	35	15.7**
More sown pastures to improve future profitability	74	61	19.3**
Growth promotants to improve future profitability	18	8	16.9**
Rumen modifiers to improve future profitability	19	8	18.8**
Enterprise breeding and fattening	73	61	21.7**
Enterprise - breeding only	22	35	
Meatworks feedback			
Number of respondents	1549	382	
Prime steers and bullocks sold at 3 years or younger	60	63	0.9
Prime steers and bullocks sold direct to works	50	29	48.6**
Use of a personal computer to aid property management	15	11	3.8
Enterprise breeding and fattening	74	60	31.0**
Enterprise -breeding only	21	35	

Table 84. Difference between properties rating planning issues as important or not important to improve future profitability across response rates (%) to related issues.

Issue	Important	Not important	Chi-squared
Improved financial planning and control			
Number of respondents	1352	554	
Reduced labour input in the last 5 years	55	46	14.5**
Fencing planned over next 2 years	85	75	30.9**
Use of personal computer to aid property management	16	10	10.9**
Use of decision support packages			
Number of respondents	512	1210	
Improved financial planning and control to improve future profitability	89	61	128.6**
Use of personal computer to aid property management	23	11	41.2**
Use of decision support packages on personal computers	34	14	14.7**

* This is an area where beef producers possibly lack the basic skills and a program could be developed to provide training for industry on financial planning and management. QDPI already has some projects in place in central and southern Queensland to address this issue but much more input is required.

9.5.4 Use of decision support packages

* The need for decision support packages to aid in decision making in the future was identified by 30 percent of respondents overall with a range of 22 to 41 percent. This is much higher than the 14 percent who indicated they currently use a personal computer to aid in property management (Table 15).

* More of this group also identified improved financial planning and control as important (89 v 61%), used personal computers (23 v 11%) and currently use decision support packages (34 v 14%) (Table 84).

* As the benefits of these packages in assisting to assess the complex options facing beef producers on a regular basis becomes more apparent, this figure is likely to increase. It is important that development of these decision support packages continues to receive support and their usage is fostered.

9.6 Cost reducing management

* An alternative to increasing levels of production is to achieve the same levels of output with a reduced level of inputs. A number of issues under this theme of cost reducing management were identified by respondents, in particular, labour saving devices (73%), more efficient mustering via laneways and small paddocks (59%), enterprises requiring less labour (56%) and energy sources for power (44%).

9.6.1 Labour saving devices

* The overall percentage of respondents identifying labour saving devices was 73 percent, with all regions rating it quite highly (Table 85). There was a tendency for levels to be higher in the more extensive areas where total labour input to the enterprise was greater (Tables 6, 7). In general, the more intensive regions scored between 60 and 70 percent while the more extensive areas scored between 80 and 90 percent.

* There was an association between the importance placed on use of labour saving devices and current labour usage. More of the group rating it as important employ four or more people in the beef enterprise (24 v 19%), have reduced labour input in the last five years (58 v 37%), achieved this via labour saving technology (49 v 31%), planned additional fencing over the next two years (84 v 76%) and have a set of portable yards (29 v 18%) (Table 86).

Table 85. Proportion (%) of properties rating issues on Cost Reducing Management as important to improve future profitability

Region	Labour saving devices	Enterprises requiring less labour (for example fattening)	More efficient mustering: laneways, small paddocks	Energy sources for power
Overall	73	56	59	44
High Rainfall	67	59	48	31
Brigalow	72	58	61	40
S. Speargrass	66	49	47	37
Qld Bluegrass	67	58	46	36
S. Aristida	60	57	60	49
S. Rolling Downs	83	58	62	45
C & N Rolling Downs	74	49	53	48
Mulga Lands	74	53	73	51
Qld Spinifex	79	59	73	61
N. Speargrass	79	55	67	45
N. Aristida	83	65	68	52
Gulf-Peninsula	82	63	65	61
NT/WA Spinifex	91	68	74	80
NT/WA Speargrass	82	67	82	71

Table 86. Difference between properties rating saving on labour as important or not important to improve future profitability across response rates (%) to related issues.

Issue	Important	Not important	Chi-squared
Labour saving devices			
Number of respondents	1405	532	
Four or more persons working in the beef enterprise	24	19	22.1**
Reduced labour input in the last 5 years	58	37	66.4**
Reduced labour via labour saving technology	49	31	20.1**
Fencing planned over next 2 years	84	76	16.4**
Have a set of portable yards	29	18	21.5**
Enterprises requiring less labour			
Number of respondents	1037	826	
Four or more persons working in the beef enterprise	25	20	17.6*
Reduced labour input in the last 5 years	59	43	42.8**
Laneways used to aid in mustering	38	34	3.7
Cattle traps/spears used to aid in mustering	23	18	5.5*
Helicopters used to aid in mustering	20	14	10.9**
Portable yards used to aid in mustering	18	14	7.4**
Fixed wing aircraft used to aid in mustering	9	5	6.8**
Enterprise - breeding and fattening	75	66	29.2**
Enterprise - breeding only	19	30	

9.6.2 *Enterprises requiring less labour*

* More than half (56%) of the respondents identified a change to enterprises requiring less labour as being an important option for the future. The levels were quite uniform across regions with a range from 49 to 68 percent, although there was a tendency for values to be higher in more extensive regions in the north.

* The example given for this issue was fattening, representing a change from breeding and fattening to buying and fattening. If the move to younger turnoff age occurs with increased numbers of breeding females, one might wonder how this change to enterprises requiring less labour might be achieved especially in harsher, more extensive regions.

* More of the 1405 respondents who rated a change to enterprises requiring less labour as important were in breeding and fattening operations (75 v 66%) while fewer were in breeding only (19 v 30%) (Table 86). A higher percentage of this group had reduced labour input in the last five years (59 v 43%) and used cattle traps/spears (23 v 18%), helicopters (20 v 14%), portable yards (18 v 14%) and fixed wing aircraft (9 v 5%)to aid in mustering (Table 86).

9.6.3 *More efficient mustering via laneways and small paddocks*

* An overall 59 percent of respondents identified more efficient mustering via laneways and small paddocks as being important for the future. There was a trend for the importance of this issue to increase from the more intensive regions where levels were between 40 and 50 percent to the more extensive regions where levels were 65 to 80 percent. Currently, 35 percent of respondents use laneways (Table 9).

* There was a strong association between attitude to this issue and current practice. A higher percentage of the 1152 respondents who rated it as important had reduced labour input in the last five years (61 v 42%), achieved this via better subdivision (55 v 44%), used laneways (45 v 25%), cattle traps/spears (28 v 11%), helicopters (23 v 11%), portable yards (21 v 10%) and fixed wing aircraft (9 v 5%) to aid in mustering, planned fencing over the next two years (87 v 76%), which was to create a new laneway (35 v 10%) and had a set of portable yards (31 v 19%) (Table 87).

9.6.4 *Energy sources for power*

* Overall, 44 percent of respondents identified energy sources for power as being important for the future. Currently, 76 percent of properties utilise windmills for pumping water while only five percent use solar power (Table 13). There would appear to be a definite interest in greater use of natural power sources, possibly solar, for power generation on properties. One must assume this would be for a wider

Table 87. Difference between properties rating reducing costs as important or not important to improve future profitability across response rates (%) to related issues.

Issue	Important	Not important	Chi-squared
More efficient mustering			
Number of respondents	1152	816	
Four or more persons working in the beef enterprise	25	20	14.1*
Reduced labour input in the last 5 years	61	42	66.2**
Reduced labour via better subdivision	55	44	11.3**
Laneways used to aid in mustering	45	25	81.0**
Cattle traps/spears used to aid in mustering	28	11	85.3**
Helicopters used to aid in mustering	23	11	47.3**
Portable yards used to aid in mustering	21	10	43.7**
Fixed wing aircraft used to aid in mustering	9	5	16.4**
Fencing planned over next 2 years	87	76	38.7**
Fencing planned to create a new lane	35	10	120.2**
Have a set of portable yards	31	19	34.4**
Energy sources for power			
Number of respondents	816	1026	
Pumped water used by > 50% of herd in a normal year	46	40	11.8*
Pumped water used by > 50% of herd in a dry year	63	54	27.9**
Power sources for pumping water - fossil	21	26	17.6**
Power sources for pumping water - natural	14	20	
Power sources for pumping water - both	64	54	

range of uses than merely pumping water.

* There was a wide variation in the ratings across regions from a low of 31 percent in High Rainfall to 71 percent in NT/WA Speargrass and 80 percent in NT/WA Spinifex. It is significant that 96 percent of properties in NT/WA Spinifex use windmills while 30 percent use solar power to pump water.

* More of the group identifying this issue as important used pumped water for over 50 percent of the herd in a normal year (46 v 40%) and in a dry year (63 v 54%) and used a combination of natural energy sources and fossil fuels (64 v 54%) while fewer used fossil fuels (21 v 26%) or natural sources (14 v 20%) only (Table 87).

10. FUTURE RESEARCH AND DEVELOPMENT NEEDS

One of the major issues facing industry, research providers and funding bodies is the identification and prioritising of issues requiring research and development. Accordingly the opportunity was taken to seek industry input by asking producers to list up to five issues on which they would like research and development to be concentrated over the next five to ten years.

* Overall, 68 percent of producers identified issues for further research and development. This proportion was reasonably uniform across regions ranging from a low of 61 percent in Central and Northern Rolling Downs to a high of 79 percent in Gulf-Peninsula (Table 88). This response rate is quite high given that this was the final question in a long, complex questionnaire and an open-ended, written response was required.

These open-ended responses were categorised into four major groups:

* Sustaining the Resource;
* Increasing Cattle Production Efficiency;
* Marketing; and
* Cost Reducing Management.

* Differences between those requesting and not requesting research and development are highlighted here for the main categories of requests across related issues. The chi-squared test was used to indicate the relative importance of these differences and to test for their statistical significance. This sketches a profile of properties requesting research and development into specific topics and complements the regional pattern.

10.1 Sustaining the Resource

* Issues under the theme of Sustaining the Resource were raised by 28 percent (414) of respondents with considerable variation across regions. Requests were highest for Northern Speargrass (43%) and Southern Rolling Downs (41%) and lowest for NT/WA Spinifex (2%), NT/WA Speargrass (10%), Gulf-Peninsula (16%) and Central and Northern Rolling Downs (19%).

* Weed control was the main specific issue suggested under this theme with 23 percent of respondents raising it (Table 93). There was wide regional variation in the responses received with levels exceeding 30 percent of properties in Northern Speargrass, Southern Rolling Downs, Mulga Lands and Southern Aristida while levels were less than 10 percent of properties in NT/WA Spinifex, NT/WA Speargrass and Gulf-Peninsula.

Table 88. Proportion (%) of properties requesting research and development (R&D) and theme to be concentrated on.

Region	Requesting R&D	Sustaining the resource	Increasing cattle production efficiency	Marketing	Cost reducing management
Overall	68	28	76	37	7
High Rainfall	72	28	85	26	2
Brigalow	69	26	77	41	9
S. Speargrass	68	30	83	31	6
Qld Bluegrass	64	35	71	45	7
S. Aristida	67	38	79	31	0
S. Rolling Downs	67	41	68	27	5
C & N Rolling Downs	61	19	73	46	9
Mulga Lands	69	37	53	47	3
Qld Spinifex	66	23	67	35	11
N. Speargrass	77	43	73	28	6
N. Aristida	73	25	77	34	7
Gulf-Peninsula	79	16	77	36	9
NT/WA Spinifex	63	2	78	42	13
NT/WA Speargrass	78	10	87	29	3

* Issues raised by fewer respondents were rangeland management (3%) and general issues (2%).

* There was no consistent relationship between requests for research and development on sustaining the resource and property size or current pasture management practices (Table 89). More of those people requesting research and development on this topic identified weed control (78 v 65%) and timber treatment (67 v 58%) as important for future profitability but not reduced stocking rate (38 v 37%). Similarly, more of this group experienced problems with various weed species. The species where significant differences occurred are given in Table 89.

10.2 Increasing Cattle Production Efficiency

* This was the most popular theme for research and development with 76 percent of respondents (1127) raising issues (Table 88). There was considerable variation between regions with the level in Mulga Lands (53%) being well below average while levels in NT/WA Speargrass (87%), High Rainfall (85%) and Southern Speargrass (83%) were slightly above average.

* There were relationships between whether or not a respondent requested research and development and various factors. More of those requesting research and development on this theme considered animal health problems lower productivity (29 v 18%), obtained more than two-thirds of their gross income from beef (82 v 73%), normally feed phosphorus supplements (36 v 26%) and had some Zebu content in their herd (81 v 71%), while fewer left their bulls in the herd all year (51 v 63%) (Table 90).

* Requests under this theme were divided into eight broad components. Animal health (40%) and pastures (32%) were most frequently identified with supplements (14%) and breeding (12%) also important (Table 91). However, issues related to productivity and management (4%), drought (3%), improvements (2%) and vermin (2%) were also requested.

* Requests under animal health were highest in High Rainfall (66%) and Southern Speargrass (60%) and lowest in Mulga Lands (18%), NT/WA Speargrass (23%) and NT/WA Spinifex (24%). The main issues identified in the animal health theme were control of buffalo fly (19%) and cattle tick (14%) with three-day sickness (5%) and botulism (2%) as minor issues (Table 91). Since 68 percent of respondents identified buffalo fly control as important for improving future profitability, 47 percent identified tick control, 39 percent use of three-day sickness vaccine and 32 percent botulism vaccination (Table 72), it appears that most of the respondents considered the necessary technology to effectively control these animal health issues exists already.

Table 89. Difference between properties requesting or not requesting research and development on Sustaining the Resource across response rates (%) to related issues.

Issue		Requesting R&D	Not requesting R&D	Chi-squared
Number of respondents		414	1 751	
Property size	<10 000 ha	62	61	98.1**
	10 000 - 50 000 ha	30	14	
	>50 000 ha	8	25	
Land management issues as part of planning		57	52	3.5
Preferentially graze or spell paddocks		70	71	0.1
Manage to encourage regneration of pastures		82	82	0.0
Rung/poisoned/pulled any timbered areas in the last two years		53	45	8.5**
Weed control important to improve future profitability		78	65	26.6**
Timber treatment to improve future profitability		67	58	10.3**
Reduced stocking rate to improve future profitability		38	37	0.4
Eucalypt regrowth as a problem		69	54	30.5**
Black wattle as a problem		40	32	8.9**
Lantana as a problem		31	17	27.7**
Rubber vine as a problem		31	15	53.7**
Parthenium as a problem		26	15	22.7**
Pimelea as a problem		15	7	27.8**

Table 90. Difference between properties requesting or not requesting research and development on Increasing Cattle Production Efficiency across response rates (%) to related issues.

Issue	Requesting R&D	Not requesting R&D	Chi-squared
Number of respondents	1 127	1 038	
Over ⅔ of gross income from beef	82	73	25.7**
Bulls remaining in herd all year	51	63	26.7**
Reduced labour input in the last 5 years	55	49	9.1**
Animal health problems lowering productivity	29	18	32.7**
Parts of property considered phosphorus deficient	47	36	28.1**
Normally feed phosphorus supplements	36	26	25.2**
Enterprise breeding and fattening	71	70	7.4*
breeding only	25	24	
Some Zebu content in herd	81	71	25.7**

Table 91. Proportion (%) of properties requesting various components under the theme of Increasing Cattle Production Efficiency.

Region	Animal health	Pastures	Supplements	Breeding
Overall	40	32	14	12
High Rainfall	66	30	13	6
Brigalow	38	38	9	12
S. Speargrass	60	31	13	11
Qld Bluegrass	30	36	8	11
S. Aristida	28	45	14	10
S. Rolling Downs	45	32	5	7
C & N Rolling Downs	26	20	16	24
Mulga Lands	18	17	10	10
Qld Spinifex	32	11	21	5
N. Speargrass	31	25	27	10
N. Aristida	30	36	25	7
Gulf-Peninsula	39	32	30	18
NT/WA Spinifex	24	31	27	13
NT/WA Speargrass	23	48	26	19

* There was a strong relationship between requests for research and development on animal health issues and current attitudes and management practices. More of those requesting research and development considered buffalo fly control (80 v 63%), cattle tick control (57 v 44%), worm control (50 v 40%) and use of three-day sickness vaccine (47 v 35%) as important for future profitability but not control of botulism (33 v 32%) (Table 92). Requests for research and development were generally higher amongst groups treating for common parasites and diseases. However, there was no relationship with property phosphorus status or current phosphorus supplementation policy (Table 92).

* General animal health issues were requested by 17 percent of respondents.

* Requests for research and development on buffalo fly were highest in High Rainfall (51%) and Southern Speargrass (42%) and below 10 percent in inland and northern regions (Table 93). A greater percentage of respondents requesting research and development on buffalo fly consider buffalo fly control is important for future profitability (92 v 64%) and routinely treat to control buffalo fly (91 v 63%) (Table 94).

* Patterns of requests for cattle tick research and development were similar, but the highest levels were 28 percent for High Rainfall and 27 percent for Southern Speargrass. More of those requesting research and development on cattle tick control consider cattle tick control important to improve future profitability (88 v 43%) and routinely treat for tick control (82 v 39%) and vaccinate against tick fever (54 v 25%) (Table 95). Requests for tick control were not related to Zebu content in the herd.

* Although only 35 producers requested research and development on botulism they had a distinct profile. More of this group identified phosphorus supplementation (88 v 38%) and botulism control (79 v 31%) as important to improve profitability (Table 96). More of them come from phosphorus deficient properties (91 v 41%), routinely feed phosphorus supplements (67 v 31%) and routinely vaccinate against botulism (80 v 18%).

* Research and development on pastures was requested most in NT/WA Speargrass (48%) and Southern Aristida (45%) and least in the inland regions of Queensland Spinifex (11%), Mulga Lands (17%) and Central and Northern Rolling Downs (20%) (Table 91). Issues identified under the pasture theme were general issues (17%), legumes (13%), grasses (5%), tree crops (1%) and native pastures (1%). Requests for legumes were highest in Brigalow (22%) but low in all of the extensive regions (Table 93). This probably reflects the limited availability of legumes adapted to cracking clay soils while stylos and Wynn cassia are suited to

Table 92. Difference between properties requesting or not requesting research and development on animal health across response rates (%) to related issues.

Issue	Requesting R&D	Not requesting R&D	Chi-squared
Number of respondents	590	1 575	
Buffalo fly control to improve future profitability	80	63	55.3**
Cattle tick control to improve future profitability	57	44	26.7**
Worm control to improve future profitability	50	40	13.7**
Botulism control to improve future profitability	33	32	0.1
Three-day sickness vaccine to improve future profitability	47	35	23.6**
Routinely treat for buffalo fly control	78	63	46.4**
Routinely treat for cattle tick control	55	39	62.7**
Routinely vaccinate against redwater/tick fever	40	23	58.8**
Routinely treat for worms	46	36	19.7**
Routinely vaccinate against leptospirosis	23	18	5.3*
Routinely vaccinate against vibriosis	21	14	12.7**
Routinely vaccinate against diseases covered by 5-in-1	59	45	36.4**
Routinely vaccinate against botulism	20	18	0.8
Routinely treat or vaccinate against 3-day sickness	19	12	17.7**
Animal health problems lowering productivity	32	21	31.9**
Parts of property considered phosphorus deficient	45	40	5.0
Normally feed phosphorus supplements	34	31	2.5

Table 93. Proportion (%) of properties requesting specific topics for research and development.

Region	Buffalo fly	Cattle tick	Legumes	Weed control
Overall	19	14	13	23
High Rainfall	51	28	13	25
Brigalow	17	14	22	20
S. Speargrass	42	27	14	26
Qld Bluegrass	14	13	11	27
S. Aristida	3	14	14	31
S. Rolling Downs	7	5	16	34
C & N Rolling Downs	4	5	5	16
Mulga Lands	2	0	5	33
Qld Spinifex	2	5	2	18
N. Speargrass	10	12	8	41
N. Aristida	2	5	9	25
Gulf-Peninsula	7	9	5	9
NT/WA Spinifex	7	4	2	2
NT/WA Speargrass	0	6	3	3

Table 94. Difference between properties requesting or not requesting research and development on buffalo fly across response rates (%) to related issues.

Issue	Requesting R&D	Not requesting R&D	Chi-squared
Number of respondents	277	1 888	
Buffalo fly control to improve future profitability	92	64	84.7**
Cattle tick control to improve future profitability	66	44	42.4**
Routinely treat for buffalo fly control	91	63	85.8**
Routinely treat for cattle tick control	70	39	91.9**
Routinely vaccinate against redwater/tick fever	52	24	97.1**
Animal health problems lowering productivity	29	23	4.9*
Enterprise breeding and fattening	78	70	7.4*
breeding only	18	26	
Some Zebu content in herd	86	75	15.5**

Table 95. Difference between properties requesting or not requesting research and development on cattle tick across response rates (%) to related issues.

Issue	Requesting R&D	Not requesting R&D	Chi-squared
Number of respondents	214	1 951	
Buffalo fly control to improve future profitability	92	65	58.2**
Cattle tick control to improve future profitability	88	43	145.7**
Routinely treat for buffalo fly control	89	64	51.4**
Routinely treat for cattle tick control	82	39	148.8**
Routinely vaccinate against redwater/tick fever	54	25	84.0**
Animal health problems lowering productivity	32	23	8.2**
Enterprise breeding and fattening	72	71	0.5
breeding only	25	25	
Some Zebu content in herd	77	76	0.1

Table 96. Difference between properties requesting or not requesting research and development on botulism across response rates (%) to related issues.

Issue	Requesting R&D	Not requesting R&D	Chi-squared
Number of respondents	35	2 130	
Phosphorus supplementation to improve future profitability	88	38	28.1**
Botulism control to improve future profitability	79	31	29.9**
Routinely vaccinate against botulism	80	18	88.5**
Parts of property considered phosphorus deficient	91	41	36.6**
Normally feed phosphorus supplements	67	31	19.1**

a wide range of lighter soils.

* Incidence of requests for research and development on pastures was related to many current pasture management strategies (Table 97). More of those requesting research and development on pastures considered land management issues in their planning (69 v 49%), preferentially graze or spell paddocks (76 v 69%), manage to encourage regeneration of pasture (88 v 81%) and sowed pasture in the last two years (68 v 50%).

* More than 20 percent of properties in remote, extensive regions requested research and development on supplements (Table 91). Requests were mostly general (9%), with five percent for phosphorus and one percent for each of growth promotants and rumen modifiers. It is significant that 38 percent of producers rated phosphorus supplementation as important for improving future profitability (Table 74) but only five percent requested research and development on this issue. It seems that respondents are satisfied that the technology they need on this issue already exists. This seems incredible when 24 percent of producers indicated they do not feed phosphorus in the wet season because they cannot deliver it, while 32 percent say cattle will not eat it, 20 percent say cattle are too spread out and 15 percent say feed spoils. These would seem to be legitimate subjects for research and development.

* Requests on research and development on supplements were related to current practice with more of the group requesting research and development considering supplementation with protein/energy (69 v 37%), phosphorus (72 v 34%) and minerals (50 v 21%) and use of rumen modifiers (38 v 15%) and growth promotants (26 v 16%) important for future profitability (Table 98). More of the group currently supplement, use growth promotants and rumen modifiers and plan to change to a younger age of turnoff (40 v 28%).

* Requests for research and development on breeding were relatively uniform across regions with only Central and Northern Rolling Downs (24%), NT/WA Speargrass (19%) and Gulf-Peninsula (18%) being higher than average (Table 91). General breeding issues were most popular (10%), with two percent requesting genetics research and less than one percent requesting research on bull selection and artificial breeding. These figures contrast with the 93 percent who identified superior bull selection and 87 percent who identified selecting breeders on fertility as being important for improving future viability.

* While more of the respondents requesting research and development on breeding weaned to a minimum age of less than six months (81 v 65%), had some Zebu content in their herd (86 v 75%), identified selection of breeders on fertility (95 v 86%) and performance recording (54 v 41%) as important to improve future profitability, fewer left their bulls in the

Table 97. Difference between properties requesting or not requesting research and development on pastures across response rates (%) to related issues.

Issue		Requesting R&D	Not requesting R&D	Chi-squared
Number of respondents		468	1 697	
Land management issues as part of planning		69	49	57.3**
Preferentially graze or spell paddocks		76	69	8.4**
Manage to encourage regeneration of pastures		88	81	13.3**
More sown pasture to improve future profitability		86	68	50.2**
Timber treatment to improve future profitability		64	59	4.2*
Pasture sown in the last two years		68	50	45.9**
Timber cleared and introduced pasture		73	67	4.7*
Rung or poisoned and introduced pasture		10	12	0.9
Why pastures not planted	soil and climate unsuitable	30	40	5.8*
	property fully developed	5	11	5.1*
	inadequate finance	53	38	13.0**
	benefits too small	10	21	11.6**
	no suitable pasture plants	24	11	21.2**
	more profitable investments	12	9	1.1
Enterprise	breeding and fattening	71	70	0.6
	breeding only	25	25	

Table 98. Difference between properties requesting or not requesting research and development on supplements across response rates (%) to related issues.

Issue		Requesting R&D	Not requesting R&D	Chi-squared
Number of respondents		214	1 951	
Protein/energy supplementation to improve future profitability		69	37	71.6**
Phosphorus supplementation to improve future profitability		72	34	102.3**
Mineral supplementation to improve future profitability		50	21	81.0**
Rumen modifiers to improve future profitability		38	15	62.7**
Growth promotants to improve future profitability		26	16	12.2**
Change to younger age at turnoff		40	28	13.8**
Supplementing weaner heifers in a normal year		47	23	53.8**
Supplementing weaner heifers in a dry year		73	55	23.9**
Parts of property considered phosphorus deficient		73	38	96.4**
Normally feed phosphorus supplements		59	28	81.7**
Normally feed supplements of	sulphur	29	16	14.0**
	salt	51	34	14.7**
	calcium	31	13	33.1**
	urea	55	34	24.3**
	molasses	55	41	10.0**
	proprietary mixes	25	17	5.5*
	cottonseed meal	41	16	53.7**
	meat meal	22	9	22.9**
Use of hormonal growth promotants		31	16	28.3**
Feed rumen modifiers with supplements		23	7	63.6**
Enterprise	breeding and fattening	69	71	9.6**
	breeding only	30	24	
Some Zebu content in herd		88	75	20.9**

herd all year (48 v 58%) (Table 99).

10.3 Marketing

* Marketing issues for future research and development were raised by 37 percent of respondents (Table 88) with similar response levels across regions, the range being 26 to 47 percent. Most requests (25%) under this theme were for general marketing issues, while market requirements, processing, government policy and transport were each requested by four percent of producers. Processing costs were raised by three percent and live animal assessment, bruising and quarantine each by one percent.

* There was a link between requests for research and development on marketing and the importance of marketing issues for future profitability. More of those requesting research and development on marketing considered knoweldge of market specifications (89 v 83%) and meatworks feedback (87 v 78%) as important to improve future profitability (Table 100).

10.4 Cost Reducing Management

* Cost reducing management issues were identified by seven percent of respondents (Table 88) with highest levels in NT/WA Spinifex (13%) and Queensland Spinifex (11%).

* Requests for research and development in this area were not strongly related to many other issues. More of those requesting research and development identified more efficient mustering as important to improve future profitability (69 v 58%) and had reduced labour input in the last five years (67 v 51%) (Table 101).

Table 99. Difference between properties requesting or not requesting research and development on breeding across response rates (%) to related issues.

Issue	Requesting R&D	Not requesting R&D	Chi-squared
Number of respondents	177	1 988	
Superior bull selection to improve future profitability	97	92	4.9*
Selection of breeders on fertility to improve future profitability	95	86	11.5**
Prevention of out of season calving to improve future profitability	56	47	5.3*
Performance recording to improve future profitability	54	41	9.3**
Bulls remaining in herd all year	48	58	5.4*
Minimum age at weaning < 6 months	81	65	16.8**
Minimum weight at weaning < 150 kg	58	41	6.4*
Enterprise breeding and fattening	73	71	3.6
breeding only	26	25	
Some Zebu content in herd	86	75	11.3**

Table 100. Difference between properties requesting or not requesting research and development on marketing across response rates (%) to related issues.

Issue	Requesting R&D	Not requesting R&D	Chi-squared
Number of respondents	543	1 622	
Over ⅔ of gross income from beef	74	79	4.4*
Market specifications to improve future profitability	89	83	11.0*
Meatworks feedback to improve future profitability	87	78	20.2**
Improved financial planning and control to improve future profitability	72	70	0.6
Prime steers and bullocks sold at 3 years or younger	57	56	0.1
Buy stores to fatten	47	41	6.3*
Enterprise breeding and fattening	72	70	0.8
breeding only	23	25	
Some Zebu content in herd	74	77	1.9

Table 101. Difference between properties requesting or not requesting research and development on cost reducing management across response rates (%) to related issues.

Issue	Requesting R&D	Not requesting R&D	Chi-squared
Number of respondents	107	2 058	
Labour saving devices to improve future profitability	78	72	1.9
More efficient mustering to improve future profitability	69	58	4.8*
Energy sources for power to improve future profitability	52	44	2.2
Use of casual labour	57	53	0.5
Reduced labour input in the last five years	67	51	9.7**
Enterprise breeding and fattening	69	71	1.0
breeding only	25	25	

10. CONCLUSIONS

* This survey has produced the best snapshot to date of the northern Australian beef industry and provides an excellent base on which to assess the impact of research, development and technology transfer exercises in the immediate future. The willingness of such a large sample of producers to contribute to the survey is evidence of their interest in the future of their industry.

* The high proportion (> 80%) of producers who identified knowledge of market specifications and meatworks feedback as being important for future profitability indicates a swing in the industry to a market driven rather than a production driven approach. However, only 52 percent of producers (representing 58 percent of stock numbers) currently sell prime steers and bullocks direct to works. There is an obvious need for a mechanism to be put in place to make the requirements of our various markets freely available to industry. In addition, a significant percentage of northern producers need to change their marketing methods to enable them to receive feedback. The Ausmeat Feedback Workshops must be fostered to provide industry with a better understanding of the Ausmeat language and the benefits to them of sending animals direct.

  It is unfortunate that usage of CALM has been so low as it provides the advantages of both the saleyard system (competition) and direct consignment (minimal stress and weight loss). The CALM management needs to communicate effectively with rank and file producers to determine why they will not use the system and then make a conscious effort to enhance the scheme to make it more attractive to industry.

* The survey has highlighted the ages at which most prime steers and bullocks are slaughtered in northern Australia with 74 percent of producers marketing them at two to four years of age and seven percent at more than four years. If we are to capitalise on the opportunities in the lucrative Asian markets, management systems will need to change to allow younger age of turnoff. Significantly, 29 percent of respondents indicated they intended to sell their prime steers and bullocks at younger ages.

  One of the most likely methods of achieving this is by nutritional means with improved pastures playing a key role. The fact that 54 percent of respondents planted improved pastures in the last two years and 72 percent identified more sown pastures as important for future profitability augers will for progress in this area. It is significant that 13 percent of producers indicated they had not planted improved pastures in the last two years because of lack of suitable species. This lends support to the ongoing species evaluation program currently being supported by MRC.

  The benefits of this program are already being realised as 14 percent of respondents planted stylo species during the past two years.

* Producers gave strong signals that selection of breeding stock rated highly in ensuring their future profitability. Ninety-three percent rated superior bull selection as important while 87 percent rated selection of breeders on fertility as important. This contrasts with the 43 percent who considered performance recording as important. It is obvious that an on-going technology transfer program is required to inform producers of the production benefits to be obtained from objective selection of replacement stock, especially sires.

  The low proportion (24%) of respondents who culled more than 20 percent of their bulls annually indicates that, even with objective selection of sires, rate of genetic progress will be slow because of long generation intervals. Modelling exercises should be carried out to determine rates of genetic progress with a range of scenarios plus economic outcomes of different selection and culling policies to provide evidence which might convince producers to cull bulls at younger ages.

* The results of the survey indicate that the industry is in a healthy state with producers prepared to adopt new technology in an endeavour to enhance their level and efficiency of production. A typical example of this is the fact that 14 percent of respondents currently utilise personal computers as an aid in property management. The fact that 22 percent of this group utilise decision support packages and 30 percent of all respondents consider use of such packages is important to improve future profitability suggests that this area should be supported and fostered.

* Producers demonstrated a high level of interest in Land Care Issues which strongly questions the criticism often levelled at them that they are production orientated and have scant regard for the natural resource. Weed control figures highly in their priorities for improving future profitability which endorses the current support by MRC for research and development into woody weed control.

  In this regard more than 60 percent of respondents indicated that timber treatment was important for improving profitability. This could be a potential area of conflict with the conservation lobby in the future.

  It is significant that 50 percent of respondents listed control of poisonous plants as being important for improving future profitability. Some problem plants for which no effective control programs currently exist are pimelea, Georgina gidgee and heart leaf. The MRC is currently funding research into methods of coping with pimelea, and there may be justification for supporting research into mechanisms for combating the effects of other species.

  Only 37 percent of producers suggested that reduced stocking rate was important for the future despite a commonly held belief that overstocking is a problem in many of the intensive areas of northern Australia. There is a need to obtain objective data on pasture and animal performance at a range of stocking rates on various ecological areas so that management systems can be devised which are biologically stable and economically viable. The

Sustainable Grazing Project (DAQ.073) currently underway in central Queensland will provide some interesting data on this issue.

* Animal health issues rated prominently as factors impacting on future profitability. Buffalo fly and cattle ticks are considered the most important problems to be overcome despite the lack of scientific evidence to support any effect of buffalo fly on liveweight gain and the ability to combat cattle tick problems by infusion of *Bos indicus* blood. It is obvious that the tick vaccine being developed by CSIRO and their commercial partners will receive ready adoption when it is released.

  It is rather surprising that 44 percent of producers with >5%Zebu still dip for tick control. This would seem to be an unnecessary cost on the production system and is an area where these producers could effect savings.

  Surprisingly, few producers (19%) requested research and development on buffalo fly while 68 percent considered it important for future profitability. Industry experience is that few of the chemicals currently available for buffalo fly control are effective. While the fly trap developed by CSIRO Division of Entomology is effective in certain situations, further research is needed to develop non-chemical methods of buffalo fly control.

* Thirty-two percent of producers identified botulism vaccination as important for future profitability but only 19 percent actually vaccinate. This represents a significant area of loss and one where production benefits could be made through a change of management policy. Even in the most phosphorus deficient regions where botulism is endemic, a maximum of 75 percent of producers vaccinate against botulism. Fewer than one percent of producers indicated that they were aware that botulism was present but failed to vaccinate. This suggests that an awareness campaign stressing the extent of possible losses and the extent of the occurrence of botulism is warranted.

* Associated with botulism is the issue of phosphorus deficiency. While most producers felt confident that they knew the phosphorus status of their properties, 19 percent overall (and as many as 42 percent in some regions) were unsure. This suggests the need for an educational campaign to enable producers to assess the phosphorus status of their properties.

  Incidence of phosphorus feeding was high with more than 70 percent feeding in some regions. However, 43 percent feed only during the dry season with 48 percent of these saying that phosphorus is not required in the wet. This indicates a lack of awareness of the appropriate time to feed phosphorus supplements and suggests that an awareness program should be mounted. Since feeding incidence is high, the issue to be addressed is not whether to feed but rather when to feed.

  Problems with delivery of the supplement were highlighted by many respondents with 'cattle will not eat, cattle too spread out, can not deliver and spoilage' being specifically identified. This is an obvious area for research and

development as the benefits to be obtained from development of successful delivery systems are substantial. Despite these obvious problems only five percent of respondents identified phosphorus feeding as an issue for future research and development.

Overall 55 percent of producers who supplement with phosphorus use monoammonium phosphate (MAP) with as many as 84 percent in some regions. It is not surprising then that producers were very concerned in 1990-91 when concerns were raised about the cadmium and fluorine levels in MAP from various sources and QDPI recommended against its use. Fortunately, dicalcium phosphate is available and satisfactory feed formulations have been developed, albeit at a higher price.

* The widespread adoption of weaning (95 percent overall) is evidence that technology transfer processes have been successful. There has also been significant adoption of early weaning with seven percent overall weaning down to less than four months of age with much higher levels in harsher, northern regions. This highlights the willingness of industry to adopt new technology and is further evidence that the research undertaken in NAP1 is bearing fruit.

* The reduced labour input on beef properties was highlighted by the 52 percent of properties which reduced labour usage in the last five years. This impact was greatest in more extensive areas and was made possible by increased adoption of labour saving technology.

  This is an important area for future research and development. While the drift from rural areas to urban areas is not desirable, it seems inevitable. Technology must be developed to reduce labour usage and production costs to enable our industry to remain competitive.

REFERENCES

Alexander, G.I., Sullivan, J.J. and Stokoe, Mrs J. (1970) Cottonseed meal and grain as supplements for grazing beef cattle. *Proceedings Australian Society of Animal Production* 8: 45-49.

Anon (1991) Swans Lagoon Beef Cattle Research Station 1991 Annual Report. Qld Department of Primary Industries.

Daly, J.J. (1978) Rail movements of cattle in Queensland. Beef Cattle Husbandry Branch Technical Bulletin No 17. Qld Department of Primary Industries.

Holroyd, R.G. (1977) Reproductive performance of beef cattle in Northern Queensland. M.Sc. Thesis, James Cook University of North Queensland.

Holroyd, R.G. and O'Rourke, P.K. (1989) Collation of basic biological data on beef cattle production in north Australia. 92p Report to Meat Research Corporation, Sydney.

Ladds, P.W., Summers, P.M. and Humphrey, J.D. (1975) Pregnancy in slaughtered cows in nroth-eastern Australia. Incidence and relationship to pregnancy diagnosis, season, age and carcase weight. *Australian Veterinary Journal* 51: 472-7.

Lindsay, J.A. and Loxton, I.D. (1981) Supplementation of tropical forage diets with protected proteins. *Proceedings Recent Advances In Animal Nutrition in Australia.* University of New England, Armidale.

Shorthose, W.R. and Harris, P.V. (1990) Effect of animal age on the tenderness of selected beef muscles. *Journal of Food Science* 55: 1-8 &14.

Wythes, J.R. and Shorthose, W.R. (1984) Marketing cattle: Its effects on liveweight, carcases and meat quality. Australian Meat Research Committee Review No 46: 1-27.