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Education and Training to Support Sustainable Management of Australia's Pastoral Industries

**Report for the Australian Meat &
Livestock Industry, 6 February
1998.**



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Education and Training to Support Sustainable
Management of Australia's Pastoral Industries

6 February 1998

Report to
Meat Research Corporation

AGTRANS RESEARCH

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STUDY TEAM

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DISCLAIMER

This report has been prepared for the Meat Research Corporation. The report is based upon discussions with, and information provided by, representatives of educational institutions and stakeholders in the rangelands. All conclusions and recommendations are made on the basis of information provided to the consultants. The consultants accept no liability for any damage suffered by any third party who relies on this assessment.

EXECUTIVE SUMMARY

This study has investigated education and training to support sustainable management of Australia's pastoral industries with reference to rangeland areas. The results indicate there is scope for the Meat Research Corporation (MRC) to initiate action to improve rangeland management education and training offerings to stakeholders.

Across all groups of stakeholders in the rangelands, educational and training offerings available at present are generally perceived:

- to be unavailable on the specific topic of rangeland management;
- to have inadequate focus upon the practical aspects of rangeland management;
- to inadequately integrate the production and ecological aspects of rangeland management; and
- to be somewhat 'out of touch' with the educational and training needs of stakeholders in the rangelands.

There was general agreement by rangeland stakeholders that there is a need to improve education and training offerings for a wide range of groups associated with the rangelands. Only a minority of those contacted expressed an opinion that current education and training offerings relevant to rangeland management were adequate, or believed there is no need to further develop or improve education and training in this area.

The above mentioned views were elicited from stakeholders in the rangelands as a result of undertaking a phone/fax survey and from proceedings of a number of discussion groups. The types of stakeholders involved within these consultations included: pastoralists, research and extension personnel, national park personnel and other public land managers, service providers to persons in the rangelands (for example bankers, rural merchandisers), Aboriginal land managers, and policy persons.

A summary of education and training offerings relevant to rangeland management was compiled. It was evident there are no courses currently available that focus specifically upon rangeland management, although there are several agricultural production and natural resource management courses available that give some attention to rangeland management. A small number of courses were identified as containing a number of elective subjects specific to rangeland management or the option to specialise in this area with a group of subjects. The courses identified with a particular focus on rangeland management include the Bachelor of Natural Resources offered by the University of New England and the proposed Bachelor of Applied Science (Crops and Rangeland) to be offered in 1998 by the University of Queensland, Gatton College. Subjects specific to rangeland management are available through the TAFE system; two elective subjects are currently available within a Rural Business Management certificate or undergraduate diploma. These two subjects attempt to integrate the production and ecological aspects of rangeland management.

Stakeholders in the rangeland perceived there was a need to provide education and training of specific relevance to the rangelands in a variety of forms, such as short courses and degrees. Flexibility in education and training offerings was viewed as important in

terms of time to complete the course, location of the course, method of presentation and delivery, and method of assessment. There were seen to be a wide range of needs due mainly to the different education levels and levels of understanding of existing and prospective rangeland managers. Distance education options through traditional correspondence or technologies such as the internet were perceived to be important to stakeholders in rural and remote areas.

The motivational problems associated with undertaking education and training through distance education mechanisms were recognised by stakeholders. This is a critical issue, particularly for pastoralists, whose learning philosophy is strongly oriented to 'on-the-job' acquisition of skills, rather than to formal training. Low receptivity to formal courses reinforced by time and financial constraints may deter participation in on-going education and training. Also, as the majority of courses currently available were not perceived to specifically meet pastoralists needs, there is a general attitude that the value of further education and training was not particularly high. Significant change in course offerings was required.

The concept of a Rangeland Management Centre and Network (RMC&N) to coordinate courses specific to rangeland management was supported by the majority of stakeholders contacted. Reservations noted were that the centre and network should not duplicate existing efforts in this area and should be integrated with existing institutions where appropriate. Also experts in the area of rangeland management, including existing rangeland managers, should be closely involved in the activities of the centre and network.

It was perceived that the RMC&N would cater for the education and training needs of a wide range of people involved in and associated with rangelands management. The RMC&N would offer a wide range of high quality, practical and flexible courses that integrate the production and ecological aspects of rangelands management, as well as promote an integrated approach to whole property planning and business and financial management. Both short courses and degree courses would be supported initially. The various types of training would be directed towards existing and prospective pastoral managers, extension service personnel including consultants, State Department advisers, public land managers, aboriginal land managers, those in servicing industries such as a bankers, and natural resource policy personnel.

The RMC&N would encourage and develop linkages with other relevant educational institutions and with stakeholders in the rangelands. It would facilitate a strong network of existing tertiary institutions with an interest in rangeland management and associated disciplines. It would act as a repository of information relevant to the rangelands, and would be an initial point of contact for queries regarding rangeland management. It could also fulfil an important function as the pivotal national disseminator of current information on rangeland management and be integrated with the extension services in a number of Australian States and Territories. Integration of education and training courses with the knowledge and practical experience of individual rangeland managers and with other resource management initiatives such as property management planning and the landcare movement would be expected.

The vision for the RMC&N is that it would encompass a new ethos for rangeland management in Australia and would be attuned to the real needs of the stakeholders in

rangelands. It would strive to be a Centre of Excellence in rangeland management and serve firstly Australia and, in time, other relevant areas of the world. The RMC&N would be integrated strongly with industry and would be responsive to changing economic and ecological circumstances regarding the rangelands.

Close industry and other land user involvement in the establishment, development and operations of the RMC&N would be essential in ensuring that ownership is provided to those groups that would benefit from the initiative. Not only should the management of the Centre be driven by industry, but also industry should be involved in the facilitation of the provision of practical experience within Centre courses and other courses linked into the network. Further, individuals from industry could make significant contributions in the development and delivery of short courses.

Although firm estimates of the number of persons likely to be interested in undertaking some form of education and training in rangeland management were unable to be quantified within the study, there is a large demand from pastoralists for relevant, well targeted and well presented short courses. In this respect the market is perceived to be significant. Likely entry numbers for a three or four year degree course would most likely depend on the level of specialisation in rangeland management offered. However, if the extent of specialisation was no more than one year, and the degree course was promoted strongly, an entry number of 25 per year could be attainable.

Regarding the types of activities and courses that could be developed through the proposed entity, a number of options are presented in this report for further consideration by MRC. However, the process of developing specific courses is likely to be best undertaken by education and training experts in conjunction with stakeholders in the rangelands.

It is the view of the study team that MRC should further pursue the concept of establishing a RMC&N. The following initiatives could be considered by MRC:

- (i) MRC should establish a Steering Committee made up of representatives from MRC, IWS and representatives of beef and wool producer groups plus one independent person drawn from the tertiary education sector. The Steering Committee would further develop the concept outlined in this report and may further any or all of the proposed actions in (ii) to (vi) below.
- (ii) The Steering Committee may engage in further consultations with industry groups and governments. Consultations would include obtaining further input from pastoralists and others with interests in the rangelands and should include Aboriginal groups.
- (iii) The Steering Committee may bring this report to the attention of the National Rangeland Management Working Group for consideration and incorporation of education and training elements into the National Strategy for Rangeland Management. Support from this Group should be sought for the concepts outlined in this report.
- (iv) The Steering Committee may need to initiate further investigations in one, some, or all of the following areas:

- requirements for the first two or three years of a degree course in accredited institutions and mechanisms whereby such cross-institutional arrangements may operate including funding, degree conferral etc.
- assessment of the acceptance in relevant agricultural science, agricultural economics, agribusiness or management degrees of final year specialist options in a Rangeland Management Centre and the likelihood of these being taken up by each institution and its students
- the potential demand for various modes of offering of formal degree courses, especially by distance education or internet (e-mail) methods.
- broad notions of curricula in the various courses
- the specific types of short courses that might be offered by the RMC&N in terms of subject areas
- the concept of articulation of short courses towards a formal qualification and how work place assessment might be incorporated into such a qualification
- potential financial support through the National Heritage Trust (NHT) and the Department of Employment, Education, Training and Youth Affairs (DEETYA)

(v) The Steering Committee may then consider producing a more detailed proposal for the structure and operation of a RMC&N than is contained in the current report. Expressions of interest for involvement of tertiary institutions and others such as producer groups and research/extension agencies could then be sought.

(vi) As a result of the expressions of interest received, the Steering Committee could then invite specific tertiary institutions (singularly or combined) to develop the structure and function for the RMC&N. The conduct of further research to assess the number of people operating in rangeland management, now and in the future, and estimates of the proportion that might be interested in various courses could be included as part of this invitation.

1 INTRODUCTION

This report presents the results of a study to identify and report on the existing education and training offerings relevant to rangeland management, to assess whether these offerings meet the needs of those operating in, and associated with, rangeland management, and to suggest how these needs may be better serviced in the future. Specifically, the concept of a 'Rangeland Management Centre' was studied and opinion of stakeholders concerning such a concept was tested.

The specific objectives of this study were:

- to identify the current and likely future needs in education and training to support continued profitability and ecological sustainability in the management of Australia's extensive pastoral industries in the rangelands;
- to examine and report on whether, and by what means, these needs are being met and to highlight changes in institutional structures, materials and delivery systems that would assist the industries in meeting domestic and international requirements; and
- if warranted, make recommendations on steps the Meat Research Corporation (MRC) could take to help ensure the industries' education and training needs are met in full, and provide costings of the action required.

Rangelands have been defined as areas where 'domestic stock are grazed on native pasture' (LWRRDC, 1994), or 'the low rainfall and variable climate arid and semi-arid areas and, north of the Tropic of Capricorn, some seasonally high rainfall areas' (ANZECC and ARMCANZ, 1997).

For the purposes of this study rangelands are defined as those lands predominantly associated with grazing industries and where cropping activities are infrequent. According to this definition rangelands include more than just the dry, remote or native pasture regions of Australia. While predominantly grazing lands, the rangeland area would also include non-grazing areas such as national parks and aboriginal lands located in the grazing regions.

Rangelands disciplines include both management and science related disciplines. Science disciplines would include, for example, plant science, soil science, animal science, ecology and hydrology. When applied to grazing systems and a management dimension is introduced, key rangeland disciplines would include pasture management, grazing systems management and natural resource management. Also of high relevance to rangelands management are the disciplines of farm business management, property management planning and whole farm management.

More specific subject areas that would be relevant to rangeland management include: habitat assessment and management, rangelands and environmental law, land resource evaluation in rangelands, rangelands and environmental policy, animal behaviour in rangelands, sustainable wildlife management systems, the economics of rangelands, whole farm and catchment planning in rangelands, water management systems, rangelands rehabilitation principles, fire management, ecotourism and environmental assessment.

The report is presented in six chapters. Chapter 2 presents a summary of the existing education and training offerings available across Australia that are relevant to rangeland management. Chapter 3 provides the results of a survey of stakeholders in the rangelands undertaken to assist in determining the needs for future education and training relevant to rangeland management. Chapter 4 presents the results of discussion groups involving rangeland stakeholders held to provide further information and to test hypotheses formed as an outcome of the analysis of survey results.

Chapter 5 identifies the future needs for education and training in the rangelands. The scope and vision for a Rangeland Management Centre and Network are identified and specific functions and characteristics of such an entity are presented. Chapter 6 provides some options for the types of educational and training offerings that might be considered. Some other initiatives relevant to rangeland management education and training are reported, and factors affecting the numbers of people likely to be interested in undertaking education and training relevant to rangeland management are also presented. Sources of potential funding for the proposed Centre are also identified within Chapter 6. Chapter 7 presents the conclusions from the study and suggests future activities that could be undertaken by the MRC in progressing the concept further.

2 EXISTING EDUCATION AND TRAINING OFFERINGS

2.1 Information Required

The objective of this part of the study was to identify and briefly describe courses relevant to rangeland management offered by Australian educational and training providers. Courses and subjects currently available, and those planned to be available in 1998, were included in the overview. This brief review contributes to the assessment of whether the present supply of courses in this area is adequate or if there is a need to improve existing education and training offerings.

2.2 Method

Universities, colleges and other educational and training institutions and providers that offer courses relevant to rangeland management were identified from a range of sources. Further relevant institutions were identified within Anon (1997) which lists Australian educational institutions that offer courses with an agricultural focus.

The course coordinator or other relevant person within each group identified was contacted by telephone, and information was sought regarding course and subject descriptions relevant to rangeland management. A judgement was necessary regarding the relevance of particular courses and subjects to rangeland management. For example, geography and other courses including some reference to land management issues were initially considered, but as these courses have only limited relevance to rangeland management, it was considered they be omitted from the scope of the assessment. Information on funding for, and costs of, various existing courses and institutions was excluded from the review.

Based on the material received from each provider, a brief summary of the offerings of each institution relevant to rangeland management was compiled. Each summary was later checked by a relevant person within each institution. Comments received from institutions regarding the content of the summary were taken into account in finalising the account of educational and training offerings relevant to rangeland management. The content and structure of a number of relevant courses offered were found to be under review, or in the process of alteration by particular institutions. Thus, although the information within this report is correct to the knowledge of the authors at the time of writing, it is likely some changes will be made to particular courses in the future.

The remainder of this chapter provides an overview of the reviewed courses available relevant to rangeland management. The review was not necessarily comprehensive and there may be some overlooked courses which may be relevant to rangeland management. Appendix 1 provides more detailed information on the offerings of each of the institutions contacted.

2.3 Summary of Relevant Offerings

2.3.1 Institutions Contacted

Institutions and organisations from which information on courses relevant to rangeland management was sought included the following;

- Burdekin Agricultural College, QLD
- Central Queensland University, QLD
- Charles Sturt University, NSW
- Curtin University of Technology, Kalgoorlie Campus, WA
- Curtin University of Technology, Muresk Institute of Agriculture, WA
- Dalby Agricultural College, QLD
- Emerald Agricultural College, QLD
- Flinders University, SA
- Griffith University, QLD
- Longreach Pastoral College, QLD
- Marcus Oldham College, VIC
- Murdoch University, WA
- Northern Territory Rural College, NT
- Northern Territory University (also Cooperative Research Centre for the Sustainable Development of Tropical Agriculture), NT
- Resource Consulting Services, QLD
- TAFE Colleges
- University of Adelaide, Adelaide, SA
- University of Adelaide, Roseworthy, SA
- University of Melbourne, VIC
- University of New England, NSW
- University of Southern Queensland, QLD
- University of Queensland, St Lucia, QLD
- University of Queensland, Gatton College, QLD
- University of South Australia, SA
- University of Sydney, Sydney, NSW
- University of Sydney, Orange Agricultural College, NSW
- University of Western Australia, WA
- University of Western Sydney, Hawkesbury, NSW

2.3.2 Courses and/or Subjects of Relevance to Rangeland Management

Courses of relevance to rangeland management were identified as such if there was a 'rangeland management' (or similar) subject/s or module/s within the course. However, it should be noted there are likely to be additional courses not identified here with subject/s or module/s that may be directly relevant to rangeland management, for example, those containing subjects such as land management and pasture management.

Courses containing some subjects and/or modules of relevance to rangeland management are available from educational and training institutions throughout Australia, in Queensland, Northern Territory, Western Australia, South Australia, Victoria and New South Wales. However, the extent to which rangeland management is studied within these courses is only minor within the majority of courses reviewed.

The University of Queensland (Gatton College) offers a subject called 'Crops and Rangelands in Perspective' within the Bachelor of Natural Resources (Rural Systems Management), Bachelor of Agricultural Science (Rural Technology), and Diplomas of Applied Science (Agronomy, Animal Production and Equine Studies). From 1998, the University of Queensland, Gatton College will be offering a three year Bachelor of Applied Science (Crops and Rangelands). This course is made up of two years basic applied science subjects and one option is to specialise in rangeland management in the third year. Within the third year subjects include: 'Rangeland Management I', 'Rangeland Management II', 'Rangeland Excursion', and 'Rangeland Management Case Studies'. The rangeland subjects make up about 50% of the final year if this specialisation is undertaken. A 'Range Management' subject is also offered by the University of Queensland (St Lucia) within a Bachelor of Agricultural Science (Animal Science). Also in Queensland, Longreach Pastoral College offers a 'Rangeland Ecology' subject area which is made up of one subject entitled 'Soil Features'. A 'Rangeland Ecology' subject area can also be undertaken within a Certificate of Pastoral Production at Longreach Pastoral College, which includes the following subjects: 'Basic Plant Growth', 'Soil Science', and 'Pasture Principles'. A similar subject area is offered within the Diploma of Applied Science (Pastoral Production) at the same institution. Dalby Agricultural College in Queensland offers a Certificate IV, a Diploma and an Advanced Diploma in Rural Business Management with two elective Rangeland Management modules being available. These modules are also offered through the TAFE system. The TAFE offerings are discussed in more detail later in this section.

Northern Territory Rural College offers 'Rangeland Management' modules within the Certificate in Beef Cattle Production, the Diploma in Beef Cattle Management and within the Certificate IV, Diploma and Advanced Diploma available through the Rural Business Management Home Study Program. The Northern Territory University currently offers a Masters course in Tropical Environmental Management, which has some relevance to rangeland management. The CRC for the Sustainable Development of Tropical Savannas intend to support the development of a Masters level unit in Tropical Rangeland Management, which may be available in 1998 within the Masters in Tropical Environmental Management through the Northern Territory University.

The University of Western Australia currently offers a Bachelor of Science (Natural Resource Management). An elective unit entitled 'Rangeland Management' can be undertaken in the fourth year of this course. This unit focuses upon the environmental,

economic and social aspects of managing rangelands, with emphasis on Western Australia. Another fourth year elective unit within this course entitled 'Animal Resource Management' includes a module entitled 'Management of Animals in the Rangelands'. Curtin University of Technology, Kalgoorlie Campus, offers a 'Semi-arid Rangeland Management' subject within a Diploma of Applied Science (Environmental Technology).

The University of Adelaide offers a 'Rangeland Management' subject within an undergraduate diploma in Natural Resource Management and also a 'Rangeland Ecology and Management of Rangelands' subject within a Bachelor of Environmental Management. A Bachelor of Natural Resources is offered by the University of New England. This course is made up of elective units grouped into programs to provide specialisation in a particular area of resource management, and one program offered is entitled 'Rangeland Management'. Within this program, subjects are offered relevant to production, ecology and management, and practical work is undertaken in the semi-arid rangelands on the Western Plains of New South Wales. A Bachelor of Landscape Management and Conservation, and a Bachelor of Systems Agriculture is available through the University of Western Sydney, Hawkesbury. Within these courses, some rangeland management studies could be undertaken electively via off-campus case studies and project activities in the final two years of each course.

A number of TAFE Colleges and agricultural colleges in Australia offer a Certificate, a Diploma and an Advanced Diploma in Rural Business Management. These courses include elective Rangeland Management I and Rangeland Management II modules. The main topics included within the Rangeland Management I module are 'Rangeland Plant Communities', 'Grazing and Rangelands', 'Land Uses', and 'Land Degradation Prevention Control'. Rangeland Management II module includes topics covering 'Rangeland Plants', 'Effects of Cattle Grazing', NT Pastoral Lands Act' and 'Carrying Capacities'.

Short courses and educational and training opportunities with focus on particular aspects of rangeland management are available through a number of miscellaneous initiatives such as Landcare, courses offered by private consultancy groups and government departments, and other initiatives. These courses are typically directed toward land managers and range in duration from a few days to a week. Some information was compiled on short courses, although a comprehensive review was unable to be undertaken due to time constraints.

2.3.3 Integration of Production and Ecological Aspects

Of the education and training opportunities reviewed, it appears that, although there are subjects and modules available specifically relating to rangeland management, there are no courses currently available that focus directly, and primarily, upon management of the rangelands, either from a production or an ecological perspective. The courses with the strongest focus on rangeland management are the option within the Bachelor of Applied Science (Crops and Rangelands) to be offered by the University of Queensland, Gatton College from 1998, and the Bachelor of Natural Resources at the University of New England.

The majority of rangeland management subjects or modules offered appear to be within either production-orientated or ecologically-orientated courses and there does not appear

to be an abundance of courses that concentrate on the integration of production and ecological principles.

Ecologically-Orientated Courses:

Courses relevant to rangeland management with an ecological-orientation are identified based upon an analysis of the course content. Courses are defined as relevant to Rangeland Management if there is at least one subject within the course that is of particular relevance to rangeland areas, rangeland science or rangeland management. These courses include:

- Masters (Tropical Environmental Management), Northern Territory University
- Graduate Diploma in Environmental Management, Central Queensland University
- Graduate Diploma of Applied Science (Environmental Management), Charles Sturt University
- Graduate Diploma of Applied Science (Parks, Recreation and Heritage), Charles Sturt University
- Graduate Diploma in Landcare, Muresk Institute of Agriculture
- Bachelor of Environmental Science, Flinders University, University of Adelaide, Murdoch University, Central Queensland University
- Bachelor of Environmental Management, Flinders University, The University of Adelaide
- Bachelor of Natural Resources, The University of Queensland, Gatton College
- Bachelor of Science (Environmental Science), The University of Western Australia, Murdoch University
- Bachelor of Applied Science (Conservation and Park Management, Environmental Management), The University of South Australia
- Bachelor of Applied Science (Environmental Tourism), The University of Queensland, Gatton College
- Bachelor of Applied Science (Ecotourism), Charles Sturt University
- Bachelor of Technology (Ecotourism), Flinders University
- Bachelor of Applied Science (Natural Resource Management), University of Melbourne
- Bachelor of Science in Australian Environmental Studies, Griffith University
- Bachelor of Science (Natural Resource Management), University of Western Australia
- Bachelor of Applied Science (Parks, Recreation and Heritage), Charles Sturt University
- Bachelor of Science (Tropical Environmental Science), Northern Territory University
- Associate Degree of Applied Science (Parks, Recreation and Heritage), Charles Sturt University
- Associate Diploma of Applied Science (Environmental Science), Northern Territory University

- Diploma of Applied Science (Wilderness Reserves and Wildlife), The University of Queensland, Gatton College
- Diploma of Lands, Parks and Wildlife Management, Northern Territory Rural College
- Diploma in Natural Resource Management, The University of Adelaide
- Diploma of Applied Science (Environmental Technology), Curtin University of Technology (Kalgoorlie Campus)
- Certificates in Lands, Parks, & Wildlife, Northern Territory Rural College
- Certificate in Natural Resources, The University of New England
- Certificate IV (Landcare), Dalby Agricultural College
- Certificate IV, Diploma and Advanced Diploma in Tropical Resource Management (Northern Territory University)

In the main, the above listed ecologically-orientated courses are directed to persons such as park rangers, environmental officers, and natural resource managers. Within some of the above courses, subjects are offered specific to the management of rangeland areas, but generally the rangeland management component is not a significant part of the overall course.

Production-Orientated Courses:

Courses relevant to rangeland management with a production-orientation include:

- Graduate Diploma in Systems Agriculture, University of Western Sydney, Hawkesbury
- Graduate Diploma of Agricultural Science, University of Sydney
- Graduate Diploma (Sustainable Agriculture, Rural Management Studies), University of Sydney, Orange Agricultural College
- Graduate Certificate (Sustainable Agriculture, Rural Management), University of Sydney, Orange Agricultural College
- Bachelor of Applied Science (Agriculture), Charles Sturt University
- Bachelor of Systems Agriculture, University of Western Sydney, Hawkesbury,
- Bachelor of Agricultural Science, The University of Queensland, St Lucia and Gatton College
- Bachelor of Agriculture, The University of Adelaide, The University of New England
- Bachelor of Science (Agriculture), The University of Western Australia
- Bachelor of Agricultural Science, University of Melbourne
- Bachelor of Rural Science, The University of New England
- Bachelor of Applied Science (Crops and Rangelands), The University of Queensland, Gatton College
- Bachelor of Management (Land Resources, Farm Business, Rural Business Administration), The University of Sydney, Orange Agricultural College

- Advanced Diploma (Land Management, Farm Management, Rural Business Administration), The University of Sydney, Orange Agricultural College
- Advanced Diploma and Diploma in Rural Business Management, Dalby Agricultural College
- Diploma of Applied Science (Agronomy, Animal Production, Equine Studies), The University of Queensland, Gatton College
- Diploma of Applied Science (Pastoral Production), Longreach Pastoral College
- Diploma of Applied Science (Agricultural Practice), Emerald Agricultural College
- Diploma of Applied Science (Agricultural Production), Dalby Agricultural College
- Diploma of Beef Cattle Management, Northern Territory Rural College
- Diploma in Agricultural Production, The University of Adelaide
- Certificate in Agriculture, The University of Queensland, Gatton College
- Certificate IV in Agricultural Practice, Emerald Agricultural College
- Certificate IV in Rural Business Management, Dalby Agricultural College
- Certificate III and IV (Farm Management), Dalby Agricultural College
- Certificate in Tropical Agriculture, Burdekin Agricultural College
- Certificate in Beef Cattle Production, Northern Territory Rural College
- Certificate in Pastoral Skills, Longreach Pastoral College
- Certificate in Pastoral Production, Longreach Pastoral College
- Certificate II in Farm Skills, Burdekin Agricultural College
- Certificate II in Stock and Station Skills, Northern Territory Rural College

The production-orientated degree courses listed above are directed to people such as farm managers, researchers, agricultural consultants, and agricultural extension officers. The certificate and diploma courses are directed to those working on farms or students from school. Most courses appear not to be directed to persons in career positions, but at educating 'new students' straight from school. This was identified by the structure of the courses offered.

The rangeland management component within the above production-orientated courses was in most cases only minor, with focus upon scientific or management principles and applications.

Tables 1 and 2 report the types of ecologically-orientated and production-orientated courses available by institution, whether the courses have a management, a scientific, or a technical/vocational orientation, and whether courses are available externally.

Table 1: Institutions Offering Ecologically-Orientated Courses

Institution	Type of Course		
	Certificate	Diploma	Bachelor
Griffith University		M	S
University of Queensland			SE
Central Queensland University	ME	ME	SE
Northern Territory University	ME	M	S
Northern Territory Rural College	M	ME	
University of Western Australia			S
Curtin University of Technology - Kalgoorlie		S	
Curtin University of Technology - Muresk		SE	
Murdoch University		S	SE
Flinders University			M
University of South Australia			SE
University of Adelaide		M	S
University of Melbourne		M	S
University of New England	S	S	SE
University of Western Sydney		S	SE
Charles Sturt University		SE	SE

Key: M - management orientated; S - science orientated; E - course offered externally

Note: From the information obtained from institutions, in some cases it was not clear if the courses were available externally; there may be additional institutions other than those marked with 'E' that offer courses externally.

Table 2: Institutions Offering Production-Orientated Courses

Institution	Type of Course		
	Certificate	Diploma	Bachelor
University of Queensland	S	SE	S
Longreach Agricultural College	T	T	
Emerald Agricultural College	T	T	
Dalby Agricultural College	T	TE	
Burdekin Agricultural College	T	T	
Northern Territory Rural College	TE	TE	
University of Western Australia			S
Curtin University of Technology - Muresk			SE
University of Adelaide			S

University of Melbourne			S
Marcus Oldham College		M	
University of New England			SE
University of Western Sydney		SE	S
University of Sydney, Orange Agricultural College	ME	ME	ME
University of Sydney		S	S
Charles Sturt University		SE	SE

Key: M - management orientated; S - science orientated; T - technical or vocationally orientated;
E - course offered externally.

Note: From the information obtained from institutions, in some cases it was not clear if the courses were available externally; there may be additional institutions other than those marked with 'E' that offer courses externally.

In addition to the courses offered by the above listed institutions, management orientated short courses are offered by Resource Consulting Services (RCS) and the University of Southern Queensland, and other short courses are likely to be offered by various other groups.

2.3.4 Accessibility of Courses

Based on the information received from the various institutions, it appears particular institutions focus upon offering educational and training opportunities externally, while other institutions do not offer the opportunity to study externally. The University of Queensland (Gatton College) offers diploma courses and one bachelor course externally and Central Queensland University offer bachelor and graduate certificate courses externally. Dalby Agricultural College offer many of their certificate and diploma courses externally, and the Northern Territory Rural College offer particular certificate courses externally. Particular post-graduate courses are available externally from Curtin University of Technology (Muresk College). Bachelor courses offered by Murdoch University can be externally studied. The first year of various bachelor courses offered by the University of New England can be undertaken externally, but the remainder of the course is required to be undertaken internally. Almost all courses with relevance to rangeland management offered by the University of Sydney (Orange Agricultural College) can be studied externally. In general, greater scope for external study is available from the production-orientated institutions such as the agricultural colleges compared to the ecologically-orientated courses.

Part-time study opportunities are offered by some institutions from which information was sought on education and training relevant to rangeland management. Certificate, diploma and degree courses can be undertaken on a part-time basis through particular institutions. (Refer to Appendix 2 for specific details of the particular courses that are available to be undertaken on a part-time basis).

Course requirements may limit accessibility to these courses, particularly for those actively engaged in rangeland management. For example, course structure, course length, location of institutions and the lack of distance education options may restrict enrolments to persons able to commit one or more years to full-time study at a particular location.

Certain short courses encourage participation by land managers in regional and remote areas. These include courses provided by specific Landcare groups, training courses on Property Management Planning (PMP), and Future for Profits Schools. Also, the Queensland Department of Primary Industries offer a range of short courses and it is likely the relevant government departments in other states of Australia offer similar courses. Also, the Australian Rural Leadership Program offers the opportunity for individuals to undertake two years of leadership skills development, examination of key national and international issues, and interactions with leaders in industry, government and the community.

These educational and training opportunities are typically held over a short period of time and at a range of locations. Based on the information compiled, there may only be a limited availability of short courses offered by the institutions investigated. However, the number of week-long courses such as the 'Grazing for Profit' course offered by Resource Consulting Services appears to be increasing. There appears to be a greater number of short courses offered in the production area than the ecological area.

2.3.5 Integration Between Institutions

Across those educational institutions contacted, there does not appear to be any significant integration or formal collaboration. While this information was not sought specifically, indications of any integration did not appear in the literature received. There is evidence of some integration between the TAFE system, agricultural colleges and some universities. This study did not allow the extent of this to be determined but such trends are increasing and being encouraged by governments.

It is understood that transferability of credits from one educational institution to another is possible and increasing. Most institutions will accept up to 50% of the degree requirements being satisfied by credits (or advanced standing) from other comparable institutions and this can be higher in some special circumstances.

2.4 Summary

Based on the information supplied by the various institutions contacted, there are few courses offered with a central focus on rangeland management although several agricultural production and natural resource management courses have been identified that give some attention to rangeland management. The rangeland specialisation within the Bachelor of Applied Science (Crops and Rangelands) to be offered by Gatton College from 1988 appears to contain the most subjects of direct relevance to rangeland management. The Bachelor of Natural Resources offered by the University of New England also offers an area of specialisation in rangeland management. However, the subjects within these two courses appear not to integrate the production and ecological aspects of rangeland management. Subjects offered through the TAFE system entitled 'Rangeland Management I' and 'Rangeland Management II' appear to integrate the production and ecological aspects.

Particular subjects within a few courses do focus on rangeland management. However, based on the information available, few subjects appear to present the production and

ecological aspects of rangeland management in an integrated manner, although in most cases this is difficult to ascertain from the extent of material supplied by education and training providers.

The present supply of courses could be restrictive in terms of location and distance-education opportunities, although it appears some courses relevant to rangeland management from various institutions are available externally. Based upon the information available, there may be a restricted number of relevant short courses available directed specifically at rangeland management.

3 SURVEY OF STAKEHOLDERS

3.1 Introduction & Method

In order to assess, in general terms, the educational and training needs, and attitudes toward a Rangeland Management Centre, a number of stakeholders across the rangelands were contacted. The stakeholders included pastoralists, researchers, extension staff, and others associated with the rangelands (mainly agribusiness personnel).

Rangeland managers were identified through producer organisations, Landcare, Aboriginal Land Councils and other groups. Researchers and extension staff were identified within state government departments, government agencies, private consultancy groups and others servicing the rangelands. The 'other' category of people included representatives of banks servicing the rangelands, representatives of National Park services and input supply organisations.

A background information page presenting the concept of a Rangeland Management Centre was compiled, and a two-page questionnaire was developed to elicit from stakeholders their attitudes to various educational and training needs in rangeland management. These two documents were faxed to stakeholders following a brief telephone conversation with the most relevant person within each organisation or group contacted. The majority of persons contacted by telephone were receptive to receiving the questionnaire. Appendix 2 contains a copy of the background information and questionnaire.

The major intent of the survey was to elicit general opinions and attitudes from which hypotheses could be formed and then tested at the stakeholder discussion groups that followed. The survey was not intended to involve formal survey techniques enabling quantitative analysis of the results. Although, a range of stakeholders were contacted, the sample was not intended to be fully representative of all rangeland stakeholders.

3.2 Results

A total of 77 persons were contacted by telephone to gauge their initial interest in the proposed Rangeland Management Centre and in completing the questionnaire. The number of questionnaires faxed out was 71, and 58 completed questionnaires were received by the cut-off date. An additional 18 completed questionnaires were received from participants in the discussion groups who were asked to read the background information and complete the questionnaire in preparation for the discussion group meetings. Table 3 outlines in further detail the number of persons contacted, and the number of responses received from each of three groups of respondents.

Table 3: Survey Response Rate

Number of Respondents	Type of Respondent			Total
	Pastoralists	Research and Extension Personnel	Others	
Spoken to on telephone	34	30	13	77
Questionnaires sent out	31	30	10	71
Questionnaires received back from those sent	17	26	7	50
Non-respondents	12	3	3	18
Would not reply	2	1	0	3
Extra questionnaires received back ^A	3	3	2	8
Extra questionnaires received from participants in the discussion groups	11	5	2	18
Total number of completed questionnaires received	31	34	11	76

^A Additional questionnaires were received from persons to which the questionnaire was not directly sent. This was because some persons receiving the questionnaire passed copies of the questionnaire to others in their industry or organisation.

Upon receipt of the questionnaire, a number of persons telephoned to further discuss the overall project prior to submitting a response. A small number of non-respondents telephoned indicating that they would not be responding to the questionnaire, either because they did not have time, or did not have a positive view to the proposed Centre or the questionnaire.

Based on the questionnaire responses received by the cut-off date, the majority of respondents (approximately 80%) believed that in the pursuit of sustainability, the current management of rangeland areas in Australia could be improved significantly. A lesser proportion of respondents (approximately 60%) believed the sustainability of current management of rangeland areas in the region known to them could be improved significantly. There was wide variation in the size of the region indicated by respondents.

Over 95% of respondents believed the management of the rangelands could be improved through greater integration of the production and ecological aspects of rangeland management. Many questionnaire respondents provided reasons for their response. Improved integration between researchers/extension personnel and rangeland managers was frequently mentioned. An improvement in communications between rangeland producers and ecologists was also noted by some questionnaire respondents. Sustainable practices were perceived as important, involving an integration of production objectives and ecological objectives. At present it was perceived production aspects of rangeland management were of greater importance to current rangeland managers, that ecological aspects required further attention, and that some producers may not be in an economic position to adopt sustainable practices.

Over 95% of respondents believed that the management of the rangelands could be improved through increased focus on whole property management and business efficiency. It was noted by a number of questionnaire respondents that pastoralists tend to focus on production orientated management, rather than business management or management in a

more holistic sense. Producers need to be convinced of the improved profitability arising from sustainable rangeland management.

Almost all respondents to the questionnaire believed there is a need to improve education and training opportunities. The main perceived deficiencies were the limited number of courses adopting a holistic, integrated approach and the lack of success in attracting participants. There was a need to raise the public profile of rangeland management. Some respondents believed there was a need to educate environmentalists in practical pastoral management and vice versa so both bodies could work together as a team. Also, some respondents believed that improved education and training opportunities would lead to increased efficiency and profitability as well as improved sustainability.

Respondents to the questionnaire were, in general, either supportive (over 60%) or neutral (around 35%) toward the concept of a Rangeland Management Centre. The main reason for the neutral attitude was that further information was required by respondents regarding the scope and focus of the centre before an indication of support or otherwise toward the Centre could be provided. There was some scepticism expressed toward the formation of another 'centre', and fear that the centre would duplicate the function or offerings of already existing educational and training institutions, such as agricultural colleges. The view was expressed that the proposed Centre should not seek to replace existing institutions, but rather add value to them.

Respondents anticipated that the general attitude toward the proposed Rangeland Management Centre would be positive (over 50%), with 30% expecting that the general reaction would be neutral. Respondents were asked to suggest alternatives to the proposed concept of the Rangeland Management Centre, but few were suggested. It was suggested the Centre be established within an existing agricultural science faculty, although another respondent believed a university would be an unsuitable location for the Centre. The idea of establishing multiple centres was also mentioned. The need to establish a centre with a specific focus on the rangelands, the network concept, and the need for the centre to be closely linked with industry were commonly supported by respondents.

The following principal reasons to undertake education and training provided by the proposed Rangeland Management Centre were endorsed by all groups of respondents (in order of overall importance):

- to improve knowledge, skills and attitudes about sustainable management of rangelands;
- to integrate production and ecological principles with practical application;
- to improve knowledge, skills and attitudes about production management of rangelands; and
- to develop a more holistic approach to rangeland management.

Reasons for undertaking rangeland management education and training that were considered of lesser importance by all groups of questionnaire respondents included:

- to attain an understanding of sustainability and environmental issues that may facilitate future export market access for rangelands products;

- to improve understanding of natural resources and the environment in order to take advantage of future economic opportunities (eg ecotourism, bush food etc);
- to attain a recognised qualification; and
- to be better informed of the needs of rangeland managers in terms of managing regulation, input support and services for rangeland enterprises.

The pastoralists and the 'other' (bankers, agribusiness, national park managers) groups of respondents both ranked 'to attain a recognised qualification' as the least important reason they would undertake any education and training offered by the proposed Rangeland Management Centre. However, research and extension persons in particular emphasised the benefit of attaining a recognised qualification. Additional reasons included: to improve risk management skills; to gain international knowledge; and to gain an expanded education.

Questionnaire respondents believed the proposed Rangeland Management Centre should provide educational and training offerings for a wide range of persons in the agricultural and natural resource management sector. In order of importance, the following groups of persons were considered potential targets for the Centre:

- primary producers in the rangelands and their families;
- extension staff and other educators;
- public land managers (national park administrators); and
- managers of Aboriginal lands.

Other groups considered of lesser importance included (in order of importance):

- agribusiness staff (eg bankers);
- government policy staff (eg persons involved with drought relief policy);
- researchers;
- new young students from outside the rangelands;
- people starting new businesses in the rangelands (eg ecotourism); and
- consultants.

There was little difference between the responses given by the three types of respondents (producers, researchers and extension persons, and others associated with the rangelands) with regard to the types of persons the proposed Centre should primarily cater for. All three groups believed the main focus of the centre should be upon educating and training primary producers in the rangelands and their families. Additional groups nominated that could be catered for by the proposed Centre included personnel from: producer representative organisations; social service providers; overseas people; politicians and their advisers; and personnel from conservation agencies.

There were few differences between the groups of respondents regarding the type of courses the proposed Centre should provide. It was clearly suggested by all groups of respondents that the most useful would be short courses, although a full range of courses was also seen as desirable. The view was expressed by some respondents that a degree course focusing on rangeland management may be seen as restricting graduates

employment opportunities. In general, the shorter the course, the more attractive it was to a greater number of stakeholders in the rangelands.

The general features of courses provided by the proposed Rangeland Management Centre and Network considered to be of importance were:

- distance learning mechanisms (external courses, home study options);
- a full range from short courses to degree programs;
- greater focus on whole property management and business efficiency; and
- greater focus on the practical aspects of rangeland management.

Of lesser importance were the following features (in order of importance):

- more flexible structure of courses such as part-time;
- greater availability of courses with a central focus on rangeland management;
- gaining credit for appropriate subjects from different institutions outside the network;
- gaining qualifications by undertaking subjects at different institutions within the rangelands network; and
- compatibility of subjects and courses for qualification building (articulation).

There were no significant differences between the responses provided by the three groups of respondents on the above features. Additional desirable features noted by questionnaire respondents included:

- no compulsory assessment in short courses (as this deters pastoralists); and
- quality staff to deliver courses.

A number of questionnaire respondents took the opportunity to add additional comments to their response. These miscellaneous comments were wide-ranging in content. A full list of issues raised by more than two respondents is contained in Appendix 3. The following points were raised by a significant number of respondents:

- courses need a practical focus;
- need for short courses and a range of other courses;
- need for courses to be more relevant;
- the centre should be closely linked with industry and 'people on the ground';
- land managers are restricted in education and training by financial and time limitations;
- delivery of courses is important (method of delivery, flexibility, type of people delivering);
- qualifications are not important to the majority of pastoralists;
- centre should integrate with other institutions;
- need to coordinate existing information on rangeland management and facilitate access to this information by pastoralists and researchers;
- danger of bureaucracy;
- the value of production from rangelands is reducing, and natural resource or other values are increasing; and

- rejection of the claim that 'rangelands are presently unsustainably managed'.

3.3 Summary

The results of the questionnaire were in general supportive of the concept of establishing a Rangeland Management Centre. However, there were some concerns which should be taken into consideration in any later stages of development.

Some specific deficiencies in existing offerings were identified. The lack of integration of production and ecological aspects of rangeland management was considered to be important, and there was a perceived need to offer a range of courses with a practical base and a flexible structure. Distance learning concepts were rated as highly important in the delivery of courses. A holistic approach to rangeland management was seen to be important within education and training in this area with greater focus on whole property management and business efficiency. Interaction of the proposed Centre with already existing educational institutions, and with people in the rangelands were seen as important so to avoid the creation of a bureaucratic and isolated centre which may provide 'more of the same'.

4 STAKEHOLDER DISCUSSION GROUPS

4.1 Introduction

Two stakeholder face-to-face discussions were held in the Queensland rangelands, and two teleconference discussions were held involving rangeland stakeholders from Western Australia, South Australia and New South Wales. The aim of these discussion groups was to discuss the concept of the proposed Rangeland Management Centre and gain further information to that obtained in the stakeholder survey. Also, hypotheses formed as a result of the survey of stakeholders were tested at the discussion groups.

4.2 Method

Face-to-face discussion groups:

The venues selected for the stakeholder discussion groups in Queensland were Roma and Charters Towers. A number of potential locations were nominated, and in selecting the venues, consideration was given to travel distances for the stakeholders to the venue. Those stakeholders invited to the discussion group included mainly pastoralists, with some research and extension personnel and agribusiness persons. Eleven people attended each discussion group. Representatives of the Queensland Department of Primary Industries in Roma and in Charters Towers assisted with inviting stakeholders and organising the discussion group venue.

Prior to the discussion group, participants were faxed a copy of the background information and questionnaire used in the stakeholder survey. Participants were asked to read these documents and complete the questionnaire in preparation for the discussion group. The completed questionnaires were collected, and this information was analysed along with the other survey responses.

Each discussion group was undertaken over approximately three hours and was facilitated by Peter Chudleigh. A representative from MRC attended the Roma discussion group. The Roma discussion group was held on Wednesday 20 August, and the Charters Towers discussion group on Friday 22 August. The agenda for each of the discussion groups consisted of the following topics:

- existing education and training offerings
- training and education needs
- inhibiting factors to education and training
- distance education
- short courses
- degree/diploma courses
- Rangeland Management Centre and Network
- likely numbers attending courses

Teleconference discussion groups:

In order to gain input from persons in the rangelands in South Australia, Western Australia and western New South Wales at a reasonable cost, it was decided teleconferences rather

than face-to-face discussion group meetings would be held for these regions. A selection of people for the teleconference were identified from the University of Sydney, Orange Agricultural College's extensive network of supporters and contacts. Participants included individual pastoralists, personnel from agencies such as NSW Agriculture and the Department of Land and Water Conservation, the banking sector, Rural Lands Protection Boards, and farmer representative groups.

Two teleconferences were held, each with six participants. The teleconferences were held from 7.30 pm to 9.00 pm and from 9.00 pm to 10.30 pm on Thursday 21 August. The teleconferences were facilitated by John Chudleigh, and the agenda for the two teleconferences was the same as for the Queensland face-to-face discussion groups. Prior to the teleconferences, participants received a copy of the background information and questionnaire used in the survey of stakeholders for their information. Completed questionnaires were received by mail from the participants.

4.3 Results

The following summarises the results of the discussion group meetings. The results are presented under distinct sub-headings representing each item on the agenda. Appendix 4 presents further details of the major points raised at each discussion group.

Only a few differences were evident between the results of teleconference discussion groups and the results of the face to face discussion groups. The most significant difference was the importance of distance education to various stakeholders. As Roma and Charters Towers are, in comparison to other rangeland areas, significant rural centres, the importance of distance education was not given as much emphasis as evident in the stakeholder survey. This was the case even though some pastoralists travelled several hundred kilometres to attend the Queensland discussion groups. However, within the teleconferences, which involved stakeholders in the more remote areas of the rangelands, distance education was given greater emphasis.

4.3.1 Existing Education and Training Offerings

Participants in the discussion groups recognised only a limited number of institutions that offer education and training relevant to the rangelands. Universities and agricultural colleges offering courses of relevance to the rangelands were identified mainly from within the region or state in which the participants resided. Overall, there was a lack of awareness of the range of courses on offer, and the response to existing education and training offerings was that there were insufficient courses that focus upon the rangelands specifically.

In general, it was believed that courses of relevance to rangeland management were often compartmentalised, and there were no courses that take a holistic approach. The offerings of particular institutions were recognised as being externally available in some cases. It was believed there was no recognised body of knowledge available on which to base specialised training and no courses available that were specifically focused upon rangeland management.

4.3.2 Training and Education Needs

A need to improve rangeland management education and training was expressed. There was perceived to be a need to offer education and training focusing specifically on rangeland management for a wide range of persons across Australia. It was suggested a more detailed analysis of needs for rangeland management education and training be undertaken to help identify how to achieve desired outcomes.

A need was identified to integrate the practical and theoretical aspects of rangeland management in education and training and to provide offerings that are relevant to different areas of the rangelands. The need for training and education to be of practical relevance to persons in the rangelands was emphasised by many participants in the discussion groups.

It was recognised there are a diverse range of persons to which rangeland management education and training should be directed, and these persons would have differing former education experiences, and require different types of education offerings. A range of courses including short courses, certificate and diploma courses, degree and post graduate courses were all perceived as important. There was seen to be a need to emphasise the importance of continuous learning and adult education principles for persons in the rangelands. Integration of courses with experience of existing pastoral managers and communities was seen to be important. Also, in one discussion group, there was seen to be a need to provide rangeland management education and training within the school system.

Recognition of the motivation behind different people undertaking education and training was seen as important. The need for training of different groups has changed over time, and there is now seen to be a need for business and financial management skills to be integrated with ecological principals and management practices. This would provide a holistic rangeland management education and training opportunity. It was recognised that the future needs for education and training may increase due to the likely future importance of accredited environmental management for market access. There was a recognition that some movement towards a 'qualified' rangeland manager status may occur in the future. The concept of a paradigm shift to resource management, and the influence of the green movement and possible regulation were recognised by particular participants and viewed as important future influences.

4.3.3 Inhibiting Factors to Participation in Education and Training

There is a lack of awareness of education and training offerings which may be a factor inhibiting persons taking up existing education and training relevant to rangeland management. Also, current courses offered are not perceived as relevant to the needs of particular persons in the rangelands. Also, time and financial constraints were perceived as important factors inhibiting persons in the rangelands from undertaking further education.

Courses currently available are not perceived to be flexible enough to meet the needs of full-time workers in the rangelands such as pastoralists. The location of particular courses is seen to be another factor limiting the uptake of education and training.

It was recognised that there are likely to be persons in the rangelands who would view education and training offerings as threatening or challenging their management skills. Some would consider they do not require any education or training as they have survived so far without it. Cultural factors and hereditary factors were perceived as important limitations to high participation rates in education and training. Some persons may lack confidence, or be embarrassed to undertake rangeland management education and training, and the fear of traditional assessment methods (ie assignments or exams) is present among a proportion of persons.

4.3.4 Distance Education

Distance education was seen to be very important for rangeland management education and training as many potential participants in these offerings would be located in rural and remote areas of Australia. It was seen as necessary for distance education to be flexible in terms of the timeframe over which the course could be undertaken, the mode of delivery, and the requirement for residential schools.

Motivation of persons via distance education was seen in some cases to be difficult due to the lack of interaction with other students or with those offering the course. However, there may be methods of overcoming these motivational problems through inreach activity. There was a perceived need to provide information in a format acceptable to persons in remote areas of the rangelands, either through traditional distance education mechanisms or via information technology mediums such as the internet and videos. Problems with accessing the internet in particular rural regions was seen as a potential barrier to delivering courses via the internet. Also, the cost of accessing the internet may be restrictive in particular areas. On the other hand, there was a realisation that these constraints will probably decrease over time as technology and infrastructure improves. Some groups of participants believed social interaction with others in the rangelands would be an important factor in encouraging participation in education and training.

It was considered important for the presenters of distance education and training offerings to be credible and have experience in the practical aspects of rangeland management. It was believed theory and background information on rangeland management would be easier to learn through distance education mechanisms than practical aspects. Videos with rangeland managers together with educators were seen as having potential for improving the credibility of presentations for distance education, and conveying practical aspects of the course.

4.3.5 Short Courses

Some short courses currently offered by various groups such as government departments and private consultants were identified by discussion group participants. It was perceived there was little information available regarding the range and extent of short course offerings. Most courses identified were those directed toward pastoralists. In general the majority of existing short courses identified were highly regarded by persons in the rangelands.

It was believed short courses should be offered to a range of persons associated with the rangelands including rangeland managers, Aboriginal land managers, administrators, government representatives, policy developers and land administrators, extension officers,

agribusiness persons, bankers, stock and station agents, distance education teachers, and personnel from mining companies. The courses should be flexible, and possibly tailored for specific regions in the rangelands. A short course may be a starting point for particular persons to be introduced to the concept of education and training, and may encourage persons to then go on and undertake further education. Examples of topics to be included in short courses could be: succession planning; business and financial planning; animal nutrition; and grazing management.

It was recognised there were schemes to encourage participation in short courses and further education through financial support from the Commonwealth Government. Participation in short courses could be further encouraged through having good quality course coordinators with particular teaching skills, and course content of high quality.

4.3.6 Degree/Diploma Courses

Diploma and degree courses in rangeland management were recognised as offering the opportunity for persons to gain expertise specifically in rangeland management. These courses may appeal to small numbers of persons currently in the rangelands, who wish to undertake some form of education and then return to the rangelands with particular knowledge and expertise. Degree courses were seen to be more relevant in the main to those interested in research and/or extension.

It was seen to be necessary to integrate the course work of any degree and diploma courses with varied practical experience. For example, practical experience within different regions and with different managers (pastoralists, national park managers etc) was perceived as important to gain an overall perspective of rangeland management.

The idea of undertaking the first two years of a degree course on broad management and science subjects, and then specialising in rangeland management in the final years was put forward by one group of participants.

4.3.7 The Rangeland Management Centre and Network

The participants at the discussion groups believed the concept of a Rangeland Management Centre and supporting network was feasible, although attention would need to be given to particular aspects in order to ensure such a development was successful. The proposed Centre was seen to be a 'centre of excellence' in rangeland management, and was perceived as a group of expert people working in conjunction with stakeholders in the rangelands rather than another academic or bureaucratic body. A major role of the Centre was seen to be to coordinate courses offered by the Centre with those courses of relevance to rangeland management offered by other institutions. A further role of the Centre was seen to be to integrate the academic thrusts and research findings with practical experience associated with the rangelands.

The Centre was envisaged to be situated in an already existing institution, with links with other institutions (such as agricultural colleges) and with individual stakeholders in the rangelands. Stakeholders in the rangelands were seen as important in developing the types of courses offered by the centre, and the functions and operations of the centre and its network.

Participants believed it may be difficult at this stage to attract specialists in rangeland management to the Centre, as there are only a small number of specialists in Australia. However, it was seen as imperative to the success of the Centre and its network that knowledgeable and expert persons are associated with the Centre. The personnel of the Centre were also considered important, and quality staff were seen as essential in encouraging further education and training of persons in the rangelands.

4.3.8 Likely Numbers Attending Courses

It was difficult for discussion group participants to estimate the number of persons that would be likely to undertake education and training that might be offered by the Rangeland Management Centre and its network. It was suggested that in order to reduce the risk of the Centre failing, a small number of people should be catered for initially, possibly through short courses, and over time the scope should be widened as the Rangeland Management Centre proves its value.

There was seen to be a greater demand for short courses than the degree course and other formal qualifications. One estimate put forward was that 20 persons per year may be interested in undertaking the degree, but this number was dependent on how specialised the degree course would be. A broader, wider focused course was seen to attract a greater number of people. It was apparent that a degree focused totally upon rangeland management may be perceived as too narrow, and limit employment prospects for new graduates seeking employment.

4.4 Summary

Overall, the participants across the four discussion groups had similar opinions regarding the needs for further education and training in rangeland management and the concept of a Rangeland Management Centre and its network. It was perceived there was a need to improve education and training opportunities in rangeland management, and to meet the needs of a wide range of persons either working in, or in an area of relevance to, the rangelands.

Existing training and education opportunities of relevance to rangeland management were not well recognised, and it was also perceived there are no offerings of direct relevance to rangeland areas. In order to provide education and training opportunities for persons in rangeland management, a number of important factors should be taken into consideration in developing the content, structure and method of presentation of courses. A range of factors inhibiting the uptake of education and training offerings by stakeholders in the rangelands were identified, although many of these factors were seen to be able to be overcome. The motivations behind different persons undertaking rangeland management was seen to be variable, thus education and training offerings should be tailored to meet the needs of different types of people. It could be expected that particular groups of stakeholders in the rangeland do not believe they require education and training, and this mindset and culture could be a significant barrier to be overcome by the Centre.

Distance education and flexibility of courses were perceived as very important to stakeholders in the rangeland. The need for key experts and knowledgeable persons in

rangeland management to be associated with any initiative was also perceived as important.

Short courses were viewed as an area that could underpin demand for education and training in the rangelands. Interest in education and training could be improved through the successful development of a range of short courses. This may then lead to greater interest in achieving more formal qualifications that might be desired in the future.

The Centre was seen as the focal point of the concept. The Centre would have a number of roles including coordination, promotion, and forging links between different groups such as researchers and stakeholders. It was of concern that the establishment of a Centre may be seen to be a bureaucratic centre, and of little relevance to the people on the ground in the rangelands.

5 FUTURE NEEDS

5.1 Key Needs and Criteria

As a result of the needs analysis reported in Chapters 3 and 4, it is possible to construct a summary of the key needs required by rangeland managers. Such a summary of needs, together with an estimate of the relative importance attached to each by pastoralists, is provided in Table 4.

Table 4: Summary of Education and Training Needs of Pastoralists

NEED	EXTENT TO WHICH NEED CURRENTLY BEING MET	IMPORTANCE TO RANGELAND MANAGERS
Short courses related to rangeland management	Private sector meeting some demand; greater frequency, wider range of locations and more specialist topics required in short courses.	****
Degree courses focusing on rangeland management	Very few; some new (1998) courses (eg UQ Gatton) have a moderate degree of rangeland management focus	***
Focus for information on rangeland educational and training offerings	Need currently not met	***
Flexibility in methods of delivery and time to complete courses	Some existing courses are delivered by distance education but they are not highly relevant to rangelands; flexibility (eg part-time and full-time) with many courses is adequate	**
Flexibility in location of offerings, articulation between courses and assessment measures	Locations of offerings is fairly rigid; articulation between courses is still inadequate; catering for both assessment and non-assessment requirements is increasing but still inadequate	**
Integration of ecological, grazing management and business principles	Inadequately covered, except for some private sector short courses	****
Holistic approach to rangeland management	Inadequately covered except for some private sector short courses	****
Specialist rangeland managers to impart credibility to delivery of courses	Rarely achieved except for some private sector short courses	***
**** extremely important to pastoralists *** very important to pastoralists ** important to pastoralists		

Criteria that would be important therefore for a RMC&N to address would include:

1. The RMC&N would need to organise and coordinate short courses on a range of rangeland management subject areas, as well as a degree course that focused on rangeland management.

2. Both short courses and degree courses would need to integrate ecological, grazing management and business principles wherever appropriate and adopt a holistic approach to rangeland management.
3. Specialist rangeland managers would need to be involved in delivery of short courses and involved in the practical aspects of degree courses.
4. Courses would need to be structured in a flexible manner with regard to delivery mechanisms, time to completion, assessment procedures, and articulation between courses.
5. The RMC&N would need to provide information on education and training offerings throughout Australia.

From the analysis of education and training currently available, it appears that only some private short courses were addressing many of the key needs. Of the five criteria listed above for a RMC&N, very few are being met by any Australian public tertiary educational institution.

5.2 Scope and Vision

The RMC&N would cater for the education and training needs of a wide range of people involved in and associated with rangelands management. The RMC&N would offer a wide range of high quality, practical and flexible courses that integrate the production and ecological aspects of rangelands management, as well as promote an integrated approach to whole property planning and business and financial management. Both short courses and degree courses would be supported initially. The various types of training would be directed towards existing and prospective pastoral managers, extension service personnel including consultants, State Department advisers, public land managers, aboriginal land managers, those in servicing industries such as bankers, and natural resource policy personnel.

The RMC&N would encourage and develop linkages with other relevant educational institutions and with stakeholders in the rangelands. It would facilitate a strong network of existing tertiary institutions with an interest in rangeland management and associated disciplines. It would aim to narrow the gap between researchers and stakeholders in this regard. The network would cover rangeland regions predominantly associated with wool and beef production.

The RMC&N would act as a repository of information relevant to the rangelands, and would be an initial point of contact for queries regarding rangeland management. It could also fulfil an important function as the pivotal national disseminator of current information on rangeland management and be integrated with the extension services in a number of Australian States and Territories. Integration of education and training courses with the knowledge and practical experience of individual rangeland managers and with other resource management initiatives such as property management planning and the landcare movement would be expected.

The vision for the RMC&N is that it would encompass a new ethos for rangeland management in Australia and would be attuned to the real needs of the stakeholders in rangelands. The RMC&N would provide a focus for education and training for those involved in rangelands management throughout Australia. The vision for the RMC&N is that it would strive to be a Centre of Excellence in rangeland management and serve firstly

Australia and, in time, other relevant areas of the world. The RMC&N would be integrated strongly with industry and would be responsive to changing economic and ecological circumstances regarding the rangelands through providing an outward view of the management of the rangelands and the environment in which they exist.

5.3 Specific Functions and Characteristics of the RMC&N

The needs identified above may be best addressed through the development of a Rangeland Management Centre and Network (RMC&N) which would encompass existing relevant education and training institutions across Australia. While the name of the entity providing these various functions has been adopted as the Rangeland Management Centre and Network for the purposes of this report, a more appropriate name could be something like 'Rangeland Industry Open Learning Institute' (RIOLI). Further thought should be given to an appropriate name of the entity.

Focus on rangelands

At present, there is no entity within Australia that focuses specifically on education and training relevant to rangeland science or rangeland management. The survey of stakeholders and proceedings of the discussion groups have indicated, in particular, a clear need to establish an entity that could provide a focus for information on rangeland management education and training offerings, as well as other information on rangeland management in the broader sense.

Provision of education and training

The RMC&N could contribute to the development and delivery of both short and degree courses and subjects in rangeland management through its central node and its network. The entity could also serve as a repository of knowledge concerning the rangelands. A range of courses and parts of courses should be provided or facilitated. Courses would include short courses through to graduate and post-graduate courses for those operating in, and associated with, the rangelands. There is significant diversity in the types of people the entity could provide for although this brief study has not been able to quantify the relative demand from particular interested groups of people.

Flexibility

Flexibility in the presentation of education and training options in rangeland management is important to meet the needs of a wide range of persons. Flexibility in the following aspects is considered important:

- the method of delivery;
- the time to complete courses;
- the type of courses offered;
- assessment measures;
- articulation between courses; and
- location of offerings.

Integration

In the development of any new offerings or coordination of existing offerings, there should be an emphasis on the integration of ecological, grazing management and business principles in rangeland management. In addition, the development of courses with a

holistic approach to rangeland management is desirable. These needs were seen as central to the interests of both pastoralists in terms of productivity and to the environment in terms of natural resource management.

Practical theme

Integration of the practical and theoretical aspects of rangeland management with a particular emphasis on the practical aspects is considered an important function of any new entity. There is seen to be a strong need to provide education and training that is relevant to people currently in the rangelands. There is also a perceived need for specialist rangeland persons to be involved in the delivery of education and training offerings.

Through the RMC&N nodes in the rangelands and other nodes associated with rangeland needs, the wide diversity and practical aspects of rangeland management could be better integrated into education and training offerings. Nodes are viewed as other tertiary education institutions interested in rangeland management, and groups of rangeland managers and research and extension personnel organised around specific locations in the rangelands.

Coordination with other offerings

There is a fear held by stakeholders in the rangelands of the development of a bureaucracy in the establishment of a Rangeland Management Centre. A coordination role should also be undertaken by the entity, and the involvement of other education and training institutions related to the rangelands will be important. Duplication of existing education and training offerings should be avoided and means should be sought to marshal all existing efforts in this area into a more meaningful total effort. Flexibility in course structure and delivery should be given strong consideration in order to cater for the long distances and isolation in Australia's rangeland areas. Distance education processes should be an integral part of course development.

Information centre for rangeland management

An important additional function which could be advantageously undertaken by the RMC&N is to act as the pivotal national centre for information exchange and communication on current rangeland management issues, including notices of all relevant activities, such as conferences, submissions and short courses offered either by the RMC&N or by other organisations. This role as an information clearing house could be undertaken using a variety of communication channels, including the internet, as well as a regular newsletter which could be circulated both directly and also as an insert within the circulars/newsletters of associated organisations, especially producer organisations. Not only would this raise the profile of the RMC&N and provide much needed regular and widespread publicity about its programs (and other related programs), but it would also widen the horizons of rangeland management and help reduce any parochialism and sectionalism. Given that the RMC&N would not represent any sectional interest, it would be well placed to undertake this role.

Overseas demand

The RMC&N could potentially cater for overseas students in rangeland management, and the postgraduate diploma may be particularly suitable. While the overseas demand for courses should not be a major driver in course development and design, additional numbers of students from sources in South Africa and South America could assist the

viability of offerings. To attract students from other countries would require a Centre with a strong reputation for integration of theory and practice in rangeland management.

Industry involvement

The development and control of the RMC&N should closely involve rangeland managers and others associated with the rangelands. Through this involvement, the perceived gap between people on the ground in rangeland areas, and research and extension persons could be reduced and ownership of the RMC&N could be imparted to stakeholders in rangeland areas. Stakeholders should also be involved with the development of inreach and outreach components of all courses.

It is concluded that close industry and other land user involvement in the establishment, development and operations of the RMC&N would be essential in ensuring that ownership is provided to those groups that would benefit from the initiative. Not only should the management of the Centre be driven by industry, but also industry should be involved in the facilitation of the provision of practical experience within Centre courses and other courses linked into the network. Further, individuals from industry could make significant contributions in the development and delivery of short courses.

6 POTENTIAL OPTIONS, NUMBERS AND FUNDING

6.1 Examples of Possible Education and Training Offerings

There was neither the time nor resources within the present study to define the preferred course offerings in any detail or to suggest firm priorities between the various levels of courses that might be offered. Such an objective should be pursued in the future in order to define more specifically the preferred offerings of the RMC&N and its affiliated tertiary education institutions.

A starting point is that the proposed RMC&N should provide education and training offerings to cater for the needs of all groups of stakeholders in the rangelands. Courses ultimately could be offered or coordinated to address the needs of those seeking a first degree, new graduates, existing rangeland managers, research and extension persons, and others associated with the rangelands such as rural service providers.

The following features should be common to all education and training offerings:

1. Offerings should emphasise the practical aspects of rangeland management.
2. Offerings should be flexible in nature in terms of course structure, timing, articulation, assessment and external delivery options.
3. Offerings should recognise and address the differences between various areas of the rangelands in Australia.

A few options are identified below as examples of the types of courses the RMC&N could offer. The options presented are meant to be indicative only.

6.1.1 Higher Education Offerings

A number of options for higher education offerings could be proposed. These options are not necessarily mutually exclusive, and include a three year degree specialising in rangeland management in the final year, a four year degree specialising in rangeland management in the final year and a postgraduate diploma in rangeland management. It is probable degree courses or subjects would be offered by the RMC&N in conjunction with existing accredited tertiary institutions.

A four year degree may be preferable if the object desired by the student is a higher level of science and a career is expected in the research and extension sphere. A three year degree might be offered for those contemplating a pastoral management career.

One format may be to have accredited existing tertiary education institutions provide the first two (in the case of a three year degree) or first three years of the course (in the case of a four year degree). The final year (third or fourth year) of the degree would be located at the Rangeland Management Centre itself. The first two years of training should be provided in preferably two of the following areas: biological sciences; agricultural sciences; environmental studies; physical geography; natural resource management; or business management. A reasonably generous approach could be taken by the RMC&N in awarding full credit for appropriate two year completions from any recognised university

level institution. Substantial credit for any relevant previous tertiary-level study could also be considered.

There may be difficulties with such options regarding Equivalent Full time Student Units (EFTSU) transfers and who issues the formal qualification. The final year, or electives within the final year, could be offered through the Centre, either by full time attendance at the Centre or by offering through a distance education provider such as Open Learning Australia. Such offerings would be credited to the course by the institution offering the main proportion of the program and who would confer the degree. Some allocation from government to the Centre to cover the cost of providing the education would be required. Alternatively, institutions who agreed to the offerings from the Centre could pay the Centre from existing EFTSU allocations. Transferability would not appear to inhibit the possibility of offering the final year specialist subjects in rangeland management for degree programs across Australia.

Two options regarding the level of attention given to rangeland management in the final year of say, a four year degree course could be considered. One option would be for all subjects in the final year to be associated with rangeland management. Another may be for only half these subjects to be associated specifically with rangeland management. The RMC&N or the accredited tertiary institution could offer a four year Bachelor of Applied Science (Rangeland Science) that includes 75% of fourth year subjects from a rangeland science stream, and 25% from a management stream. A four year Bachelor of Applied Science (Rangeland Management) could be offered with 75% of fourth year subjects from a management stream, and 25% from a rangeland science stream. There could be equivalent options for a three year degree with specialisation in rangeland management.

There could be another option provided with a finishing period of up to two years at the Rangeland Management Centre, but such a degree of specialisation might not be viewed as favourably as a shorter period of specialisation as the longer period may limit the employment prospects for new graduates. Using the rangeland subjects developed by the RMC&N, the Centre could also offer a one year graduate diploma to existing graduates.

Table 5 provides a summary of some of the options discussed above.

Table 5: Some Options for RMC&N Higher Level Courses

Option: Degree in Rangeland Management (three years) and/or Rangeland Science (four years)	
General Description	Three or four year degree; with first two/three years in accredited courses in agricultural science, ecology, or other broad degree courses in a range of institutions that joined the program. The final year or part of the final year of this course would be provided by the Centre.
Subject Emphasis	First two or three years on production and ecological science and principles; some management/economics and perhaps other training. Third year for Rangeland Management with particular emphasis given to integration of production and ecology with further emphasis on holistic approach to rangeland management. Fourth year for Rangeland Science to cover more detailed grazing management and range science aspects.
Clients	Pastoral managers and others servicing the rangelands for Rangeland Management degree. Rangeland Science degree aimed at training under-graduates for research and extension positions in the rangelands.
Practical Emphasis	Part of final year in both courses to be spent in rangeland nodes and associated with rangeland management.
Delivery System	Flexible in first 2/3 years and can be undertaken at a range of institutions; possible that third year in rangeland management degree can be undertaken part time and/or by distance education with some inreach requirements.
Role of Nodes	Assistance with organisation of practical experience. Development of links between stakeholders in the rangelands and the Centre.
Links to PMP and Individual Rangeland Managers	Part of practical experience could involve understudying a rangeland manager (eg. a pastoralist or national parks manager). Some links to property management planning envisaged.
Additional Offering: Postgraduate Diploma in Rangeland Management	
General Description	A one year postgraduate diploma for those that have completed a degree in agriculture or ecology/environmental science. Offers a specific qualification relating to rangeland management
Subject Emphasis	Integration of production and ecology, grazing management and holistic approach to rangeland management. Range of electives available for those with special interests.
Clients	Pastoralists with degrees or experience; new graduates in agriculture or environmental science requiring further specialisation in the rangelands for management, research, extension, agribusiness.
Practical Emphasis	Part of year to be spent in rangeland nodes and rangeland management.
Delivery System	Course can be undertaken part time and/or by distance education with some inreach requirements.
Role of Nodes	Assistance with organisation of practical experience and external students situated close to nodes.
Links to PMP and Individual Rangeland Managers	Part of practical experience will involve understudying a rangeland manager, (eg. a pastoralist or national parks manager). Some links to property management planning envisaged.

6.1.2 Certificate and Undergraduate Diploma Courses

As a result of the stakeholder survey it appeared the shorter the course, the more favourably it was viewed. However, when this hypothesis was tested at the discussion groups, it was found there appeared less interest among stakeholders for certificate and undergraduate diploma courses. The study team was less convinced that there is a large demand for these courses as opposed to the higher level courses and short courses to be discussed later.

One factor operating is that there may be a trend for those property managers or undergraduate students who intend to return to pastoral management to desire to undertake a three year degree rather than a certificate or diploma. This might be associated with lower entry levels to degree courses compared to the past and the recognition that a degree may be worth more than a certificate or diploma in widening career options.

There are difficulties in using the same resources and course work in offering a finishing year for a degree and an undergraduate diploma in rangeland management. Hence there would have to be significant demand for both finishing degree and diploma offerings to support two sets of educational resources, particularly if both were to be located in the one tertiary entity.

An alternative to offering certificate and diploma courses at the Centre would be to develop a rangeland management diploma or certificate course by strengthening already existing TAFE courses or agricultural and pastoral college courses. Also, the idea of short courses (to be discussed later) being articulated into a one year certificate or undergraduate diploma course may have substantial merit.

A summary of some options for certificate and diploma courses is given in Table 6. It should be noted that the study team is less enthusiastic about the two year diploma than the one year diploma.

Table 6. Options for RMC&N Certificate and Diploma Level Courses

Option: Associate Diploma in Rangeland Management	
General Description	A one year undergraduate diploma course with six months at the centre, and six months at one of the nodes.
Subject Emphasis	Integration of production and ecological aspects of rangeland management, relevant to grazing and holistic principles.
Clients	Existing rangeland managers and others servicing the rangelands. Undergraduate students.
Practical Emphasis	Second six months to be undertaken in the rangelands, with particular practical emphasis.
Delivery System	Option of first six months to be undertaken either externally or internally, and on a part-time or full-time basis (flexible). Second six months to be undertaken in the rangelands under supervision of the node.
Role of Nodes	To coordinate and supervise practical experience in the second six months.

Links to PMP and Individual Rangeland Managers	Part of practical experience will involve working with a rangeland manager (eg. a pastoralist or national park manager).
Option: Diploma in Rangeland Management	
General Description	A two year undergraduate diploma course with first year at the Centre and second year at one of the nodes.
Subject Emphasis	First year on principles of ecology and production in the rangelands with further emphasis on holistic approach and farm business management applied to the rangelands. Emphasis and most time in second year on practical experience supported by nodes.
Clients	Rangeland managers and others servicing the rangelands, undergraduates.
Practical Emphasis	All of second year of diploma to be spent in rangeland nodes and practical rangeland management.
Delivery System	Flexible only in first year which could be undertaken part time and/or by distance education with some inreach requirements. Second year would involve practical experience under supervision of nodes. Some flexibility in design and location of practical experience.
Role of Nodes	Supervision of second year practical experience.
Links to PMP and Individual Rangeland Managers	Part of practical experience will involve working with a rangeland manager (eg. a pastoralist or national park manager).

6.1.3 Short Courses

There is perceived to be a significantly large demand for short courses, particularly from pastoralists and possibly from those servicing the rangelands (such as bankers, rural merchandisers etc), although the demand from the servicing sector was largely untested in the current study. It was perceived by pastoralists that short courses on rangeland management should be undertaken by those servicing the rangelands, so to develop their understanding of rangeland management issues.

Short courses were seen as attractive to existing pastoral managers as they are more likely to fit an immediate and practical need. Also, there would be only a low financial and time commitment required to participate in short courses. Short courses would be of varying length and subject matter with the main challenge in the method of delivery of such courses.

Short courses should be demand driven and therefore one option for the Rangeland Management Centre would be to facilitate and support the organisation and delivery of such courses in particular regions. This could be effected through the nearest network node (another tertiary institution, a State Department of Agriculture Centre) with delivery through local node personnel, pastoral manager input, and personnel and materials from the Rangeland Management Centre wherever applicable.

Short courses could be designed so that they may be articulated into an undergraduate diploma qualification. When used for this purpose, some form of assessment would be

necessary. However, it may be desirable to have optional assessment of each individual short course, in order to maximise participation, including those not seeking any formal qualification. It is possible, that once a person becomes familiar with undertaking short courses, the option of assessment could be more palatable. A summary of several options is given in Table 7.

Table 7: Some Options for RMC&N Short Courses

Option: Short Courses for Rangeland Managers	
General Description	A suite of different short courses aimed toward rangeland managers. Each short course could articulate to form a recognised qualification. eg certificate or associate diploma. Courses of one day to one week duration.
Subject Emphasis	Each course would have a particular subject emphasis.
Clients	Rangeland managers including pastoralists, national park managers, Aboriginal land managers.
Practical Emphasis	Strong practical emphasis so to maintain high level of relevance to the rangeland managers.
Delivery System	Courses offered at nodes or other rural centres, depending upon demand for courses in particular areas, with support from the Centre.
Role of Nodes	To supply short courses throughout the year. To receive proposals from groups of rangeland managers regarding the types of short courses in which they are interested.
Links to PMP and Individual Rangeland Managers	Some links with PMP.
Option: Short Courses for Others (eg rural service providers)	
General Description	Short courses for those associated with the rangelands less directly than rangeland managers, but who require a short course to familiarise and update their education specific to rangeland management. Courses of one day to one week duration.
Subject Emphasis	Rangeland management and principles of relevance to the particular sector.
Clients	Agribusiness persons, bankers, PMP coordinators, Landcare coordinators, local government, rural merchandise managers, tourism operators in the rangelands.
Practical Emphasis	Some practical emphasis.
Delivery System	Courses to be undertaken at the Centre. Specific trips to the rangeland nodes if required.
Role of Nodes	Provide support to the centre, and information for inclusion in these short courses.
Links to PMP and Individual Rangeland Managers	Some links with PMP, not a major feature.

6.1.4 Other Initiatives

Certain current initiatives associated with rangeland management were noted by the study team. It is likely other initiatives exist that have not come to the attention of the team.

1. Darling Downs Institute of Advanced Education

In 1977, a paper was produced by B.R. Roberts of Darling Downs Institute of Advanced Education (DDIAE), Toowoomba, Queensland assessing the need for education in Rangeland Science in Australia. This paper was presented to the Rangelands Society and contains some similar themes to those contained in the present study for MRC. It suggested 'Range Science' was closely associated with a number of disciplines both production-orientated and ecologically-orientated. Within the document, the need to establish tertiary education courses specifically for stakeholders in the rangelands was recognised, and it was intended the Australian Rangelands Society could take an initiative in this area. A copy of this document is presented within Appendix 5.

2. Proposed Cooperative Research Centre (CRC)

A Rangelands Research and Development group comprising representatives from CSIRO, NSW Departments of Agriculture, Land and Water Conservation and Queensland's DPI, DNR and DEH submitted a plan for CRC funding. The group published a Background and Action Plan in November 1993. The Proposal remains unfunded. (Source: Longreach Pastoral College, *unknown*.)

3. Longreach Pastoral College

Longreach Pastoral College has recently prepared a concept paper for a Centre for Semi-Arid Rangelands Management. This initiative was established to address the issue of sustainable agriculture in Australia's arid rangelands. Several recommendations were formed including the involvement of the Queensland Department of Primary Industries, Queensland Department of Natural Resources, Longreach Pastoral College and University of Queensland in the establishment of a Centre for Semi-Arid Rangelands Management, to be headquartered in Longreach. Links with CSIRO, other departments (Federal and interstate) and other university groups were seen to further enhance the benefits from the centre. The functions of the proposed centre include research and development, extension, education, and policy advice to government. The Centre was seen to have both national and international significance, and could provide educational offerings to overseas students. Following from the concept paper was the recommendation that a Steering Committee be formed to advance the establishment of a Centre for Semi-Arid Rangelands Management.

4. Curtin University of Technology - Kalgoorlie Campus

The Curtin University of Technology, Kalgoorlie Campus, the Goldfields Esperance Development Commission and the WA Department of Commerce and Trade have funded a consultancy study to undertake research and preparation of a report on the feasibility of establishing a National Centre for Arid Land Science based in Kalgoorlie. The aim of the Centre would be to provide an international focus for teaching, training, applied research and consultancy relating to arid/semi-arid zones and to identify better and more responsible (ie sustainable) ways of utilising arid/semi-arid regions and thereby improving the world's natural resource base. The proposed Centre would focus upon providing

opportunities for specialised and collaborative research, education and training activities focusing on arid land issues. The Centre's activities could fall into six core divisions:

- higher education and training;
- short courses and conferences;
- applied research and development;
- Aboriginal interests;
- commercial and consulting services; and
- public programs.

It is proposed the Centre should have an advisory board whose members are representative of a broad range of stakeholders and interested parties.

5. Central Queensland University

An advisory committee comprising staff from CQU, CSIRO Division of Tropical Agriculture and DPI and industry representatives has been formed to assist with the development of proposed course work for a Graduate Certificate in Tropical Beef Systems. This proposed course is seen to address the need for training which covers the 'big picture' and integrates issues of production, marketing and sustainability.

6. National Strategy for Rangeland Management

The Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) produced a draft 'National Strategy for Rangeland Management' in 1997. Within this document goals, objectives and actions have been drawn up with regard to improving the management of rangeland areas. One point of relevance to education and training is that the Draft Strategy recommends that rangeland managers and users engage in self-directed and continuous learning to develop their business management skills and best practices in order to achieve ecologically sustainable rangeland management. A range of other actions are recommended with relevance to social issues, research and development, and other topics, but education and training is not given attention.

7. North Australia Beef Research Council:

The North Australia Beef Research Council (NABRC) have developed a Strategic Plan for the period 1997 to 2003. This plan contains overall goals and strategies for NABRC, and reports the results of regional beef research committee strategic plans for eight areas in northern Australia. One of the 14 goals of NABRC was 'to improve the knowledge and technical and managerial skills of beef industry participants to enhance long-term profitability and the vitality of the industry'. Another goal of NABRC of relevance to the proposed RMC&N is 'to improve land management to maintain and enhance land resources for the North Australia beef industry'. Within many of the regional strategic plans, future strategies associated with education and training are highlighted, thus this area is considered of importance to the north Australian beef industry. In particular, support for short, specific courses including Information Days and Meat Profit Day activities was highlighted by some regional beef research committees.

8. Synapse Report to RIRDC

A study was undertaken by Synapse Agricultural and Resource Consulting for the Rural Industries Research and Development Corporation entitled 'Farmer Education and

Training - A Policy Context for Future Research and Development Strategies' (Gleeson et. al., 1997). Aspects of the draft report of relevance to material in the present study relating to rangeland management education and training are noted below.

- The National Farmers Federation recognised the need to promote the value of education and training to farmers.
- There is a need to provide education and training that meets industry needs.
- There is a need to improve education and training opportunities for persons in rural areas.
- Farmers prefer short, informal, practical courses with flexibility to accommodate for seasonal work demands.
- There is a need for business, finance and risk management courses for farmers.
- There is a trend to universities moving to a national system of credit accumulation and transfer.

6.2 Likely Numbers

Enrolment projections in specialised rangeland courses are not readily undertaken. The discussion groups were unable to provide any specific estimates. However, some useful information was gleaned from pastoralists at the discussion groups, telephone interviews with managers of large pastoral companies, academics, and from representatives of government departments and agribusiness firms.

There is a large demand from pastoralists for relevant, well targeted and presented short courses and in this respect the market is perceived to be significant. However, pastoralists are discerning about presentation, material presented and feel they need to be switched on by those providing the courses. Course presenters who had something specific to say relevant to their region gained respect. There was less interest in diploma and certificate courses, as well as degree courses although the need for well trained research and extension personnel was evident. It was acknowledged that some existing pastoralists and younger members of their families would seek out a degree in rangeland science or management but the number was not expected to be large.

Additional information was sought over the telephone from representatives of some Australian pastoral companies with landholdings in the rangelands.

Company A:

This pastoral company has over 20 pastoral managers, of which only two or three have formal qualifications, mainly diplomas or certificates. Persons that have undertaken a degree are more likely to be associated with the company's activities in the feedlot or genetics sectors of the beef industry. The company's current policy is to lift the level of qualifications held by employees in the future. A motivating force behind this policy was to have pastoral managers with equal or better quality than those in national parks and heritage areas. The company has considered supporting scholarships and cadet schemes in the future and has implemented cadet support schemes in the past.

Company B:

It was considered by a representative of this company that short courses would be of most use to property managers due to the pressures upon rural industry at present. The time and resources required to undertake further education would restrict the number of persons able to participate in further studies. The company currently has seven property managers and believes at least one would be interested in undertaking a formal certificate or diploma course on a part-time basis. A greater number would be interested in undertaking short courses (eg one week). It was considered unlikely new graduates of a proposed rangeland management degree would find employment within this pastoral company.

Company C:

There are 16 pastoral managers employed by company C, of which two thirds would have a formal qualification of some type (certificate to degree). The remainder would not have undertaken any formal education or training. According to a representative of the company, the type of education and training that would most appeal to pastoral managers is short courses of one day duration. It was estimated about one third of their pastoral managers would participate in a one day course similar to the 'Meat for Profit' one day program. Technology days in different locations are of interest to approximately one third of pastoral managers and may be an effective method of communicating new technologies and research outcomes to pastoralists. The company would be likely not to require formally qualified rangeland management graduates.

Company D:

There are 13 property managers employed by company D, of which one or two may be interested in undertaking a short course specific or relevant to rangeland management. A degree course was not likely to be undertaken by their pastoral managers. Lack of time was noted as the major constraint on pastoral managers undertaking further education and training.

Company E:

One other pastoralist who owned a number of properties in the rangelands believed there is no need to educate and train property managers of these properties, and it was unlikely that property managers would be interested in further education and training in rangeland management.

The Queensland Department of Primary Industries currently employs about 60 to 70 professional staff in what may broadly be described as 'rangeland management areas' (Shakovskoy G, pers comm, January 1998). The turnover rate for staff is about 7 to 8 per cent, resulting in about six staff being recruited into this area each year. While in the short term some of these positions would be filled by internal transfers and some by graduates in other areas, a significant proportion could be filled by graduates in rangeland management. Within Queensland, the Department of Environment and the Department of Natural Resources would also be likely to recruit some new graduates with a rangeland management specialisation. It is likely that up to 10 graduates in rangeland management may find government positions in Queensland alone, and the numbers across Australia would be proportionally greater.

As of mid-January 1998, the new B App Sc (Crops and Rangelands) at UQ Gatton, has received 32 first preference applications. Given that the fallout from first preferences may roughly equal additions from those with initial lower preferences, this number is encouraging in a year when many tertiary enrolments are down compared with previous years. Further, the course was not promoted by UQ Gatton.

The higher the degree of specialisation in rangelands the lower the likely intake number would be. The B App Sc (Crops and Rangelands) is a six month full-time specialisation. A one year specialisation would probably attract a lesser number of students, but an intake of 30 to 35 per year into a rangelands management course would be potentially achievable, particularly if the course were promoted. Such an intake number could produce 20 graduates per year. Such a number could be employed in, for example:

- four as pastoral industry rangelands management
- one in National Parks rangelands management
- one in Aboriginal land management,
- ten in extension and research
- one in the policy and regulation area,
- one in agribusiness (banking), and
- two others in the private sector.

There are a number of forces that could impinge on the future demand for rangeland management education in Australia. Greater attention being given to the management and conservation of the environment is clearly one major factor that may create a need for a wider and deeper education of those managing the rangeland areas. The acceptability of rangeland product in overseas markets in the future may be tied to accreditation of rangeland managers in Australia in the future. Such forces could operate to increase demand for both degree and short courses associated with rangelands at some stage in the future.

6.3 Potential Funding for a RMC&N

A number of sources of funding might be considered for the RMC&N. These are listed below:

- tertiary institutions
- DEETYA special initiative
- National Heritage Trust
- Government incentives for short courses (the new Integrated Rural Package)
- full cost recovery from students/participants with the aid of scholarships and employers' support

Tertiary Institutions

Existing tertiary institutions are downsizing at present due to budget cuts and there are limited funds currently available in the education system. If RMC&N were to be funded out of the existing education system, other courses would most likely have to be curtailed.

No more EFTSUs are being funded by government. However, some institutions may desire to enter this field and may be prepared to switch student places to the RMC&N, assuming such student places were recognised by DEETYA. Institutions which are already committing staff to rangeland management units may be in a better situation than those who would have to initiate new staff places.

Any incentive offered by MRC and IWS, for example 50% funding for the RMC&N for three to five years may stimulate significant interest from tertiary institutions. Once the RMC&N is established, and is seen to be successful over a five year period, then the student places might be continually funded through the education system.

DEETYA Special Initiative

It is possible DEETYA could provide funding for the proposed RMC&N, although government cutbacks in recent years have reduced the amount of any special funding available for new initiatives. In order to obtain DEETYA funding, the RMC&N would be required to have whole of government support.

There is the possibility that DEETYA through the Training for Aboriginal People (TAP) program may provide funding for consultancy studies, or support for salaried positions. Funding approval is subject to negotiations, although funding is more likely to be forthcoming if the initiative is directed toward reducing unemployment. The TAP program is currently looking at becoming more involved with the private sector within their employment strategy.

National Heritage Trust

The proposed RMC&N would appear to be eligible for various forms of funding from the National Heritage Trust (NHT). The NHT funds areas of relevance to the RMC&N such as 'skills training and education/awareness' and 'sustainable agriculture and fisheries'. There are both Commonwealth and community initiatives that could lead to financial support through the fund. The various avenues of support from the NHT should be further explored.

Institutions Associated with Education of Aboriginal People

Due to recent funding cutbacks the Aboriginal and Torrens Strait Islander Commission (ATSIC) is no longer involved directly with education and training due to recent funding cutbacks. ATSIC formerly had a Community Training Program, but this area is now addressed by DEETYA within their TAP program.

Government Incentives for Short Courses

The recently announced Integrated Rural Package of the Commonwealth Government contains significant increases in resources for continuing education for farmers and graziers to improve competitiveness, address risk management issues, and encourage a whole property approach. These would be a source of funds for the provision of short courses.

Full Cost Recovery from Participants in Education and Training

This is the strategy being adopted by the CQU group whereby pastoralists are willing to pay for short courses themselves, presumably aided by the existing government subsidy.

Full cost recovery for degree or diploma courses would most likely reduce the demand for these courses considerably, particularly from the pastoralist sector.

Scholarships and employer-support would assist the full cost recovery option but the numbers of students in degree and diploma courses that might be supported through such means is likely to be small.

Likely cost of the RMC&N

It is assumed the proposed RMC&N would require:

- a number of staff;
- an allocation for travel expenditure;
- funds to support the nodes;
- funds to assist with the provision of lecturing materials and course aids; and
- administrative inputs

It is assumed the RMC&N would require five new additional appointees at the centre, but no additional full time personnel at the nodes. An indicative budget for the RMC&N is outlined below in Table 8. This budget is indicative only, and once the actual objectives of the RMC&N are defined more closely this budget could substantially change. The indicative total to fund could be less depending on the scope for any resources supplied by existing education and training institutions.

Table 8: Indicative Budget for the RMC&N

Item		Expenditure (\$ per annum)
Staff salaries	Professor	\$85 000
	Senior lecturer	\$60 000
	Lecturer	\$45 000
	Assistant	\$30 000
	Secretary	\$30 000
On costs (@ 30% of total staff salaries)		\$75 000
Travel		\$60 000
Node support		\$100 000
Lecturing material and course aids		\$30 000
Administration		\$60 000
TOTAL		\$575 000

Note: Assumes buildings and support services are supplied by the host tertiary institution.

7 CONCLUSIONS AND FURTHER ACTIVITIES

7.1 Conclusions

(i) There are few if any courses offered in Australia that could be considered specialist courses in rangeland management and/or ecology. Further, there is limited integration of ecological and production outcomes in those courses that currently provide education and training of some relevance to rangeland management.

(ii) There is a need to improve education and training for stakeholders associated with the rangelands by providing a specific focus on rangelands within a series of short courses as well as greater focus on rangelands in degree courses. There is a potential demand for short courses from rangeland managers including Aboriginal land managers. There is also a potential demand for short courses from others associated with rangeland areas (eg personnel associated with input supply, the environment and policy development).

(iii) There is a need to train relevant research and extension personnel with some form of degree or postgraduate diploma with a specialisation in rangeland management. The need for an undergraduate diploma or certificate in rangeland management is uncertain.

(iv) Courses focusing on rangeland management should emphasise the integration of ecological and production perspectives and take a holistic approach to the management of both business and natural resources.

(v) The establishment of more targeted courses servicing the rangelands should utilise and complement the existing courses and subjects associated with rangeland management currently provided by tertiary education establishments. Duplication of existing courses should be avoided.

(vi) Any new training and education initiatives should utilise the experience of those managing and servicing the rangelands and integrate such experience into course design and presentation and delivery methods.

(vii) The concept of a Rangeland Management Centre and Network (RMC&N) could meet the identified needs. The RMC&N would comprise the Centre, members from supporting institutions or accredited providers of the first two or three years of a degree course, as well as nodes in the rangelands that could be accredited for short course organisation and delivery.

(viii) The Centre could best be based at an existing tertiary institution that would be able to provide support across a range of disciplines associated with the rangelands. Ideally, such an institution would best be located in or close to the rangelands. However, this would not be essential given the nodal approach specified, and the need to attract knowledgeable staff and experts to the Centre.

(ix) The Centre and its nodes could also act as repositories of knowledge concerning local ecosystems and rangeland management, and could supply information on a broad level regarding the rangelands.

(x) There is a need to bring together a critical mass of expertise in rangelands management. Such expertise need not be located totally at the Centre, in fact, it would be preferable if it were not. Individuals (eg rangeland managers, researchers) could be registered as associates of the RMC&N and could contribute in various ways to short courses and to other Centre activities. For example, experts in distance education in other institutions could be associates of the RMC&N. Overseas experts with interests in particular aspects of rangelands relevant to Australia could also be invited to be associates of the RMC&N.

(xi) The Centre itself will require a high profile leader in rangeland management able to maintain a high level of range science and management, be devoted to rangeland issues, and to be able to communicate with a range of rangeland stakeholders. If the Centre is to facilitate knowledge repositories across the rangelands it will need a high level of staff capabilities, interest, and devotion to rangelands.

7.2 Further Activities

It is the view of the study team that MRC should further pursue the concept of establishing a RMC&N. If MRC endorses this proposal, then the following alternative initiatives will need to be considered by MRC:

(i) MRC should establish a Steering Committee made up of representatives from MRC, IWS and representatives of beef and wool producer groups plus one independent person drawn from the tertiary education sector. The Steering Committee would further develop the concept outlined in this report and may pursue any or all of the proposed actions in (ii) to (vi) below.

(ii) The Steering Committee may engage in further consultations with industry groups and governments. Consultations would include obtaining further input from pastoralists and others with interests in the rangelands and should include Aboriginal groups.

(iii) The Steering Committee may bring this report to the attention of the National Rangeland Management Working Group for consideration and incorporation of education and training elements into the National Strategy for Rangeland Management. Support from this Group should be sought for the concepts outlined in this report.

(iv) The Steering Committee may need to initiate further investigations in one, some, or all of the following areas.

- requirements for the first two or three years of a degree course in accredited institutions and mechanisms whereby such cross-institutional arrangements may operate including funding, degree conferral etc.
- assessment of the acceptance in relevant agricultural science, agricultural economics, agribusiness or management degrees of final year specialist options in a

Rangeland Management Centre and the likelihood of these being taken up by each institution and its students

- the potential demand for various modes of offering of formal degree courses, especially by distance education or internet (e-mail) methods.
- broad notions of curricula in the various courses
- the specific types of short courses that might be offered by the RMC&N in terms of subject areas
- the concept of articulation of short courses towards a formal qualification and how work place assessment might be incorporated into such a qualification
- potential financial support through NHT and DEETYA

(v) The Steering Committee may then consider producing a more detailed proposal for the structure and operation of a RMC&N than is contained in the current report. Expressions of interest for involvement of tertiary institutions and others such as producer groups and research/extension agencies could then be sought.

(vi) As a result of the expressions of interest received, the Steering Committee could then invite specific tertiary institutions (singularly or combined) to develop the structure and function for the RMC&N. The conduct of further research to assess the number of people operating in rangeland management, now and in the future, and estimates of the proportion that might be interested in various courses could be included as part of this invitation.

(vii) Estimates of indicative costs of the above activities could be as follows:

Activity	Indicative Cost to MRC
Four meetings of the Steering Committee in first year	\$10 000
Further consultation and promotion of the RMC&N	\$50 000
Further investigations before final specification	\$60 000
Calling for expressions of interest and funding invited tertiary education institution proposals and development plans	\$50 000

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APPENDIX 1: SUMMARY OF EDUCATIONAL AND TRAINING OFFERINGS RELEVANT TO RANGELAND MANAGEMENT

The University of Queensland (Gatton College and St Lucia)

The Faculty of Natural Resources, Agricultural and Veterinary Science within the University of Queensland offers a Bachelor of Applied Science (Rural Technology) at Gatton College. Two fourth year subjects within this course are of particular relevance to rangeland management. 'Rangeland Management' subject aims to provide an understanding of the theory of rangeland management, and 'Rangeland Management Excursion' includes a five day excursion to rangeland areas in southern and south-west Queensland. A parallel subject entitled 'Range Management' is offered in the Bachelor of Agricultural Science, Bachelor of Land Resource Science, and Bachelor of Agricultural Economics at St Lucia Campus.

From 1998, the University of Queensland, Gatton College will offer a Bachelor of Applied Science (Crops and Rangelands). The course will be a three year full-time or six year part-time degree and can be undertaken externally or internally. The rangeland specialisation is built around four specialist subjects 'Rangeland Management I', 'Rangeland Management II', 'Rangeland Excursion', and 'Rangeland Management Case Studies'. Other supporting subjects are 'Crops and Rangelands in Perspective', 'Integrated Industry Study', and 'Integrated Industry Seminar'. These subjects will also be available within the Bachelor of Agricultural Science (Rural Technology), which will be a four year, internal only course. The 'Crops and Rangelands in Perspective' subject can also be undertaken within a number of other production-orientated bachelor and diploma level courses offered by Gatton College.

At the Gatton Campus, courses are available relevant to the rangelands with an ecological orientation such as the Bachelor of Natural Resources (Natural Systems and Wildlife Management), Bachelor of Applied Science (Environmental Tourism), Bachelor of Applied Science (Protected Area Management), Diploma of Applied Science (Nature Conservation) and Diploma in Applied Science (Wilderness Reserves and Wildlife Management). These courses do not specifically focus on the ecology and management of protected areas, including the rangelands. The Bachelor of Natural Resources is four years in duration and available internally only, while the Bachelor of Applied Science and Diploma of Applied Science are of three and two years duration respectively, and can be studied either internally or externally. Certificate courses in Agriculture and Animal Husbandry are also offered at Gatton. These are two year full-time courses and can only be undertaken internally. These courses are production-orientated with a balance of theoretical and practical work.

At the St Lucia campus, the revised courses will continue to include a 'Range Management' subject within the Bachelor of Agricultural Science (Animal Science; Soil and Pasture Science), Bachelor of Natural Resources (Natural Resource Science), and Bachelor of Natural Resource Economics. These courses are offered full time over four years, and are available internally only.

Griffith University

Griffith University offers a Bachelor of Science in Australian Environmental Studies at the Nathan Campus. This is a three year full-time course. Students are required to complete one or more majors. Majors of particular relevance to rangeland management include 'Ecology and its Applications', and 'Land and Water Processes'. 'Ecology and its Applications' considers the ecological and biological principles underlying natural systems. 'Land and Water Processes' develops an understanding of the physical and biological bases of land and water management. Relevant subjects in the program include 'Environmental Management of Soils', 'Hydrology and Water Resources', 'Animal and Plant Diversity', and 'Introduction to Land and Water Processes'.

Griffith University also offer a Master of Science in Environmental Management, which is of some relevance to rangeland management. This course is currently undergoing a comprehensive restructuring with a view to commencing a new program in 1998. The focus of this course will be on management, and will include topics such as Environmental Systems and Audits, Management of Biological Resources, and Natural Resource Management and Indigenous People.

Central Queensland University

The Faculty of Applied Science within the Central Queensland University offers a Bachelor of Environmental Science which has the flexibility to be tailored to individual areas of interest, such as rangeland management. This degree is three years full-time and can be undertaken on a part-time basis. The course aims to train persons in the field of ecologically sustainable development and environmental resource management. There is a strong ecological orientation, and practical work is undertaken within this course. The course is available to be undertaken internally or externally at the Rockhampton campus. The first year of the course is also offered by the Bundaberg and Mackay campuses. If the course is undertaken externally, particular units require participation in residential schools.

Since 1997, Central Queensland University has offered a Graduate Certificate and Graduate Diploma in Environmental Management. The Graduate Certificate is a one year course available externally and on a part-time basis only. The Graduate Diploma is a two year course and is also offered part-time and externally only.

Central Queensland University is also progressing toward developing a Graduate Certificate in Beef Systems course which may be available from mid-1998. This course would address the need for the beef industry to be aware of wider ecological and market issues and the integration of issues of production, marketing and sustainability. The course will be offered by a partnership between Central Queensland University, CSIRO, Queensland Department of Primary Industries and industry. Some proposed course units within the Graduate Certificate would have some relevance to rangeland management such as 'Grazing Ecology', 'Property Management Planning', and 'Resource Management'.

The University of Southern Queensland

The Land Use Study Centre within the University of Southern Queensland offers 'Homestudy' courses, publications and videos with some relevance to rangeland management. These offerings are directed mainly at primary producers.

Homestudy courses relevant to rangeland management include a 'Practical Grazing Management' course and a 'Practical Landcare Techniques - Principles and Application' course. Both courses are directed to land holders and/or managers. A Certificate of Completion is awarded following satisfactory completion of the course. The courses cannot be used as credit towards any approved degree or diploma.

The 'Practical Grazing Management' homestudy course usually takes four or five months to complete. The course costs \$120 which includes a textbook, studybook, book of readings, and mailing and tutoring fees. The course focuses on pasture management and animal husbandry applied to the rangeland conditions in the Murray-Darling Basin. Contents of the studybook with some relevance to rangeland management include 'Grazing Management: Principles and Practices', 'Property Planning and Grazing Resource Mapping', and 'Condition Assessment of Native Pastures'. The course tends to be production orientated.

The other course 'Practical Landcare Techniques - Principles and Applications' also has some relevance to rangeland management. This course also takes four or five months to complete and costs \$120. Topics with some relevance to rangeland management include 'Landcare Action in Ecological Sustainable Development', 'Building Blocks of Sustainable Agriculture', 'Native Pastures' and 'Pastoral Properties'. The course integrates the ecological and production aspects of land management.

Other short courses offered by the Land Use Centre at the University of Southern Queensland include 'Fire Management: the use and control of rural fire', 'Wildlife Management on Farms', and 'Effective Rural Groups'.

The Landuse Study Centre is a retail outlet for publications and videos on landuse. One publication is entitled the 'Call of the Country' (collected papers on Landuse) which contains a section on rangelands. Also for sale are videos such as 'The Care Takers' which presents information on two award-winning grazing properties in Queensland where the principles of sustainable pastoralism are demonstrated.

Longreach Pastoral College

Longreach Pastoral College offers Certificates in Pastoral Skills and Pastoral Production and a Diploma of Applied Science (Pastoral Production). The aim of Longreach Pastoral College is to develop proficiency in practical skills and to enable students to make management decisions that are technically, economically and environmentally sound.

The Certificate in Pastoral Skills is a 12 month full-time residential course. The course is production-oriented and there is a strong practical and manual skills emphasis in the course. The course includes a rangeland ecology subject area which is made up of one subject entitled 'Soil Features'.

The Certificate in Pastoral Production is a one year full-time residential course and requires the completion of the Certificate in Pastoral Skills. This course also has a rangeland ecology subject area with subjects such as 'Basic Plant Growth', 'Soil Science', and 'Pasture Principles'. Other subjects offered within this course include 'Plan a Rural Property', and 'Fence Design and Maintenance'. There are also elements of rangeland management within cattle management and sheep management subjects.

The Diploma of Applied Science (Pastoral Production) is a one year full-time residential course. A rangeland ecology subject area is included as part of the course and is made up of the following subjects: 'Soil Science', 'Pasture Principles' and 'Plant Science'. Additional subjects included within the diploma include 'Climatology', 'Fence Design and Maintenance', 'Plan a Rural Property', 'Issue Analysis', 'Management Case Study', and 'Surveying Practice'. Elements of rangeland management are also within the cattle management and sheep management subjects.

Emerald Agricultural College

Emerald Agricultural College offers Certificate III and IV courses in Agricultural Practices. The Certificate courses are one year full-time course offered internally. The courses include subjects such as 'Sustainable Agriculture', 'Sustainable Management of Native Pastures', 'Pest and Weed Control' and 'Rural Property Planning'. These courses are orientated towards on-farm practices.

A Diploma of Applied Science in Agricultural Practices is also offered. This is a two year full-time course and is aimed at preparing students for on farm management or positions in rural related industries. This course includes 'Rural Property Planning', 'Pest and Weed control', 'Cattle Husbandry', 'Tillage Practices', 'Rural Surveying', 'Rural Business Management', 'Land Tenure and Farm Valuation', 'Land Management', 'Water Supply', 'Pumps and Pumping' and 'Water Supply Design'.

In both the Certificate and Diploma courses, either Stock Production, Crop Production or a combination of both Stock and Crop Production can be undertaken.

Dalby Agricultural College

A Certificate III in Agricultural Production and Certificate IV in Agricultural Production are one year courses offered internally by Dalby Agricultural College. A Diploma of Applied Science (Agricultural Production) is a 600 hour course also offered internally. These courses are production orientated and have a significant component of practical work. Topics included in the courses include sustainable agriculture and farm business management which have some relevance to rangeland management.

Dalby Agricultural College also offers a Certificate IV, a Diploma, and an Advanced Diploma in Rural Business Management through an external study program. These three courses can be undertaken over an extended period of time, and are targeted towards primary producers. Assessment is by assignment only, and the modules within the courses are based on national competency standards for farm business management.

The external modules offered within the Rural Business Management courses tend to have a business and management orientation. There are two elective modules available which focus upon rangeland management and provide an integrated production and ecological approach to rangeland management. However, these two modules do not make up a significant part of the courses.

The Certificate IV, Diploma and Advanced Diploma in Rural Business Management courses are also offered through the TAFE system, and can also be undertaken through Longreach Pastoral College, Burdekin Agricultural College and Emerald Agricultural College.

Burdekin Agricultural College

Burdekin Agricultural College offers a Certificate II in Farm Skills, a Certificate III in Tropical Agriculture and a Certificate IV in Tropical Agriculture. The latter is a 36 week course to be completed over one year and is offered full-time and internally only. The course includes advanced subjects in rural management and farm operations. The course is production oriented and includes a high practical content.

Another course offered by Burdekin Agricultural College is a Diploma of Applied Science. The course is run over two years and is offered internally and full-time only. Subjects included are farm business management, landcare and environmental management, and crop and pasture management. The course is production oriented and emphasises practical fieldwork. Burdekin Agricultural College also offer a range of short courses and traineeships relevant to agricultural production.

Northern Territory University (also CRC for the Sustainable Development of Tropical Savannas)

The Northern Territory University currently offers a Masters course in Tropical Environmental Management. The unit offerings within this course have been developed to complement the Masters program at James Cook University. The CRC for the Sustainable Development of Tropical Savannas offers financial and logistic support to students studying for the Masters in Tropical Environmental Management who wish to choose a suite of subjects from both Northern Territory University and James Cook University. The CRC will also be supporting the development of a Masters level unit in Tropical Rangeland Management; this unit may be available in 1998 and may be further developed within a multi-media format. The Masters program can be completed in 12 months if the summer semester is used to complete the project work, otherwise the course is one and a half years full-time or three years part-time.

The Northern Territory University also offers a Bachelor of Science (Tropical Environmental Science) which is a three year course available on a full-time basis only. A Certificate IV (550 hours), a diploma and an advanced diploma in Tropical Resource Management are offered. These resource management courses are offered at the Casuarina Campus, Darwin and Aboriginal Communities across northern Australia. A three year Bachelor of Tropical Resource Management is currently being developed by the Northern Territory University. Also currently being developed is a new degree program at

Bachelor and Masters level for the tourism industry with a focus on the requirements of northern Australia.

A Certificate III in Lands, Parks and Wildlife is a one year full time or two years part-time course offered by Northern Territory University. An Associate Diploma of Applied Science (Environmental Science) which is a two year full-time course or up to six years part-time can also be undertaken at Northern Territory University. The Northern Territory University covers education and training activities across the vocational (VET) sector as well as higher education. Technical level training and accreditation is available in areas such as weeds control, chain saw operation, horticulture and land rehabilitation.

Northern Territory Rural College

Northern Territory Rural College offers three courses in Lands, Parks and Wildlife Management. Certificate III consists of 810 hours, Certificate IV is 360 hours and the Diploma course in 420 hours. All courses are offered on a full-time or mixed mode (part-time) basis with home study packages reinforced in compulsory residential schools for a few weeks a year. Core modules such as ecology and natural resource management are offered in Certificate III while Certificate IV contains modules on land resource capability assessment. All courses have an ecological and sustainable orientation and there is a strong practical emphasis.

Other courses offered include a Certificate II in Stock and Station Skills (13 weeks), a Certificate III in Beef Cattle Production (Northern Australia) (20 weeks), and a Diploma in Beef Cattle Management (North Australia). The latter two courses are offered internally and full-time. Rangeland management modules are offered in both courses. Both courses tend to focus on production aspects and have a strong practical emphasis.

A Property Management Training Program of 200 hours duration is also offered by Northern Territory Rural College in conjunction with other government agencies, including the Northern Territory Department of Primary Industries and Fisheries. This program has been compiled to suit the needs of rural managers thorough workshops, seminars, field days and home study packages, and articulates into the Rural Business Management Home Study Program. A Certificate (IV), Diploma, and an Advanced Diploma can be studied externally. The suite of three Rural Business Management courses are directed toward training managers, owners or partners in rural business and contains rangeland management modules as electives. The program is production oriented although a significant number of natural resource management electives are available. The modules are offered through Open Learning Australia and in the future ABC radio and television will be used.

University of Western Australia

The University of Western Australia offers a Bachelor of Science (Natural Resource Management) course. It is a four year course full-time (or part time equivalent) and may be awarded with honours. There is both theoretical work and practical field studies within this course, which focuses on the sustainable management of natural resources. In the fourth year students can take an elective unit called 'Rangeland Management' which focuses on the environmental, economic and social aspects of managing rangelands, with

emphasis on Western Australia. Another fourth year elective unit 'Animal Resource Management and Technology' offers a number of modules including 'Management of Animals in the Rangelands' and 'The Impact of Animal Industries on the Environment'.

A Bachelor of Science (Agriculture) is also offered by the University of Western Australia. The degree is a four year full-time course (or part-time equivalent) which includes subjects which are mainly production-oriented but includes some ecological subjects such as systems ecology.

Another course offered by the University of Western Australia relevant to rangeland management is a Bachelor of Science (Environmental Science). This degree is a three year full-time course (or part time equivalent) but does not include subjects that directly address rangelands.

All courses offered above by the University of Western Australia are available internally only.

Curtin University of Technology - Muresk Institute of Agriculture

Muresk Institute of Agriculture is a branch of Curtin University of Technology and offers traditional courses in Farm Management and Agribusiness. A Bachelor of Agriculture is offered by Muresk which includes a subject entitled 'Arid Land Management' focusing on sustainability aspects. The Bachelor of Agriculture is a four year full time course or part time equivalent and some units are available externally. Areas of specialisation relevant to rangeland management include agribusiness marketing and farm management

Muresk Institute of Agriculture also offers a Graduate Diploma in Landcare which is a one year full-time course. The course can also be undertaken on a part-time basis both internally or externally over a number of years. Subjects included within this course are 'Soils and Land Use', 'Land Degradation and Conservation', 'Landcare Extension', and 'Arid Landcare'. The Arid Landcare subject focuses upon pastoral land use, degradation and conservation of arid land and would be relevant to rangeland management.

An Associate Degree in Agriculture which is available at Muresk Institute of Agriculture consists of one year practical experience and two years of formal studying. The course includes a farm management subject, as well as an agricultural production systems subject. Also available is a Graduate Diploma in Agribusiness, a Master of Rural Management, a Master in Technology, and a PhD.

Curtin University of Technology (Kalgoorlie Campus)

Curtin University of Technology offers a Diploma of Applied Science (Environmental Technology) which is a two year full-time course or part-time equivalent. Subjects include 'Semi-arid Rangeland Management', 'Applied Ecology' and 'Principles of Resource Management'. The course aims to provide training and experience in various areas of environmental technology and the course has an ecological orientation.

Murdoch University

A Bachelor of Environmental Science is offered by Murdoch University which is a four year full-time course and can be undertaken internally or externally on a full-time or part-time basis. Subject with some relevance to rangeland management include 'Ecology', 'Environmental Management' and 'Land Management'. The course has an ecological focus.

A Bachelor of Science (Environmental Science) is also offered. The course is a three year full-time course or part-time equivalent offered internally or externally. Other courses are also offered including a Bachelor of Applied Science (Environmental Management stream), a Bachelor of Environmental Impact Assessment (EIA), a Postgraduate Diploma in Environmental Impact Assessment, and a Master of Science in Environmental Science.

Flinders University

Flinders University offers three courses of some relevance to rangeland management. These include Bachelor of Environmental Management, Bachelor of Environmental Science, and Bachelor of Technology (Ecotourism). The Bachelor of Environmental Management, the Bachelor of Environmental Science and Bachelor of Technology (Ecotourism) are all three year full-time courses. Courses are available through Flinders University on a full-time and part-time basis, and must be undertaken internally.

Information available on the degrees offered by Flinders University indicates there is little focus upon rangeland management within these three courses. These courses focus on general resource management and scientific material, and interactions between society and the environment.

University of South Australia

The University of South Australia offers two courses of some relevance to rangeland management, a Bachelor of Applied Science (Conservation and Park Management) and a Bachelor of Applied Science (Environmental Management).

Both are three year courses and both offer an additional Honours year. They are available to full and part-time students, but are only offered internally. Both courses offer subjects in the biological and earth sciences which are fundamental to an understanding of rangeland management.

Subjects in the Bachelor of Applied Science (Conservation and Park Management) which are particularly relevant to rangeland management include 'Introduction to Ecology', 'Australian Ecosystems', 'Resource Management and the Law', 'Fire in Rural Landscapes', 'Environmental Remote Sensing' (includes GIS) and 'Habitat Assessment Field Study'. The course has an ecological focus and there is a strong emphasis on practical fieldwork. Case studies relevant to rangeland management are undertaken within this course.

Additional subjects in the Bachelor of Applied Science (Environmental Management) which are particularly relevant to rangeland management are the same as for the Bachelor

of Applied Science (Conservation and Park Management) as well as 'Environmental Management Systems'.

University of Adelaide (Adelaide and Roseworthy)

A number of courses are offered by the University of Adelaide, Roseworthy Campus with some relevance to rangeland management including diplomas, degrees, graduate certificates, graduate diplomas, and masters. These courses are offered through the Faculty of Agricultural and Natural Resource Sciences. Within the Faculty, there are eight departments, one of which is entitled the Department of Environmental Science and Management.

From 1998, a Diploma in Natural Resources Management will be offered by the University of Adelaide. This Diploma takes two years full-time to complete and includes subjects such as 'Indigenous Australian and Environmental Management', 'Soils' and 'Conservation Biology'. A 'Rangeland Management' subject currently available within this diploma will not be offered in 1998. A two year Diploma in Agricultural Production is also offered full-time and can be undertaken on a part-time basis. This course is offered internally only and subjects cover agricultural systems, grazing and intensively managed livestock, and farm management. There are no specific subjects relating to rangeland management.

A Bachelor of Environmental Management is available internally as a three year full-time course or part-time equivalent. Honours can be taken in an additional fourth year. Subjects such as 'Ecology and Management of Rangelands', 'Soil Management and Conservation', 'Aboriginal Land Use' and 'Economics of Resource Management' are included within this course. There is a strong emphasis on both practical and scientific principles.

A Bachelor of Environmental Science is also available. This is a four year full-time course or part-time equivalent and is offered internally only. Fourth year streams include 'Sustainable Agriculture' and 'Biodiversity and Conservation'. This course is ecologically orientated and there is strong emphasis on practical work. A Bachelor of Environmental Studies is also offered by the University of Adelaide, although this has limited relevance to rangeland management, and is designed to train persons in the areas of policy research and policy development.

A Bachelor of Agriculture is a three year full-time course or part-time equivalent and is offered internally only. Students can specialise in one of the following streams: dryland farming; horticulture and irrigation; and livestock production. This course is production-oriented and there is a strong emphasis on practical fieldwork. The Bachelor of Agriculture is designed to aid the development of practical skills required to operate a farm in a sustainable manner, and there is limited specific focus on ecological subjects or rangeland areas.

The University of Sydney

The University of Sydney offers a Bachelor of Science in Agriculture which is a four year applied science degree. Subjects with some relevance to rangeland management include

'Production Economics', 'Resource Economics', 'Animal Production', 'Farming Systems', and 'Northern Territory Faculty Excursion'.

Also offered is a Graduate Diploma of Agricultural Science (48 units) and a Master of Agricultural Science (56 units). Advanced Pasture Agronomy is a subject offered (eight unit points) which identifies management problems relating to pastures within farming systems. Agronomy can also be studied within a Master of Science in Agriculture looking at the applied ecology of farming systems.

The University of Sydney (Orange Agricultural College)

The University of Sydney, Orange Agricultural College, offers a number of undergraduate courses. An Advanced Diploma of Land Management can be undertaken only by external study. This course is two years full-time or part-time equivalent. Core units include applied ecology, environmental impact assessment, land use planning and management, and land resource evaluation. This course places emphasis upon sustainable land management practices and rehabilitation of degraded lands with a holistic approach to land management. Practical work experience has to be undertaken before completing the course.

There are also other Diplomas offered including an Advanced Diploma of Farm Management and an Advanced Diploma of Rural Business Administration. Both are two year full-time courses or part-time equivalent which can be undertaken internally or externally. These courses have limited relevance to rangeland management.

The Bachelor of Management (Land Resources) runs for three years full-time or part-time equivalent. The first 16 units of study is offered externally only while the last eight units can be undertaken externally or internally. This course offers similar core units as the Advanced Diploma of Land Management. However, in the third year more advanced managerial subjects are undertaken. Again there is some focus on sustainability and ecological issues, and an emphasis on developing some research skills.

Another degree offered is the Bachelor of Management (Farm Business) which is a three year full-time course or part-time equivalent. The course is offered both internally and externally. This course is production-orientated but there is also some integration of sustainability aspects. Orange Agricultural College also offers a Bachelor of Management (Rural Business Administration) which is a three year full-time course or part-time equivalent. This course is offered both internally and externally.

Post-graduate courses offered by Orange Agricultural College that could be relevant to rangeland management include:

- Graduate Certificate in Sustainable Agriculture (six months full-time or part-time equivalent, external)
- Graduate Certificate in Rural Management Studies (six months full-time or part-time equivalent, external)
- Graduate Diploma in Sustainable Agriculture (one year full-time or part-time equivalent, external)

- Graduate Diploma in Rural Management Studies (one year full-time or part-time equivalent, external)
- Master of Rural Management Studies (two years full-time or part-time equivalent, external)

University of Western Sydney, Hawkesbury

A Bachelor of Landscape Management and Conservation is available through the University of Western Sydney, Hawkesbury (Richmond Campus). This is a four year full time or seven year part time course. Students can focus on rangeland management via off campus case studies and project activities in third and fourth years. There are also core subjects in ecology and environmental management. The course emphasises community involvement in landscape management and there are electives relating to biophysical and socio-political aspects of natural resource management.

The University of Western Sydney, Hawkesbury also offers a Bachelor of Applied Science (Environmental Management and Tourism). This is a three year full time course in which the major fields of study include environmental management and planning, ecotourism and tourism management. Graduate Diploma, Masters and PhD courses are also available.

A Bachelor of Systems Agriculture is also offered by the University of Western Sydney, Hawkesbury. This is a three year full time or six year part time degree. The major fields of study in the first half of the course are ecology and agricultural systems. However, students may choose to focus on rangeland management through appropriate off campus case studies and project activities in second and third years. Electives in natural resource management are available, similar to those electives available within the Bachelor of Landscape Management and Conservation. Majors in Systems Agriculture are available in Agribusiness and also Rural Development. These majors enable the student to focus on management or community development aspects respectively. Bachelor of Systems Agriculture students can continue on to a fourth year honours degree, Masters (Research), or PhD if desired.

A Graduate Diploma in Systems Agriculture and Master of Applied Science (Agriculture and Rural Development) are course work programs available over one year full time or two years part time. These courses feature self directed learning activities and personal development. Rangeland studies are possible if the student chooses appropriate projects and electives. The courses are offered in external mode and are designed to suit employed persons wishing to upgrade their qualifications.

University of New England

A number of courses with some relevance to rangeland management are offered by the University of New England (UNE). Undergraduate courses include Bachelor of Natural Resources, Bachelor of Rural Science and Bachelor of Agriculture. UNE is currently developing a new course entitled Bachelor of Environmental Science. Post-graduate courses available with some relevance to rangeland management include Graduate Certificate in Natural Resources, Graduate Diploma in Natural Resources, and Masters in Agriculture, Environmental Management, Natural Resource Science and Rural Sciences.

The Bachelor of Natural Resources is a four year full-time course and can be undertaken part-time. The first year is offered internally as well as externally but the last three years can only be undertaken internally. Elective units are grouped into programs designed to provide a specialisation in a chosen field of resource management. An elective unit currently available is entitled 'Rangeland Management'. Subjects included in this unit include production subjects, ecology subjects, and management subjects. There is a focus on ecological sustainable management practices for natural resources. Practical work is undertaken at semi-arid rangelands on the Western Plains within this course. A survey of graduates from the Bachelor of Natural Resources indicates most graduates become employed by government agencies involved with, for example, sustainable land management, soil conservation, and water resources.

A Bachelor of Rural Science is available both internally and externally for the first three years, however the fourth and final year is available internally only. Subjects include agricultural and environmental ecology, agricultural systems management, farm and resource management, and crop and pasture production. The course is production orientated, and includes a compulsory 24 weeks of practical experience.

A Bachelor of Agriculture can be undertaken through UNE in three years full-time and six years part-time. The course is offered internally and externally and includes similar subjects to the Bachelor of Rural Science. This course is also production-oriented and has a strong practical emphasis.

There are developments for a new course called a Bachelor of Environmental Science which may be offered in 1988. This course may include a sustainable land use subject area.

Marcus Oldham College

Marcus Oldham College's focus is on farm business management with an emphasis on the case study approach to develop analytical and decision making skills. Marcus Oldham College offers a Diploma in Farm Management which is a three year full-time course offered internally only. The course is production-orientated with the first year focusing on the principles of farm management, the second year involving a full year of practical experience on a farm, and in the third year analytical and decision-making skills are taught. Subjects of some relevance to rangeland management include 'Cropping and Pasture Management I', 'Cropping and Pasture Management II', 'Land Management', and 'Animal Management for Production'. There are no subjects of direct relevance to rangeland management offered by Marcus Oldham College.

Charles Sturt University

Charles Sturt University offers a Bachelor of Applied Science (Parks, Recreation and Heritage) comprising three years full-time or six years part-time study internally or externally. Subjects include; 'Principles of Ecology', 'Natural Resource Management', 'Vegetation Ecology', 'Fire Ecology and Management' and 'Ecotourism'. Also available is a Graduate Diploma of Applied Science (Parks, Recreation and Heritage) which is a two year course part-time by distance education. An Associate Degree of Applied Science (Parks, Recreation and Heritage) is a four year part time course offered by distance

education. Subjects with some relevance to rangeland management include 'Natural Resource Management'. Further study includes a Master of Applied Science (Parks, Recreation, and Heritage) which is four years part-time offered by distance education.

A Bachelor of Applied Science (Environmental Science) is also offered by Charles Sturt University. This is a three year full-time course on campus and six years part-time on campus or by distance education. Subjects with most relevance to rangeland management include 'Restoration Ecology' and 'Environmental Assessment'. Further studies offered include a Graduate Diploma of Applied Science (Environmental Management) which is a two year course offered part-time and also a Master of Applied Science (Environmental Management and Restoration) which can be undertaken over three years part-time.

A Bachelor of Applied Science (Agriculture) is also offered at Charles Sturt University. This is a three year full-time course on campus and is also available part-time and externally. Subjects include 'Agricultural Systems', 'Grazing Livestock' and 'Farm Management' and the course is production oriented. Further study offered includes a Graduate Diploma of Applied Science (Agricultural Studies) which is a one year full-time or two year part-time equivalent course offered on campus and externally. Subjects include 'Advanced Pasture Management' and 'Animal Production Systems'. A Master of Applied Science (Agriculture) can also be undertaken in two years of full-time study or part-time equivalent, either on campus or by distance education. There is considerable flexibility within the Masters course, as students can undertake special topic subjects that cater to their specific needs, including rangeland management needs.

Charles Sturt University also offers a Bachelor of Applied Science (Ecotourism) which is a three year course full-time. The course is also available part-time within six years internally or externally. Honours can be undertaken following the completion of the degree. A Graduate Certificate of Applied Science (Ecotourism) can also be undertaken. Subjects with some relevance to rangeland management include 'Wildlife Management', 'Principles of Ecology', 'Aboriginal Land Management', and 'Vegetation Ecology'.

University of Melbourne

The University of Melbourne offers a Bachelor of Applied Science (Natural Resource Management) which is a three year full-time course or part-time equivalent. Subjects include 'Ecological Management', and 'Whole Farm Planning'. A Diploma in Natural Resource Management is also available at the University of Melbourne, Dookie College. This is a two year full-time or part-time equivalent course. Subjects with some relevance to rangeland management include 'Agriculture in Victoria', and 'Resource Assessment'. Field work and practical experience are a major component of the course. Honours and a Master of Applied Science (Natural Resource Management) are also available.

Dookie College also offers a Bachelor of Applied Science (Agriculture) which is three and a half years full-time or part-time equivalent. Subjects with some relevance to rangeland management include 'Agricultural Production Systems I', 'Agricultural Production Systems II', 'Soil and Water Resource Conservation', and 'Systems and Rural Resource Management'. This course integrates ecological and production aspects.

A Bachelor of Agricultural Science offered at Parkville Campus is also another course which integrates ecological and production aspects. The course is four years duration with first year covering topics such as 'Land Resources and their Management' and third and fourth year topics covering agricultural economics and business, animal management and production, crop and pasture science, and environmental soil management.

The University of Melbourne's Faculty of Agriculture, Forestry and Horticulture has recently merged with the Victorian College of Agriculture and Horticulture to form an Institute of Land and Food Resources. This Institute is Australia's largest educational provider of TAFE, higher education and short courses concerned with agriculture, horticulture, forestry and food production and technology. TAFE courses are offered at six campuses located across Victoria: Burnley (Richmond), Dookie (Northern Victoria), Gilbert Chandler (Werribee), Glenormiston (Western Victoria), Longerenong (Wimmera) and McMillan (Gippsland). Degree courses are also offered through the above campuses and at Creswick (Ballarat) and Parkville (Melbourne). Many of the courses are available through distance education.

TAFE Colleges

A number of TAFE Colleges in Australia offer a Certificate, a Diploma and an Advanced Diploma in Rural Business Management. These courses include elective Rangeland Management Modules into their curriculum.

Certificate IV in Rural Business Management consists of 400 hours. Core modules relevant to rangeland management include rural enterprise management and rural business planning, and as elective modules production and rangeland management.

A Diploma in Rural Business Management consists of 900 hours. Core modules within this course include rural property planning, rural management integrative project and again elective modules on production and on rangeland management are available.

An Advanced Diploma in Rural Business Management requires 1500 hours of study to complete. Core modules relevant to rangeland management include managing agricultural systems and a rural management project. Elective modules Rangeland Management I and II are offered within this course.

Rangeland Management I Module

Rangeland Management I is 60 hours of duration. The purpose of this module is to make aware the components of the rangeland resource and inappropriate management practices on rangelands. The main topics included within the module include: rangeland plant communities, grazing and rangelands, land uses, and land degradation prevention control.

Rangeland Management II Module

Rangeland Management II is 40 hours of duration. This module analyses methods to implementing more sustainable rangeland practices. Topics covered include rangeland plants, effects of cattle grazing, NT Pastoral Lands Act, and carrying capacities.

Resource Consulting Services

'Grazing for Profit' School

Rural Consulting Services offers short 'Grazing for Profit' schools. These schools run over a period of eight days. The cost to participate in the course is \$2395 for the first person of a business and \$1895 for a second person. A repeat option is also available (with updated information) at a cost of \$400. Subjects covered include ecology, farm planning, grazing management, production and profit. How to increase profit in a sustainable way and a holistic approach to farm and livestock management are a major focus of the course.

Grazing for Profit Schools are currently offered in Queensland, New South Wales, Tasmania, Victoria, Western Australia and in the future will also be held in South Australia. In 1997 two courses were offered during February/March and June/July in Queensland.

The number of people attending the schools varies each year, depending on the location of the schools and the length of time since the last school in particular areas. This year over 50 people attended each school in Queensland. The last two schools held in Queensland were both fully booked, and a school held in New South Wales was attended by approximately 40 people with only a few extra places available.

Grazing for Profit Schools are now more established and demand for these schools is increasing. It is planned there will be a total of eight Grazing for Profit Schools held in Australia in 1998.

'Applied Grazing' Course

RCS also offers a four day 'hands on' course on intensive grazing management. The primary focus of the course is the construction, operation and management of grazing cells and time control grazing. The course cost is \$795 for Grazing for Profit graduates and \$1 400 for non-graduates. Courses generally involve 20 people, and are conducted in all Australian states.

'Executive Link'

RSC also offers a continuing education program for graduates of its courses. Executive Link involves regional affinity groups who cooperate and support each other to apply the principles of effective business management learned at the Grazing for Profit school. Groups meet at least three times per year. Meetings are conducted over a three year period. The cost is \$3 400 per business. Executive Link chapters are located in central Queensland, northern NSW, southern NSW, Victoria and Tasmania. Chapters will be established in Western Australia and South Australia in early 1998.

Property Management Planning and Other Initiatives

Among other training initiatives are Property Management Planning and the Queensland Beef Producers Best Management Practice Project which is targeted at small groups of producers using local consensus data (LCD) techniques and modelling packages. This project is aimed directly at facilitating sustainable management of grazing lands including rangelands.

Additional Educational and Training Offerings

Other certificate courses that are offered throughout northern Australia include:

- Certificate III in Lands Parks and Wildlife (Northern Territory University and Northern Territory Rural College)
- Certificate in National Park Conservation
- Certificate in Conservation Techniques and Skills
- Certificate II in Australian Land Conservation and Restoration

The following table lists additional institutions which may offer courses of some relevance to rangeland management. Due to time limitations, details were not sought regarding the courses currently offered by these institutions.

Name of Institution	Town	State
Australian National University	Canberra	ACT
TAFE (ACT Canberra Institute of Technology)	Canberra	ACT
University of Canberra	Canberra	ACT
Alexander Agricultural College (Tocal)	Paterson	New South Wales
Murrumbidgee College of Agriculture	Yanco	New South Wales
Southern Cross University	Lismore	New South Wales
TAFE, New South Wales		New South Wales
University of Newcastle	Newcastle	New South Wales
University of Wollongong	Wollongong	New South Wales
James Cook University of North Queensland	Townsville, Cairns	Queensland
Sunshine Coast University College	Maroochydore	Queensland
TAFE, Queensland		Queensland
TAFE, South Australia		South Australia
University of Tasmania	Hobart	Tasmania
TAFE, Tasmania		Tasmania
Deakin University	Melbourne	Victoria
La Trobe University	Melbourne	Victoria
TAFE, Victoria		Victoria
University of Ballarat	Ballarat	Victoria
TAFE, Western Australia		Western Australia
Australian Correspondence Schools		Queensland

APPENDIX 2: BACKGROUND INFORMATION AND QUESTIONNAIRE

The Concept of a Rangeland Management Centre

Primary production across Australia has experienced declining terms of trade over the past few decades as the prices of rural commodities such as beef and wool have decreased relative to the costs of production. This has caused financial pressures in the rural sector particularly in rangeland areas. Sustainability and environmental pressures too have become increasingly significant to rangeland areas, with problems such as woody weeds and pasture species degradation. Furthermore, land use pressures have become more significant recently, and alternative uses to pastoralism for parts of the rangelands and land tenure issues have received significant attention.

A need has arisen therefore to assess the educational and training opportunities for those involved in the future management of Australia's rangelands. As a significant proportion of the rangelands are presently unsustainably managed, there is seen to be a need to integrate both the production and ecological aspects of rangeland management, and to improve whole property management and business efficiency, in order to enhance the profitability and sustainability of pastoral activities in the rangelands. One way of achieving this would be through the provision of a range of education and training opportunities by establishing a Rangeland Management Centre that would provide a strong focus for rangeland management and integrate existing education and training opportunities that presently exist in various institutions.

The proposed Rangeland Management Centre would have the following characteristics:

- A small unit (The Rangeland Management Centre) based in an existing tertiary education organisation that would integrate education and training opportunities.
- The Centre would facilitate a strong network of existing tertiary institutions with an interest in rangeland management and associated disciplines.
- The Centre and the network would offer a range of subjects, short courses, certificates, diplomas, degrees, and post-graduate level courses that would provide a focus for education and training in management of commodity production, ecosystems and natural resources in the rangelands.
- The types of training would be directed towards existing and prospective pastoral managers, extension personnel including consultants, State Department advisers, public land managers, aboriginal land managers, those in servicing industries such as bankers, and natural resource policy personnel.
- The network would be expected to cover rangeland regions associated with both wool and beef production, with a particular emphasis on the northern rangelands.
- Courses emanating from the Centre would be structured to accommodate the needs of persons in remote areas as well as those in full time employment.
- Integration of the education and training curricula with individual rangeland managers and with other resource management initiatives such as property management planning and the landcare movement would be encouraged.

Questionnaire

Name: _____

Position and organisation: _____

Please specify any qualifications in rangeland management (or similar) that you currently hold:

1. How would you assess the sustainability of the current management of rangeland areas in a region known to you? (Please specify the region to which you refer.) _____

☐ very good ☐ adequate ☐ could be improved significantly

2. In general, how would you assess the sustainability of the current management of rangeland areas in Australia?

☐ very good ☐ adequate ☐ could be improved significantly

3. Do you believe management of the rangelands could be improved through greater integration of the production and ecological aspects of rangeland management?

☐ yes ☐ no

Please give your reasons. _____

4. Do you believe management of the rangelands could be improved through increased focus on whole property management and business efficiency?

☐ yes ☐ no

Please give your reasons. _____

5. Do you believe there is a need to improve the education and training opportunities available for rangeland management?

☐ yes ☐ no

Please give your reasons. _____

6. Do you support the concept of establishing a Rangeland Management Centre?

☐ yes ☐ no ☐ undecided

If yes or no, please give your reasons. _____

7. If you believe there is need to improve rangeland management education and training, can you suggest an improved alternative to the proposed Rangeland Management Centre?

8. How would you assess the general reaction of primary producers to the concept of a Rangeland Management Centre?

☐ positive ☐ neutral ☐ negative

9. What would be the principal reasons people may undertake education and training provided by the proposed Rangeland Management Centre and its network? (Tick as many boxes as desired.)

- ☐ to improve knowledge, skills and attitudes about sustainable management of rangelands
- ☐ to improve knowledge, skills and attitudes about production management of rangelands
- ☐ to integrate production and ecological principles and practical application
- ☐ to develop a more holistic approach to rangeland management
- ☐ to attain a recognised qualification
- ☐ to attain an understanding of sustainability and environmental issues that may facilitate future export market access for products produced in the rangelands
- ☐ to improve understanding of natural resources and the environment in order to take advantage of future economic opportunities (eg ecotourism, bush food etc)
- ☐ to be better informed of the needs of rangeland managers in terms of managing regulation, input support and services for rangeland enterprises
- ☐ other (please specify) _____

10. If you believe there are opportunities for a Rangeland Management Centre, for which of the following groups do you believe the proposed centre should mainly cater? (Tick as many boxes as desired.)

- ☐ primary producers in the rangelands and their families
- ☐ consultants
- ☐ new young students from outside the rangelands
- ☐ extension staff and other educators
- ☐ researchers
- ☐ government policy persons (eg persons involved with drought relief policy)
- ☐ public land managers (national park administrators)
- ☐ managers of Aboriginal lands
- ☐ people starting new businesses in the rangelands (eg ecotourism)
- ☐ agribusiness persons (eg bankers)
- ☐ mineral exploration and mining persons
- ☐ others associated with rangeland management (please specify) _____

11. What type of course would you consider to be most useful to be offered by the Centre and its network? (Please rank in order of importance. Leave blank if not important.)

- | | | |
|---|--|--|
| <input type="checkbox"/> short courses | <input type="checkbox"/> certificate courses | <input type="checkbox"/> diploma courses |
| <input type="checkbox"/> degree courses | <input type="checkbox"/> post-graduate courses | |

12. What general features of courses provided by the Centre and its network would you consider to be important? (Tick as many boxes as desired.)

- ☐ range of short courses to full degree courses
 - ☐ compatibility of subjects and courses for qualification building (articulation)
 - ☐ distance learning mechanisms (external courses, home study options)
 - ☐ more flexible structure of courses such as part-time
 - ☐ greater availability of courses with a central focus on rangeland management
 - ☐ greater focus on the practical aspects of rangeland management
 - ☐ qualifications can be gained by undertaking subjects at different institutions within the network
 - ☐ credit could be gained for appropriate subjects from different institutions outside the network
 - ☐ greater focus on whole property management and business efficiency
 - ☐ other (please specify) _____
-

[illegible]

Thank you for your assistance with this important study.

APPENDIX 3: MISCELLANEOUS COMMENTS MADE BY QUESTIONNAIRE RESPONDENTS

The following comments were received additional to the completed questionnaire from questionnaire respondents.

Comments made by pastoralists

- The Centre should have a practical base. For example; 1) We believe that any management Centre should have access to a bank of regional resource data and this should be supplied at the property level through digitised imagery and data bases. 2) We need to have a data base. The major sustainability issue is woody weeds 3) Property management planning needs support through budgetary and monitoring software suites; at the fingertips of practical pastoral managers.
- From a pastoralist point of view we, I think, would be worried about scientists getting control of the agenda. The centre should have a practical focus. Knowledge of the rangelands is essential but so is experience; especially experience of outback areas. The best thing governments can do to stimulate good rangeland management is tax incentives. Percentage write off on all improvements of properties is the way to go. Good management is all about control of stock.
- This is the second one of these this week and probably the 20th in the last five years. When does it end? You mention in your covering letter that significant areas of rangelands is unsustainably managed. Who says so and if so where are they instead of making a broad statement like this. They should be identified so something can be done about them instead of all people being put in the same class. We hear about biodiversity and ecological sustainability but no one seems to know exactly what this means. What have we to measure this by as in days gone by half or more of the country would have been destroyed by fires after good seasons. This followed by drought would have destroyed the ecology of any country. I only speak for our area and I would say there is more of everything native here than 100 years ago.
- The concept of a Rangeland Centre is great. Obviously each interest group would like to dominate the centre ie. researchers or educators etc, however, it has to be a joint concern. From a producers point of view I would like to see the integration of production (namely quality and consistency) with range condition ie. if range condition is X in October and you shear in March the probability of rain to then is Y. The amount of wool per head will be 'a' key at 'b' micron with sheep being a fat score 'c'. This would enable producers to lock in at forward prices etc. In South Australia producers want all the administrators to be based at a Rangeland Management Centre (in the rangelands!)
- Agree with the concept of a Rangeland Management Centre that is developed with land manager (producer) input. The concept would need to have producer ownership by inviting an encouraging practical as well as technical and theory. It is of little use spending time and money on a Rangeland Management Centre that is irrelevant and seen as another form of bureaucracy by land holders and

managers. That is the Rangeland Management Centre would have to be seen as a valuable tool to enhance management skills and improve profitability and not just a fund-raising exercise for extension and technical people. Some work has been done in Central Queensland on this concept (Rangeland Management Centre).

- I think idea is excellent. The courses should also try and acknowledge graziers existing knowledge (level of). The courses must be offered externally and my suggestion would be to bring the short courses to a region and run them for groups or postal subjects which can be completed. I'm sure the 'Desert Uplands' committee would help the Meat Research Corporation if they thought we could play a role in its developments.
- Perhaps we need a 'rangelands bureau' where research papers can be collated from university thesis etc from all over Australia so we know what has been done, the results and conclusions reached, a short synopsis of each and where to find the information. This could be integrated with an information delivery system as proposed, but new technology may make this unnecessary, an 'internet centre' or several of them where requested information can be accessed and sent via post or fax to rangeland managers. This would include information on what, when and where courses are to be had on each topic. Economic pressures make it hard for rangeland managers to take the time to do longer study. Short courses located on-farm or in centres nearby may be more likely to be taken up.
- The statement 'rangelands are presently unsustainably managed' is a totally subjective statement, suggesting that there is the government finance and political will to manage in some different and unspecified way which is sustainable, or that existing rangelands managers can separate themselves from the profit imperatives so as to do so themselves. I question the adjective 'significant' and the Tothill and Gillies report itself. Both accessibility and desire for the degree style courses will be limited to academics and public servants largely, (and the consultants), and these people can already access these through existing institutions. I believe that the rest of the training suggesting is already available through a myriad of other channels, and uptake by the (often forgotten) on ground land managers is restricted by perceptions of irrelevance, financial limitations, time limitations and cynicism towards staying power of government funded programs eg RAS, Drought Exceptional Circumstances declarations and other support mechanisms which have been removed just in time to avoid major long-term benefits. What does greater integration of the production and ecological aspects of rangeland management entail? A simple understanding of the need for healthy pasture (which is already universally agreed) and the most effective way to achieve this will gain the above. This knowledge is already available so uptake is the issue to be addressed and I find it difficult to believe that another institution is the way to achieve this. As the CUA has said, the absence of active management of rangelands represents the greatest single threat to their survival since there is evidence that active management has been occurring since the year dot. I present system such active management needs money, no matter who provides it. Money (profit) is radically influenced by all federal and most state policies and the only sure thing is that primary production will be expected to fund this

proposal in the long run. Funds needed for this worthy enough initiative should be directed to managers ability to access existing programs as they see necessary. There are ample existing processes for delivery of these funds (unless they are shut down too) eg Landcare, Natural Heritage Trust, Property Management Planning, to name a few. There is far too much emphasis laid on the value of academic qualifications in land management, and scant notice generally taken of how and why some of the most successful land managers are thus. Also too much time is spent looking for what is wrong in the rangelands and not enough on identifying the many reasons why these problems are absent from the rest of the rangelands. Trite solutions such as '29% stock reduction is good therefore 60% stock reduction must be three times as good' will alienate and frighten land managers and if implemented may lead to the problems found in the Lakefield National Parks, in North Queensland.

- I believe that one of the really big issues and threats to rangelands users are environmental issues. I am not sure that rangeland users fully recognise this. Also the rest of the community is now demanding (perhaps not demanding yet) the sustainability of rangelands but currently deny the realities that go with it. We need a good scientific, social, ethical and cultural knowledge to provide a satisfactory outcome for all.
- To offer significant opportunities for Aboriginal land managers in the Kimberleys. A Rangeland Management Centre should ideally; 1) be located in the Kimberleys or Top End Territory 2) offer a range of short, practically oriented courses 3) offer delivery of course components through or with support of regional tertiary institutions (eg Broome has three university annexes and there is a regional TAFE network). 4) offer courses which can accommodate students who lack advanced literacy skills 5) offer courses with significant practical and in-field components. 6) offer courses capable of being linked with bridging courses for post-secondary education. However Aboriginal land managers can also be expected to take advantage of appropriate full diploma or degree courses if these are also available. In other respects the potential for postgraduate and research facilities also encouraged and supported.
- Generally I believe it would be a good idea if it is focused on a practical production basis with sustainable rangeland research and not a place to teach people to join the Agriculture Department and other Government Departments.
- I greatly support the Rangeland Management Centre. Although I have no formal qualifications I have an intense interest in sustainable management and have been involved in the practice, research and extension of rangeland issues for over ten years. I believe there is a genuine need to better integrate existing courses and to bring about an ethos of what sustainable management really is. Producers are lacking management and basic resource knowledge and need to be able to access short courses and possibly diploma and certificate level. The centre would be able to cater for postgraduate students who although qualified in one discipline, undertaking study at the centre would be able to obtain a more holistic qualification. Bankers and policy people would be able to access information that hopefully would not be 'politicised' to be able to bring about equitable incentive based support scheme in times of drought etc rather than current practice of 'propping' up the inefficient, the incapable or the ignorant.

Although I believe the opportunities for this centre are endless funding realities might limit its priorities. I think producers need to seek more information and producer/researcher and extension partnerships are essential.

- While the concept of a national Rangeland Management Centre to provide a focal point for education and training for stakeholders may be sound, the practical application of the concept will be very difficult to implement effectively. Presuming the overall aim is to improve rangeland management and rangeland condition, then a critical mass of rangeland managers must be reached. The main problem is that there is no significant culture of adult education and or training among the two largest stakeholder groups; pastoralists and Aboriginals. To break this syndrome it would not appear appropriate to simply to set up a specialised education facility with a variety of available courses. Delivery is paramount. The prospective 'clients' for the education process are not likely to be lining up four abreast with lap-tops in hand, waiting for the doors to open. They will have to be found; to feel a need for this education process, what ever it may be. It follows that the courses will need to fit into an holistic application and be delivered in a way suited to the particular sociology of each client group. Existing adult education programs such as property management planning may be appropriate delivery vehicles. Incentive packages may be required. In summary unless the Rangeland Management Centre is part of a larger rangeland strategy with Commonwealth, State and Territory backing and stakeholder support then it is likely to be a futile exercise in improving rangeland management and condition.
- Who suggested having to do a course. More focus on people actually on land. Not who may end up on land.
- The contents of courses offered need close monitoring so as to keep them practical and not become some mumbo jumbo scientific jargon. Could require a Consultative Committee to be set up comprising present rangeland users, managers, with adequate representation from primary producers, while keeping a lid on public servants and minority interest groups.
- It is very important that the people delivering the courses are very well versed in this subject. How are their qualifications to be evaluated? It should start with a series of short courses to a mixed audience, to assist this evaluation, and then be targeted to a wide audience. Many of the most knowledgeable managers, don't have the formal education to articulate their information in an accepted manner. They still need to be identified and utilised, within the proposed structure.
- There is an alarming trend in our community of relegating to a poor second, training from within an industry, when an institution has a degree course available. The marrying of the two disciplines is the essential outcome. Recognition of prior learning must be given. I would see the 'centre' as topping up the knowledge of existing managers. There are many good and effective managers who never have and never will enter a lecture theatre. It would be criminal to discount such people. I have witnessed an attitudinal change over the last thirty years. Consequently in ten years time I would perhaps put the degree course as the first option provided the essential ingredient of such a course was a major on farm component.

- Development is a very important part of rehabilitating rangelands. Producers not cost managers need help understanding rangelands. For people to work and take care they need to be shown how they can profit from what they do. No 'jobs for the boy's', get any money on the ground.
- If this proposed centre intends to simply offer courses as 'stand alone' courses, either on-campus or distance learning, then the Centre will have value, but limited value only. The value of the Centre would be far greater if elements or units are provided to "slot in" to agricultural courses in as many universities and agricultural colleges as possible throughout Australia. I don't know if it is feasible to do this but I believe that at present, where agricultural courses touch on rangeland matters, many students are given information that is outdated or inaccurate (or both) by lecturers whose knowledge of the rangelands may be at best sketchy. The students in general agricultural courses should not have to undertake a complete specialist rangelands course. They deserve accurate, relevant information about rangelands as part of their general agricultural course. A 'centre of excellence' such as this proposal Centre could provide this service to every general agricultural course in Australia. Staff and students of the Centre could collect and index all published articles relating to rangelands in Australia. At present knowledge on what papers have been published about which subjects seems to be fragmented.
- Consideration given to rangeland 'open learning programs' as part of course. 'Rangeland management and science' have never been recognised as a discipline.

Comments made by research and extension persons

- The centre must have strong links with industry and be focused on training for the people on the land including: managers/owners, Aboriginals, mining, government land. Money must be spent on training of people who are the key players not the minor less effective players.
- We do not need more of the same. We need a needs based experiential learning/action learning based program delivered to the bush and providing for professional and personal development
- Any attempt to coordinate rangeland management training which fails to recognise the need for training which caters for all land use activities in the rangelands will miss an opportunity to deliver the best possible outcomes in terms of the wide range of land uses possible in the future. The centre would need to go well beyond the interests of the industry groups most involved with the Meat Research Corporation.
- A Rangeland Management Centre represents a new and exciting proposal. There is much information available on rangeland management but much of it is fragmented and difficult for managers and students to access. Many producers are excellent livestock managers, not so good at business management and poor at managing the plant/soils systems on which their livelihood depends. Many use the condition of livestock as indicators of the condition of the land. The integration of conservation values is vital for sustainable management. Australia's urban population is insisting politically that the Australian biota has

an intrinsic value and must be preserved as much as possible within the constraints of agricultural production. School of Rural Science and Natural Resources at University of New England is an ideal place for the establishment of a Rangeland Management Centre.

- An holistic approach to rangeland management is very worthwhile. Of course it should concern itself with the whole range of scientific, technical, administrative, policy, legal and economic disciplines that a modern manager must have. My residual concerns relate to the scope and diversity of Australian rangelands. While there are indeed genuine components that can be taught and learnt anywhere, there are very major regional ecological differences that impact on management. A rangeland management network, that linked a number of key tertiary institutions and rangeland research centre might be a better solution.
- Urgent need for a Rangeland Management Centre, indeed a Range Science Department or Faculty within an Australian institution. Need for a better understanding of what actually comprise rangelands. Unfortunately we really do not have a institution situated in the middle of the rangelands (ie Texas A&M, Fort Collins, Utah State). This has contributed a lot to range science being seen as an 'add on' rather than as a central focus of discipline training. Yet in terms of the sheer size of the resource (irrespective of its contribution to the economy) it is obvious that range science ought to be a central focus of biology based training in the country. Do we need first an Australian Range Management text (based on the standard US models) written by someone respected in the field (eg Wilson, Friedal, Whalley?) before we have a Range Management Centre? It is doubtful if such a centre would have sufficient funds to kick off with a critical mass of suitable qualified (in range science) staff. Funds which might be initially 'volunteered' to help establish the centre might alternatively be provided to commission the production of the Australian focused textbook? If such a text existed I'm sure it would find an enormous audience in educational institution and amongst professional Research & Development persons who may not even see themselves as 'range scientists' Whatever is recommended should be designed to succeed. It would do considerable damage if a half-hearted effort guaranteed failure to establish the credentials of the ongoing need. We must succeed for this country's future.
- The idea has a great deal of merit. However what is already there must be looked at before proceeding.
- What is meant by 'unsustainably' managed? Is the objective sustainable production or ecological sustainability? There is a view held by many that the barriers to better management are not necessarily related to the skills or knowledge of scientists and managers but are a consequence of structural and institutional factors operating in the rangelands.
- We must keep a realistic viewpoint when dealing with this issue. Decisions made on the basis of ecological sustainability are few and far between because managers do not appreciate that their raw material is forage and what the real cost of that raw material is.
- Definite need of better training in rangeland management. Need to integrate resource management, production and financial management and closely

integrate theory and practice. The practical component should be designed to allow development of management systems which accommodate theoretical requirements not to reinforce the status quo. While I'm sympathetic to the concept as an attempt to improve the standard of rangeland education in Australia, it is not clear what the Centre would add to the existing training opportunities. The proposal seems to envisage little more than a co-ordinating mechanism and I'm not sure how this would work. Rangelands occupy 75% of Australia. Training of rangeland managers etc should be part of the mainstream of agricultural/scientific education not the responsibility of a coordinating body which simply brings together courses/qualifications from whatever is already available. Instalment of two departments in rangeland management (North and South) to develop suitable course for the major environments. A single centre may not really add anything to what is already available.

- Any Centre should include good coverage of the tropical rangelands. These are particularly important for Australia and most of the overseas centres are based in more temperate locations. The centre should take a very level view of what rangelands are and look to link a overlay with studies/disciplines on its borders? eg sociology, anthropology
- For the tropical savanna rangelands, all the proposed activities of the Rangeland Management Centre are already in train as part of the savanna CRC.
- The real value of a centre would have to be a very strong theoretical focus in rangeland management (ecological, social, policy) as it applies to Australia. If the focus is applied there would be little use in forming a new centre. Why not supply top-up funding to already existing but struggling centres? The problem with a Centre is that it run the risk of being extremely dogmatic if it has an applied focus and no competition. If it has a more theoretical focus it could work with existing applied groups to improve quality of applied research and extension. Funding should be adequate for a real faculty (three-four senior staff and support) and allow for a high level of academic freedom if any proposal is to be made.
- Support Rangeland Management Centre but ask myself why does Australia need this? The Agricultural Colleges, for example, Longreach provide courses of an applied nature, the universities provide good agricultural courses (both internal and external) and State Departments extend knowledge with their dwindling resources. Initiative would have to provide something special which would attract students (of all ages) to invest time and money in education over and above what is offered already. The proposal is for more of the same kind of courses already on offer. More thought needs to go into idea.
- Must be attractive to existing and potential land managers. Must also be accessible to the above. Costs of completing courses to be kept low (ie HECS, assistance schemes, scholarships etc). Centre staff should be experienced, credible and respected in the relevant fields of rangeland management. Centre must be well promoted. Centre need to minimise the bureaucracy associated with tertiary institutions. Centre need to be visible in rangeland areas. Centre needs to draw on all available expertise.
- Concept of a central clearing house for developing a focus on rangeland management is good but I suspect the model of a distributed network

benefiting from approaches and materials from its modules is more likely to meet the need of a vastly dispersed population with a big diversity of ecological and practical management problems than a single central monolith providing the teaching. This is notwithstanding the real problems of administering and an exercise also providing it with some form. Thus I'm almost suggesting an Association of Units offering rangeland management information with significant funding disbursed to members in return for a coordinated and flexible approach. Agree that the rangeland managers would benefit from significant recognised qualifications but don't think people will make the effort to obtain these until they either have to or receive significant benefits for doing so (eg legal requirements or increased requirements for bank loans). Naturally this is an iterative process since they can't get benefits until the qualification are well recognised. But I think it is important to realise that all this may be a relatively slow evolutionary process.

- Concept very good but I would warn against trying to achieve many objectives ie. concentrate on short courses but leave out degree or postgraduate courses. There is, of course, a great need for a university department to provide a focused degree course but my impression is that the Meat Research Corporation has neither the funds nor the will to bring this about. In conclusion knowledge of rangeland management among producers is very poor, we need the centre.
- Need self directed open-learning especially for primary producers and people servicing producers. This learning and utilisation of this centre can be life-long. For primary producers can be based on practical needs basis eg soil, pasture and animal tests for various nutrients, have access to panel of people knowledgeable in those aspects so can ask questions, learn principles, be sent information on other things to look at that may impact on the management of that piece of the rangelands. Can do it at own pace based on what he wants to do and needs to learn this is applicable to their property.
- Centre of Excellence a good idea. Need focus and concentration of training to increase skills. Need training for current land managers, training for future land managers, training for ecology based land management understanding. Local adaptation of grazing management principles to your system (whole property, integration) pasture, animals, economic.
- There are many institutions, agencies and related enterprises that have established networks which could act as webs for the centre. They should be utilised to ensure the centre gets maximum credibility and to show the first step in being resourceful. People are sick of seeing the duplication of funding and resources to achieve very similar goals. To be interactive and transparent with stake holders and end users. The centre should be managed by people who can be accessible to those who have an interest.
- The concept of a centre is a noble one. Proposals for rangeland centres have failed in the past because they are not distributed and disbursed. Improved communication technology may help now. This centre needs to be contrived with an appropriate vision in mind - the end result should be recognised along with good centres in the USA eg Texas Tech might be appropriate. Be careful not to reinvent the wheel. There are some good offerings available already.

Include what is good. Note that the leading rangeland people in Australia are mostly not in educational institutions. This centre will fail if the wrong people with an inappropriate mind set are appointed.

- Overall concept looks OK. Real doubt is whether a market is available or interested. As the rangelands head more towards 'natural' values with lesser productivity value the rangeland management becomes less of a need and Natural Resource Management more so. Professionally, a Rangeland management degree can lock people in to a very large part of low population and opportunity in Australia and therefore is not a desirable option for students.

Comments made by 'others'

- Rangeland management and sustainable production are two of the most talked about subjects with producers today. Any attempt to deliver education to producer could be of a great benefit. The establishment of a Rangeland Management Centre or delivery of course should not be used as another vehicle to create more academics rather a place or course where the mums and dads who are running our rangeland can get some good education.
- The concept of a Rangeland Management Centre would be well supported by agribusiness and farmers alike providing courses that are relevant, practical and can demonstrate that economic and sustainable practices are interlinked.
- Not sure if land managers themselves would see a need for training?
- Achieving Ecologically Sustainable Management in the rangelands is a very difficult challenge where issues of economic viability with an industry where global economic forces are strong. The Meat Research Corporation could have a role to play if it helped players involved (government, academic, private and public landholders, industry). A holistic approach is also vital and this is expressed in recent argument that Landcare cannot move towards Ecological Sustainable Management where there is no economic viability.
- See benefit in targeting and coordinated marketing of courses from various institutions. Danger of being seen as 'another beauracracy'. Need to 'balance' emphasis on practical training of academic achievement. For existing landholders a short term workshop probably most appealing.
- Present undergraduate courses with rangeland management components (eg University of Adelaide) produce graduates with a popularised 'land degradation' view of the rangelands. Course work appears to focus on the problems not solutions. The ecology components seem to be shallow. For extension staff, courses focusing on sociology or psychology relevant to rangelands could be of considerable benefit. Adoption rates, not technology, are the major impediments to improving management. Rangeland extension has a very poor record in Central Australia. Courses for actual land managers will need to be relevant and presented in a flexible format. External study is difficult in Alice Springs due to postal delays and worse on stations since a mail service is not universal. Pastoral managers spend significant amount of time in stock camps during the year which is not conducive to study. Short courses for stock

agents and bankers would be worthwhile since they exert significant influence on enterprise management and utilisation levels in particular.

- If an education program is to succeed at grass roots level then believe considerable effort is needed to identify grazing management systems (strategies) that are more sustainable than set stocking. Stocking rate has always emerged as a major factor affecting sustainability. Yet not convinced rangelands are being managed more sustainably. Stocking rates not answer to sustainability.
- The more education that can be provided to primary producers the better. This way pastoralists are better equipped to handle fluctuations in factors that have influences on their business.

APPENDIX 4: POINTS RAISED BY DISCUSSION GROUP PARTICIPANTS

1. Roma Workshop

ISSUES RAISED BY PARTICIPANTS AT ROMA DISCUSSION GROUP 20/8/97

1. EXISTING EDUCATION AND TRAINING RANGELAND OFFERINGS

- (i) No courses (certificate to degree) aimed specifically at rangeland management.
- (ii) Education and training for whom: pastoral land managers, rangeland servicing personnel, wide range of people to cover
- (iii) Institutions mentioned:
 - QLD Agricultural and Pastoral Colleges
 - "Grazing for Profit"
 - "Holistic Resource Management"
 - University of Queensland, Gatton
 - Orange Agricultural College
- (iv) Wide range of ecosystems to cover and no central study point
- (v) Differences with rangelands to other agricultural science education is the time element of change in plant communities and relation to grazing management; not as critical in other areas as it is in rangelands.

2. TRAINING AND EDUCATION NEEDS

- (i) Needs have changed over time; farming now is a business and financial management is more important. Even greater financial pressure in rangelands as productivity is difficult to raise as rainfall is limiting and unreliable.
- (ii) Need to focus education and training on people on the land.
- (iii) Need to stress continuous learning.
- (iv) Central focus in education and training should be on understanding how plants perform under grazing strategies. Strategies can be developed from both principles and experience. Management is about working with the weather, not blaming it.
- (v) Education and training must involve both principles and experience. Any courses should involve field work.
- (vi) Practical experience could come before course, during course and always occurs after a formal course.
- (vii) Financial and physical components need to be taught separately but then need to be integrated.
- (viii) Emphasis has to be on managing 'the system'.
- (ix) There are many 'systems'; information needs to be assembled for many systems; short courses may be able to provide training on specific ecosystems and management systems. It is easier to adapt principles to strategies in a second system after it has been done once.
- (x) Focus on rangelands, a practical focus, and a focus on short courses needed.

3. INHIBITING FACTORS TO EDUCATION AND TRAINING

- (i) Time and cost
- (ii) Cultural and heredity factors are important
- (iii) Time of year and situation on property
- (iv) Lack of relevant courses
- (v) Trend to husband and wife learning and both together can not always get away.
- (vi) Location of courses
- (vii) Structured courses not necessarily the best way of learning.
- (viii) Most learn on a needs basis
- (ix) Need a switch to turn people on (eg. beer, good speaker, somebody who has done something, not academics)
- (x) Least common denomination problem: Many courses including short courses start with principles and get little further. The 'principle' often seen as necessary to get everybody up to speed. There is a good reason to have course hierarchies and standard entry levels.
- (xii) Pass or fail feature of courses is not good for everybody. Should be more emphasis on learning with examinations optional, as formal qualifications is only important to some.
- (xiii) Awareness of courses available

4. DISTANCE EDUCATION

- (i) There is increasing emphasis on distance education
- (ii) The residential commitment can still be onerous.
- (iii) There are present restrictions on use of internet in costs and speed. Although these features may improve in future in the rangelands, the internet was still seen as only way of overcoming distance.
- (iv) The benefits from social interaction between students undertaking a course were not available in distance education.
- (v) Distance education is more likely to provide principles, not strategies.

5. SHORT COURSES

- (i) There is not much information available on the availability of short courses.
- (ii) The 'Grazing for Profit' and 'Holistic Resource Management' courses did focus on relevant areas of knowledge and action. The 'Grazing for Profit' course was successful because it set goals, was based on holistic management and the 'Executive Link' option provided ongoing participation and group support.
- (iii) QDPI provided courses on 'Building Rural Leaders' and on 'Strategic Thinking and Planning'.
- (iv) Other short courses were those by the Land Use Study Centre, USQ, in Toowoomba.
- (v) Subsidies are available through RAS for support of short course provision and attendance. Up to 75% of the cost of the courses may be claimed.
- (vi) A group of graziers near Roma recently sponsored a nutrition short course and were able to access the cost subsidy. Future policy towards self help/improvement and away from drought subsidies and likely to see the frequency of such courses increase.
- (vii) The quality of presentation in short courses is important.
- (viii) PMP- There are eight one day modules in the Queensland 'Future Profit' course. PMP groups vary throughout Queensland. People delivering such courses are not trained in technology. There is also a lack of integration focus. The PMP area is evolving and developing.

6. DEGREE/DIPLOMA COURSES

- (i) Most of this discussion was focused on degree courses, although certificate and diploma courses were also considered important. Time did not permit their inclusion.
- (ii) Degree courses were viewed as being aimed at both rangeland managers and those servicing the rangelands.
- (iii) If the degree was to be four years, the first two years could impart 'principles' and be undertaken in a range of agricultural science institutions, much the same as offered today.
- (iv) The last two years would be undertaken in a specialist institution and would have total focus on rangelands. These two years would be a mixture of theory and practical work.
- (v) It was undecided how broad or narrow the rangeland focus would be in these two years. eg focus solely on grazing management strategies or broader to accommodate a range of interests.
- (vi) One option was for a series of regional centres or specialist finishing centres to offer the 2 final years, but opinion was generally in favour of a key centre of excellence. Students would go forth from this centre to undertake their practical training.
- (vii) It was felt that practical experience through a range of locations and enterprises was required. One option was for experience to be gained across 3 or 4 locations; another was for 10 regions to be covered, each for a week. It was pointed out that the cost of this might be prohibitive. The argument for the broad location experience was that learning through comparisons and contrast was very valuable.
- (viii) Another suggestion was to take the key players in the rangelands to the students.
- (ix) It would be important to involve industry participants through curriculum development and to permanently link producers in to accommodate training.
- (x) National park management and other rangeland should also be included in practical experience.
- (xi) Practical work experience on properties every year should be a feature of the course.

7. RANGELAND MANAGEMENT CENTRE

- (i) Features of the Centre are that it needs to be flexible and involve producers and other rangeland users.
- (ii) The Centre should support groups of graziers trying to help themselves.
- (iii) The Centre should support short courses /diploma-certificate /degree courses, not necessarily by offering them all itself, but by acting as an umbrella organisation. It should work with existing institutions wherever possible.
- (iv) Location wise it would be preferable if the Centre was in the rangelands and locations nominated as potential sites were Alice Springs, Rockhampton, Townsville, and the Arid Zone Institute.
- (v) The foregoing location principle was tempered with the need to locate the Centre where in depth support and skills were available. Key people also needed to be attracted.
- (vi) The Centre should also act somehow as an information centre.
- (vii) It was suggested that TAFE Colleges and Agricultural Colleges in the rangelands could be integrated by providing live-in courses for a week or so. Another idea was for a rolling number to be at the Colleges all the time, each intake for a week or so.
- (viii) Also it was suggested that Colleges and TAFES could offer to supply the 3rd year of the degree course (the first year of the two rangeland years).
- (ix) The financial constraint to people attending such courses was emphasised. How could resources be made available?

- (x) The Centre should adopt a 'seek and find' support system, experiential learning and adult education concepts.
- (xi) The idea of entering the 3rd and 4th years with a diploma /certificate was raised. Whether the diploma/certificate training would be adequate in basic science and principles was questioned. One solution was for the 3rd and 4th year rangeland subjects to count also towards a diploma qualification.
- (xii) The idea of promoting the 2 year rangeland focus for persons already with a degree was also mentioned, that is some type of post graduate qualification.

8. NUMBERS

- (i) The difficulty of estimating whether numbers would be sufficient to promote a 2 year specialisation in rangeland management was discussed. No solution was offered.
- (ii) The wider the training in the 3rd and 4th year, the higher the likely numbers.
- (iii) Some idea of what the rangelands might support might be gained from the pastoral companies such as Twynham who currently provide scholarships.
- (iv) IAMA has 200 agronomists but can not get graduates at present. Most agronomists are in cotton and grains and very few in crops/pasture or pasture systems.
- (v) A strategy was suggested of starting with short courses where the implications of failure/getting it wrong are not that great. This may then generate further interest in certificates /diplomas and ultimately degrees.

2. Charters Towers Workshop

ISSUES RAISED BY PARTICIPANTS AT CHARTERS TOWERS DISCUSSION GROUP

22/8/97

1. EXISTING COURSES ON OFFER RELATING TO RANGE MANAGEMENT

- (i) Nominated 'Grazing for Profit' - which is a holistic approach.
- (ii) Other courses maybe ecologically orientated but not profit associated. Also many courses are compartmentalised and not holistic.
- (iii) Courses at USQ with Brian Roberts. He has some home study courses which can be articulated.
- (iv) Adelaide University have some range courses
- (v) Longreach and Emerald graduates are not around Charters Towers; their practical work is not extensive enough. These courses are very basic. Maybe skills orientation but can not apply them very well. Producers don't often speak out about the Colleges. Courses need to be made more relevant.
- (vi) PMP and 'Future Profit'
- (vii) Should paradigm be restructured towards ecology?
- (viii) Lawrence/ social and economic; business and ecology; attempts to integrate at CQU.
- (ix) Gatton - Wildlife course

- (x) Field days and social interaction is important and individual exchanges; these are less formal methods but are nevertheless valuable.
- (xi) Need to train extension officers. Rural Extension Centre at Gatton.
- (xii) Masters in Tropical Agriculture and Tropical Environmental Management at James Cook and NTU.

2. NEEDS

- (i) Do we need a paradigm change; focus on natural systems; may be need transition phase or mainstream may not accept shift.
- (ii) Rockhampton initiative; CQU, DPI and producers (CSIRO to a lesser extent)
Check with Errol Payne. Articulated courses. Certificate issued with 5 modules approximately 8 days with some in house; then go out and incorporate action learning; total of a 6-8 week cycle based on adult education principles.
- (iii) Skills versus qualifications?
- (iv) Need qualifications to gain recognition; eg. from green movement or from regulators or from ISO 14000.
- (v) Three tiered; (a) formal degree - some producers but mainly others. (b) diploma: pastoralists and others; (c) adult learning for existing pastoralists.
- (vi) Use trained people in community
- (vii) Extension personnel; need degree in rangeland management.
- (viii) Students to spend 6 months in field with rangeland professional.
- (ix) Rangeland management - relevant to national parks, aboriginal land
- (x) Include economics and socio-economics and business management.
- (xii) School education balance - introduce range management to schools- schools starved for information.

3. INHIBITING FACTORS

- (i) Lack of awareness
- (ii) lack of confidence/embarassment
- (iii) 'don't need it' - survived so far mentality
- (iv) challenge to their management
- (v) pioneering image
- (vii) access and time
- (viii) People differences and their attitudes
- (ix) Switches: eg McCosker's success
 - self perpetuating image of course
 - recognise existing skills of people
 - marketing
 - charismatic
 - taps into motivation
 - not threatening style of delivery
 - need ownership of course

4. DISTANCE EDUCATION

- (i) Combats time/access constraints
- (ii) overcomes embarrassment as can do it at own pace and can get group support
- (iii) technology - existing phone systems - problems but such constraints will be removed.
- (iv) Component of training visiting regions- outreach as well as increach
- (v) Time disciplines- cocus on material can be difficult.

- (vii) Should get a certificate of participation
- (viii) Incentive (Landcare Council and integrate with group support)
- (ix) Motivation is important; such courses can become dry; emphasise on interaction; integrate with landcare and future profit.

5. SHORT COURSES

- (i) Clients would be both producers and service people including government and agribusiness personnel
- (ii) Pastoralists would be central but also consider aboriginal people, administrators and financial people and agribusiness. (Short courses for such agribusiness and financial people of more emphasis on degrees for them?)
- (iii) Relevant groups together as precursor before short course development.
- (iv) For producers, incorporate into adult group learning.
- (v) Formal short courses at RMC - for others (6-8 weeks)
- (vi) Some producers may go to the centre for short courses
- (vii) Short courses at RMC- practical experience/; rely on the job training; very short courses for agribusiness (Awareness type courses).
- (viii) Differences between regions is important
- (ix) Who the teachers would be is important as there is a lack of people with desirable skills.
- (x) Short courses need to be flexible and may vary from region to region.
- (xi) Centre may concentrate on a coordination role and give a taste of education possibilities with short courses.
- (xii) Centre to facilitate group meetings eg spinifex country
- (xiii) Information transformation package - technology translated into producers guidelines.
- (xiv) may be able to build on knowledge in region
- (xv) Give focus and momentum in rangeland management.
- (xvi) Centre becomes vital in understanding needs and structuring information.
- (xvii) Information dissemination both ways; the Centre needs to involve all stakeholders.
- (xviii) Ways people learn and extension

6. DEGREE

- (i) Need broad base to provide information to various people
- (ii) Identify target students first eg rangeland managers and extension personnel
- (iii) Postgraduate diploma to top up degree in business or law.
- (iv) One to two years at least for range management specialisation
- (v) Use network approach eg. Longreach. Make use of existing resources
- (vi) 'Outback classroom' idea
- (vii) Need practicality emphasis.
- (viii) Streamlining in final 2 years; eg pastoral management or research etc
- (ix) Different types of practical experience necessary. eg some to work with agency people.

7. RANGELAND MANAGEMENT CENTRE

- (i) Interpretation of information into practical management guidelines would be a major role
- (ii) Strong linkages with practical management
- (iii) Offer degree and short courses - or facilitate such

- (iv) Provide opportunity to study rangeland ecology and linkage to rangeland management
- (v) People need to be comfortable with personnel
- (vi) Not more of same or bureaucracy
- (vii) Integration of social and economic
- (viii) Location best near rangelands but also has to be linked to a major existing institution to provide support disciplines etc
- (ix) Links need to be set up with existing institutions
- (x) Centre needs to have practical appreciation of wider issues.
- (xi) Experience requirement related to interests
- (xii) Supplementary short courses on particular ecosystems for graduates
- (xiii) The centre should be seen as a group of people not bricks and mortar.

8. NUMBERS

- (i) Numbers may build over time if function is useful; the multiplier effect will be important once started and if successful.
- (ii) Pastoral companies may employ personnel
- (iii) Training for succession will be important in the future
- (iv) DPI and other state government departments may have a requirement. How many currently operate in extensive grazing lands? They may be willing to pay for good quality training.
- (v) Researchers need training also.
- (vi) May be a demand for temporary managers
- (vii) Need for training the trainers; also build trainers from short courses; need both types. Will build relevance with both approaches
- (viii) Group thought that 20 per year would be possible.

3. Teleconferences

1. Existing Education and Training Offerings

- (i) Existing institutions offering rural resource management/agricultural training were recognised e.g. Roseworthy, Longreach, UNE, Murrumbidgee - none focussed specifically on 'rangelands' one reference group member had graduate from Orange Agricultural College in Land Management.
- (ii) Other levels of training mentioned included TAFE short courses, 'Grazing for Profit', Farming for the Future and Property Management Planning training courses.
- (iii) Department of Land and Water Conservation (NSW) in conjunction with TAFE (NSW) have designed an 'earthmovers' course of 5 x 36 hour block programs on specific rangeland issues, including Blade Ploughing, Woody Weeds, Contour Furrows, Water Ponding, Rabbit Ripping.
- (iv) Rangelands Management was seen as a 'black hole' in natural resource education with no recognised body of knowledge available on which to base the necessary specialised training.

2. Training and Education Needs

- (i) All participants agreed there was a need for specialised rangelands management training at all levels. Participants would include practising pastoralists, young people seeking careers in the rangelands areas and teachers in non-rural areas in order to extend the knowledge of and interest in the rangelands environments.

- (ii) The varying levels of training needs recognised and the variation in rangelands environments identified seemed to indicate that a rangelands management course could not be too generic and still meet the needs of all who might benefit from such training.
- (iii) There was strong agreement that there needs to be a thorough needs analysis as well as gathering information on what is considered 'world's best practice' for rangelands management and how to impart this knowledge in a user friendly and useful format and achieve worthwhile outcomes.
- (iv) At all levels (short-courses to formal education) the areas recognised as requiring practical management included land resources, vegetation, animals, financial, risk, and people (human) - these needed to be integrated in any course aiming to provide the desired 'systems' approach to rangeland management.
- (v) Economic viability and therefore business management skills were recognised as essential elements in achieving ecological sustainability.
- (vi) More young people today were looking for a fuller education and completing a full 12 years of schooling and looking for further education although returning to the property or rangelands might still be their ultimate goal.
- (vii) It was recognised that training needs to meet people at their own level and where they are at - i.e. have several levels of training available from short-courses to tertiary level and a variety of delivery options - distance education, open learning, 'local' schools.
- (viii) A valuable feature of a rangeland management centre would be to provide a pathway of articulation whereby credit could be offered for courses previously completed if people continue with further study/specialisation in rangeland management.

3. Inhibiting Factors:

- (i) 'Opportunity cost' of being away from the business to attend training as many operations are now 'one-man-bands'.
- (ii) Lack of credibility of those delivering courses based on limited hands-on experience. Average age of graziers 50 - 60 and have a different perception of experience of those delivering courses (*being told how to suck eggs from across the generation gap*).
- (iii) Decreasing numbers of graziers in rangelands areas and large gaps in age groups means demand for training will not always be steady.
- (iv) Experience of poor quality in current general agricultural courses providing out-of-date information, wrong information, ignorant of rangelands management issues - recognised that students deserve better and quality was a huge issue.
- (v) Rangelands management was seen as being at the cross-roads with issues such as whether or not rangelands should be habitated, grazed and world heritage issues
- (vi) There is currently a confusing range of courses on offer and a 'centre for excellence' would enable students to focus on what they wanted to specialise in.

4. Distance Education

- (i) Distance education was seen as just part of the necessary 'multi-faceted' approach to rangelands management training.
- (ii) There should be a good selection of training alternatives, but the theory and background could be well suited to distance education with videos used to demonstrate the more practical aspects.
- (iii) Information technology was definitely improving the access to information for people in the rangelands areas and should be utilised, however it is still expensive in many areas and the cost was an important consideration

(iv) The issues of credibility of presenters was raised again, identifying the need to keep people in the rangelands areas long enough to gain a wealth of knowledge - it was suggested that existing landholders be used in video demonstrations.

5/6 Short courses/Degree courses

(i) People/groups identified as possible end users of training included pastoralists, extension officers, statutory decision makers, bankers, stock and station agents, distance education teachers.

(ii) Possible outcomes would be personal development, time management, succession planning, technology management, ecological management.

(iii) Short courses were seen as a way to start and were a good method of providing different subject material to different customers.

(iv) A large percentage of the next generation of pastoralists were seeking further education (degree courses) with the view of bringing back good information but not necessarily on rangeland management.

(v) Specific rangeland management education would allow young people to return to the rangelands areas with specific expertise in rangeland management.

(vi) Current focus on rangeland management is often seen as being remote from the property management aspects and more focussed on an ecological basis.

(vii) One of the biggest landowners in the rangelands areas were mining companies and there could be potential to provide training in rangeland management to the mining companies.

7. Rangelands Management Centre

(i) There is currently some expertise in rangeland management but at present it is very thinly spread - students in an institution may wish to specialise in rangeland management but may not be lucky enough to strike a rangeland management expert in their course.

(ii) A rangeland management centre was seen as a place to consolidate existing expertise in a 'Centre of Excellence'.

(iii) A hub and spoke method was suggested with courses emanating from a central point (quality control) but offer a variety of methods of delivery and have a variety of 'property campuses' where demonstrations and hands-on experience can be provided on properties where things are being done well.

(iv) 'Property campuses' would enable the diversity of rangelands from north to south to be addressed - different rangelands require different environmental and management practices. This could not be achieved if the rangeland management centre was restricted to a single location.

(v) The rangeland management centre could be developed where there is existing infrastructure already in place (as the hub) and utilise spokes in the rangeland areas.

(vi) An objective of such a centre should be to close the gap between the academic program and experiential learning - such as a full semester work experience.

(vii) Telecentres and the internet should be used for delivery for people who have no way of actually getting to the RMC.

(viii) The location of the actual centre was not seen as being too relevant, more the methods of delivery and the availability of courses/practicals over a wide location.

(ix) The RMC could provide a venue for the Rangelands Society Conferences which are held every two years and attract a variety of people who have an interest in the rangelands areas.

- (x) The RMC should aim at being outstandingly good and providing education and training options that no other institution can
- (xi) It is difficult at present to get a critical mass of expertise in existing centres/institutions.
- (xii) A role of the Centre could be to produce/sell courses to existing agricultural courses to improve quality in rangelands education.
- (xiii) Suggestions on how the RMC should be managed included setting up a Board of Governors which must include a variety of stakeholders including pastoralists, aboriginals, educators etc.
- (xiv) The issue of funding was raised with suggestions that funding would have to come from a number of sources, including private industry sponsorship, especially from mining companies.

8. Likely Numbers Attending Courses

- (i) Would depend on the structure of the centre and the levels of training offered.
- (ii) Would need a survey on specific rangeland courses and a build-up of data on numbers enrolled.
- (iii) Could be only a small percentage of those participating in general agriculture at the degree level, but at the short course level could attract a larger range of numbers.

APPENDIX 5: DETAILS OF FORMER INITIATIVE

This appendix contains a copy of a document prepared in 1977 by B.R. Roberts entitled 'The Need for Education in Rangeland Science in Australia'. This paper was presented to the Australian Rangeland Society Conference, Broken Hill, 8 July 1977.

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THE NEED FOR EDUCATION IN RANGELAND SCIENCE IN
AUSTRALIA

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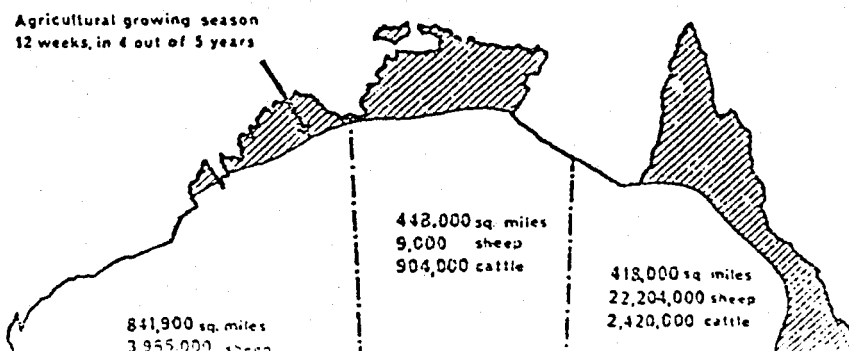
*PRESENTED TO AUSTRALIAN RANGELAND SOCIETY
CONFERENCE, BROKEN HILL, 8/7/77 PP 25-34.*

ABSTRACT:

Both the condition and the productive potential of Australia's rangelands indicate a neglect of these resources by governments, research organizations and teaching institutions. There is a need to synthesize existing specialised information into integrated managerial policies before a sound basis for training in and application of resource management in rangeland areas can be formed. Overseas developments in the sphere of range science as a discipline, and of range management as a profession can act as a guide to initiating a similar identity for the rangeland scientist in Australia. Australian tertiary institutions have not offered rangeland science as a major study area although many allied resource studies have been taught for many years. Several institutions have recently initiated moves to establish range ecology, rangeland management and range science as extensions of existing ecologically orientated science offerings. The need for range science to establish itself as a recognised tertiary discipline before its proponents can expect to be accepted as an identifiable professional group is emphasized.

SIGNIFICANCE OF RANGELAND AND NEED FOR MANAGEMENT

The term "rangeland" applies to those ecosystems which are used primarily for the grazing of animals on natural pasture. While such ecosystems include considerable areas in the humid and subhumid regions of Australia, rangelands are generally considered to be those vast arid and semi-arid zones of the continent. A total of 2,200,000 sq. miles (.38sq.m. = 1sq.km.), or 74% of Australia, falls within these latter zones and supports one third of Australia's sheep and beef cattle. Figure 1 (Perry 1968) indicates the location and animal populations of the arid and semi-arid rangelands which produce export earning worth \$450 million (Perry, 1967).



The importance of Australia's rangelands should be gauged not only from pastoral production but also from the many other values and uses which natural grazing land provides as indicated by Lewis (1969) in Table 1.

TABLE 1
SOME POTENTIAL GOODS AND SERVICES
SUPPLIED BY RANGE ECOSYSTEMS

Grazing and/or habitat
Livestock
Wildlife
Water
Recreation
Minerals
Beauty
Preservation of a healthful environment
Preservation of natural or seminatural ecosystems for scientific study
Preservation of endangered species
Preservation of germ plasm for domestication or breeding
Timber (small value)

The Arid Zone Conference at Broken Hill reiterated the need for greater attention to be paid to the degeneration and lack of research in Australia's rangeland area. According to the Organizing Committee, "It is abundantly evident that large areas of the more arid parts have suffered severe degradation of the vegetative cover. This degradation has resulted in lower productivity and low durability and represents a substantial loss to the nation" (Anon, 1970). Subsequently, Roberts (1972) and Leigh (1974) have made detailed analyses of the evidence of rangeland deterioration in Australia and recently Roberts (1977) has enunciated the sequential ecological processes involved in such deterioration.

The great need for natural resource managers in Australia's rangeland area has been stressed by Box (1969) who quotes the survey of Nelson and Schapper (1966) into managerial needs in rural Western Australia. This survey indicated that presently training was quantitatively insufficient and qualitatively inadequate. After 1976 an estimated 500-600 new farm managers would be required annually for the next 20 years, although the agricultural high schools and colleges of that State produced only 185 certificate and diploma holders each year. Considering all States, 1.7% of Australia is used for forestry, 3.7% for cropping and sown pasture, 57.1% is natural grazing and 37.4% is not used for primary production. Queensland with 82.4% has the highest proportion of natural grazing.

Many writers have noted the fact that virtually all those presently responsible for managing rangeland in Australia are self-taught or hold inappropriate qualifications for their job.

PRINCIPLES, FACTUAL INFORMATION AND RESEARCH

Although many studies relating to individual facets of rangeland science have been undertaken over the years, the adequacy of current knowledge as a basis for the formulation of principles of management of particular regions or vegetation types remains questionable (Anon, 1970).

Since early years research workers have been aware of the potential of Australia's indigenous pastures (Richardson, 1924; Anon, 1927). However, the initial appreciation of the need for management of natural grazing lands (Griffiths Davies & Sim, 1931) never developed into a research commitment to rangeland management so that to-day range ecologists ask "Where are the long-term grazing intensity studies in the arid or semi-arid zones of Australia? How many have been initiated? How many are planned to be initiated? (Van Dyne, 1970). It is true that although many scientists have undertaken good research on soils, plants and animals of the drier regions of Australia (vide Hilder, 1966; Williams, 1968; Squires & Hindley, 1970; Dudzinski, Pahl & Arnold, 1969; Wilson & Leigh, 1970; Marshall, 1970) grazing experiments and range management programmes have been limited to a few short term research projects (Woodroffe, 1941; Roe and Allen, 1945; Suijdendorp, 1955; Nunns, 1960). More recently the Joint U.S.-Australia Range Science Workshops have published a number of grazing management reviews based on Australian experience (Newman, 1971, Wilson, 1972, Burrows, 1974).

An examination of the published factual data on rangelands of Australia suggests that two basic constraints have been operative in limiting rangeland research in this country: (a) the lack of acceptable facilities and living conditions in inland areas generally (Box, 1969) and (b) the lack of graduate training in synthesis of specialist subject areas required in integrated rangeland research (Van Dyne, 1970).

RANGELAND SCIENCE AS A DISCIPLINE

Lewis (1969) points out that range management as a science appears to have had its origin in North America although it has been "enriched by the inclusion of concepts and practices developed or expanded in other lands". The comprehensive review of the early history of range management by Campbell, Price & Stewart (1944) indicates how serious studies of the grazing resources were not initiated until widespread deterioration of the western range caused concern in 1895. By 1938 Renner and his co-workers were able to list 8274 references in their bibliography on management of the western ranges. Despite a voluminous literature, range science, compared with other quantitative sciences has lagged behind. According to Lewis (1969) there are four reasons for this: (i) meagre research resources, (ii) complexity of range ecosystems, (iii) inadequate methodology and (iv) low level of application of proven techniques and principles.

The philosophy and scope of range management as an area of study and practice have changed little with time. In 1914 Sampson maintained that optimum range management would mean "utilization of the forage crop in a way to maintain the lands at their highest state of productiveness and at the same time afford the greatest possible return to the stock industry". In 1943 Stoddart and Smith defined range management as "the science and art of planning and directing range use so as to obtain maximum sustained livestock production consistent with conservation of the range resource. In 1966 Hedrick defined range management as "manipulation of the soil, plant and animal complex used by grazing animals" but a year later Pechanec (1967) distinguished between the narrower concern for forage and livestock as opposed to the broad professional concern for all the goods and services which rangelands can provide. With this background to-day's range management specialist has been defined "not a generalist or social scientist and certainly not a superficialist, but rather a highly skilled applied ecologist thoroughly grounded in basic sciences and well-trained in the characteristics of range ecosystems, their potential uses, the impact of these uses on the ecosystem, the compatibility of these uses, and management for maximizing values and minimizing conflicts and costs; and schooled in the use of decision-making tools" (Lewis, 1969).

Apart from the North American developments in rangeland science, South Africa has been the only other country to undertake major training and research programmes in this field over a long period. Scott's (1947) "Veld Management in South Africa" and Roberts' (1968) "Pasture Science as a university discipline" reflect the way in which rangeland science in Southern Africa has developed primarily as an ecologically based field of study in resource conservation rather than in animal production. As in the American situation, the need for management action superceded the accumulation of a sufficiently sound factual research base for rangeland science in Southern Africa and as Roberts (1968) points out "Having established Pasture Science as a university discipline (in the 1940's) it was necessary that the subject acquire the objects, scope and depth that are required of university curricula.

AUSTRALIAN TRAINING IN RANGELAND RESOURCES

North America has 25 institutions offering range management at B.Sc. level, 23 at M.Sc. level and 14 at Ph.D. level (Lewis, 1969). South Africa has three universities offering pasture science (veld management) up to doctoral level. Australia has approached the task differently and offers a variety of agricultural and resource based training programmes but has yet to offer rangeland science as an identifiable discipline at undergraduate and postgraduate level.

In 1969 Box made a survey of training programmes for arid zone personnel offered in Australia by 53 organisations. The 45 organizations which replied, employed 434 scientists for the equivalent of 182 "scientific

overall increase of 150% in the number of scientists required in the next 15 years if arid zone research goals were to be achieved. The types of scientists required and the estimated relative demand for each is shown in Table 2 (Box, 1969):

TABLE 2
SCIENTISTS, BY DISCIPLINE, AND SCIENTIFIC-MAN-MONTHS EMPLOYED IN 1969 AND NEEDED IN 1985 BY 45 AUSTRALIAN RESEARCH AGENCIES

Discipline	Employed—1969		Needed in 1985	
	No.	SMM	No.	SMM
Agricultural scientists	45	230	79	672
Biological scientists	149	1015	272	2357
Earth scientists	135	266	136	796
Engineers	53	468	67	767
Natural resource scientists	32	151	77	557
Social scientists	15	54	24	196
	434	2184	655	5545

Relating these data to the number of universities in Australia at that time (1969 B.C.*) it was estimated that each university would be required to graduate approximately 200 trainees for arid zone work over the subsequent 15 years. The hazards of such quantitative predictions are obvious, but clearly Box's indications at that time were supported by the Arid Zone Conference Organizing Committee when they noted the "lack of adequate research and management" adding, "Adequate courses are not available at either undergraduate or postgraduate levels at any university in Australia" (Anon, 1970).

Recently however, a number of universities and colleges have made meaningful efforts to develop and offer a range of courses, streams or major areas across the spectrum of land resources.

Although the Directory of Tertiary Courses (Anon. 1977) lists no courses in Rangeland Science, it includes a variety of allied courses as shown in Table 3.

TABLE 3 : RESOURCE COURSES AT AUSTRALIAN TERTIARY INSTITUTIONS (Anon, 1977)

Course	Number of Institutions	
	Universities	Colleges
Agricultural Science	8	8
Botany	14	0
Ecology	4	1
Environmental Studies	8	3
Rural Management	0	4
Wool and Pastoral Science	0	1

Included in the above courses are units in Agricultural Botany, Land Use, Conservation, Natural Resources, Grazing, Animal Husbandry, Pasture Production, Agrostology, Farm Planning and Property Management

Individual majors, streams or subject areas at certain tertiary institutions appear to encompass facets of Rangeland Science as indicated in Table 4.

TABLE 4 : OFFERINGS IN THE SPHERE OF RANGELAND SCIENCE AT AUSTRALIAN TERTIARY INSTITUTIONS (Anon, 1977)

<u>Subject</u>	<u>Institution</u>
Conservation	Dookie Agricultural College
Grazing Animal Husbandry	Hawkesbury Agricultural College
Resource Use and Conservation	Melbourne University
Agro-Ecology, Natural Resources	New England University
Pastoral Science, Land Resources	Queensland University
Ecosystem Management, Land Use	Griffith University
Resource Planning and Management	Canberra College of Advanced Educ.

In addition to the above offerings a number of institutions are presently preparing additional offerings in resource management for the 1978-80 triennium.

It is hoped that these will include innovations which will aid in developing a clear identity for the rangeland scientist in this country.

Vickery (1976) in referring to the present fragmented departmental approach to land resource problem-solving, has labelled the situation in the States "chaotic". The most recent Kalgoorlie Arid Zone Conference (Anon, 1976) has put before the Standing Committee on the Arid Zone a motion calling for the establishment of tertiary courses specifically for the training of personnel working in rangelands. The Newsletter of the Australian Rangeland Society has distributed a call for professional training of rangeland scientists in Australia.

If the Rangeland Scientist is to be recognized and accepted within the Australian scientific, pastoral and administrative communities, he will require the level of identity and professionalism that Ecologists had first to acquire before they were recognized as a meaningful group with problem-solving expertise. To gain such identity, training appropriate to any self-respecting professional will have to be developed, offered and applied.

TABLE 5: Average weightings in 15 U.S. four year degree programmes in Range Management.

	Average semester Credit requirement	
Natural Sciences		35.98
Botany (Basic*, Physiology*, Taxonomy*, Ecology*)	14.82	
Chemistry (Inorganic*, organic*)	10.53	
Geology	2.13	
Physics	2.20	
Zoology (Basic, Animal Ecology)	4.26	
Others (Genetics, Entomology, Bacteriology)	2.18	
Mathematics and Engineering		9.38
Mathematics (Algebra*, Trigonometry*)	4.98	
Statistics	1.11	
Engineering (Drafting, Surveying)	3.29	
English and Social Sciences		22.11
English (Composition*, Speech, Writing, others)	10.10	
Economics (Basic*, Agricultural)	6.39	
Social Sciences, History & Government	5.62	
Agriculture		21.22
Orientation	1.16	
Agronomy (Elements, Forage crops)	3.84	
Animal Husbandry (Basic and Production*, Nutrition and Feeds*)	9.84	
Soil science (Basic*, others)	5.44	
Others	0.94	
Other Wildland Uses		8.60
Forestry	4.49	
Watershed Management, Soil Conservation	1.78	
Wildlife Management	2.33	
Range Management		18.29
*Agrostology, Range Plants, Range Ecology	6.80	
*Methods, Utilization, Condition and Trend	3.24	
*Management, Improvements, Planning, Economics, Policy	5.85	
Seminar	0.96	
Field Trip	1.44	
Total		115.58

*Subjects required in all curricula.

It is not inferred that the emphases and balance of the American curricula are necessarily appropriate to the Australian situation, and the contribution of soil science and meteorology (including drought strategies) may warrant particular attention in the Australian context. It may well be that there is a strong case for curricula in different States to be tailored to meet the particular soil-climate-vegetation-management situations in each State.

It is hoped that the Australian Rangeland Society will use its influence and collective knowledge to initiate the developments referred to in this paper.

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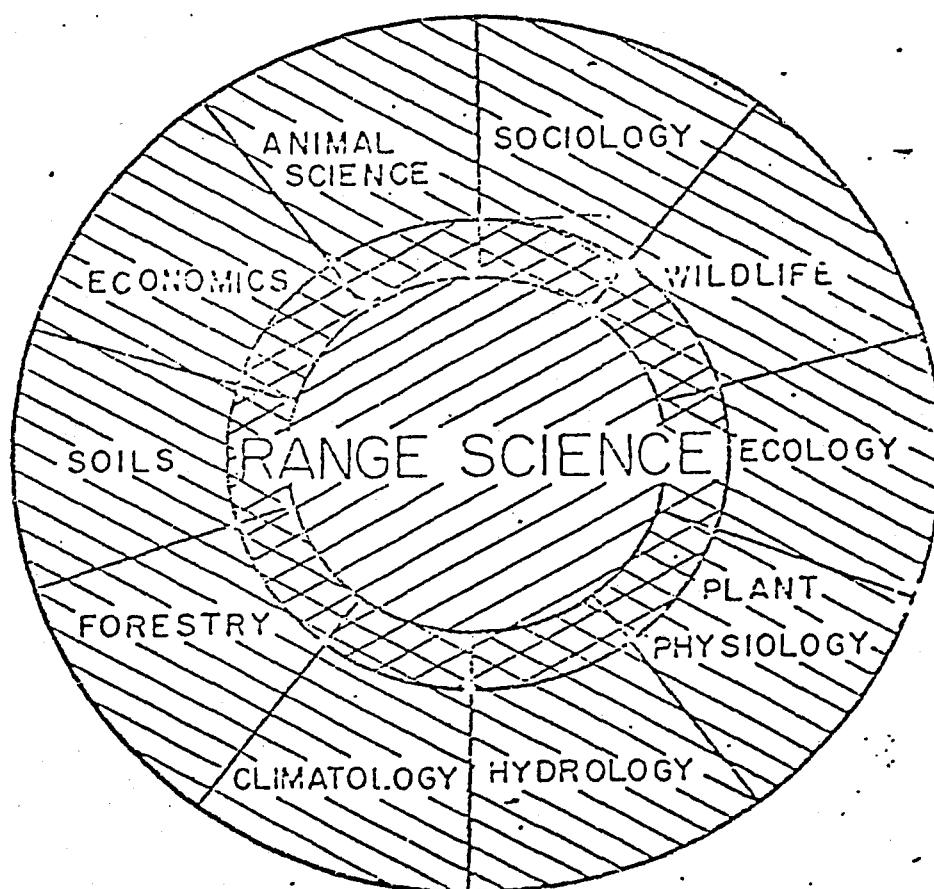
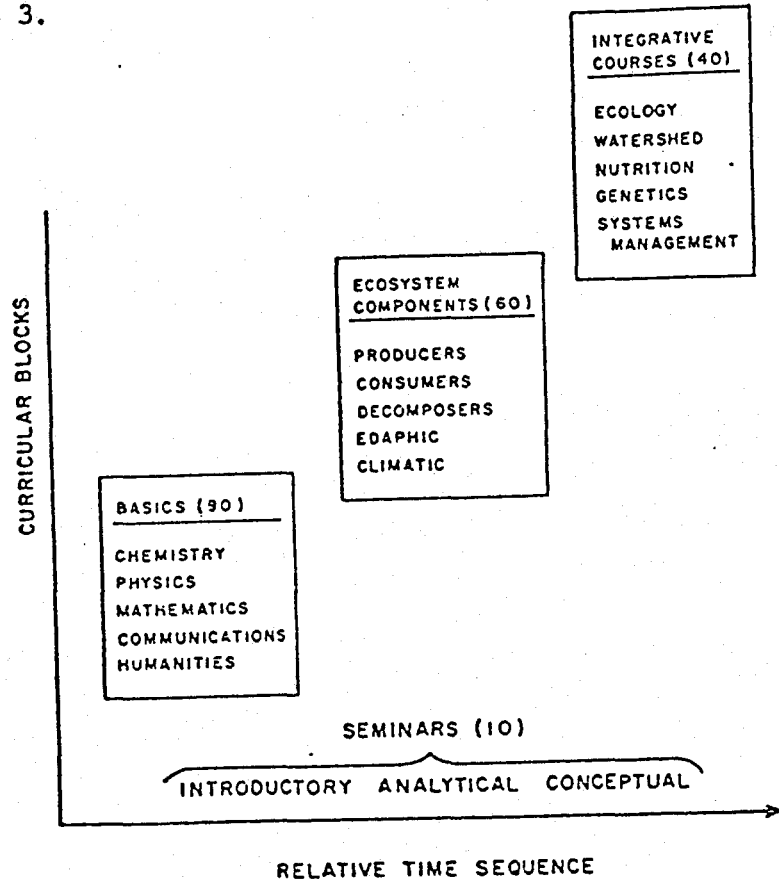


Fig. 1.2 Range management, whether as a practice or as a science, is intimately associated with other more or less closely allied disciplines.

CURRICULUM CONTENTS

Australian tertiary institutions will need to clarify objectives for Range Science courses before the details of curricula can be meaningfully proposed. The American experience in rangeland and natural resource training has a number of guidelines worthy of consideration by Australian institutions. Van Dyne (1969) has suggested a sequential four year programmes for natural resource training as shown in Figure 3.



The logical development of such ecology based courses from the basic sciences through to integrated management programmes has much to recommend it, if training is to be well based and vocational in its objectives.

Heady has analysed the Range Curricula as offered at 15 institutions in the U.S.. The general weighting of course components is given in Table 5 (Heady, 1961) and includes an indication of which subjects are required as compulsory core subjects by the Education Council for Range Management.