



# Australian Nuffield Farming Scholars Association

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**Report of the Study Tour to the  
United Kingdom and Europe & Zimbabwe**

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1993 Western Australian Nuffield Farming Scholar**

**SUBJECT:**  
Rangeland monitoring systems, revegetation  
and rehabilitation techniques

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Bill and Cindy Robertson who filled the breach when Megan joined me and also my father and mother in law Geoff and Rita James.

The Selection Panel who had faith in my ability to be a Nuffield Scholar and to Past Scholars both here and the United Kingdom who keep the organisation going.

My referees Mr R.J. Batchelor, J.P., and Mr A.R. Williams, O.I.C., Kalgoorlie Branch, W.A. Department of Agriculture.

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Wes Farmers

### In the United Kingdom

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### Fellow Scholars

Mick Sheehy, Northern Territory.  
Kym Green, S.A.  
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Jean Marc Texien, France.  
Tony Jupp and Ian McKenzie, New Zealand.  
*In Zimbabwe:*  
Bruce and Louise Stobart  
Bill and Trish Davey

Phil and Maureen Rogers  
Ian and Margaret Swanick  
Stan and Jeanette Schur

It is with great sadness that since our visit to the Schur's, Jeanette has passed away due to injuries received from an intruder.

### Objective

To study rangeland monitoring systems, revegetation and rehabilitation techniques. Also large scale stock production. The central part of my report is a paper I presented at an international conference on Rangelands in Kalgoorlie. The production of this paper would not have been possible without my Nuffield Scholarship.

I could not possibly put everything I have learnt during my trip on paper as every day something relevant comes to mind. The paper endeavours to develop thought and discussion on the problems we in the rangelands face. My scholarship has provided me with a greater insight and appreciation of what is needed to overcome them. I would welcome any contact from people requiring more detailed information or who have any to pass onto me.

## THE WORLD'S RANGELANDS - A PASTORALIST'S PERSPECTIVE

This paper was written shortly after my 1993 Nuffield Farming Scholarship to the United Kingdom, Europe and Zimbabwe. It endeavours to show that the pastoral manager is the crucial factor in having a sustainable rangeland throughout the world.

With continuing rises to labour costs and unfavourable economic and climatic times it is essential that land managers be provided with continuing research and technological data that may enhance his ability to manage the rangeland better.

Several methods are suggested here and hopefully research into these methods will follow to assess their suitability of application.

The research and development that is occurring in our rangelands locally around Kalgoorlie both on pastoral properties and on mining leases is amongst the best in the world. Creation of a Kalgoorlie University will make it possible to bring education focusing on arid land use into the Goldfields pastoral areas.

It was interesting to note that many universities in Britain had a rangeland department with many overseas PhD students in residence. Surely with the arid rangeland environment at the University's door and the abundance of land and local expertise in arid management, we must be able to bring this new industry to the Goldfields.

### 1.0 INTRODUCTION

Colonialism in Australia led to the beginning of the commercial use of rangelands. Previously traditional use was mainly for the survival of nomadic peoples. In Western Australia land degradation accelerated due to inappropriate government legislation and regulation, and poor management practices adopted by the early pastoralists

(Select Committee into Landcare, 1991, Western Australia Government, 1989). Unfavourable climatic conditions, coupled with periodic economic pressures experienced by the pastoral industry only hastened the appearance of degradation problems. Successive State Governments failed to exercise adequate supervision and intervention to halt the deteriorating condition of pastoral land resources (Select Committee into Landcare, 1991). The degradation history of the rangelands of Western Australia is not unique. Other examples are the impoverishment of the Fulani pastoralists of Nigeria, brought about by the commercialisation of their cattle herds at the hands of cattle traders and middle men who dominated the livestock trade (Watts, 1983), and the Communal Lands of Zimbabwe which I visited recently.

As the population explodes and the Zimbabwe government needs to appease the people for political survival, more rangelands and in some cases productive farms are turned into communal use. The new settlers are given very little guidance and advice on agricultural and conservation practices, and as a result a slash and burn policy is quite evident. The range degradation is very rapid and permanent.

This government approach is similar to that taken by the WA government in the late 1800's (i.e. compulsory stocking of leases within two years regardless of adequate infrastructure, and compulsory stocking of pastoral leases at all times (Select Committee into Landcare, 1991).

The state of the Western Australian rangelands is very good when compared to those in other parts of the world and today's managers are to be congratulated for the improvement in rangeland condition over the last 20 years, particularly in hard economic times.

The condition of our rangeland must be maintained if we are to sustain a healthy and profitable pastoral industry into the future and not fall into the same position as the Fulani people of Nigeria.

As a non-academic rangeland manager, I am deeply concerned about the condition of world rangeland resources, from the Highlands of Scotland to the semi-arid areas of Western Australia. All have been subject to misuse at some stage, overgrazing, deforestation and excessive density of human habitation having been the main causes.

- How will our rangelands look once they have been used for the same length of time as other areas of the world?
- How can we maintain and improve the rangeland condition we have now?
- What can we learn from the mistakes of others?
- What aids to management are available?

I was awarded a Nuffield Farming Scholarship in 1993 during which I visited the UK, parts of Europe and Zimbabwe. This allowed me to gain first hand experience of what others are doing in the management of arid and non-arid rangelands.

This paper details some of my observations in an endeavour to show that the pastoral manager, with the right stimulation and inputs, is the crucial factor in having sustainable rangelands throughout the world.

## 2.0 ITINERARY

I visited a number of universities, research institutions and farms in the United Kingdom and Zimbabwe. (Appendix I). This gave me the opportunity to observe and discuss comparative rangeland management problems, and the techniques and technology others use to promote rangeland condition and productivity.

## 3.0 OBSERVATIONS & DISCUSSION

### 3.1 Level of Rangeland Utilisation

"People tend to look at livestock particularly in Africa as wealth and also at the health of the animals. As a result they tend to forget that without vegetation there would be no livestock" (Cedric Milner pers comm). The condition of livestock should be the first indicator used to monitor the condition of rangeland and it does not necessarily follow that the range can handle continuing pressure without being damaged.

It must also be remembered that the smaller the animal, the more selective its grazing is according to the availability of preferential vegetation.

The first preference of small grazing animals is for the high protein succulent grasses and herbage unlike the larger animals who require large amounts of roughage such as dry stipa grass, to maintain and increase their body condition.

While this may be beneficial to the animal it can be very damaging to the rangeland, if left unmonitored and managed.

The sheep will continue to graze preferred species until they disappear and so on through the plant palatability chain the sheep continues until the palatable vegetation is gone.

It may therefore be important to cross index stock condition with range condition and establish an index of stock condition relative to the condition of your vegetation. The properties I visited in rangeland situations all weighed a tagged sub-sample of their stock on a regular basis. If a continuing downward trend was evident then this was treated as the first indicator of a deterioration in their range. This would then trigger an inspection of stock numbers, vegetation monitoring transects, water availability and the general environment that those particular livestock units were in. The appropriate remedial measures then taken. It must be remembered that the pastoralists are at the forefront of monitoring and their knowledge of the land is probably the most valuable monitoring tool available. However the more management aids at their disposal the better. This is particularly so for new comers into the industry. There is no doubt in my mind that stock condition is the first indication of rangeland condition and more research in this area is needed.

## 3.2 Stock Grazing Systems

### 3.2.1 Rotational grazing

Whilst not in vogue in our rangelands, rotational grazing is in favour in many other parts of the world's rangelands. For those using rotational grazing the critical factor is how long the rotation should be.

"Simply stated, overgrazing occurs when an animal bites off a plant before it has recovered from the last severe bite. This second bite weakens the plant because it must sacrifice energy stored in its roots to recover from any severe defoliation during growth, and successive losses without recovery can destroy the roots altogether. Overgrazing happens when animals linger too long among rapidly growing plants - or if they return too soon when growth is slow". (Bingham with Savoury, 1990)

It all depends on the time the vegetation takes to recover and the ability of the pastoralist to recognise this time frame. Using the above argument of recovery the successful rotation needed in our rangelands may be several months or indeed yearly. This would be due to the slow recovery rate of the arid rangelands in a normal year and also our low density stocking rates.

The longer the period of grazing per paddock the less paddocks needed.

Another successful method of rotational grazing which I encountered while at Makovani Estates in Zimbabwe, was a 3 paddock system. "This involved having 3 camps (paddocks) per herd and grazing 2 of the 3 camps from the beginning of the rains to mid February. The third camp which is rested early summer, is then grazed by the here from mid February to the end of May. During the winter the two late summer rested camps are grazed as required. A different camp is ungrazed in the following rainy season" (Makovani Estate Field day Stan Schuer pers comm).

A similar method could certainly be adopted for arid rangelands. One striking factor that was very evident on the properties that used rotational grazing techniques was those who had flexibility in their system had a better rangeland condition. The rigid systems were not as good and the rigidity also showed in their day to day management. This once again falls back on the pastoral manager and their ability to interpret the condition of their range correctly. This is a huge responsibility when considering the vast areas and different types of land systems on one pastoral property.

At Triangle Ranch in Zimbabwe incorporated in the rotational grazing system was the use of herd impact as a regeneration tool. Body weights of stock, transects and photographic sites of vegetation cover and diversity are being used as a management tool in determining when to move stock and if overgrazing is occurring.

The rotation depends on vegetation and is not set but is monitored and thought about all the time. "The timing of the move and all management decisions is critical to the success of the operation" (Ian Middleton Manager, Triangle Livestock Operations pers comm).

The ground cover around all the watering points and dip

yards is as good as anywhere else on the property. The hooves and dung of the cattle are treated as ploughs and fertiliser but timing again is critical to achieve the best results.

The decision again belongs to the pastoralist on the ground.

### 3.2.2 Techniques available to monitor human influence on rangeland resources

#### *i. Ground based techniques*

The aims of Rangeland Monitoring, as expressed in the draft statement on rangeland monitoring in Western Australia policy workshop (1992) are:

1. To provide the means for pastoral leases to obtain information on range trend (change); to assist them in management decisions.
2. To provide aggregated information to other land managers and community based interest groups on trends in range condition.
3. To increase knowledge and awareness of rangeland ecological process.
4. To guide and support an ecologically and economically sustainable pastoral industry.

The W.A.R.M.S. (West Australian Rangeland Monitoring System) system used by West Australian pastoralists and the Department of Agriculture is certainly one of the most comprehensive and accurate data bases used in range monitoring anywhere in the world and certainly its concept has great potential to be used anywhere in the world. Because of the accuracy and substantial data that is available in the W.A.R.M.S. sites data base.

#### *ii. Remote sensing techniques*

During my Nuffield Scholarship tour in the U.K. I was introduced to remote sensing and the use of G.P.S. (Global Positioning Satellite) and G.I.S. (Geographical Information System) technology at the Macaulay Land Use and Research Institute at Aberdeen.

A G.I.S. is a computer based system that simply allows you to overlay digitised maps on top of one another similar to many pieces of tracing paper. I see this as the most promising development in the monitoring of rangeland use and condition for the benefit of rangeland managers. Uses of the system in the United Kingdom have included topics from habitat mapping, in conjunction with wildlife surveys, to producing scenarios of vegetation change caused by greenhouse effects.

A G.I.S. containing over 50 data sets has been compiled for the Grampian Region of north-east Scotland. These include climatic, geological, edaphic, topographic, landcover, biotic, administrative, conservation and scenic data from thematic maps as well as land cover classification from aerial photographs, Landsat multi spectral scanning (MSS) and thematic mapper imagery. Maps are vector digitised and converted to master format with a minimum 50m pixel resolution before integration within the G.I.S. (Aspinall and Veitch, 1992).

Work carried out at the Macaulay Land Use Research Institute (M.I.L.U.R.I.) on the winter distribution and habitat

suitability for red deer is a good example of how this technology can be used and expanded into our own rangelands.

### *iii. Modelling and interpreting change*

All types of spatial data can be added to the system.. In a rangeland context G.I.S. data entry could include rainfall patterns, vegetation types, geological maps, rangeland survey data, pastoral station infrastructure stocking rates, and satellite imagery. This then allows the examination of relationships between spatial data sets to characterise and also predict such items as vegetation cover and grazing distributions. CSIRO and the Department of Agriculture of Western Australia have been investigating such possibilities of a number of years (Cridland, per comm). The system has the potential to develop an extremely accurate monitoring system.

Without lack of permanent cloud cover it would not take us long to correlate an extremely comprehensive data base of Western Australia's rangeland areas.

The continued integration of satellite images into the G.I.S., combined with current seasonal conditions, would allow us to monitor our rangelands very cheaply and with great accuracy up to 90%. This will improve with the advent of new satellites and technology. Aggregate data will be available to government, regulatory bodies and other interested parties.

Individual pastoralists will be able to obtain an overall picture of conditions prevailing on their leases and the trend which the rangeland is taking.

On ground confirmation of the satellite image interpretations will be able to be done with nearly total accuracy due to the extensive W.A.R.M.S. monitoring sites already in place.

### **3.3 Government Involvement**

All the rangelands I visited were owned by the State, with varying forms of leasehold title for the landuser. This is similar to the present tenure arrangements in Western Australia.

Our system of Land Conservation Districts is unparalleled in all the places I visited. Nowhere else put so much of the decision making power for maintenance of rangeland condition in the lands of the land users. By comparison our pastoral industry is serviced by the smallest number of technical advisers and research officers. Further developments in our rangeland management systems are likely to require an injection of new research officers to undertake development research, and adaptation of good techniques from other parts of the world.

### **3.4 Education in Range Science and Technology**

Many universities in the United Kingdom have rangeland departments, with many overseas students in residence. Yet exposure to rangelands for students studying in the UK is limited to what might be described as humid moorland, where the mean annual rainfall commonly exceeds 2500 mm. This is not the type of rangeland with which the majority of these overseas students would be familiar. As

a consequence students and staff commonly travel to arid countries to undertake research projects. I am firmly of the opinion that such students could be trained more effectively and more cheaply by attending a research and teaching facility in an arid environment such as we have here. I can express this another way. We have a moral obligation to other arid parts of the world to offer our knowledge of rangeland management, stock production, water harvesting and environmental monitoring. Like the UK has already discovered, there are economic gains to be made from sharing our knowledge.

## **4.0 CONCLUSIONS**

Levels of rangeland utilisation in some areas of the world are far too high to be sustainable. Unless we use our rangelands conservatively ours could be the fate of areas that have been continuously used for two hundred years and more. Desertification of the rangelands would cause climatic changes which would also affect coastal communities. However, following a shaky start to pastoralism in W.A., our rangelands are now generally in far better condition than those of other areas I visited. Our improvement in rangeland conditions has been fostered by the growth of the Landcare movement, and research input from Government agencies, but is ultimately the achievement of rangeland managers. Considering the very difficult economic times of late, pastoralists are to be congratulated for such initiatives as the feral goat eradication campaign, the Land Use and Care Awareness Campaign, catchment rehabilitation demonstrations and Myall tree replanting on the Nullarbor, to take just a few examples from this area. Further improvements in management are to be expected when more secure land tenure provisions provide the confidence to make long term investments in new infrastructure and diversification.

The question of 'sustainability' of pastoral land use comes to the fore quite often. We shall only have a definitive answer to that after many years of monitoring rangeland environments. However, in the shorter term we can take the view that if vegetation condition is improving, and if fauna species, particularly those classed as rare are increasing in number, and if soil surfaces are stable we can assume that our impact on the land is sustainable. This leads to the conclusion that we need to increase research into how to monitor the environment effectively, accurately and economically, and what within the environment we should be monitoring.

Monitoring is the key to future advances in stocking decisions. In tandem with research into monitoring I am an advocate of research into grazing regimes. This may hold the key to resting fair conditions rangelands for rehabilitation purposes whilst maintaining station income. Whilst the research I have quoted failed to find benefits for rotational grazing over set stocking, the work was not carried out in our environment with our suite of plant species, and neither was it aimed at improving rangeland condition as a joint primary goal with optimising livestock production.

Future pastoral management will also benefit from research into the use of alternative animal species, and breeds

within species. The continuing cost price squeeze dictates that sheep and wool pastoralists must diversify now or in the future to stay viable. Alternative animal species would provide a number of avenues for such diversification. Zimbabwe examples also indicate that cattle herds can be more productive for a given area of rangeland by utilising small hardy breeds of cow crossed with bulls of species with superior growth rates and milk yield.

In the Goldfields, our tertiary level teaching facilities, our environment and our knowledge of arid land management are being underutilised. By comparison countries such as the United Kingdom capitalise in an education market for which they are environmentally not so well suited. We are ignoring both an education bonanza and a moral obligation to offer the world our rangeland technologies.

There is a perception among the general public that only pastoralists use the rangelands. They forget about the miners, conservationists, tourists, recreationalists and those who live off its natural resources.

As a result man is the one factor that has the most impact on the rangeland. Some occupy the range for survival and try to make out a living for themselves, usually on a very small area of land that is not suitable for continual agricultural use and cannot be considered sustainable. These people are generally not well educated and have no comprehension of the damage they are causing and are simply intent on surviving (e.g. tribal areas of Africa).

Others are there simply for quick commercial gain and are likely to have a short, sharp, hard impact that in a lot of cases can be rehabilitated quite quickly (i.e. minesites). But the general influx of people whether it be for mineral exploration, tourism in general or recreation unless properly managed have a huge impact on the land. It may be a bog hole that due to erosion over a 50 year period becomes a gully and changes the flow of water further across the land. These rangelands users must be educated and made aware of how brittle our rangelands are.

Unfortunately, it will ultimately be the pastoralist who will bear the brunt of the fully and may end up with a destocking order placed on the property through no fault of his or her own.

Continuing education programs for potential rangeland users must continue (i.e. such as the Kalgoorlie LCDC's LUCAP program).

Records of many monitoring sites in the Goldfields of Western Australia show improvement in vegetation condition over the last 5 to 10 years. Using my earlier argument this would indicate that given the right stimulation and inputs pastoral use of rangelands can be sustainable. Pastoralists have the day to day care of the rangelands in their control. They are the crucial factor in achieving sustainability.

## 5.0 ACKNOWLEDGMENTS

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## 7.0 APPENDIX I

### *Individuals and institutions visited.*

Dr Lloyd Anderson	Institute of Terrestrial Ecology.
G.L. Radford	Bangor, North Wales
Prof. Cedric Milner	University College of Wales, Bangor, North Wales
Dr Richard Aspinall	Macaulay Land Use Research Institute
Dr Claire Howard	Aberdeen, Wales
Dr Ian Gordon	
Dr Geoff Milner	
Stan Schuer	Makavani Estate, Zimbabwe
Ian Middleton	Triangle Estate, Zimbabwe
Ian Swannick	Zvisa Avanne, Zimbabwe
Phil Rogers	Bulawayo, Zimbabwe
Dr Mick Gammon	Matopos Research Station, Zimbabwe

G.P.S. (Global Positioning Satellite) and G.I.S. (Geographical Information System) technology at the Macaulay Land Use Research Institute.

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Kraft Foods Limited  
Launceston Bank for Savings  
McCains  
John McIlwraith  
McKay Components  
Milne Feeds  
M.M. Autos - Launceston  
Mountain District Cattlemens Association of Victoria  
Murray Goulburn Dairy Co-Op Company  
New Zealand Implement Co Pty Ltd  
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