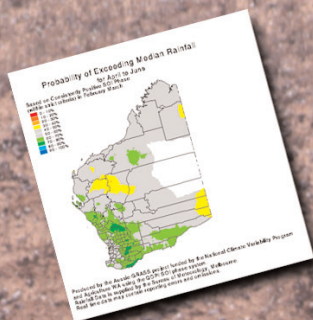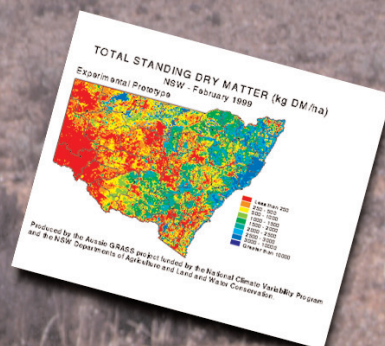# A SURVEY OF THE ASSESSMENT OF SEASONAL CONDITIONS IN PASTORAL AUSTRALIA

Benchmarking in the *Aussie GRASS* Project
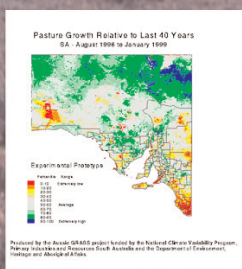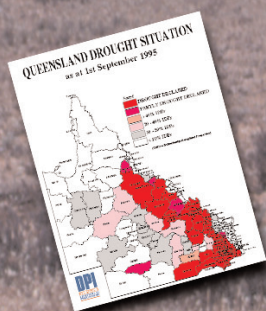
PART 3: SOUTH AUSTRALIA

November 1999

A SURVEY OF THE ASSESSMENT OF SEASONAL CONDITIONS IN PASTORAL AUSTRALIA

Benchmarking in the *Aussie GRASS* Project

PART 3: SOUTH AUSTRALIA REPORT

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A product of The Aussie GRASS Project

General Disclaimer

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FOREWORD

Australian rangelands have an extremely variable climate which has contributed to land degradation on some pastoral areas over the years. In order for graziers, agribusiness and policy-makers to make timely, profitable and sustainable management decisions, they need to have access to accurate up-to-date information on current and forecast seasonal conditions.

The Aussie GRASS Project.

Pasture research over the last 30 years, combined with modern technologies, is opening up new possibilities for assessing seasonal conditions and improving pasture management decisions. From 1991 to 1996, a spatial modelling framework was developed for Australia to provide up-to-date simulations and forecasts of pasture growth and utilisation, but with an emphasis on Queensland. This work integrated climatic and natural resource data, remote sensing, historical agronomic research and simulation modelling. While seasonal rainfall explained only 40% of the variation in seasonal pasture growth, models of soil water and pasture growth explained approximately 70% of observed variation.

The second stage of the project, called Aussie GRASS, commenced in April 1997. It involves nationwide collaboration of organisations in New South Wales (NSW), Northern Territory (NT), Queensland (Qld), South Australia (SA) and Western Australia(WA), in both research and extension; the aim is to expand the spatial modelling framework and make it operational to enable regular assessment of the condition of Australia's grazing lands. The Queensland Department. of Natural Resources is lead agency in the Project, which is supported by funding from the National Climate Variability Program (administered by the Land and Water Resources Research and Development Corporation).

A range of 32 spatial mapping products has been produced for the States of Queensland, New South Wales, South Australia, Western Australia and the Northern Territory (including some generic Australia-wide maps). These products can be divided into the following groups: recent rainfall, current pasture production/condition, drought situation, seasonal climate outlook indicators, forecast rainfall/pasture condition, and integration of products. Most products are currently available on one or more of the following information systems: Internet World Wide Web - 'The Long Paddock'; SOI Fax Hotlines; Farmfax - Climate section; and SOI Phone Hotline.

These widely available products will enable more timely and improved assessment of seasonal conditions, recognition of climate-related opportunities and threats, and thus influence management decisions such as stocking rate and burning. This will lead to grazing industries and other resource managers being better in tune with changing seasonal conditions and the natural resource base. As a result, proactive management decisions will minimise land degradation during drought events, and government drought policy will be more transparent and nationally consistent.

The Project involves liaison and interaction with a wide range of stakeholders, agencies and related programs and projects, as the products can help with a wide range of decisions.

The Survey

The purpose of the survey was to provide a benchmark profile of Australian graziers for the Aussie GRASS Extension sub -project. The survey was designed to gain information primarily from graziers. However, some feedback was also sought from agribusiness operators in pastoral areas who could contribute up a maximum of 10% of the sample.

The aims of the survey were:

1. To measure the knowledge, attitudes, skills and aspirations of graziers and pastoral agribusiness managers pertaining to the assessment of seasonal conditions, including the use of seasonal climate forecasting;

2. To ascertain how pastoralists currently assess seasonal conditions, the decision-support information/tools they access, and how the information is used in making key property management decisions; and

3. To provide a sound basis for the development of communication and extension strategies in order to achieve effective and efficient transfer of information and technological outputs of the Aussie GRASS research program.

Method

A standard covering letter and questionnaire were used in the survey. The Results section uses the structure and actual questions of the questionnaire in order to systematically report on the responses of participants.
The eight key questions in the survey were:

- KNOWLEDGE about making sound pasture management decisions regarding stocking rates (Question 16);
- ATTITUDES about the usefulness of 'big-picture' information (Questions 19a and 19d);
- SKILLS in accessing relevant information systems (Question 21e); and
- ASPIRATIONS regarding commitment to adoption of sustainable management practices (Questions 17c, 25, 28 and 30)

The aim was to survey a 'representative' sample of at least 50 graziers and pastoral agribusiness managers (up to a maximum of 10% of the total sample) in each of NSW, SA, WA, NT and Qld – that is a total of 250 people. Location, property size, land system, pasture species and enterprise(s) were all considered when developing a 'representative' sample in each State/Territory.

Samples for surveying were obtained in various ways in the collaborating States and the NT. Many of the extension officers in pastoral areas were involved in the distribution of survey forms and collection of completed survey forms.

Most people in the sample were phoned prior to sending out the survey form in order to obtain some commitment to providing feedback. However, time constraints did not always permit this.

Survey forms were mailed in March 1998. The generic covering letter was customised by each State/Territory to indicate local involvement in the Project, as was a follow-up letter to those who had not responded within one month of mailing the survey forms.

As promised, those who provided their names and addresses were sent a coloured poster showing historical Australian rainfall maps and SOI graph, and their names were placed in the draw for 16 book prizes. The book prize winners for the State/Territory were named in the covering letter sent with the posters. Again generic covering letters sent with the posters and the book prizes were customised by each State/Territory prior to sending.

An electronic version of the survey form was produced by the Queensland Centre for Climate Applications, and placed on the SILO World Wide Web site. Each State/Territory then entered their own data that was placed in a relational database. Printed copies of the data entered for respondents were then checked and the errors corrected.

Summaries of the data for each State/Territory were distributed to facilitate production of these detailed reports on the findings for each State/Territory. These reports were then used to compile a national report summarising the overall findings of the Survey.

Feedback in Other States

This report was produced as five separate publications in order to encourage and facilitate the interpretation, distribution and fruitful use of the results on a State/Territory basis:

- Part 1: Queensland Report, Queensland Department of Primary Industries Report Series QO99014, ISSN 0727-6281;

- Part 2: New South Wales Report, Queensland Department of Primary Industries Report Series QO99015, ISSN 0727-6281;
- Part 3: South Australia Report, Queensland Department of Primary Industries Report Series QO99016, ISSN 0727-6281;
- Part 4: Northern Territory Report, Queensland Department of Primary Industries Report Series QO99017, ISSN 0727-6281; and
- Part 5: Western Australia Report, Queensland Department of Primary Industries Report Series QO99018, ISSN 0727-6281.

Each of these reports provides the complete survey results on a regional basis, including all individual responses to open questions, and local interpretation of the responses. In addition, a national summary of the survey results (based on these State/Territory reports) will be published shortly by the Land and Water Research and Development Corporation as an Occasional Publication.

Col Paull
Leader
Aussie GRASS Extension sub-project

INTRODUCTION

The South Australia survey was conducted as part of the national Aussie GRASS survey. An outline of the Aussie GRASS Project, the aims of the survey, the survey design and method used, and publication of the results (in a national summary and for each State/Territory) are covered in the Foreword. The detailed results for South Australia are given below.

SUMMARY

The random sample was obtained from BME's pastoral leaseholder database and stratified within the seven Soil Conservation Districts. Several agri-businesses were also included in the survey. A total of 49 completed survey forms was returned. The feedback collected covered four areas: general information about respondent; monitoring seasonal conditions; 'big-picture' information; and scaled attitudinal responses. Detailed responses to all questions are given, including all individual responses received from open questions.

The following conclusions can be made from the survey:

- The survey results provide reasonable guidance for developing an effective Communication Plan and extension program.
- The knowledge and attitudes of agribusiness managers are not well represented in the data obtained. However, they were represented at the workshop in December 1998 and supported the project.
- Daily rainfall records were kept by 96% of respondents, and 85% of these have 'complete' or 'fairly complete' records, the challenge is to help them to make better use of the valuable records being produced. A total of 74% of respondents do not currently use long-term climatic records to assist in decision-making.
- Judgements of future climatic conditions were 'very important' or 'moderately important' for 79% in their planning or decision-making, so they are likely to be receptive to training aimed at a better understanding of seasonal climate forecasting, and the use of such information. Seasonal climate forecasts are currently used in decision-making by 20% .
- There is a reasonably good acceptance of probability-based information, as 45% said that probability-based information is 'moderately useful' to 'very useful' in the management of their business. In addition, most respondents agree with releasing seasonal climate forecasts in the form of probabilities.
- While 40% said big-picture information was 'moderately important' to very important' in their planning, 20% were unaware of the information. In addition 37% of those who have used big-picture information have found it 'moderately useful' to 'very useful'. Also 30% of those who have not used big-picture information thought it could be 'moderately useful' or 'very useful', while 15% of respondents have no idea how useful it might be. Thus respondents should generally be receptive to Aussie GRASS extension activities.
- Users of big-picture products have some problems with accessing information, interpreting and using it; also there are some reservations about product accuracy and forecasting ability. These issues need to be addressed in implementing the Aussie GRASS extension program.
- The most convenient ways to access seasonal climate outlook information are 'faxed directly', rural newspapers, TV, and radio. As 87% have a facsimile machine, this appears to be the best current method for pastoralists to obtain accurate information. However, 61% have a computer, 20% currently have access to the Internet and most respondents accept that an increasing amount of information will be computerised. Thus their use of software programs and the Internet are likely to increase.
- There appears to be strong support for the concept of Feed Shortage Alerts, and moderate support for the provision of warnings of possible deterioration of pastures or soil.

METHOD

The random sample (88) was obtained from BME's pastoral leaseholder database (335 lessees) and stratified within the seven Soil Conservation Districts. Several agri-businesses were also included in the survey.

Total	Agri-business	Soil Conservation Board District							
		Flinders Ranges	NE Pastoral	Marree	Marla-Oodnadatta	Kingoonya	Gawler Ranges	Eastern Districts	Central Eyre/Far West Coast
335		59	55	51	31	38	56	30	7
88	3	21	15	10	8	6	16	6	3

RESULTS – SOUTH AUSTRALIA

The following number of completed survey (50%) forms were received:

Total	Agri-business	Soil Conservation Board District							
		Flinders Ranges	NE Pastoral	Marree	Marla-Oodnadatta	Kingoonya	Gawler Ranges	Eastern Districts	Central Eyre/Far West Coast
49	1	17	5	7	7	2	7	2	1

The following answers and comments were obtained in response to the various questions (the total number of responses in each category is indicated in bold type, followed by the percentage of those who responded to the specific question shown in brackets): In some cases the respondents did not answer all questions and the total for individual questions varies from 41-49. Results have been aggregated over all districts.

PART A: General Information about Respondent

What is your nearest town? _____ In what State?_____

What is the name of your local government area/district? _____

Q3: How big is your property?

There were 47 responses to this question (one respondent said that the question was not applicable):

0 – 1000ha	**0**	(0)
>1000 – 10 000ha	**2**	(4)
>10 000 – 30 000ha	**6**	(13)
>30 000 – 100 000ha	**18**	(38)
>100 000 – 300 000ha	**11**	(23)
>300 000ha	**9**	(19)

Q4: How big is your business? ($ turnover per annum).

There were 49 responses to this question:

> $20 000 - $200 000	**27**	(55)
> $200 000 - $2 000 000	**22**	(45)

Q5: What industries are you in?

There were 55 responses to this question (some of the 49 respondents may have answered more than one question):

Beef	**24**	(49)
Sheep	**30**	(61)
Wintergrain	**5**	(10)
Other[1]	**3**	(6)

Q6: For how many years have you been a primary producer?

There were 44 responses to this question:

Up to 10 years	**4**	(9)
> 10 – 20 years	**9**	(20)
> 20 – 30 years	**11**	(25)
> 30 – 40 years	**4**	(9)
> 40 – 50 years	**11**	(25)
> 50 years	**5**	(11)

Q7a: Do you keep daily rainfall records?

There were 48 responses to this question:

Yes	**46**	(96)
No	**2**	(4)

Q7b: How many years have you kept these records?

There were 42 responses to this question:

Up to 10 years	**2**	(5)
> 10 – 20 years	**8**	(19)
> 20 – 30 years	**9**	(21)
> 30 – 40 years	**1**	(5)
> 40 – 50 years	**7**	(17)
> 50 years	**15**	(36)

Q7c: How complete are these records?

There were 44 responses to this question:

Complete	**25**	(57)
Fairly Complete	**14**	(32)
Patchy	**5**	(11)

[1] Tourism   **4** (8); Wildlife sanctuary **1** (2); Wool **1** (2); Sheep **3** (6); Camels **1** (2); Pasture **1** (2).

Q8: What is your average annual rainfall?

There were 48 responses to this question:

0 – 200mm	**27**	(56)
> 200 – 400mm	**19**	(40)
> 400 – 600mm	**2**	(4)
> 600	**0**	(0)

Q9: When do you receive most of your rainfall?

There were 61 responses to this question (some of the 48 respondents gave more than one answer):

Summer	**20**	(42)
Autumn	**3**	(6)
Winter	**16**	(33)
Spring	**6**	(13)
Evenly Spread	**16**	(33)

PART B: Monitoring Seasonal Conditions.   This section is about how you monitor seasonal conditions and respond to a changing situation. The following questions ask for your opinions and your reasoning. These might be based on information or advice from outside sources and/or your own observations, 'rules of thumb' and so on. There are no 'right' or 'wrong' answers.

Q10: From your experiences and knowledge, do you believe that your climate during the 1980s and 1990s has changed compared with that of the 1960s and 1970s?

Q10a: Rainfall

There were 45 responses to this question:

Don't know	**9**	(20)
No change	**18**	(40)
Drier	**9**	(20)
Wetter	**9**	(20)

Q10b: Rainfall variability

There were 44 responses to this question:

Don't know	**4**	(9)
No change	**17**	(39)
More variable	**20**	(45)
Less variable	**3**	(7)

Q10c: Summer daytime temperatures

There were 43 responses to this question:

Don't know	**8**	(19)
No change	**19**	(44)
Hotter	**11**	(26)
Cooler	**5**	(12)

Q10d: Frost

There were 44 responses to this question:

Don't know	**10**	(23)
No change	**23**	(52)
More frost	**3**	(7)
Less frost	**8**	(18)

Q10e: Humidity

There were 44 responses to this question:

Don't know	**10**	(23)
No change	**25**	(57)
More humid	**9**	(20)
Less humid	**0**	(0)

Q10f: In what year were you born?

There were 45 responses to this question:

1920s	**4**	(9)
1930s	**7**	(16)
1940s	**10**	(22)
1950s	**16**	(36)
1960s	**8**	(18)

Q10g: Any other comments?

- 1960s, very dry; 1970s very wet; 1980s and 90s more stable seasons. It is very difficult to make a comparison about rainfall between 1960s and 70s and the present, as there was such a striking difference between 1960s and 70s.
- 1992 was our wettest recorded year; 1967 our driest year.
- A slight increase in average rainfall; drier over all seasons.
- Although the weather appears to alter from one period (say 5 years) to another, I tend to think such variations have probably been going on for centuries.
- Average rainfall since 1908: 214 since 1977: 244 since 1986: 266.
- Have had falls of rain in past 4 years 100mm plus in downpours. Have 49 years in pastoral area, and experienced downpours but 4 years a row.
- Have only lived in this area since 1978.
- I would like to think that the late 80s and early 90s were dry due to cyclic conditions.
- My family has had the lease of the property since 1902.

- Only been on this property 10 years; working answers on previous records
- Rainfall events are more variable but not as general or widespread. Temperatures are hotter but for shorter time periods, eg., 2-3 weeks extreme heat then cool change. During the 60s and 70s, not quite as hot, certainly not as humid, but for months on end
- Rainfall in this area seems to run in cycles.
- Tendency seems to be towards heavy, unpredictable summer falls with winter pattern slow to set in.
- The data I have over 50 years isn't enough to make assumptions on the climate changes in my area.
- We are in an irregular rainfall area. Some years reasonably good rain falls, then the next year has poor rainfall.
- Yes, I do feel we are immersed {?} in a climate change {the rest is illegible}

Q11: How important are your judgements of future climatic conditions (over the next three to 12 months) in your planning or decision-making?

There were 46 responses to this question:

not at all	**4**	(9)
slightly important	**7**	(15)
moderately important	**9**	(20)
very important	**26**	(57)

Q12: Do you currently use long-term (20 years or more) climatic records to assist your decision-making?

There were 47 responses to this question:

Yes	**12**	(26)
No	**35**	(74)

Q13: In your business/industry, what are the three most important annual decisions you make in which the outcomes are affected by future climatic influences?

There were 116 responses to this question (some of the 46 respondents gave more than one answer):

Selling/agisting of stock	**42**	(91)
Buying stock	**20**	(43)
Forward selling/hedging	**16**	(35)
Sowing crops/pastures	**6**	(13)
Burning pastures	**2**	(4)
Weed/disease/pest control	**15**	(33)

Other Important Annual Decisions:

Summary of answers:

Mating stock………………….. 7
Capital investments……………. 1
Selling stock………………….. 1

- Age groups of stock mated.
- Breeding numbers.
- Capital investment in water points
- Ewes mated and when.

- Lambing time.
- Mating stock
- Number of ewes mated.
- Road repair delayed until after summer rains; we have 100 km of privately maintained roads on the property, and most are lost annually due to flooding, so repairs are delayed until end March each year in case we get more rain.
- Selling wool.
- We sell surplus: sheep in November and sell cattle when fat. The only stock we buy are rams and bulls.
- Whether to mate all ewes or not.
- Whether to mate ewes if dry.

Q14: How useful is probability-based information in the management of your business?

There were 47 responses to this question:

I don't use it	**15**	(32)
Not at all useful	**2**	(4)
Slightly useful	**15**	(32)
Moderately useful	**12**	(26)
Very useful	**3**	(6)

Q15: Do you currently use seasonal climate forecasts, for example information on SOI /El Niño / Indian Ocean temperatures/other indicators to assist with any of your decision-making?

There were 49 responses to this question:

Yes	**10**	(20)
No	**39**	(80)

Q16: If you keep stock, how do you decide what stock numbers to carry through the months of the year when feed shortages are most likely to occur?

There were 55 responses to this question (some of the 43 respondents gave more than one answer):

Observe pasture growth/conditions	**41**	(95)
Use seasonal climate outlook/forecast	**7**	(16)
Measure pasture growth/condition	**6**	(14)
Use AUSTRALIAN RAINMAN	**1**	(2)

Use of other aids

Summary of answers:

Rainfall	2
Wind	1
Past experience	2
Monitoring pasture yield	1

- As in semi-desert, amount of and timing of rain.

- Depending on heat wind. Wind factor influences life of feed or pasture. In extremely strong or prolonged wind, pasture dries out and blows away. Natural waters do not last as long.
- I keep fairly stable stocking. After shearing (Oct) I decide what numbers I think I can carry through the Summer months. I don't often sell later on, nor do I buy more when there is a surplus of feed.
- If we have had only patchy storms in the previous 12 months, it is time to start destocking.
- Natural grazier.
- Past experiences.
- Some pasture monitoring of standing yield at fixed monitoring sites.

Q17a: What signs or indicators do you look for in a paddock to assess the health of your pasture or stock?

Summary of answers:
Pasture

Herbage/ephemerals	10
Condition of Perennials	16
Ground cover	8
Indicator species	5
Observation and experience	4
Surface water supplies	3
Soil moisture	3
Utilization levels	4
Photopoint vegetation changes	3

Stock

Condition of stock	7
Feral and native animals	4

- Herbage
- Ephemeral-amount, condition 2. Chenopod -amount, condition 3. Total Surface cover 4. Stock condition
- A quick and experienced survey of bush and shrubs for signs of stress at a desirable distance from watering point, plus general condition of the stock.
- Abundance and vigour of Mitchell grass; new growth and leaf content on saltbush; amount of flood herbage such as clover; amount of annual grass including content of oat grass in sandhills. Condition of stock, numbers of lactating cows; distance from water
- At different times of the year, different pastures and bush grow.
- Availability of edible stock feed and condition of stock. Keep an eye on seasonal plant growth.
- Bush, grasses.
- Changes in ground cover. Period since last significant rainfall.
- Changes to ground cover - salt bush etc.
- Condition of stock and feed growth.
- Condition of stock with regard to health; Grazing pressure on bush around waters; Signs of overgrazing.
- Condition of the stock and bush.
- Experience in observation of stock and the landscape.
- Feed availability depends on season. It rains in a good year, not in a drought. We generally have the same weather system. Some years they produce rain, others not. Rain seems to follow on. If you start a season with a good rain, most years it follows on.
- General condition of livestock; excessive grazing of "indicator species" (more palatable perennial plants); lack of leaf litter and ephemerals between perennial plants (conducive to soil erosion); increase of invader species and weeds
- General overall health of the land indicated by condition of the flora, and to a certain degree, its biomass. Recruitment of both plants and native animals.
- Ground cover
- Ground cover/ annual or seasonal grasses. Perennial feed, eg, assessment of bush grazing pressure in any location, eg, around waters, etc.
- Growth - density of perennial grasses and bushes; Presence of ephemeral plants; Rainfall; Cattle condition; Numbers of feral animals.

- Growth of feed; growth of grass.
- In SGS they are: ground cover, annuals and perennials, weeds, salinity patches.
- Look at perennial growth in paddock. Indicator species ie bluebush, saltbush etc. Rabbit numbers high etc. Has the rain been general or storms? Spread of stock over as wide an area as possible. Ferals. Kangaroo numbers.
- Moisture reserves in soil; Time of season and plant maturity.
- Nothing in general, only experience.
- Pasture deterioration.
- Pasture productivity indicators.
- Photo points 3 km from watering points.
- Photo points have been established; stock"s general condition.
- Quality and quantity of pasture feed.
- Rabbit and kangaroo numbers; last season/this season growth (bulk); seasonal composition - variations in pasture species prevalent.
- Species of native bushes and shrubs that are being eaten and to what extent.
- Stock: condition; Vegetation: condition; Stock numbers are run to what feed condition is like.
- Sub moisture, quantity, colour, pests, tissue tests
- The condition of the stock is a good indicator of a paddock's current health; The type of herbage/grass that is present indicates the length of the assured future, as of course does the bulk of feed present.
- The health of perennial bush.
- Usually tonnage of dry matter per ha.
- Volume of feed matter, by visual inspection; Health of stock is by visual appraisal
- Water level in dams; pasture coverage; condition of bush.
- We have salt bush country and very seldom get short of feed. Surface water is a problem here. When the dams go dry, the paddocks get a spell.
- You can tell from experience whether you have enough feed to carry your stock and act accordingly.

Q17b: Do you measure or record information for individual paddocks? (for example pasture species, stock numbers).

There were 48 responses to this question:

Yes	**25**	(52)
No	**23**	(48)

Q17c: What do you measure or record in individual paddocks?

Summary of answers:

Stock numbers	12
Class of stock	1
Amount of perennial bush	2
Photopoint vegetation change	3
Rainfall	1
Key species	1
Ferals and natives animals	1

- Amount of bush; stock numbers
- Cereal yields; pastoral growth
- Class of stock and numbers; pasture species composition and abundance at one point in paddock typical of main pasture type within paddock. Only key species listed.
- Farming, we do soil tests and tissue tests in crops to check to check fertility etc.
- I rely on my experience to make judgements as to the numbers and disposition of stock.
- Over 3000 sq miles we only have about 4 paddocks. We are in the desert here.
- Photo points assess the perennial and annual growth.
- Photo-point analysis; stock numbers.
- Plant coverage; variety of species

- Record rainfall, state of pasture, pasture re-growth.
- Rotation cropping methods, chemical and fertilizer use.
- Sheep numbers
- Stock numbers
- Stock numbers according to cover.
- Stock numbers only.
- Stock numbers, fertilizer analysis, paddock history, rotations/ sprays/ fertilizer
- Stock numbers, visual recording of vermin, kangaroos, and rabbits etc. and stress on perennial species. We also have a scientific measurement with photo points and transect lines.
- Stock numbers.
- Stock numbers; Rainfall statistics.
- Stocking rates; pasture conditions, especially perennial species.
- We have photographic monitoring points - measure plants and numbers etc.

Q18: Do you regularly compare property management options by actual calculations of the production and financial outcomes of all options?

There were 45 answers to this question:

Yes	**16**	(36)
No	**29**	(64)

PART C: 'Big-picture' Information.   Several groups have recently developed seasonal climate outlook information, seasonal climate forecasting systems (based on the Southern Oscillation, El Niño, SOI, sea-surface temperature patterns), pasture production computer models and satellite imagery (see 'Definitions' on last page). This work has resulted in a range of 'big-picture' products being made available, usually in the form of a map, covering recent rainfall, recent pasture growth, drought-declared areas, seasonal rainfall outlook and pasture growth prospects. The following questions ask for your thoughts on <u>this</u> 'big-picture' information. There are no 'right' or 'wrong' answers.

Q19a: How important is <u>this</u> big-picture information in your planning, risk management or decision-making?

There were 48 responses to this question:

Unaware of information	**9**	(19)
Not at all important	**11**	(23)
Slightly important	**8**	(17)
Moderately important	**16**	(33)
Very important	**4**	(8)

Q19b: Have you used any of the following types of 'big-picture' information?

There were 51 responses to this question (some of the 27 respondents gave more than one answer):

Recent rainfall maps	**19**	(70)
Recent pasture growth maps	**4**	(15)
Drought declared/exceptional circumstances maps	**4**	(15)
Seasonal rainfall forecasts	**21**	(78)
Seasonal pasture growth forecasts	**3**	(11)

Q19c: (If you answered 'yes' to any part of Question 19b). Generally to what extent has the information, which you have used, been useful?

There were 26 responses to this question:

Not useful	**1**	(4)
Slightly useful	**14**	(34)
Moderately useful	**8**	(31)
Very useful	**3**	(12)

Q19d: (If you answered 'no' to all parts of Question 19b). To what extent do you think this 'big-picture' information could be useful to you?

There were 28 responses to this question:

I have no idea	**4**	(14)
Not useful	**4**	(14)
Slightly useful	**11**	(39)
Moderately useful	**6**	(21)
Very useful	**3**	(11)

Q19e: (If applicable). What problems have you had in using this 'big-picture' information?

There were 36 responses to this question (some of the 30 respondents gave more than one answer):

I don't use this information	**12**	(40)
It is difficult to interpret/use	**7**	(23)
No problems	**6**	(20)
Information not detailed enough	**5**	(17)
Access to it is difficult	**6**	(20)

Other Problems in Using 'Big-picture Information:

Summary of answers:

Accuracy of forecasts	4
Difficult to understand	1
Need more information	1
Interpretation of results	1

- As far as seasonal forecasting is concerned, the information is generally not correct.

- I seldom use this information
- It doesn't matter what is predicted, it is what actually occurs that we act on, for we have learnt from experience that outlooks do not count.
- Jargon is great for scientists, but not for Mr Average.
- Many of the NOAA responses vary more with the land type, and "greenness" product must be interpreted for mulga, gibber, sandhill etc., as well as rainfall. Greener does not mean higher rainfall.
- No forecast has been accurate yet.
- No problems with synoptic charts, but that's all we use.
- No set seasonal patterns in this region. Very unpredictable rain forecast due to location - far NW of SA. Winter is cold; Summer is extremely hot.
- Not accurate for particular small areas.
- Still more work to be done to relate the probabilistic information to individual farmer's contexts.
- Very erratic rainfall. No one seems to be able to forecast it.
- Would use if knew where and when it is available.

Q20: What 'big picture information would help you to make better management decisions, and when or how often is it required?

Summary of answers:

Accurate quarterly forecasts	7
Fast access to Internet	1
Drought maps	1
Greenness Maps for SA	1
Climate Models for SA	3

Four times per year.

- Four to five-day forecasts, and three-month forecasts.
- A quarterly fact sheet giving forecasts for the next 12 months.
- Access to Internet and faster telecommunications services.
- Accurate forecasts.
- Accurate rainfall forecasts. Accurate cattle price movements.
- Accurate seasonal forecasts for cereal growing.
- As before - it rains in a good year, little or less in a bad year. You make your decisions as you go along.
- Drought declared area maps.
- If sea surface temp. relationships in the Indian Ocean could be developed; if Greenness Maps of SA were available similar to those for Qld.
- Long range forecasts; but cannot be taken as gospel, only as a guide.
- Long range weather forecast (rain).
- Monthly-detailed weather forecasting for a more defined area. Not just the NE or NW of SA.
- More accurate long term rainfall forecasts.
- More information regarding pastoral areas of S.A.
- Much more accurate data to correctly determine droughts and good seasons many months in advance.
- Not sure of its accuracy within this area.
- Probability information specific to this region (northern SA) - perhaps based on southern or Indian Ocean models.
- Queensland rainfall info- to indicate the possibilty of flooding. In areas of high rain may be looking for share cattle assist in va
- Seasonal pasture growth forecasts (corrected for main land types)would be required at end of April and mid October as a mini during first and second round of mustering.
- Useful models which deliver local answers.
- When droughts would break.
- Condensed supplement in the "Stock J

Q21a: Do you have a computer?

There were 47 responses to this question:

Yes	**30**	(64)
No	**17**	(36)

Q21b: Do you currently have access to the Internet?

There were 47 responses to this question:

Yes	**10**	(21)
No	**37**	(79)

Q21c: Do you have a facsimile machine?

There were 48 responses to this question:

Yes	**42**	(88)
No	**6**	(12)

Q21d: What would be the most convenient ways for you to access seasonal climate outlook information?

There were 126 responses to this question (some of the 46 respondents gave more than one answer):

TV	**23**	(53)
Radio	**21**	(49)
Telephone recordings	**5**	(12)
Daily newspapers	**4**	(9)
Local newspapers	**2**	(5)
Rural newspapers	**22**	(51)
Computer packages	**4**	(9)
Internet/E mail	**8**	(19)
Personal conversations/neighbours	**9**	(21)
Faxed directly	**28**	(65)

Other Convenient Ways to Access Information

- Change "checkbox" to "radio"
- Internet needs to be available at proper speed and reasonable cost.
- Internet/email, when ISP?STD costs reduce
- Radio, rural newspapers, faxed directly
- Would like to be able to download to a package that could superimpose a paddock plan.

Q21e: Which of the following sources of seasonal situation/outlook information have you used at least once?

Queensland Centre for Climate Applications (QCCA)

There were 50 responses to this question (some of the 34 respondents gave more than one answer):

SOI Phone Hotline	**0**	
SOI Fax Hotlines	**3**	(9)

| Internet - 'The Long Paddock' | **3** | (9) |

Bureau of Meteorology (BoM)

Fax Services	**28**	(82)
Internet site	**5**	(15)
Seasonal Climate Outlook subscription	**4**	(12)

Other

Computer Software (for example, AUSTRALIAN RAINMAN, Metaccess) **3** (9)
SILO (QCCA/BoM) - Australian meteorological and agricultural information on Internet **2** (6)
Private Consultant **2** (6)

Other Sources of Seasonal Situation/Outlook Information:

- ABC Country Hour. Stock journal.
- None.
- Our own judgement.
- There are several other web-sites.

Q21f: Considering all of the seasonal situation/outlook information sources you know of (including media sources, those above, personal contacts etc.), which source(s) do you think are best and, briefly, why?

Best Sources of Seasonal Situation/Outlook Information:

Summary of answers

FAX from BOM	11
TV	4
Internet	2
Radio	5
Rural Newspapers	2
Observations	4

Individual Answers

- 4 day BOM forecasts; cloud maps via fax; seasonal probability info specific to SA.
- Bureau fax service 4 day forecast, instant information for spraying programs.
- Computer and fax, always available and can get instant updates.
- Daily synoptic charts and satellite photos from Internet.
- Did not know they are available.
- Direct fax is good because of the weather maps and clouds on satellite photos.
- Fax services because they can be studied at leisure.
- Fax services, Bureau of Meteorology. Easy to access.
- I am not overly confident about predicting the weather. It is sometimes interesting to receive the faxed weather map or watch the weather on the news.
- I do not rely on any long range forecasts.
- I listen to ABC Country hour. I always read the Walker long range weather forecast.
- I think you have to cross check all sources of forecast and use a common sense approach yourself.
- Internet and personal as these are up to date.
- Look out the window.
- Media - regular information.
- No idea
- No one area is best. They are used together to look at probable outcomes. Probability factors of what makes a decision high risk or low risk.

- None yet in the main; sowing grain is a major gamble
- Personal contacts.
- Radio 4 day forecast. Pretty accurate for such a dry area.
- Reports on seasonal situations in rural newspaper; it can be perused at length and filed away for future reference.
- Rural newspapers - most landholders subscribe to them, and they can read them when time permits.
- Rural radio reports and newspaper because of the time and ease to us busy farmers.
- Satellite fax gives you best look at cloud coverage etc.
- SBS Weather map: it is in colour, available twice daily, and free. Coloured state rainfall summary in Rural newspaper: good overview on likely cattle supply. NOAA "greenness" pasture image supplied monthly for SA by DEHAA; good overview on likely cattle spread.
- Television - easy to access.
- The rural press is a convenient way of gaining such information as I think helpful.
- TV weather report. It has to be reasonably accurate.
- TV, radio, Fax. Do not get newspaper.
- We watch approaching system on Faxed Bureau info. at times.

PART D: Scaled Attitudinal Responses.   How do you respond to the following statements concerning seasonal situation assessment in pastoral crop areas? Tick the box that indicates your 'position' on the scale, where: 1 = I strongly disagree; 2 = I disagree ; 3 = I neither agree nor disagree; 4 = I agree; 5 = I strongly agree.

Q22: "It is better management practice to simply respond to changing seasonal conditions, rather than try to anticipate and reduce seasonal climatic risks."

There were 44 responses to this question:

Strongly disagree	**6**	(14)
Disagree	**5**	(11)
Neither agree nor disagree	**10**	(23)
Agree	**12**	(27)
Strongly agree	**11**	(25)

Q23: "I accept that seasonal climate forecasts are better expressed in terms of probabilities (e.g. '60% chance that the next three months will be drier than average') than like a traditional weather forecast."

There were 42 responses to this question:

Strongly disagree	**3**	(7)
Disagree	**2**	(5)
Neither agree nor disagree	**15**	(36)
Agree	**14**	(33)
Strongly agree	**8**	(19)

Q24: "At present, SOI and probability-based forecasting places undue responsibility on 'users' to interpret the information."

There were 40 responses to this question:

Strongly disagree	**1**	(3)
Disagree	**7**	(18)
Neither agree nor disagree	**15**	(37)
Agree	**11**	(27)
Strongly agree	**6**	(15)

Q25: "Warnings of possible stock feed shortages in 3-6 months time, at a district level, would be valuable in making my management decisions."

There were 43 responses to this question:

Strongly disagree	**6**	(14)
Disagree	**2**	(5)
Neither agree nor disagree	**4**	(9)
Agree	**15**	(35)
Strongly agree	**16**	**(**37)

Q26: "At present, adequate experience and information are available to enable me to link climate-related information/forecasts to practical property management."

There were 42 responses to this question:

Strongly disagree	**3**	(7)
Disagree	**12**	(29)
Neither agree nor disagree	**17**	(40)
Agree	**5**	(12)
Strongly agree	**5**	(12)

Q27: "I am comfortable with the increasing level of climate-related materials now becoming available via computer programs and computer networks."

There were 41 responses to this question:

Strongly disagree	**4**	(10)
Disagree	**5**	(12)
Neither agree nor disagree	**16**	(39)
Agree	**10**	(24)
Strongly agree	**6**	(15)

Q28: "Warnings of the possible pasture deterioration (for example weed invasion, loss of desirable species) at a district level, before the main growing season, would be valuable in making my management decisions."

There were 38 responses to this question:

Strongly disagree	**4**	(11)
Disagree	**6**	(16)
Neither agree nor disagree	**13**	(34)
Agree	**6**	(16)
Strongly agree	**9**	(24)

Q29: "Generally, the rural media provide credible and useful sources of seasonal climate forecast information."

There were 44 responses to this question:

Strongly disagree	**3**	(7)
Disagree	**6**	(14)
Neither agree nor disagree	**13**	(30)
Agree	**16**	(36)
Strongly agree	**6**	(14)

Q30: "Warnings of possible soil deterioration (for example reduced ground cover, soil loss - see 'Definitions' on last page) on a district basis, before the level of pasture ground cover became critical, would be valuable in making my management decisions."

There were 42 responses to this question:

Strongly disagree	**4**	(10)
Disagree	**4**	(10)
Neither agree nor disagree	**14**	(33)
Agree	**9**	(21)
Strongly agree	**11**	(26)

Q31: "Scientific seasonal climate forecasting is a valuable tool for managing my property in the face of seasonal variability."

There were 41 responses to this question:

Strongly disagree	**5**	(12)
Disagree	**3**	(7)
Neither agree nor disagree	**11**	(27)
Agree	**11**	(27)
Strongly agree	**12**	(29)

Q32: Do you have any further comments to make, for example on what we may have missed in this questionnaire?

Summary of answers

Seasonal forecasting would be good if accurate	5
Present climate models not relevant to SA	3
Willing to liaise to improve	2
Need more weather stations	1

Individual Answers

- Accuracy is the main issue. Until weather predictions can be 100% accurate, management of properties, especially pastoral, should not alter on hearsay.
- All information cannot be taken as gospel, as conditions can vary from property to property, especially in pastoral areas.
- Because of the flukish nature of the rainfall in this area, one property may be in good heart, while the next may be suffering.
- While general and district forecasts may be some guide, the actual rainfall received is really the crux of the matter.
- In my region there is doubt as to the accuracy of El Nino predictions, and ISO relativity to our climatic patterns. Currently some work is being done on creating a more accurate index.
- It is very much opportunity country here. Drought is the rule rather than the exception, mostly, and most climatic predictions are regarded a little cautiously in this area.
- Many questions are difficult to answer because our property is in the very dry pastoral areas with sporadic rain any time of the year.
- Note: we have 4 self-contained cottages we hire out to tourists and they are often inquiring about our weather patterns and how we manage our stock to suit, so we would appreciate any material you can send us.
- Our area is pastoral area where no chemicals or weed chemicals are used on the stock or land, so we see no invasion of weeds or other problems that need control, other than dingoes and large numbers of kangaroos. These are our major problems along with la
- Part D not really applicable as we do not have stock or crops.
- Part D, "we are grazing only".
- Q 7a. We keep annual rainfall records. Q 11. Cannot predict weather in this area at all. Part D. Left blank because we do not crop. Q 32. We have, in the past, tried to use past rainfall records etc., to assist in decision-making and have come dreadfully
- Q 7b. Some trouble locating daily rainfall, but daily is reported to Meteorology Bureau at end of each month. Q 9. Slight summer dominance. Q 32. The ideal situation would be when the pasture yield forecasting had accurate enough land type and growth mode
- Q.12. For research planning Q.32. This is not really an appropriate questionnaire for me. SGSKP is keen to collaborate/collude to improve the usefulness of such forecasts and especially to link them into useable models.
- Q.18. Sometimes
- Q.6. Have been a primary producer for 16 years (on this property), a family business Q.9. Summer, if thunderstorm activity about Q.11. optimistic Q.22. don't know Q.24. don't know
- Question 19b - Have not used drought-declared areas/exceptional circumstances maps in SA.
- Seasonal probability forecasting seems to vary a lot from region to region in terms of accuracy or applicability. Do more region-specific models need to be developed?
- Take the opposite view of long range forecasts and you are just as likely to be right.
- The 90s have produced three wet harvests resulting in weather-damaged grain, but going back through records, this has happened before. Yes, I believe El Nino etc., does affect weather and rainfall. But, some El Nino years are wet, others dry. For example,
- This property is 100% pastoral relying mostly on bush cover.
- We live in semi-arid district. Most of our rain comes in thunderstorm weather. When conditions are right in autumn and spring, we get sufficient rain to grow cereal crops. Part C. We do not use El Nino maps.

- We live in the driest part of the driest state of the driest continent in the world.
- We strongly push that small country weather stations be manually maintained to keep up with the vast and variable weather locations across our state and nation.

DISCUSSION

Part A – General Information about Respondent

The survey included only pastoral lessees who hold leases under the Pastoral Land Management & Conservation Act 1989, which is administered by DEHAA. No cropping is permitted on these leases. Properties in SA south of the Dog Fence are either sheep, sheep and cattle or sheep and tourism (mainly in the Flinders Ranges and Gawler Ranges). All leases north of the Dog Fence run cattle on large properties. A few properties on the Far West Coast and Eyre Peninsula run sheep and also crop on land which is not pastoral lease.

A total of 49% are involved in the beef industry, while 61% run sheep with a few (8%) engaged in tourism. (Q 5).

79% of respondents had been involved in primary production for 10 to 50 years, with an irregular spread over this range (Q 6). Q10f indicates that 76% are 40-60 years old and 18% less than 40 years.

96% keep daily rainfall records with 57% of records complete. Monthly records are submitted along with annual stock returns in March. 36% of records are for >50years (Q 7).

Rainfall is less than 250mm with only 16 receiving above 250mm (Q 8).

Part B – Monitoring Seasonal Conditions

Perceptions of climate change: 20% consider their rainfall has become drier, and 20% wetter, most consider there has been no change (Q10a). 45% believe that their rainfall has become more variable, but 39% consider there has been no change (Q 10b). Only 26% believe that summer day-time temperatures have become hotter, with 44% consider there is no change (Q10c). 52% believe that there has been no change in frost frequency, while 18% believe that has been 'less frost' during the 1980s and 1990s (Q10d). 57 % believe that there has been no change in humidity, and 20% feel that the climate has become more humid (Q10e).

An analysis of the correlation between answers to the climate-change questions above and the age of the respondent, may reveal further patterns of perception (Q10f).

Use of climate information: 77% said that judgements of future climatic conditions were 'very important' or 'moderately important' in their planning or decision-making (Q11). 74% do not use long-term climatic records to assist in decision-making (Q 12). 32% said that probability-based information is 'moderately useful' to 'very useful' in the management of their business (Q 14). 20% currently use seasonal climate forecasts in decision-making (Q 15).

Important annual decisions: Selling/agisting stock, and buying stock were highlighted. Surprisingly under 'Others' no respondents mentioned financial budgeting, while two referred to specific capital improvements which would be related to cash-flow (Q 13).

Responses for indicators of health of pastures or stock ranged from visual appraisals to detailed biomass measurements at photo-points (Q 17a). 95% observe pasture growth/conditions when deciding on what stock numbers to carry (Q16). 52% measure or record information for individual paddocks (Q17b). Most recorded stock numbers in paddocks and some recorded notes on plant species and abundance (Q17c).

36% regularly compare property management options quantitatively (Q 18).

Part C – 'Big-picture' information

While 41% said big-picture information was 'moderately important' to very important' in their planning, 19% were unaware of the information (Q 19a). The main types of big-picture information used by respondents are seasonal rainfall forecasts (78%) and recent rainfall maps (70%) (Q19b). 43% of those who have used big-picture information have found it 'moderately useful' to 'very useful' (Q19c).

While users of big-picture products have some problems with accessing information, interpreting and using it, the comments under 'Other problems' indicate some reservations about product accuracy and forecasting ability (Q19e)..32 % of those who have not used big-picture information thought it could be 'moderately useful' or 'very useful', while 14% of respondents have no idea how useful it might be (Q 19d). Problems with using big-picture information were mainly related to access and difficulty in interpretation (Q 20).

A relatively large group (64%) have a computer (Q 21a) and 21 % of respondents currently have access to the Internet (Q 21b). A high percentage (88%) have a facsimile machine (Q 21c).

The most convenient ways to access seasonal climate outlook information are 'faxed directly', TV, rural newspapers, and radio (Q 21d).

Question 21e. The main sources of seasonal situation/outlook information used at least once are BoM Fax Services. Some responses indicated a lack of awareness of the various sources of information (Q 21f).

Part D – Scaled Attitudinal Responses

"It is better management practice to simply respond to changing seasonal conditions, rather than try to anticipate and reduce seasonal climatic risks." (Q 22). 23% response of 'neutral' while 52% either 'agree' or 'strongly agree' with this statement.

"I accept that seasonal climate forecasts are better expressed in terms of probabilities (for example, '60% chance that the next three months will be drier than average') than like a traditional weather forecast." (Q 23). 36% response of 'neutral' while 52% either 'agree' or 'strongly agree' with this statement.

"At present, SOI and probability-based forecasting places undue responsibility on 'users' to interpret the information." (Q 24). 37% 'neutral' while 42% either 'agree' or 'strongly agree' with this statement.

"Warnings of possible stock feed shortages in 3-6 months time, at a district level, would be valuable in making my management decisions." (Q 25). 72% 'agree' to 'strongly agree' with this statement.

"At present, adequate experience and information are available to enable me to link climate-related information/forecasts to practical property management." (Q 26). 40% 'neutral' response while 29% 'disagree'.

"I am comfortable with the increasing level of climate-related materials now becoming available via computer programs and computer networks." (Q27). 39% response of 'neutral' while 39% either 'agree' or 'strongly agree' with this statement.

"Warnings of the possible pasture deterioration (for example weed invasion, loss of desirable species) at a district level, before the main growing season, would be valuable in making my management decisions." (Q 28). 34% response of 'neutral' while 40% agree with the statement and 27% disagree with it.

"Generally, the rural media provide credible and useful sources of seasonal climate forecast information." (Q 29). 50% either 'agree' or 'strongly agree' with this statement.

"Warnings of possible soil deterioration (for example reduced ground cover, soil loss - see 'Definitions' on last page) on a district basis, before the level of pasture ground cover became critical, would be valuable in making my management decisions." (Q 30). 33% of responses were neutral while 47% either 'agree' or 'strongly agree' with this statement.

"Scientific seasonal climate forecasting is a valuable tool for managing my property in the face of seasonal variability." (Q 31). 27% of responses were neutral while 56% either 'agree' or 'strongly agree' with this statement.

'Do you have any further comments to make, for example on what we may have missed in this questionnaire? (Q 32). Accuracy of forecasts were the main concern, but some expressed interest in collaborating to improve the usefulness of forecasts and linking them to models.

CONCLUSIONS

The following conclusions can be made from the survey, as described, and the results obtained:

- The survey results provide reasonable guidance for developing an effective Communication Plan and Extension Program.

- The knowledge and attitudes of agribusiness managers are not well represented in the data obtained. However, they were represented at the workshop in December 1998 and supported the project.

- Daily rainfall records were kept by 96% of respondents, and 89% of these have 'complete' or 'fairly complete' records, the challenge is to help them to make better use of the valuable records being produced. A total of 74% of respondents does not currently use long-term climatic records to assist in decision-making.

- Judgements of future climatic conditions were 'very important' or 'moderately important' for 77% in their planning or decision-making, so they are likely to be receptive to training aimed at a better understanding of seasonal climate forecasting, and the use of such information. Seasonal climate forecasts are currently used in decision-making by 20%.

- There is some acceptance of probability-based information, as 32% said that probability-based information is 'moderately useful' to 'very useful' in the management of their business. However, 32% said it was 'slightly useful' while 32% do not use it. Most respondents agree with releasing seasonal climate forecasts in the form of probabilities.

- While 41% said big-picture information was 'moderately important' to very important' in their planning, 19% were unaware of the information. In addition 43% of those who have used big-picture information have found it 'moderately useful' to 'very useful'. Also 32% of those who have not used big-picture information thought it could be 'moderately useful' or 'very useful', while 14% of respondents have no idea how useful it might be. Thus respondents should generally be receptive to Aussie GRASS extension activities.

- Users of big-picture products have some problems with accessing information, interpreting and using it; also there are some reservations about product accuracy and forecasting ability. These issues need to be addressed in implementing the Aussie GRASS extension program.

- The most convenient ways to access seasonal climate outlook information are 'faxed directly', TV, rural newspapers, and radio. As 88% have a facsimile machine, this appears to be the best current method for pastoralists to obtain accurate information. However, 64% have a computer, 21% currently have access to the Internet and most respondents accept that an increasing amount of information will be computerised. Thus their use of software programs and the Internet are likely to increase.

- There appears to be strong support for the concept of Feed Shortage Alerts, and moderate support for the provision of warnings of possible deterioration of pastures or soil.]

- The provision of examples for South Australia would improve the understanding of the products. There also needs to be further investigation on suitable models that are applicable for South Australia. Further workshops in 2000 will help to develop and progress the products further.

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