final report

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Adaptation to Climate Change in Southern Livestock Program

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1. Executive Summary and Key Findings

- Shorter growing season leading to reduced stocking rates to manage ground cover over summer/autumn which results in reduced profits.
- Tableleland locations above 900m with high rainfall are not affected. The higher winter temperature remove the current block, low winter pasture production. This offset any decline in rainfall.
- There is no single adaptation which recovers all the lost profit. It requires a combination of factors. The most promising are factors producers already know. The best adaptations vary between locations.
- The size of the impact appears to get greater as the rainfall decreases.
- Sheep enterprises appear to be able to handle the increased climate pressure better than cattle.

2. Statement against Objectives and Activities

a) Project objectives (as per contract)

Objective	Status at Project End
1. Knowledge base established	Achieved
2. 3800 producers aware of key findings	Achieved
3. Program of onfarm trialling	Positive adaptation identified for regions
4. Improved modelling capactity	Achieved

b) Project activities

Activity	Contracted requirement	Status at Project End
1. Regions modelled	4	8
2. Locations modelled	8	24
3. Enterprises modelled	NA	40
4. Producer workshops held	24	19 (19+15=34)
5. Other awareness events held (e.g. seminars)	NA	15
6. Producers directly engaged	1520 (40% of 3800)	2122
7. Communication products produced	NA	12
8. Producers aware of the key project findings?	3800	6500

9. **Adaptations modelled**	**NA**	**29**

3. Methodology

The following locations were modelled comparing the base period, 1970 to 2000, against the four selected GCM (UKMO-HadGEM1, ECHAM5, GFDL-CM2.0, CCSM3) for 2030. For each GCM 30 years of potential 2030 daily weather was used so the 2030 output is based on 120 years of data. The enterprises were selected and checked by producers or experienced local extension officers. The enterprise vs locations is in the table below.

Location	Beef Cattle	Sheep – wool	Sheep – prime lamb
Yass	Y	Y	Y
Goulburn	Y	Y	Y
Moss Vale	Y		
Braidwood	Y		
Cootamundra	Y	Y	Y
Orange		Y	Y
Grenfell	Y	Y	Y
Woodstock	Y		Y
Trangie		Y	Y
Monaro (3 locations)	Y	Y	
Tumbarrumba	Y		
Holbrook	Y		
Culcairn			Y
Lockhart		Y	Y
Scone	Y		
Glen Innes	Y	Y	Y
Armidale	Y	Y	
Broken Hill		Y	
Cobar		Y	
Bourke		Y	
Hilston		Y	
Narrandera		Y	

4. Key results

a) Overview - summary of the key findings

- Shorter growing season leading to reduced stocking rates to manage ground cover over summer/autumn which results in reduced profits.

- Tableleland locations above 900m with high rainfall are not affected. The higher winter temperature remove the current block, low winter pasture production. This offset any decline in rainfall.
- There is no single adaptation which recovers all the lost profit. It requires a combination of factors. The most promising are factors producers already know. The best adaptations vary between locations.
- The size of the impact appears to get greater as the rainfall decreases.
- Sheep enterprises appear to be able to handle the increased climate pressure better than cattle.

b) Specific results – The results below report the impact of 2030, averaged for the 4 GCM against the base period for annual pasture production KG dm/ha, DSE/ha and Profit/ha. The stocking rate for each GCM has been changed so the same ground cover rule as the base period is achieved. The enterprises are a mixture of sheep and beef. The DSE and profit results for the western divison are still being worked on.

	Pasture as a % of base	DSE/ha as % of base	Profit /ha as % of base
Goulburn	93%	74%	60%
Yass	93%	71%	60%
Orange	108%	103%	109%
Glen Innes	101%	94%	96%
Trangie	86%	90%	83%
Narrandera	77%	52%	12%
Cootamundra	95%	83%	72%
Moss Vale	102%	84%	83%
Braidwood	95%	62%	loss
Tumbarumba	94%	82%	73%
Holbrook	99%	78%	43%
Culcairn	97%	92%	86%
Lockhart	91%	78%	43%
Grenfell	90%	81%	58%
Bombala	100%	71%	
Nimmitabel	101%	108%	
Broken Hill	93%*	96%*	
Bourke	92%*		
Cobar	97%*	94%*	
Hillston	92%*		

***** A CO2 level of 700 ppm was used for these sites. Also this work was done using the GRASP model.

c) Summary of adaptations exaimed and potential impact / benefit (regions especially)

The adaptations with the greatest benefit at most location were the use of a summer feedlot and continual genetic improvement from now until 2030. When combined for sheep operations this usually resulted in the recover of all lost profit resulting from the forced reduction in stocking rate. The benefits from genetic improvement were greatest in the

wool enterprises because extra wool income can be earned without increasing body weight and so having no impact on stocking rate. In the meat enterprises improving weight gain leads to increased body weight of females unless terminal sires are used. Also the genetic benefit with wool is harvested a number of times compared to once only with meat. The beef enterprises had the most difficulty recoving lost profit and in most case were not able to do so even with a combination of factors. This was most pronounced in the drier locations.

Enterprises modelled	Listing of adaptations modelled
Merino self replacing	Changing lambing time
9 locations	Use of summer feedlots
	Increase in margin required to recover $ losses
	Changing wool genetics
	Selling time of wethers – 15 mths to weaners
	Use of rotational grazing
	Moving from breeding to trading
	Impact of changing ewe flock structure
	Changing potential reproduction rates
	Adding summer active species into pasture mix
Prime lamb enterprise	Changing lambing date
7 locations	Use of summer feedlots
	Increase in margin required to recover $ losses
	Changing meat genetics
	Adding lucerne into the pasture mix
	Impact of changing selling weight of lamb
Cattle self replacing	Change calving time
10 locations	Use of summer feedlots
	Increase in margin required to recover $ losses
	Changing meat yield genetics
	Changing between vealers, weaners and feeder steers
	Use of summer and winter fodder crops
	Increasing soil fertility
	Early weaning of calves
Sheep	Impacts of changing sheep enterprises.

5. Implications of project findings

The major limitation to this work is that the GCM data that was available was current in app 2004. In this area the progress in the scienec is rapid so we were forced to use old data. There is a need that our work be checked with the latest GCM to verfy our results. This is not a big job as the farm systems are already built. As this is the first attempt anywhere at quantitifying the size of impacts it needs some caution applied to the results.

The major outcomes are

- the capability to evaluate farm system changes has been increased across the state due to staff training and the development of the farm systems.

- The farm systems provide a robust tool that could be used in policy development to test the impacts.
- The data identifies areas of the state which will be impacted most and enterprises under the greatest pressure. It also highlights adaptations worthy of further work and ones that are of little value.
- All enterprises and locations are under substantial pressure if the future climate is at the hotter and drier end of the range we have assessed.

There was an increase in the number of producers in the "don't believe in climate change" group during the project . This was most noticable after the issues became a party political divide. Having said that, because the results were presented in terms that producers understood it caused them to give some consideration to the issue even if it did not change their overall view. At present producers roll the policy responses and the physical impacts of climate change into the one issues and policy has the major influence on their views.

See appendix for full survey report.

6. Future RD&E needs

- The major gaps are in the mixed farm regions where the impacts of climate change on cropping and livestock need to be examined at a biological and economic level rather than just at an economic level as is done now. This applies to all of southern australia.
- Work needs to continue in the pastoral divisions. The current model has limitation which need to be devloped to be able to assess the financial impacts.
- The validation of the current work with updated GCM data is a must.
- More detail work on adaptations is needed in those area which have the greatest impact and currently have not been able to recover lost profit. The CSIRO work at 2050 and 2070 would also identify regions for the more details studies.

All the above issues would be relevant to FtRG. While doing the above work, the change in emmission profile could also be documented.

7. Published papers and extension communication products

Please list all publications arising from the project, including journal papers, reports, proceedings, abstracts, fact sheets, brochures etc. Please provide copies of all major publications or a link to the website where they can be found.

- ABARE conference
- Kondinin magazine
- Prograzier
- Ag Today articles (insert in Land newspaper) 4 separate features
- NSW conferences to Producers, CMA, Masterclasses, Climate Champions, Consultants, Departmental staff.
- Local w/s fpr producers
- Fact sheets of results for locations in NSW
- Video for DAFF on results.

- 15 ppt presentation were developed.