Grassland Society of NSW Inc

Newsletter

Welcome to the first Grassland Society of NSW newsletter for 2014 - a bit later than normal, but as the saying goes better late than never.

Unfortunately for most of our members, the year got off to a tough start with record high temperatures and record low rainfall in many areas of the state over summer. Hopefully you have now received some useful autumn rain, but I am sure we would all like to see some follow-up rain before winter and a delay to that first frost.

After a year off the annual conference is back! In 2014 the conference will be held in the north of the state at Inverell - a joint effort by the Northern Tablelands and the North West Slopes branches of the society. It is 6 years since the last conference in the north of the state so it is long overdue.

This will be the first time the conference will be held at Inverell and a small, but dedicated committee are working hard at developing an interesting program and tours that showcase the versatile production of both the tablelands and slopes under variable climatic conditions. More details will be available in the next newsletter or keep an eye on the website for up-to-date information.

The NSW Hay and Silage Feed Quality Awards are also back in 2014. Conditions of entry and an entry form can be found on pages 12 and 13 as well as on the website.

The Pasture Update series will continue in 2014 with preparation for a number of days around the state underway. Check the website for a venue near you. In this newsletter we have a report from the successful Pasture Update held at Taree held in December 2013 from Josh Hack on ryegrass trials.

As always we cover a diverse range of topics in this issue of the newsletter including the "Contribution of dual-purpose crops and pastures in sheep grazing systems", "The successful use of winter active tall fescue in a mixed cropping program", "Improving the feeding value of dryland lucerne in Australia" and a number of research activities dealing with climate adaptation and resilience of pastures to variable climates.

Don't forget it is the International Year of Family Farming (IYFF). The goal of the 2014 IYFF is to reposition family farming at the centre of agricultural, environmental and social policies in national agendas by identifying gaps and opportunities to promote a shift towards more equal and balanced development. A number of organisations will be coordinating events for the IYFF.

Please send any articles, letters or ideas for articles or activities to me at carol.harris@dpi.nsw.gov.au

Carol Harris
Editor

In this newsletter

THE GRASSLAND SOCIETY OF NSW INC.

Annual Conference

"Versatile production in a variable climate"

Inverell RSM

22-24 JULY 2014

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Contribution of dual-purpose crops and pasture to forage supply in sheep grazing systems

Hugh Dove, John Kirkegaard and Susan Sprague
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Introduction

The co-existence on the same farm of interacting crop and livestock enterprises can spread economic risk, provide synergies in terms of forage supply and income streams, and ultimately contribute to increased food security by producing more animal and crop product from the same area of land. All these advantages have contributed to the recent resurgence of interest in crop-livestock integration using 'dual-purpose (DP) cropping', the farming practice in which crops are sown earlier than a grain-only crop, with the explicit intent of achieving autumn-winter grazing and a high-value grain crop. Whilst the grazing of the DP crop can provide extra grazing in winter, when it is critically needed, the crop grazing also allows a period of 'pasture spelling' in winter. Theoretically, the resultant extra pasture growth should be a further advantage for a crop-livestock system, but there is little information about this aspect. Winter is also a time when pasture 'cleaning' to control weeds can influence pasture growth, so a period without grazing is of even greater significance for whole-farm feed supply.

Quantifying the forage contributions of the crop and pasture components

If the grain/seed yield penalties from grazing can be avoided or minimized by removing grazing animals before critical crop growth stages ('first hollow stem' or Zadok's growth stage 30 in wheat; buds <10cm above ground level in canola), then increased gross margins/ha for dual-purpose versus grain-only paddocks of either cereals or canola can be obtained. However, even greater benefits at the wider system or farm scale result from complementarities between cereal and canola, and from the winter spelling of pasture which occurs during crop grazing.

We have been particularly interested to quantify the value to the sheep-grazing system of the extra pasture grown during the period sheep are off pasture and grazing crop. In a large experiment in Canberra in 2010/2011, we quantified the value of spelling a phalaris-subclover pasture during winter, while young Merino sheep grazed either a wheat crop (cv. Mackellar), a winter canola crop (cv. Maxol), or a sequence of the canola and wheat. We estimated the value of the crop and pasture components by calculating the number of sheep grazing days/ha (number of sheep/ha x number of days of grazing) obtained from continuous pasture grazing, and the equivalent sheep grazing days/ha obtained when sheep grazed crop as well as pasture. Using these numbers, we then estimated the number of extra sheep grazing days/ha provided by the treatments involving DP crops. Our results are shown in Table 1.

The grazing of a single crop in 2010 (an excellent season) resulted in 800-1200 extra SGD/ha (compared with continuously grazed pasture). Grazing both crops in sequence provided almost 2100 extra grazing days. It is of interest that this is very similar to the sum of the grazing obtained from the individual crops. In addition, pasture spelling resulted in extra pasture growth and many more pasture-grazing days after the crop grazing period. In fact, of the total extra SGD/ha (column 4, Table 1) of 1500-1700 (one crop) or 3456 (both crops), 30-47% arose from the spelling effect of crop grazing on the pasture.

In 2011, which was drier and colder, less extra grazing was generated but nevertheless, grazing of a single crop resulted in about 675 extra SGD/ha and again, the grazing value of canola plus wheat in sequence was similar to the sum of the individual crops. Again, the pasture-spelling benefit was substantial and provided 30-49% of the additional grazing days obtained from the DP-grazing system, indicating a substantial extra benefit to be gained from DP crop grazing.

Conclusions

Our results indicate that in addition to the extra grazing provided by the crop component within a DP-cropping system,

Table 1. Extra sheep grazing days (SGD/ha) obtained by grazing wheat, canola or wheat+canola in sequence, and the extra SGD/ha obtained by the subsequent grazing of winter-spelled pasture (all relative to continuously grazed pasture).

Treatment	Crop extra SGD/ha	Pasture extra SGD/ha	Total extra SGD/ha	% of total from extra pasture
2010 season				
Wheat grazing	1188	521	1709	30.5
Canola grazing	822	739	1561	47.3
Canola+wheat	2076	1380	3456	40.0
2011 season				
Wheat grazing	675	456	1132	40.1
Canola grazing	670	281	951	29.7
Canola+wheat	1293	1323	2617	49.2

the extra pasture growth during the period of crop grazing was a substantial component of the total extra grazing from the system. This was not only the case in a good season (2010), but was also true in the poorer season of 2011, when the extra grazing might also be regarded as even more valuable.

The extra winter herbage afforded by grazing systems based on pastures/DP crops means that winter carrying capacities can be increased. These increases, whilst real and economically valuable, are also finite and will decline once the winter stocking rate exceeds that which can be maintained over summer. There is thus a need for more research on the comparative value of the grazing provided by the crop and pasture components, in relation to the proportion of the farm sown to DP crops. Within this, there is also a further role for computer modelling of these grazing systems, so that research results can be extended to other systems and regions.

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Ryegrass trial highlighted at Taree Update

Josh Hack, Agronomist, Elders Taree

Editors note: Josh Hack, Agronomist at Elders Taree spoke at the Grassland Society of NSW Pasture Update at Taree in December 2013.

Grazing systems on the Mid North Coast mainly consists of a Kikuyu/setaria base with annual and Italian ryegrass over sown in autumn. There are some perennial ryegrass bases on the ranges as you move west, and they are typically short term, due to insect and competition issues.

Typically growers have a pasture deficit of good quality feed in late spring and also in late autumn after planting. Selecting varieties that can give quick early feed and also be able to push into the summer until the tropical grasses begin to produce is important. This year we had extremely cold nights up until Christmas and the Italian ryegrasses showed how they can produce high quality feed well into the season.

The day was a success with 60 farmers attending to see the ryegrass variety trial at Mondrook/Taree consisting of annual and short rotation Italian ryegrasses. The season had been challenging up until some late spring rain, which was late for some annual grasses, however, the longer season Italians pushed into late December producing high quality feed. The new Italian varieties are showing great early yields to compete with annuals in that first grazing.

I am very passionate about all kinds of farming and I enjoy working with farmers. Trials and demonstration sites are important to help the industry grow. If we can improve yield and quality of feed from simply changing varieties it's the cheapest form of investment, as the other costs are constant.

We need to be able to get farmers and suppliers together to discuss issues which are affecting them and their businesses. I have found in the past field days such as these are great avenues to get everyone together to talk about their problems, because if you have a problem, it's quite likely someone else has the same problem, or they may have answers to those problems.

Pasture Management:

The day also covered key topics for pasture grazing management including;

- Rotation length
- Quality of feed
- Area mapping, paddock size and area to feed
- Pasture density (available pasture)
- Allocating Feed

Pasture management is the first thing we need as graziers to understand. The impact of management decisions on the pasture are underestimated in some instances. There has been some great work done by the DPI and Bill Fulkerson on pastures and I find it paramount to use this information to aid in decision making.

mla
MEAT & LIVESTOCK AUSTRALIA

The successful use of winter active tall fescue in a mixed cropping program

Charlie Roberts – farmer and consultant

Farm background

Dunbogan Merino stud consists of 1835 hectares 75 km east of Dubbo in the central western slopes and plains of New South Wales. The property is 80% arable with a mix of both red clay (4.8-5.5 pH $CaCl_2$) and sandy loam (4.2-4.7 pH $CaCl_2$) soil types. Average annual rainfall is 650mm split evenly between autumn-winter and spring–summer.

The livestock operation includes stud and commercial merino sheep (6.5kg/head of 19.5 micron wool), cows and progeny plus the opportunity backgrounding of cattle for the feedlot market.

A typical cropping program on the red clay loam soil type consists of wheat > canola > wheat following by a traditional pasture mix of lucerne, phalaris and subclover.

In contrast a cropping program on the sandy loam soil type includes oats > oats followed by premier digit, rhodes grass and sub-clover pasture mixes sown in the late spring.

The challenge has been to find new pasture species that would:

- Provide strong autumn and winter pasture growth,

- Be free from the risk of red gut and phalaris staggers during autumn,

- Tolerant of long dry periods and recover sufficiently to make use of unseasonal rainfall events, and

- Reduce the variable costs required to re-sow oats every year.

A range of pasture species were researched and trialled with winter active tall fescue selected as the species of choice.

Tall fescue preparation

The first tall fescue paddocks were sown in autumn 2009 following the traditional cropping program of wheat, canola and wheat. During the cropping phase lime was applied and incorporated at 2.5 t/ha.

Lime was applied to increase the soil pH (reduce acidity) from the typical level of 4.8 pH (CaCl2) up to 5.5 pH (CaCl2). Raising the soil pH helped provide the pasture with optimum growing conditions, increasing production and persistence. Applying lime also assisted in stimulating microbial activity, enhancing the availability of soil nitrogen (N) and phosphorus (P).

The paddock of choice was 44 hectares of red clay loam with a long history of cropping and a heavy infestation of horehound where previous control methods (chemical, biological and pasture competition) had failed. The pasture mix consisting of Flecha tall fescue 7kg/ha, Urana subclover 1.5kg/ha, Seaton Park subclover 1.5kg/ha, Puna chicory 0.5kg/ha and Tonic plantain 0.75kg/ha. In early May the pasture mix was direct drilled (post stubble burning) from the small seeds box of a John Shearer trash cultivator with 85kg/ha of diammonium phosphate (DAP).

After a dry start the paddock received its first grazing in early September, with rotational grazing continuing until

February 2010. The 2010 calendar year saw 1007mm of rain fall with stem elongation and seed head difficult to control during spring. The large size of the paddock made stem control particularly difficult with the tall fescue closest to the water grazed short and hard with other areas of the paddock left tall and rank. As a result the paddock was slashed in the early summer to a height of 10cm to remove dead indigestible stem and seed head.

Results

Total pasture establishment costs were $195/ha including, seed, fertiliser, labour and herbicides. Breakeven for the paddock occurred 15 months post sowing with an average stocking rate over this period of 15DSE/ha. Traditional pasture species including lucerne carried 6-8 DSE/ha over the same time period. During this time the paddock was grazed with cross bred lambs, merino wethers and feeder steers with an average gross margin of $25/DSE. The paddock is now approaching 5 years old with tall fescue populations still strong.

What's been learnt?

Paddock size is essential to ensuring optimum pasture utilisation and livestock performance when grazing tall fescue. The original paddock was 44 hectares in size which proved difficult to manage. After 12 months the paddock was divided into two twenty hectare blocks with a tank and trough system set up. Decreasing the paddock size enhanced the ease of management, enabled an even grazing of the tall fescue, increasing pasture utilisation (reducing wastage), pasture recovery and livestock performance.

The paddock established ended up being very tall fescue dominant with few companion species. The dry autumn conditions made clover establishment and recruitment difficult. Future paddocks will be sown at lower rates of tall fescue (4-5kg/ha) which will encourage clover growth and assist in achieving an optimum 30% clover mix. Where the optimum clover percentage cannot be achieved and where nitrogen cycling is not occurring, the economics of nitrogen fertiliser in autumn or early winter will be considered. If rampant stem and seed head elongation occurs in the future the fescue will be slashed, opening the pasture up, increasing sunlight infiltration encouraging clover recruitment.

Tall fescue, relative to other pasture species is expensive to establish, with the paddocks on Dunbogan showing that returns are possible where livestock classes are carefully selected for finishing rather than maintenance. It is also clear from the experience at Dunbogan that where summer seasonal conditions allowed (rainfall and temperature) the tall fescue continued to grow actively. It was only once a combination of both increasing temperature and drying soil conditions that the tall fescue became dormant.

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Improving the feed value of dryland lucerne in Australia

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Introduction

Lucerne (*Medicago sativa* L.) is the most widely grown perennial legume species in southern Australia. Within Australian farming systems it plays an important role in the provision of high-quality feed for livestock, nitrogen fixation and dewatering soils to reduce watertable recharge and dryland salinity (Cocks 2001). The majority of lucerne varieties have been developed for the areas with high rainfall or supplementary irrigation. The new challenge is to develop lucerne cultivars specifically for dryland mixed farming systems in temperate and Mediterranean climate zones (Humphries and Auricht, 2001). Persistence in these environments and feeding value to sheep are critical selection traits. In this paper we compare nutritive traits of 35 commercial and experimental accessions of lucerne, sampled during the vegetative phase, and test the hypothesis that there will be significant differences between the accessions for *in vitro* dry matter digestibility (DMD), crude protein (CP), acid detergent fibre (ADF), neutral detergent fibre (NDF) and hemicellulose.

Methods

Plant growth and sampling

The field work was located in the SARDI Genetic Resources field nursery, at the Waite Institute, Urrbrae, South Australia. Three hundred seeds of each of accession were scarified, inoculated and sown into Petri dishes between the 10th and 27th of June 2011. After 3-5 days up to 200 viable seedlings were transferred into seedling trays and grown in a glasshouse. Seedlings were planted by hand on 24th August 2011 into an experimental field following a randomised block design with 3 plot replicates of each accession. Plots were 1.8 m x 0.8 m in size and each plot contained 50 plants spaced in a 20 x 20 cm grid formation.

Soil test levels of P, K and S were at recommended levels and weed & insect control was preformed prior to planting. A cleaning cut on each lucerne plot was carried out on the 20th November 2011, using a sickle bar mower. No measurements were taken and the objective was to normalise all plots to minimise any potential differences in seed health, establishment and recovery.

Primary vegetative regrowth was measured four weeks after the cleaning cut, when there was sufficient biomass and all plants were in a vegetative physiological state. The central 15 plants of each plot were cut at 3 cm height above the ground. Herbage from the 15 plants per plot was pooled, freeze-dried, weighed and ground to pass 1 mm screen.

Nutritive value and statistical analyses

DMD was estimated using the pepsin-cellulase digestion method based on Klein and Baker (1993). Samples were run in duplicate with a subset of 7 Australian Fodder Industry Association standards (consisting of lucerne and annual legumes) with known *in vivo* DMD (AFIA, 2007). Using these standards, the pepsin-cellulase DMD was linearly adjusted to predict *in vivo* DMD.

The energy value of the sample was estimated by the equation: M/D = (0.172*DMD) - 1.707 (SCA, 2007).

Total nitrogen was determined by combustion using a Leco FP-428 N Analyser (Sweeney and Rexroad, 1987). CP was estimated by multiplying total N by 6.25. Concentrations of NDF and ADF were measured sequentially, according to operating instructions, using an Ankom 200/220 Fibre analyser (Ankom® Tech. Co., Fairport, NY, USA). Hemicellulose was calculated by NDF minus ADF. The concentrations of organic matter (OM) were determined according to the methods of Faichney and White (1983).

Results

Of the nutritive traits, there was significant variation between lucerne accessions for *in vitro* DMD (hence predicted M/D), CP, ADF, NDF,

Table 1. Grand mean among 35 accessions, minimum and maximum mean values and significant of differences from ANOVA.

	DMD (%)	CP (%)	Ash (%)	NDF (%)	ADF (%)	Hemi. (%)	DM (g)
Grand mean	69.5	22.7	11.7	31.6	24.4	7.2	114
Lowest accession	64.2	17.4	9.9	26.9	21.1	5.7	74
Highest accession	72.5	26.8	13.6	40.2	31.0	9.2	145
Sig. of diff.	*P<0.001*	*P<0.001*	*P<0.001*	*P<0.001*	*P<0.001*	*P<0.05*	ns

hemicellulose and ash (Table 1). Using the ruminant feeding model GrazFeed (Freer *et al.* 1997), it is predicted that a pregnant Merino ewe (day 100 of gestation) fed the accession with the highest DMD would eat 1.2 kg of DM per day and grow at a rate of 210 g/week. In contrast the same ewe eating the accession with the lowest DMD would eat 0.97 kg of DM per day and lose 112 g/week. For mature, non reproducing sheep, the difference in weight gain would be 3-fold (125 g gain/week on the lowest quality lucerne and 440 g/week for the highest quality lucerne). Estimated M/D values range from 9.34 to 10.75 MJ ME/kg DM. DMD was positively correlated to CP and (as expected) negatively correlated to ADF and NDF (Table 2.). Crude protein ranged from 18 to 23%, and all would meet the estimated crude protein requirements of reproducing ewes and growing lambs.

Of the morphological traits, there were no significant differences in biomass production between the accessions at the vegetative phase.

Conclusion

The results of this pilot project suggest that significant genetic variation exists within Australian commercial cultivars and experimental accessions for digestibility and feed quality related traits. The range in digestibility values (64 to 72%) is biologically and economically significant, given similar levels of biomass production. As anticipated, digestibility was positively correlated to crude protein and negatively correlated to fibre content. We are now quantifying *in vitro* methane production from the fermentation of all the accessions by rumen microbes. It should be possible to exploit variation in nutritive value through cultivar selection to optimise profitability while possibly reducing methane emissions intensity within systems.

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This paper first appeared in "Revitalising Grasslands to Sustain our Communities: Proceedings 22nd International Grassland Congress". Reprinted with permission'.

For the full paper and other papers from the International Grassland Congress go to www.internationalgrasslands.org/files/igc/publications/2013/proceedings-22nd-igc.pdf

Table 2. Correlations between nutritive traits and vegetative growth. Figures in bold: *P<0.001*, other figures *P<0.05* and ns is not a significant correlation.

	DMD	ADF	Ash	CP	NDF	Hemi.
DM production	ns	ns	-0.31	ns	ns	ns
Hemi.	**-0.48**	0.60	0.27	ns	0.81	-
NDF	**-0.78**	0.96	ns	**-0.42**	-	
CP	**0.55**	-0.52	0.25	-		
Ash	ns	ns	-			
ADF	**-0.82**	-				

Research Update

Keeping you up-to-date with pasture and grassland research in Australia. Abstracts of recently published research papers will be reprinted as well as the citation and author details in you wish to follow up the full paper.

Climate change and broadacre livestock production across southern Australia. 1. Impacts of climate change on pasture and livestock productivity, and on sustainable levels of profitability

Andrew D. Moore and Afshin Ghahramani

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Abstract: Broadacre livestock production is a major but highly diverse component of agriculture in Australia that will be significantly exposed to predicted changes in climate over coming decades. We used the GRAZPLAN simulation models to assess the impacts of climate change under the SRES A2 scenario across southern Australia. Climate change impacts were examined across space (25 representative locations) and time (1970–99, 2030, 2050 and 2070 climate) for each of five livestock enterprises. Climate projection uncertainty was considered by analysing projections from four global circulation models (GCMs). Livestock production scenarios were compared at their profit-maximizing stocking rate, constrained to ensure that risks of soil erosion were acceptable. Impacts on net primary productivity (ANPP) varied widely between GCM projections; the average declines from historical climate were 9% in 2030, 7% in 2050 and 14% in 2070. Declines in ANPP were larger at lower-rainfall locations. Sensitivity of ANPP to changes in rainfall ranged from 0.4 to 1.7, to temperature increase from _0.15 to +0.07 °C _1 and to CO2 increase from 0.11 to 0.32. At most locations the dry summer period lengthened, exacerbating the greater erosion risk due to lower ANPP. Transpiration efficiency of pastures increased by 6–25%, but the proportion of ANPP that could safely be consumed by livestock fell sharply so that operating profit (at constant prices) fell by an average of 27% in 2030, 32% in 2050 and 48% in 2070. This amplification of ANPP reductions into larger profitability declines is likely to generalize to other extensive livestock systems. Profit declines were most marked at drier locations, with operating losses expected at 9 of the 25 locations by 2070. Differences between livestock enterprises were smaller than differences between locations and dates. Future research into climate change impacts on Australian livestock production needs to emphasise the dry margin of the cereal-livestock zone.

Global Change Biology (2013) **19,** 1440-1455. www.olinelibrary.wiley.com

Climate change and broadacre livestock production across southern Australia. 2. Adaptation options via grassland management

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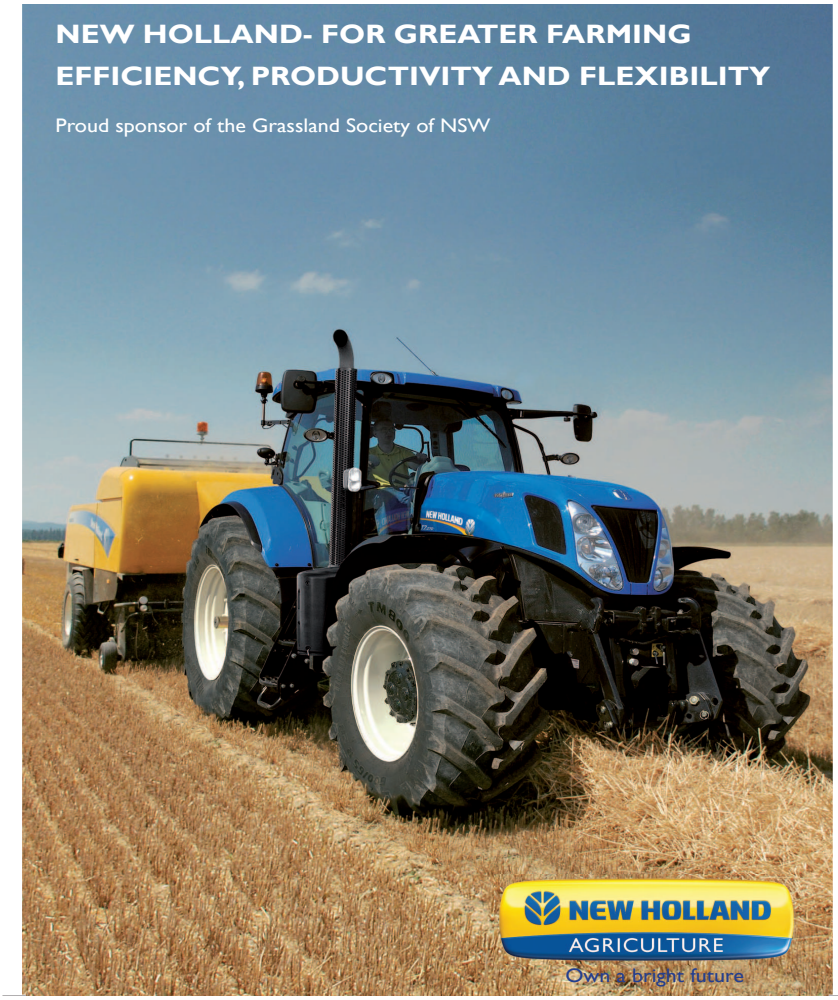
Abstract: Climate change is predicted to cause a significant reduction in the productivity of grasslands and the livestock industry across southern Australia. We have used the GRAZPLAN biophysical simulation models to assess a range of pasture management practices as adaptation options under the SRES A2 global change scenario. The modelling analysis spanned four dimensions: space (25 representative locations), time (2030, 2050, 2070, and a historical reference period of 1970–99), livestock enterprises (five), and management (four adaptation options at different levels). Climate projection uncertainty was taken into account by considering climates from four global climate models. The effectiveness of adaptation options varied widely among enterprises and locations, over time, and under the four projected future climates. Increased soil fertility by adding phosphorus and addition of an area of lucerne to the feed-base were predicted to have the greatest effect in recovering



from the negative impact of climate change on profitability. In high-rainfall zones in particular, and compared with the historical period, the most profitable option could return the profitability of livestock production systems to historical levels at 68%, 52%, and 32% of the representative locations at 2030, 2050, and 2070, respectively. At 2030, increased soil fertility, adding lucerne to the feed-base, and confinement feeding in summer recovered overall profit fully at 52%, 28%, and 12% of locations. Removing annual legumes in an attempt to preserve ground cover was ineffective as an adaptation to changing climate. For the majority of location_livestock enterprise combinations, there was at least one individual incremental adaptation that could recover the declines in the profitability at 2030, but effectiveness decreased over time after 2030. It is unlikely that the examined single climate change adaptations to the feed-base of southern Australian livestock production systems can return them to profitability in the second half of the century.

Crop and Pasture Science (2013) **64**, 615-630.
www.publish.csiro.au

Climate change and broadacre livestock production across southern Australia. 3. Adaptation options via livestock genetic improvement

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Abstract. Climate change is predicted to reduce the productivity of the broadacre livestock industries across southern Australia; to date there has been no formal evaluation of the potential of genetic improvement in cattle or sheep to ameliorate the impacts of changing climates. We used the GRAZPLAN simulation models to assess selection of five traits of sheep and cattle as adaptation options under the SRES A2 global change scenario. Analysis of the breeding strategies was carried out for 25 representative locations, five livestock enterprises and three future years (2030, 2050, 2070). Uncertainty in future climates was taken into account by considering projected climates from four global circulation models. For three sheep enterprises, breeding for greater fleece growth (at constant body size) was predicted to produce the greatest improvements in forage conversion efficiency, and so it was the most effective genetic adaptation option. For beef cow and steer enterprises, breeding for larger body size was most effective; for beef cows, however, this conclusion relied on per-animal costs (including provision of bulls) remaining stable as body size increases. Increased conception rates proved to be less effective but potentially viable as an adaptation in beef cow and crossbred ewe enterprises. In the southern Australian environments that were analysed, our modelling suggests that breeding for tolerance to heat stress is unlikely to improve the performance of livestock production systems even at 2070. Genetic improvement of livestock was able to recover muchless of the impact of climate change on profitability at drier locations where the need for adaptation is likely to be greatest. Combinations of feedbase and livestock genetic adaptations are likely to complement one another as the former alter the amount of forage that can be consumed, while the latter affect the efficiency with which consumed forage is converted to animal products. Climate change impacts on pasture production across southern Australia are likely to have only small effects on methane emissions intensity, as are a range of candidate genetic and feedbase adaptations to climate change; methane emissions per hectare in future climates will therefore be driven mainly by changes in livestock numbers due to alterations in pasture productivity.

Animal production Science (2104) **54**, 111-124.
www.publish.csiro.au

Assessing resilience of pasture production to climatic changes

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Introduction

Increasing temperatures and atmospheric carbon dioxide (CO2) concentrations, together with changes to rainfall patterns, will influence seasonal pasture production; however climate change projections for south eastern Australia are uncertain (CSIRO and BoM 2007). Despite this, climate change impact assessments generally rely on specific climate projections, but in this study an alternative approach was developed to test the resilience of production to incremental changes in climate.

Methods

Sites and pasture systems modelled

Representative pasture types were simulated for Wagga Wagga (phalaris, subterranean clover, annual ryegrass and a native C4 grass), Hamilton (perennial ryegrass and subterranean clover) and Elliott (perennial ryegrass and white clover) in south eastern Australia (Table 1). Annual pasture production was simulated as a cutting trial, with pasture mass cut to 1 t DM/ha on the last day of each month, using the Sustainable Grazing Systems pasture model (Johnson et al. 2003). In all simulations soil nutrients were non-limiting. Climate scenarios Twenty-five future climate scenarios were developed by scaling the historical climate (1971-2000) by increments of 0, 1, 2, 3 and 4ºC (with corresponding changes to atmospheric CO2 concentrations and relative humidity) and rainfall by +10, 0, –10, –20 and –30%, following the procedure of Cullen et al. (2012). These scenarios represent the range of climate change projections for southern Australia to 2070. Data analysis Surface charts showing annual average pasture production for the 25 climate scenarios were produced, and on them the range of climatic changes for 2030, 2050 and 2070 (CSIRO and BoM 2007) were indicated.

Results and Discussion

With warming alone, annual production increased for the pasture sward at Wagga Wagga that consisted of a mixture of plant species with C3 and C4 photosynthetic pathways (Fig. 1). At the cool temperate site of Elliott warming of up to 3ºC increased production, while warming up to 2ºC increased production at Hamilton. At each site, production declined with lower rainfall. Generally annual pasture production was not lower than that simulated in the historical climate with the climate change projections for 2030, but it may be reduced under the 2050 and 2070 climate projections particularly if rainfall declines are >10%. These results indicate that pasture production is more resilient to warming in cooler regions, and where there is a mix of C3 and C4 species. In cooler regions, warming overcomes low temperature limitations to growth, while it increases production of the C4 species within mixed C3/C4 swards (Cullen et al. 2012). For C3 pastures in temperate regions warming of more than 2ºC will decrease annual production as increased growth rates in winter and early spring are counteracted by a shorter spring growing season.

Conclusion

Testing the sensitivity of production to incremental changes in climate can provide insights into the characteristics of regions and pasture systems that make them more or less resilient to climate change.

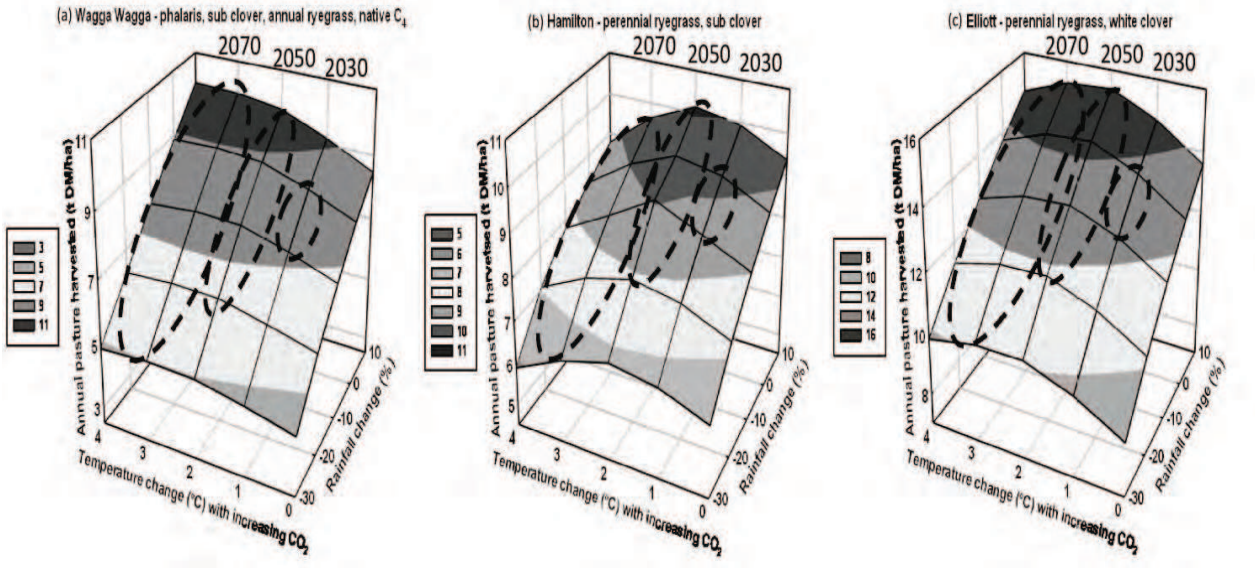

Figure 1. Surfaces of average annual pasture harvested (t DM/ha) under increasing temperature (°C) and change in rainfall (%) scenarios at (a) Wagga Wagga, (b) Hamilton, and (c) Elliott. Contours show equal values across the response surfaces. Dashed ovals show the range of climate projections for 2030, 2050 and 2070

Table 1 Location, soil types and average annual rainfall at Wagga Wagga, Hamilton and Elliott.

Site	Lat\Long.	Soil type	Climatic zone	Rainfall (mm)
Wagga Wagga	-35.10, 147.30	Red chromosol/leptic tenosol	Mediterranean	565
Hamilton	-37.83, 142.06	Brown chromosol	Temperate	689
Elliott	-41.08, 145.77	Red mesotrophic haplic ferrosol	Cool temperate	1220

Acknowledgments
This research was funded by Australian Government Department of Agriculture, Fisheries and Forestry Climate Change Research Program, Dairy Australia and Meat and Livestock Australia.

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This paper first appeared in "Revitalising Grasslands to Sustain our Communities: Proceedings 22nd International Grassland Congress". Reprinted with permission'.

For the full paper and other papers from the International Grassland Congress go to www.internationalgrasslands.org/files/igc/publications/2013/proceedings-22nd-igc.pdf

NSW Hay and Silage Feed Quality Awards 2014

Conditions of Entry

- Samples (approx. 500g) are best sent using a Post Paid Feed Quality Service sample kit available from NSW DPI. Silage should be frozen in plastic bag then wrapped in newspaper before posting early in the week. If you don't have a green FQS bag, samples can be posted early in the week to: Feed Quality Service, NSW DPI, Locked Bag 701, Wagga Wagga NSW 2650.
- The aim of these awards is to promote the benefits of high quality hay and silage to all farmers with emphasis on the importance of feed quality in animal production and how to achieve feed quality in conserved forages.
- Awards will be based on feed quality analysis results from the NSW DPI Feed Quality Service with emphasis on metabolisable energy and crude protein. Results will also be compared with guidelines provided in NSW DPI Silage Note 4 (www.dpi.nsw.gov.au) and TopFodder Successful Silage manual.
- Awards will compare hays and silages in each category ie. one award for each crop or pasture type, not separate awards for hay and silage.
- Samples must be representative and must come from commercial lot size intended for feeding to animals. Minimum lot size 5 tonnes of product.
- Samples must be of forage (hay or silage) conserved and/or fed in 2013/2014.
- Limit of 4 entries (samples) per farm or producer.
- Awards will be presented at the NSW Grasslands Society Annual Conference to be held in Inverell 22-24 July 2014.
- It is desirable for all entrants to keep photos and an example of entries until after awards are announced.
- Winners agree to co-operate with the organisers (NSW DPI and Grasslands Society of NSW) to conduct relevant field days, press and media following the awards.

Closing date: 4 July 2014

Note: Results of early submissions will be sent out at the end of each month.

Further information phone (02) 6938 1957 (lab) or (02) 4939 8948

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NSW GOVERNMENT Department of Primary Industries

THE GRASSLAND SOCIETY OF NSW INC.

NSW Hay and Silage Feed Quality Awards 2014

Entry form to be sent with sample to Feed Quality Service

Name: ..... **Business name:** .....

Postal address: .....

Phone: ..... **Fax:** .....

Email: .....

Property address (if different): .....

.....

Property Identification Code (PIC): .....

Sample details: ☐ Hay ($42.10) ☐ Silage ($70.40) Bale or pit size: .....

Note: You must enclose a cheque made payable to Trade & Investment NSW

Crop/pasture description (1 only)		Details/varieties
☐	Winter/temperate pasture	.....
☐	Summer/tropical pasture:	.....
☐	Winter crop:	.....
☐	Maize:	.....
☐	Other summer crop:	.....
☐	Lucerne:	.....
☐	Other:	.....

Harvest: Date: ..... Growth stage/maturity: .....

Machinery used to mow/bale/harvest etc: .....

.....

Storage method/facility: .....

Additives applied at harvest: .....

Quantity stored: .....

Time from mowing till harvest or storage: ..... days

Payment Authorisation (must be completed)
I hereby authorise Trade & Investment NSW to test the sample I have identified according to the above details as an entry in the 2014 NSW Hay and Silage Feed Quality Awards. I have enclosed a cheque for $_____

I accept that the judge's decision will be final and will not be challenged.

Name: ..... Signature: ..... Date: .....

Test results and findings may be provided to authorised staff and used for statistical, surveillance, extension, certification and regulatory purposes in accordance with Departmental policies. The information assists disease and residue control programs and underpins market access for agricultural products. The source of the information will remain confidential unless otherwise required by law or regulatory policies.

LABORATORY USE ONLY		
Date received:	Accession number:	Accessioned by:
Samples checked:	Total number of samples:	Testing authorised:

Closing date: 4 July 2014

NSW GOVERNMENT Department of Primary Industries

THE GRASSLAND SOCIETY OF NSW INC.

Dust to green flush in 10 days

Recent rain in the Trangie district has delivered a flush of growth with tropical pastures responding within 10 days to provide much needed quality feed for livestock, according to NSW Department of Primary Industries (DPI) development officer, Trudie Atkinson.

“We’ve seen how innovative management has lifted pasture quality and quantity to boost livestock production and farm sustainability at Dunnield, one of the properties showcased last year during the Grassland Society of NSW Pasture Update,” Ms Atkinson said.

“When we visited Peter and Fiona Howe’s property in spring, conditions were dry - by early summer they had reduced stock numbers and later began supplementary drought feeding.

“It took just 30 millimetres from the first rain of the season for the tropical pastures to take off.

“Within 10 days of the rain the Howes stopped supplementary feeding and have been able to graze 1600 lambs on a 93 hectare paddock flush with tropical pastures.”

Ms Atkinson said tropical pastures, with their characteristic high daily growth rates at this time of year, were able to deliver
a speedy turnaround in on-farm feed availability.

“It’s great to see the lambs are doing well and having very little impact on the pasture, in fact the paddock biomass is increasing,” she said.

“With a dry start to the season, Peter and Fiona Howe had the insight to fertilise two paddocks to optimise pasture response when it rained.

“Outstanding pasture growth, with broader leaves in the fertilised paddocks, exceeded their feed requirements and one paddock has been rested to allow the plants to seed.”
Now with more than 170 millimetres of rain recorded at Dunnield the Howes are continuing to reap the benefits of well-managed tropical pastures.

Producers can get more information about pasture and livestock management at upcoming Grassland Society of NSW pasture tours online

Funded by Meat & Livestock Australia the tours offer producers an opportunity to hear the latest pasture research from DPI and inspect properties where the benefits of innovative pasture and livestock management can be seen.

Kasbah's heat switch pumps pasture

Farmers facing hot, dry summers could find a saviour in a drought-resistant perennial grass, Kasbah cocksfoot, according to positive research results from NSW Department of Primary Industries (DPI).
Kasbah adapted to its native Mediterranean climate of long, dry summers and winter rainfall by using a special trait, summer dormancy, which allows the plant to switch off and avoid growth during stressful summer periods giving it the edge in hot, dry conditions.

DPI scientist, Mark Norton, said the final harvest this October of a four-year forage trial at Beckom in the Riverina saw the perennial grass, Kasbah, yield 1560 kilograms per hectare, streets ahead of phalaris TamPWA which produced 900 kilograms per hectare.

“While perennial pastures provide year-long benefits there are few varieties which survive severe heat and drought, conditions which are predicted to become more common in the future,” Dr Norton said.

“With a strong summer dormancy trait Kasbah proved its worth in the Future Farm Industries Cooperative Research Centre-funded Beckom trial where the plant survival rate was four times that of Currie cocksfoot, which is only moderately summer dormant.

“Kasbah’s ability to survive drought provides soil stabilisation and protection and those surviving plants are in the ground, ready to take advantage of an autumn break.

“Following a hot, dry summer the frost-tolerant, winter-active Kasbah can spring back in response to autumn rains to feed stock and fill feed gaps during the cooler months.

Dr Norton said ongoing research to better understand the genetics and exactly how the summer dormancy trait allows plants to adapt would benefit farming systems in areas with low to medium rainfall and long, hot summers.

“While we have had outstanding trial results from Kasbah during some of the worst drought years on record, we need to extend our knowledge so we can consistently produce enough seed to meet a growing demand,” he said.

“We also need to boost our knowledge of summer dormant grasses so they can be successfully managed and integrated with annual and perennial pasture legumes.”

Dr Norton said severe droughts in Australia, New Zealand, the Mediterranean and North America have led to an international focus on research to support grazing and mixed farming systems in a changing climate.

Global interest in the search for drought and heat tolerant pastures was highlighted at this year’s International Grassland Congress in Sydney where 46 scientists met at a specialist workshop to explore pasture plant adaptations. Podcasts of the workshop are available on the Grassland Society of NSW website.

From the President

As I sit and write this, there is beautiful rain falling over much of the Central West and Central Tablelands of NSW on this, the first day of Autumn. A quick search via the BOM shows good rain also over the Hunter region, while the North West, New England and southern regions seem to be missing out. I can only hope that the regions that are missing out on this front catch the next one.

Cattle prices have recovered a little in some centres, and again, here's hoping both the cattle and sheep markets get a significant jump in the near future.

Planning for the 2014 Annual Conference is well under way, with Inverell the Location now confirmed. A final conference theme is not far away, and the program is looking very comprehensive.

Also occurring throughout 2014 will be another round of 'Pasture Updates', so please check our website for dates and locations, and try to get to these. The programs are very informative, based on local needs, and are a great opportunity to grab 'snippets' of pasture and animal based research.

Let's hope the 50 or so mm through central NSW we have received now spreads itself over the rest of the state in the very near future. I am aware of many oat plantings already in the ground that will benefit greatly from these rains. Soon to be planted will be the grazing wheats, barley and triticale, and I look forward to, as I'm sure you all do, the grazing opportunities such crops will provide.

All the best,

Regards,

David Harbison,
President.

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Inclusion of an advertisement in this publication does not necessarily imply an endorsement of the company or product of the Grassland Society of NSW.

The Grassland Society of NSW Inc is a unique blend of people with a common interest in developing our most important resource - our Grasslands

The Grassland Society of NSW was formed in March 1985. The Society now has approximately 500 members and associates, 75% of whom are farmers and graziers. The balance of membership is made up of agricultural scientists, farm advisers, consultants, and or executives or representatives of organisations concerned with fertilisers, seeds, chemicals and machinery.

The aims of the Society are to advance the investigation of problems affecting grassland husbandry and to encourage the adoption into practice of results of research and practical experience. The Society holds an annual conference, publishes a quarterly newsletter, holds field days and is establishing regional branches throughout the state.

Membership is open to any person or company interested in grassland management and the aims of the Society. For membership details go to www.grasslandnsw.com.au
or contact the Secretary at secretary@grasslandnsw.com.au or at PO Box 471 Orange 2800

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If you are interested in reactivating an old branch or forming a new branch please contact the Secretary at secretary@grasslandnsw.com.au or by mail at PO Box 471 Orange NSW 2800

Grassland Society of NSW News

Next Newsletter: The last issue of the newsletter for 2013 will be circulated in June 2014. If you wish to submit an article, short item, letter to the Editor or photo for the second issue please send your contribution to the Editor - Carol Harris at carol.harris@dpi.nsw.gov.au or DPI NSW 444 Strathbogie Road Glen Innes 2370. The deadline for submitting contributions for the next newsletter is 05 May 2014.

New members: The Grassland Society of NSW wishes to welcome new members; Janelle Jenkins, Tumut and Peter and Karen Weller, Swan Vale.

Electronic newsletter: Don't forget you can receive the Grassland Society of NSW newsletter electronically. Just email your details to Janelle (secretary@grasslandnsw.com.au) and you will be added to the list. Next newsletter you will receive an email notification with a link to the newsletter on the website.

Grassland Society of NSW - PO BOX 471 Orange NSW 2800, www.grasslandnsw.com.au

This publication is prepared by the Grassland Society of NSW Inc and printed by GK Craig Printers, Orange on recycled paper