

On farm

Facilitation of the adoption of the decision support system *GrassGro*

Project number TR.038
Final Report prepared for MLA by:
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EXECUTIVE SUMMARY

This project has exceeded its objectives:

- Double the targeted number of clients have been trained.
- GrassGro has been adopted by the University of New England, Armidale, NSW in an integrated teaching program across all years of the Rural Science undergraduate course. This will have a lasting benefit on the education of future advisors and producers in the grazing industries.
- A comprehensive Resource Kit has been developed.
- In addition, several case studies which outline how GrassGro can be used to solve real world problems have been published.



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1. INTRODUCTION

The Meat and Livestock Project TR038 was to facilitate the adoption of the decision support tool (DS tool) GrassGro. This project aimed to support users of GrassGro and promote its adoption in the grazing industries.

GrassGro is a DS tool developed by CSIRO Plant Industry's GRAZPLAN group to examine whole enterprise production risk for grazing enterprises in high rainfall temperate zones of Australia (Moore, Donnelly and Freer, 1997). GrassGro simulates pasture growth and predicts the intake of herbage of ruminants and their productivity using daily weather inputs and user-specified descriptions of soil type, pasture species and livestock. For any specified site users can analyse grazing management systems in terms of pasture and animal production, gross margins and year-to-year variability.

The target clientele of this comprehensive decision support tool was the network of advisers, consultants, researchers and tertiary educators servicing the grazing industries.

The project funded the position of a Project Officer over three years who was to:

1. train 20 GrassGro users per year,
2. develop an educational resource kit for GrassGro,
3. liaise with a group of that represented the grazing industries, the GrassGro Advisory Group, and
4. approach industry to promote teaching opportunities.

GrassGro was released with a commercial partner, Horizon Technology Pty Limited in November 1997 and Libby Salmon was appointed as Project Officer in May 1998.

1.1 Training

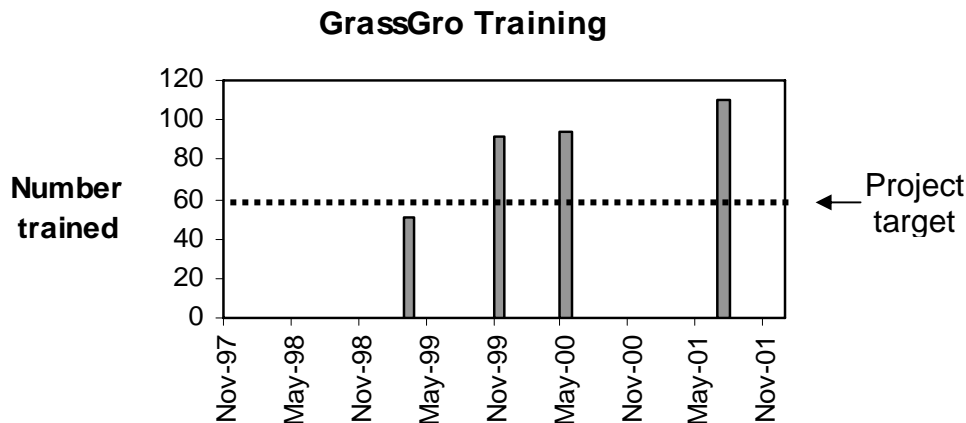
GrassGro was sold with a training package because it was novel and because potential users had variable computer literacy and gaps in their knowledge of grazing systems beyond their specialist discipline. Training comprised a two-day regional workshop followed by a one-day workshop about two months later. Users had phone and electronic access to technical support through the Project Officer. Between workshops users were asked to apply GrassGro to a grazing management issue.

By March 1999, 51 users had been trained and by November 1999, a total of 92 users had been trained in 14 workshops at 10 locations.

By January 2000, 148 licensed copies of GrassGro had been distributed to 52 sites in Australia for use by extension officers and consultants (44%), researchers (32%), tertiary educators (18%), primary producers (2%) and agricultural policy makers / other (4%). An assessment of the adoption of GrassGro based on a survey and training evaluation showed that the client group found GrassGro useful and, after training, the group members felt competent to use it (Donnelly and Moore, 1997).

At this point a decision was made to support previously trained users and by July 2001 a total of 110 users had received training (Fig 1). The release of a new version of GrassGro is anticipated in 2001 and this will be followed by training of a further 12 (approx) users later this year. The names of GrassGro users who have received training have been submitted in training reports in accordance with MLA milestones.

Fig 1: Number of GrassGro users that have received training



Evaluation of training

CSIRO Plant Industry used two methods to evaluate the effectiveness of training and the adoption of GrassGro:

- a questionnaire at the end of each training workshop, and
- a survey of users.

Formal evaluation of training commenced in mid 1998. At the end of each workshop participants were asked to complete and return, anonymously, a one-page questionnaire. Fifteen questions investigated the confidence of users in operating GrassGro, their opinion of the adequacy of the training package, their understanding of the limitations of the DS tool and the availability of technical assistance using a scale of 1 to 5. The same questionnaire was used at both initial and follow-up workshops to record any change in user response over the training period. The results of evaluation for each training workshop have been submitted in milestone reports.

In March 1999 (16 months after release) all recipients of licensed copies of GrassGro were surveyed. Fifty three questionnaires were sent by email and 80% responded by email or post. Users were asked three questions about training and five questions about their use of GrassGro. Five further questions asked the user to rank their agreement with statements about their confidence in using GrassGro and agreement with lists of issues that enhanced or impeded its use. Users were asked to make comments or suggestions.

The results of the survey and training evaluation demonstrate GrassGro’s usability and value to clients who have gained the necessary skills to apply the tool:

- The results endorsed the provision of training and support for GrassGro clients.

- Training, documentation, technical support and the forum provided by workshops to discuss grazing management issues were highly valued by GrassGro users.
- On completion of training, participants felt confident in operating and applying GrassGro.
- The range of problems analysed and categories of work to which GrassGro was applied reflect the diversity of client occupations (Table 1).
- The value of these applications is indicated by the willingness of users to extrapolate the results of an individual farm analysis to a regional level.

Table 1: Occupations of GrassGro trainees at July 2001

	Tertiary Education	Extension/ Consultant	Science/ Research	Producer	Other	TOTAL
No.	23	48	33	2	4	110
%	21%	44%	31%	2%	4%	100%

The development team's responsiveness to user concerns has fostered a collaborative relationship with the target market and has led to the development of a second version of GrassGro in recognition of user needs (Salmon and Moore, 2001).

Further evaluation of the adoption of GrassGro is planned following the release of the new version.

GrassGro Resource Kit

The resource kit is prepared for the commercially released version of GrassGro (203b) and is distributed to GrassGro users at the time of training. It was developed in several stages and used extensively at training workshops. The kit was revised continually in response to user feedback and from evaluation of training courses. The final kit has materials in hard copy to meet user demand for "manuals" as well as electronic documents that are intended to minimise publishing costs of high quality materials.

The resource kit has been reviewed by the GrassGro Advisory Group during its development and the recommendations of the group have been included.

Contents of Resource Kit

1. GrassGro CD with on-line Help
2. GrassGro Booklet
3. GrassGro Flyer
4. Hardcopy manuals for GrassGro, Met Access and LocBuild
5. Agricultural Systems Papers I, II, III
6. Worked examples of typical applications (hardcopy and PDF)
7. A copy of a PDF file of annotated Powerpoint presentations of the training workshop (hardcopy and PDF)
8. Published applications

1.2 Promotion of Teaching Opportunities

GrassGro's value as an educational tool was recognised by many users and strongly advocated by the GrassGro Advisory Group.

While CSIRO Plant Industry's commercial partner, Horizon Technology, has provided many of the contacts for initial training, the log of industry contacts submitted annually demonstrates the range of commercial and teaching opportunities pursued by the Project Officer.

As a result of these combined efforts GrassGro has been incorporated into the following successful teaching projects:

Tertiary Education

- GrassGro Teaching Project at University of New England, Armidale, NSW: 14 lecturers trained and over 2000 student contacts with GrassGro in the School of Rural Science and Natural Resources. This project, which was led by Dr Jim Scott and supported by a CUTSD grant, has integrated learning across 9 undergraduate units. As part of this project the university has developed the capability to deliver GrassGro "live" to external students over the internet.
- University of Adelaide, Adelaide, SA – undergraduate courses in Agricultural Science conducted by Dr Bill Belotti.
- Charles Sturt University, Wagga Wagga, NSW – post-graduate courses conducted by Dr E. Wolfe.
- La Trobe University, Melbourne, VIC – workshop for final year students of Agricultural Science that was designed to assist a farm case study –conducted by Dr Peter Sale.
- University of Western Sydney, Richmond, NSW – practical class to third year Agronomy students- Dr Samsul Huda

Adult Learning

GrassGro has been demonstrated to farmer groups to create an awareness of GrassGro and show its ability to assist the objective analysis of production risk for a range of typical on-farm problems.

Some of the farmer groups to which GrassGro has been presented include:

- SGS Farm Walk field days to Ginninderra Experimental Station, Canberra, ACT;
- Bombala SGS Group, Bombala, NSW;
- South Roxby Project,
- Farming for the Future Group, Delegate, NSW;

- Goulburn Comparative Analysis Group, NSW;
- Farm 2000 TopCrop group, Condobolin, NSW;
- Leading Edge Conference, Mark Lucas Agronomy Service, Walwa, VIC;
- Farmer production group led by consultant Bruce Allworth, at “Glenfalloch” , Holbrook;
- 40 farmers led by Col Medway, Agronomist with rural agents Wesfarmers Dalgety, Yass;
- NSW and VIC Grasslands Association Conferences – poster presentations.

GrassGro has also been incorporated into the following Producer Initiated Research and Development (PIRD) grants:

- Production risk at Mansfield, VIC, - Southern Farming Systems Group, co-ordinated by Dr J. Webb Ware, Mackinnon Project, Werribee, VIC;
- Limitations to production from soil physical properties and phosphorous response - Bookham Agricultural Bureau, Bookham, NSW, co-ordinated by Phil Graham, NSW Agriculture, Yass, NSW;
- High input farming -Goulburn Comparative Analysis Group, Crookwell, NSW.

Case studies

Case studies are intended to demonstrate the application of GrassGro to grazing industry issues. The case studies are used to publicise GrassGro and stimulate the demand amongst producers for GrassGro analyses by trained users. The target audiences of published case studies are advisors and consultants to the grazing industries and producers.

The following case studies have been developed for the grazing industries and reported to MLA with milestone reports:

1. “Evaluating Backgrounding Systems for Beef Herds at “Tauwitcherie””, – with Richard Harvey, “Poltalloch”, Meningie, SA;
2. “Fine tuning the time of lambing in spring” with Karl Behrendt at “Bergen”, Isabella via Burruga, Central Tablelands NSW;
3. “Assessing production risk of a grazing lease” with Grant Burbidge, “Connemara”, Tarcutta, NSW

Further case studies are in progress with beef producers at Holbrook and Bungendore, NSW; bull beef producers at Hamilton, VIC and prime lamb producers at Gundagai, NSW.

GrassGro Advisory Group

As part of the project, CSIRO Plant Industry was to “*appoint a “users group” to assist with priorities, direction and release of promotional material.*” This group, referred to as the GrassGro Advisory Group, has provided invaluable advice to CSIRO on the adoption of GrassGro, in setting strategic directions and reviewing promotional literature and educational resources for GrassGro.

The advisory group met face-to-face once a year in Canberra and by teleconference at intervening periods. The minutes of these meetings have been submitted to MLA according to milestones. The recommendations of the Advisory Group have been considered and the outcome of actions have been reported at subsequent meetings.

The members of the GrassGro Advisory Committee and observers are consultants from state departments and private industry and leading producers:

Dr Bruce Allworth
"Talooby"
HOLBROOK NSW 2644 Ph: 02 6036 9233

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Principal Research Scientist
CSIRO Plant industry

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2. CONCLUSION

This report has summarised the successful and timely completion of all milestones in this project.

The successful adoption of GrassGro by leading advisors, scientists and educationalists servicing the grazing industries has been greatly facilitated by the position of Project Officer and the delivery of comprehensive technical support of this decision support tool.

In recent years producers have been confronted with uncertainty in commodity prices and increasingly stringent market specifications. GrassGro is a tool, which can help producers, improve their profits in the face of these challenges through the objective assessment of production risk. MLA's early support of GrassGro's adoption will help producers strategically position their grazing businesses into the future.

3. REFERENCES

Donnelly, J.R. and Moore, A.D. (1997). Decision support: delivering the benefits of grazing systems research. Proc.18th Int. Grass. Cong., Saskatoon, Canada, pp 469-478.

Salmon, E.M. and Moore, A.D. (2001). Adoption and Influence: industry evaluation of the GrassGroTM decision support tool., Proc.19th Int. Grass. Cong., Sao Pedro, Brazil. Pp 1073-4.

Milestone 23: Log industry contacts, promotion of teaching opportunities

Industry Contacts April 2000 – July 2001

Date	Contact:
Apr 00:	
6 Apr	Initial runs for case study to use GrassGro to assess timing of irrigation to grazed subclover pastures at Finley, NSW. Collection of soil and pasture production data and initial runs.
10 Apr	Meeting with Roger Cohen, University of Saskatchewan, Canada to discuss training for GrassGro users.
13 Apr	Workshop on Participatory Decision Making at University of Western Sydney, Richmond, NSW.
14 Apr	Presentation on GrassGro to Peter Knight, Academy of Technical Scientists and Engineers from Perth, WA Phone hookup with CRC for Premium Wool in WA to discuss wool fibre diameter profile measurement for validation of GrassGro modelling of staple strength.
17 Apr	Presentation on GrassGro and other Decision Support Tools to Keith Gordon, CEO, Wesfarmers.
18 Apr	Speak informally to PROGRAZE group at Grant Burbidge's property "Connemara" Tarcutta, NSW. Prepare wethers, dyeband wool and measure pasture for farm case study.
19 Apr	Endorsement by NSW Ovine Johne's Disease Advisory Committee to assess management options for grazing enterprises affected by OJD to support application to APRT.
20 Apr	Meeting with Col Langford, NSW Agriculture, Goulburn, NSW to discuss suitability of data set from Project 18 trial over 7 years for modelling.
25 Apr	Farmer client request to use GrassGro to assess potential production of grazing lease: simulations by CSIRO.
28 Apr	Send Ken Greathead, Agriculture WA, Albany, WA a trail GrassGro pasture set for WA. Send draft report on Time of Lambing case study and prepare poster for NSW Grasslands Conference to/with Karl Behrendt, "Bergen" NSW

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May 00:

- 1 May Send John Crichton, AUSSIE GRASS Project, new pasture sets.
- Discussion of GrassGro simulation results for Bruce Allworth, "Talooby" Holbrook, NSW
- 3 May Meeting at request of John Paul, NSW Agriculture, Tamworth to discuss work and supply with pre-release version of GrassGro for his use with lucerne grazing trials in NSW
- 5 May Meeting with Phil Graham and Mike Keys, NSW Agriculture, Yass/Queanbeyan, NSW on measurement of pasture species composition and data collection from trail sites in southern NSW.
- 11 May Presentation of GrassGro to Dr Anna Riddley and Dr Craig Beverley, DNRE,
- Rutherglen.
- 18 May Presentation of GrassGro to Australian Wool Services Pasture Advisory Group, Melbourne, VIC.
- Preparation of GrassGro simulation files for NLWRA Billabong, NSW, catchment.
- Test and report on software bugs in GrassGro detected by John Crichton to GRAZPLAN development group.

Jun 00:

- 14-16 Jun Poster at Grasslands Society of VIC Conference
- 26 Jun Presentation to Dr M. Gill from Macaulay Land Research Institute, Aberdeen , Scotland
- 27 Jun GrassGro presentation to Ken Louie and David Pachecheo, Ministry Agric. and Fisheries, Palmerston North, NZ.
- 30 Jun Simulation of pasture growth rates for Don Fletcher, ACT Environment for eastern grey kangaroo graze down trials.

Jul 00:

- 11-13 Jul Poster at Grasslands Society of NSW Conference
- 17-18 Jul GrassGro workshop UNE
- Bob Marchant and Clare Edwards , NSW Agriculture, Armidale discuss use of GrassGro in farmer group courses on Northern Tablelands

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- 24 Jul contact Holmes and Sacket re upgrading GrassGro and use in benchmarking
- 28 Jul GrassGro simulations for Col Scrivener, Mackinnon Project, Uni Melbourne of pasture availability at Inverell, NSW
- NLWRA: Billabong catchment simulations
- Aug 00:**
- 1 Aug Presentation to Delegate Farming for the Future Group
- 7 Aug Send GrazPlan promotional material to Mr J. Wright, Meningie, SA.
- GrassGro simulations for Col Scrivener, Mackinnon Project, Uni Melbourne of pasture availability at Lucindale, SA
- 10 Aug Simulations of lucerne at Trangie, NSW for Warren McDonald NSW Agriculture as basis for discussion of pasture growth for central west Prograze manual
- Meeting with Phil Graham, NSW Agriculture, Yass on soil sampling for Bookham study
- 14 Aug Presentation to 12 producers in Goulburn Comparative Analysis Group
- NLWRA report – Billabong catchment
- Review media release on GrassGro by Gorrie Media for Wool Services publication Decision Maker
- Presentation in Canberra to Wesfarmers
- Sep 00:**
- 1 Sep Discuss application of MetAccess with HIH Insurance
- 8 Sep Meeting with Darren Kriticos re CRC Weeds and access to new version of GrassGro
- NLWRA report – Kamarooka simulations and catchment
- Oct 00:**
- 6 Oct Presentation to Farm 2000 TopCrop group
- 11-12 Oct GrassGro follow up training workshop UNE, Armidale
- 17-18 Oct GrassGro initial training workshop Seymour VIC

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- Review media release on GrassGro by Gorrie Media for Wool Services publication Wool TechStyles
- Contact Kym Abbott at Sydney University re use of GrazPlan DS Tools in Veterinary and Agricultural Science courses: sent publications.
- 25 Oct Discussed development of GrassGro users group for southern tablelands NSW with Phil Graham, Sheep and Wool Officer, NSW Agriculture, Yass
- 31 Oct Presentation on GrassGro to Christine Ludwig from CSIRO Plant Industry, Perth
- Nov 00:**
- 10 Nov Presentation to Gavin Sheath from Ruakura Research Centre, NZ
- Phone conversation with farmer Robert Campbell in response to poster in Proceedings of Vic Grasslands Society Conference
- 13 Nov Prepare GrassGro locality files for Greg Sweeney, PIRSA, Flaxley, SA
- 14 Nov John Crichton –phone conversation re representation of low ME intake with use of GrassGro in AUSSIE GRASS project, supplied copies of Northern tablelands soil profiles
- 16 Nov Ken Greathead sent final report of study of year round supply of beef using GrassGro, discussed Paul Sanford as GrassGro collaborator in WA on Ken's retirement and Ken's replacement by Xerong Wang at Albany as beef cattle nutritionist in Ag WA.
- 20 Nov Don Fletcher, Environment ACT, discuss use of GrassGro to predict pasture growth for eastern grey kangaroo graze down study
- Sally Martin, Sheep and Wool Officer, Agriculture NSW , Cootamundra- followed up inquiry re GrassGro from Horizon Technology
- 29 Nov Dan Kneebone, Toowoomba, Q, prospective PhD student at UNE - use of GrassGro discussed for tropical northern Australia
- Bruce Allworth, "Talooby" phoned re supplementary feeding steers
- 30 Nov Steve Clarke, DNRE, Hamilton, VIC re GrassGro use in climate study
- Dec 00:**
- 6 Dec Parameterisation of winter active Lucerne in GrassGro, as reported by Peter Vickery discussed

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- Phone conversation with John Crichton re GrassGro bug
- 8 Dec Contacted Peter Wynn, Head of Dept Animal Science, Faculty of Agriculture, Sydney University re upgrading their copies of GrazFeed and demonstrating GrassGro to students
- 13 Dec Presentation to Maurice Webster, Merial.
- 14 Dec Phone conversation with Kym Abbott, Faculty of Veterinary Science, Sydney University re use of GrazFeed and GrassGro
- 19-20 Dec Training workshop, Canberra
- Jan 01:**
- 16 Jan Email Steve Clark, DNRE, Hamilton, re MetAccess data importation bug
- 30-31 Jan Emails from John Crichton re GrassGro bug
- 31 Jan-1 Feb: Initial training workshop, Hamilton, VIC.
- Feb 01:**
- 2 Feb Follow-up training workshop, Seymour, VIC
- 7 Feb Phone conversation with Sari Glover, Acid Action, NSW Agriculture on GrassGro use at Durran Durra and Binalong sites.
- 8 Feb Meeting with David Buckley and ANU Statistical Consulting Unit, SOI Project
- Phone conversation with Juliette Gilmore, a PhD student at CRES, ANU re GrassGro use
- Send Charlie Showers, DNRE Rutherglen, references for soils for GrassGro for use in LANDMARK Project, discuss GrassGro weather locality problem
- 9 Feb-5 Mar: Travel to present poster at XIX International Grasslands Congress 2001, Brazil; USDA-ARS Great Plains Systems Research Unit, Fort Collins, Colorado, USA and University of Saskatoon, Canada.
- Mar 01:**
- 7 Mar Sent Steve Clarke, DNRE, Hamilton latest version of MetAccess
- 9 Mar Presentation of GRAZPLAN decision support tools to SGS National Farm walk, Ginninderra Experimental Station, ACT

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19 Mar Presentation of GrassGro at Leading Edge Conference, Mark Lucas Agronomy Service, Walwa, VIC.

23 Mar Meeting with Phil Graham, NSW Agriculture to discuss soil test results for Bookham Agricultural Bureau PIRD project.

Apr 01:

2 Apr: Meeting with Anna Riddley and Craig Beverley DNRE to discuss use of GrassGro in the Landmark Project.

5-6 Apr: GrassGro training for Dr G. Mata CSIRO Livestock Industries

26-27 Apr: GrassGro workshop with Dr Peter Sale to 25 final year Agricultural Science students in AGR41ACS, La Trobe University.

Phone calls and emails to agronomists to circulate questionnaire on flowering times for grasses parameterized in GrassGro.

May 01:

8 May Meeting with CottonLOGIC development team from CSIRO Plant Industry, Narrabri, NSW

14 May Phone conversation with Kieran Ransom re GrassGro sue in central Victoria

15 May Phone conversation with John Crichton re GrassGro bugs and AUSSIE GRASS project

Phone conversation with John Paul, NSW Agriculture Tamworth re GrassGro performance against data from lucerne trial and replacement GrassGro collaborator

Phone conversation with Tim Prance, SARDI, Goolwa, SA re GrassGro reinstallation and bugs (version 203b)

18 May GrassGro simulations for Dr C. Scrivener for MLA funding submission by Mackinnon Project

Jun 01:

2 Jun Helen Daily, UNE teaching project phone conversation re request for GrassGro GRW file tags

Rick McRae, requesting GrassGro training to use in ACT Emergency Services Bureau for prediction of fire hazard

20 Jun Phone meeting with UNE teaching project

Facilitation of the adoption of the decision support system GrassGro

- 21 Jun Meeting with Phil Graham re GrassGro simulation of time of germination at phosphorous trial site in latest version of GrassGro
- 26 Jun Meeting with Geoff and Sally White and David Kowald, "Mundango" Braidwood, NSW for initial GrassGro simulations for beef enterprise case study
- Jul 01:**
- 3 Jul GrassGro training for David Buckley, SOI Project
- 12 Jul GrassGro presentation to Incitec consultancy group, co-ordinated by Doug Edmeades, Sydney
- 19 Jul Discussion with Richard Taylor re case study for "Foxlow", Bungendore, NSW
- 20 Jul Discussion of GrassGro project with South West Lean Beef Group at Hamilton VIC, in August 2001
- 20 Jul Email from Tony Reid, business development manager for The Farmshed website re inclusion of GrassGro
- 20 Jul Contacted Paul Sanford to discuss WA collaboration for GrassGro. Discussed his proposal for GrassGro training for post doc appointee in Sustainable Grazing Systems Project Animal theme. Discussed use of GrassGro in SGS if kikuyu parameterized for new version.
- 25 Jul Poster presentation and industry display at Grassland Society of NSW, Gundagai, NSW

Case studies

Case studies are intended to demonstrate the application of GrassGro to grazing industry issues. The case studies will be used to publicise GrassGro and stimulate the demand amongst producers for GrassGro analyses by trained users. The target audiences of published case studies are advisors and consultants to the grazing industries and producers.

AWRAP has part-funded the position of GRAZPLAN Project Officer from May 2000 – Apr 2002 to undertake five case studies. Thus the case studies have been developed in response to production issues raised by leading individual wool producers, producer groups and key advisors. These issues have wide application within the wool industry. Some of the case studies that were planned and discussed last year with AWRAP have been initiated but are incomplete due to delays in on-farm data collection by producer groups or inappropriate seasons. Their completion is anticipated in 2001-02.

Case studies relevant to beef and meat sheep production are also being conducted.

1. Estimating Production Risk for a Grazing Lease

Synopsis:

Leasing country is one way to expand the scale of a well-managed wool enterprise. To assess the viability of a grazing lease a producer must calculate the required investment in livestock and fertilizer and production risk associated with the particular enterprise at the lease location. However if the lease is in an unfamiliar district the producer may be uncertain about predicting pasture production and estimating optimum stocking rates and management.

GrassGro was used to assist Grant Burbidge, a fine wool grower at Tarcutta on the south west slopes of NSW to simulate a proposed lease on the southern tablelands of NSW.

Despite using several sources of information about the lease, including local advisors, published experiments in the region, property records and his observations, Grant was concerned by the owner's comment that they had "big springs with not much feed between". The GrassGro simulations confirmed that pasture production was indeed limited in autumn and winter. GrassGro was then used to explore the best time to lamb to utilise the pasture supply, for several stocking rates and levels of soil fertility.

The simulation emphasised where management needed to differ from that on the home property to maximise use of the lease and helped in assessing the value of the lease.

Conclusion:

GrassGro improved Grant's confidence in making key decisions affecting the profitability of a grazing lease.

2. Time of lambing

Synopsis:

Selection of an appropriate time of lambing is a major profit driver in most pasture-based sheep breeding enterprises. It is well established that in most of southern Australia lambing in late winter-spring ensures the best match between ewe nutrient demand and pasture supply (Reeve and Sharkey, 1980). What are the gains to be made, if any, from lambing at different times in spring?

GrassGro was used with consultant Karl Behrendt of Behrendt Agricultural Management to determine whether lamb deaths would increase lambing was delayed from early September to late August. The property 'Bergen' is located at Isabella on the central tablelands of NSW at an elevation of 1000m. Low temperatures limit pasture growth until late September and threaten lamb and ewe survival.

GrassGro was used to estimate lamb losses and weaner growth rates for lambing dates between August and October at several stocking rates.

The GrassGro analysis demonstrated that stocking rate had a much greater impact on gross margins than time of lambing in spring. However business risk also increased at higher stocking rates. GrassGro showed that at high stocking rates later lambing in spring helped modify business risk .

Conclusion:

GrassGro:

1. highlighted the relative profitability of different management practices and helped keep the focus on the most important profit drivers ie. stocking rate rather than time of lambing in spring.
2. enabled the consultant to address concerns that inhibited adoption of higher stocking rates. The impact of lambing date on lamb survival, weaner growth rate, ewe condition and fibre diameter profile were explored within GrassGro. Gross margin sensitivity analysis of soil fertility and supplement costs did not change the initial findings.
3. boosted the consultant's confidence to adopt management practices that have a major impact on wool income.

Case studies in progress:

1. Examination of optimal stocking rates, management of autumn feed supply and time of shearing, validation of predictions of fibre diameter profiles with Grant Burbidge, "Connemara", Tarcutta – Merinos.
2. Beef production at 2 sites on the southern tablelands of NSW: Geoff White, "Mundango", Braidwood and Ginninderra Experimental Station, Canberra. Comparison of tactical decision-making in response to the drought in winter 2001 at these sites.
3. Bull beef production – South West Lean Beef Group –Graham Lean and Colin Frawley, Hamilton, VIC.
4. Impact of deferred grazing of steers in autumn with Richard Taylor at "Foxlow" , Captain's Flat, NSW –beef cattle.
5. Examination of opportunistic grazing of steers and time of calving with Bruce Allworth, "Talooby", Holbrook, NSW farmer and consultant at Holbrook –beef cattle. Sustainable Grazing Systems: Monaro, NSW with Stuart Burge: SGS trial site at Joe Hood's property "Myamba", Bombala examining optimum stocking rate and phosphorous application –Merinos – data unavailable.

Potential Case Studies:

1. Drought management in WA –Merinos.
2. Supplementary feeding in VIC- Merinos.

3. Doug Godwin, Tooraweenah, Central West NSW Lamb Production group: PIRD application for group made Feb 2000. Involvement likely to be information and general discussion of decision support tools: awaiting release of new version with parameterisation of lucerne and barley grass-like annual grass.
4. Central West Farming Systems: more likely to be a FarmWise study with mixed cropping and livestock enterprises.
5. Col Medway, Wesfarmers, Yass, client benchmarking group with PIRD funding for financial comparison by Boyce and Co. –to receive follow-up training.
6. Drought management strategies with Peter Simpson, NSW Agriculture, Goulburn, NSW: not further contact.
7. Problem to be defined but one issue is subclover persistence on black basalt soils at Col Murdoch's property "Inverloch", Ando –beef cattle.
8. Greg Meaker, use of GrassGro to explore production risk with Beef Production group at Braidwood, Southern Tablelands, NSW.
9. Acid Action on Southern Tablelands co-ordinated by Sari Glover: assessment of optimum stocking rates at trial sites and economic values of removal of production limitations.
10. Jim Weston, "Oakleigh" Parkes, NSW: autumn fed supply for Merinos.
11. Tim Prance SARDI, SA: case study to be developed with sheep that can be used in SARDI extension services –proposals by SARDI to be sent to LS.
12. CICERONE group, Armidale, NSW: no discussions but contact via Jim Scott at UNE re activities. Survey of producer members indicated several issues that were suitable for analysis in GrassGro. GrassGro pastures require further evaluation on Northern Tablelands before involvement with this group.

Collaborations

Funding for Industry Collaborations – update

1. Goulburn Comparative Analysis Group: 19 producers on Southern Tablelands of NSW successfully applied to Australian Wool Services for a PIRD grant to examine methods to increase wool production. The last of three stages for their program is to use data from trials on their farms in GrassGro to assist decision making within the group.
2. Successful application for a PIRD grant by Australian Wool Services to Bookham Agricultural Bureau producers and Phil Graham, NSW Agriculture, Yass to examine limitations to production from soil physical properties and phosphorous response:

3. Successful application to Australian Pastoral Research Trust to use GrassGro to examine the impact of weather forecasts on decisions in grazing systems at South Roxby with Mackinnon Foundation, University of Melbourne.
4. Ongoing training and technical support until Mar 2001 at University of New England, Armidale, NSW, funded by Committee for University Teaching and Staff Development: "Development and adoption of the GrassGro decision support program to facilitate integrative teaching across years in applied science and management degrees".
5. Successful application by Mr John Webb Ware from South Roxby Project for PIRD grant from MLA to use GrassGro to assess production risk with a group of graziers in NE Victoria. Application to MLA unsuccessful. Re-application to Australian Wool Services- results pending. Work expected to proceed in 2000.
6. Joint application by CSIRO Plant Industry and DNRE Victoria to Dairy Research and Development Corporation to provide a Dairy Farm Strategic Support System based on GrassGro: unsuccessful.
7. Application to Australian Pastoral Research Trust to analyse management options for grazing enterprises affected by Ovine Johne's Disease (OJD): unsuccessful

Pre-release collaborators

Eight GrassGro users have been issued copies of the new version of GrassGro for pre-release evaluation in a range of environments:

Table 3: Collaborators

Date of Issue	Collaborator	Address
Feb 2000	Doug Alcock	NSW Agriculture, Dubbo, NSW
Feb 2000	Steve Clark	DNRE, Hamilton, VIC
Mar 2000	John Crichton	NSW Agriculture, Orange, NSW
Oct 2000	Darren Kriticos	CRC for Weeds, ACT
Apr 2001	Tim O'Brien	NSW Agriculture, Tamworth, NSW
	Mike Hill	Bureau Rural Sciences, ACT
May 2001	Gonz Mata	CSIRO Livestock Industries, WA
Jul 2001	Paul Sanford	Agriculture WA, Albany, WA

Papers/Publications

Simpson, R., Donnelly, J., Graham, P., Salmon, L., Moore, A., and Hill, M. (2000) Using technology to improve the sustainability of grazing systems in high rainfall landscapes. In. Emerging Technologies in Agriculture: From ideas to adoption. (Eds. White D.H., Walcott, J.) *Proceedings of a conference 25-26 July 2000*, Bureau of Rural Sciences, Canberra.

Simpson, R.J., Salmon, L., Moore, A.D., Donnelly, J.R. and Freer, M. (2001) Towards a common advisory toolkit for managing temperate grazing systems. *Proceedings of the 10th Australian Agronomy Conference*, Hobart. www.regional.org.au/au/asa/2001/

Scott, J.M., Daily H.G., Moore A.D., Salmon E.M., Donnelly J.R., McCook R (2001) Enhancing student learning with complex Decision Support Systems *Proceedings of the 10th Australian Agronomy Conference*, Hobart. www.regional.org.au/au/asa/2001/

Huda A.S.K., George D., Salmon L., Balasubramanian T.N., Selvaraju R., Geethalakshmi V., Pandian B.J., Wallace G.(2000). Climate Education and Extension – from Teaching to Learning –*International workshop on Farm Management Decisions with Climatic Risk*, Toowoomba, Q.

Poster papers

Behrendt K., Stefanski A. and Salmon E.M. (2000) Fine tuning the time of lambing in spring: is it profitable? *Proceedings of the 15th Annual Conf. Grassland Society of NSW*: 127.

Salmon E.M. and Moore A.D. (2001) Adoption and influence: industry evaluation of the GrassGro decision support tool *Proceedings of the XIX International Grasslands Congress, Brazil (2001)*: 1073-4

Salmon L., Simpson R., Graham P. and Donnelly J.R. (2000) Setting achievable stocking rate targets *Proceedings of the 41st Annual Conf. Grassland Society of Victoria*: 153

Salmon L., Simpson R., Burbidge G. and Donnelly J.R. (2001). Estimating Production Risk for a Grazing Lease. *Proceedings of the 16th Annual Conf. Grassland Society of NSW*: (in press)

Reports

Salmon, L and Stefanski A. (2000) Report on Case Study to Evaluate Time of Lambing in Spring.

Salmon L., Simpson R., Burbidge G. and Donnelly J.R. (2000). Estimating Production Risk for a Grazing Lease.

Stefanski A., Simpson R., Salmon L., and Moore A.D (2000) National Land and Water Audit Report: Simulation of Pasture Systems (Billabong).

Stefanski A., Simpson R., Salmon L., and Moore A.D. (2000) National Land and Water Audit Report: Simulation of Pasture Systems (Kamerooka)

Media

3 GrassGro case studies for Woolmark publication Decision Maker (in press)

Article for Woolmark publication Wool Techstyles



Minutes of GrassGro Advisory Group Meeting

Monday 23 July at 10:00 am
The Link Room, Level 2, Discovery Building
CSIRO Plant Industry, Clunies Ross St, Canberra

Attendance

Bruce Allworth, Alan Bell, Mark De Mestre, Peter Doyle, Andrew Vizard, John Donnelly, Mike Freer, Richard Simpson, Andrew Moore, Libby Salmon.

Apologies

Doug Alcock, Rob McCook (Horizon Technology)

Invited speakers

Jim Scott, Grant Burbidge, Karl Behrendt

Observers

Neville Hermann, Janna Heard

Minutes of previous meeting held (20 Oct 2000) accepted.

Developments

Description and results of modelling with NutriAce - Richard Simpson

Soil phosphorous budgeting at the Wallaroo3 grazing trial at Ginninderra Experimental Station.

Setting target stocking rates with GrassGro for the Bookham district by Bookham Agricultural Bureau, NSW Agriculture and GRAZPLAN group - Richard Simpson.

Preliminary soil sampling of different land classes and data analysis by CSIRO suggest that there is a great range in the values for bulk density and plant available water in different paddocks within a single DLWC land classification. This variation may prevent generalization of soil physical characteristics for different land classes, although further work is required on the relationship between soil permeability values and land classes. This work implies that in order to set target stocking rates in a district using GrassGro, individual paddocks within a single land class must be sampled. Further soil sampling in the Bookham district is required. The Bookham Agricultural Bureau received PIRD funding from AWS for the cost of soil testing.

Wesfarmers - John Donnelly

Wesfarmers have agreed to fund a 3-year post-doc position of GRAZPLAN Systems Analyst. In return CSIRO Plant Industry will provide Wesfarmers with access to decision support tools developed at CSIRO Plant Industry in agreement with Horizon Technology and provide any

training required to use the tools. There have been delays in the signing of the legal agreement.

Andy Thomas from Wesfarmers is interested in becoming a member of the GrassGro Advisory Group, should it continue beyond the MLA funding period. The present Advisory Group agreed that a representative from Wesfarmers would be beneficial.

Southern Oscillation Index study - preliminary report on the joint study by University of Melbourne, GRAZPLAN group and Australian National University Statistical Consulting Unit funded by the Hermon Slade Foundation into the accuracy and value of the SOI for decision making in livestock industries using GrassGro. The analyses to date suggest that the SOI has limited predictive value.

Australian Wool Services Funding - John Donnelly

AWS has confirmed current funding of 50% of the position of GrassGro Project Officer. The GRAZPLAN group is involved with several divisions of CSIRO and partners outside CSIRO in currently presenting a coordinated submission to AWS for funding for a large project on profitability and sustainability.

Case studies: progress - see attached Report and Log of Industry Contacts - Libby Salmon. Peter Doyle: of the new case studies, which are the priority? - these will be the two case studies delivered to AWS on wool production issues.

Report on UNE GrassGro teaching program - Jim Scott (UNE)

The GrassGro Teaching Project at UNE has delivered over 2000 student course contacts to undergraduates in the Rural Science and Ecosystem Management degrees. GrassGro training for fourteen lecturers by Libby Salmon and development of course materials by a part time appointee for the project, Helen Daily, were funded by a CUTSD grant. Evaluation of staff and students in the project has demonstrated the value of GrassGro as a teaching tool to integrate subjects which used to be taught as isolated disciplines. GrassGro is delivered from a central server. Modifications by Andrew Moore and Neville Hermann from CSIRO PI have enabled lecturers to constrain GrassGro's functionality at several levels and control course content to ensure focused use of GrassGro by students. These constraints are removed progressively in subsequent teaching units during the degree. The course materials and GrassGro can be delivered to external students via the world wide web.

- Based on the success of the GrassGro teaching project, Col Dorber (AWS) has agreed to 3 years' funding for the development a larger teaching project at UNE on Decision Support Software. GrazFeed has recently been supplied to UNE as a teaching tool with the agreement of Horizon Technology. Other decision support software developed by CSIRO PI and other groups will be included in the course. Funding has not yet been finalised for the project.
- Rather than merely delivering course materials electronically, the GrassGro teaching project has initiated a new era of tertiary course development that is highly integrated and promotes linkages across subject areas and critical problem solving skills.
- Suggested future areas of development are global delivery of GrassGro as a teaching resource or service via the web. The requirement for training currently

limits sales globally. Modifications to GrassGro may assist this process (see notes on Templating).

Andrew Vizard: As a result of this project what can other institutions now put in place to assist their use of GrassGro in teaching?

Jim Scott: Access to project report and documentation of the technology required for delivery and use on a network. The IT department at UNE would assist but only on a full cost recovery basis. Access to the teaching modules developed at UNE could be discussed, as is occurring with David Kemp at Sydney University. The potential for UNE to deliver both GrassGro and the course materials via the web should be discussed.

Producer case studies

Two leading graziers reported on their experience in analysing practical grazing issues with GrassGro which improved their profitability and confidence in decision-making.

Grant Burbidge "Connemara" Tarcutta, NSW: Assessing production risk for a grazing lease.

Karl Behrendt "Bergen" Isabella via Burruga, NSW: Fine tuning the time of lambing in spring.

Details of these experiments have been written up and published as case studies.

Release of 2nd version of GrassGro - Andrew Moore

- The quality assurance testing and validation process prior to release of the new version of GrassGro was described. A second round of testing will commence shortly once revisions to the model from the first round of testing are completed.
- The new features of GrassGro that will be included in the second version of GrassGro were demonstrated. These changes have been made in response to feedback from users. Revisions to the Canadian version of GrassGro were outlined and may be included in the Australian version of GrassGro if this is considered desirable by the Advisory Group.
- CSIRO was negotiating with Bureau of Meteorology for use of weather data sets from patch point data or from the Data Drill for up-dated localities for commercial GrassGro users.
- Andrew Moore has developed a spreadsheet that plots equations of processes in the GrassGro plant model and enables the user to test the effect of each parameter used to describe a plant species. This will be used as the basis for pinpointing gaps in knowledge that may be the focus of either research or collection of observational data e.g. by NSW Agriculture (see below).
- The spreadsheet also has application as an advanced teaching tool to give greater insight into the plant model.

Developments to the animal model - Mike Freer

- A similar spreadsheet that shows the effect of different parameters used to describe various sheep and cattle genotypes in the GRAZPLAN animal model has been prepared by Mike Freer.
- Improvements to the animal model were outlined, including the revised prediction of milk production by fat cows on poor quality diets. This modification was made in response to observations by scientists from other organizations who use GrazFeed.
- Mike Freer addressed the request raised by Doug Alcock that the animal model should parameterise another beef cattle genotype with high feed conversion efficiency, based on recent research by NSW Agriculture. Mike Freer said that the physiological basis of such a genotype could be easily tested in the spreadsheet and help elucidate whether the improved efficiency is due to a lower maintenance requirement by the animal or a greater efficiency of conversion of energy to body gain (lean or fat)? The productive potential and profitability of these two genotypes could then be tested in a model of a grazing system (GrassGro).

Resources for parameterisation of pasture plant model with NSW Agriculture - John Donnelly and Richard Simpson

NSW Agriculture has agreed to provide resources to assist with the parameterisation of plant species for GrassGro. The work will ideally involve a dedicated position in NSW Agriculture to collect data from NSW research and help develop parameter sets with the new modeller in the GRAZPLAN group at CSIRO.

Templates (see attached)

Neville Hermann presented a summary of proposed modifications to GrassGro's interface and the development of outputs as reports to assist users run simulations of typical applications. This should improve adoption rates by advisors, potentially enable use of GrassGro by farmers, and enhance delivery via the web. The templating concepts outlined at the meeting were strongly supported by the advisory group.

Training Report - tabled by Libby Salmon (see attached)

Recommendations on GrassGro training from Advisory Group:

- Bruce Allworth: replace the follow-up workshop with three projects that require the trainee to submit relevant GRW files to Libby Salmon by email to be checked and discussed within a time frame.

Resource Kit - see attached report - Libby Salmon

Recommendations on GrassGro resource kit from Advisory Group:

- Peter Doyle: Cite key references for proposed management options.
- The GrassGro Resource Kit was strongly endorsed by the Advisory Group.


Business arising from previous meeting - John Donnelly

1. Andrew Moore should try to obtain data from Bruce Warren in Ag WA to assist with further modelling of pasture digestibility dynamics.
2. Dan Carter and Paul Sanford would be better sources of WA data sets.
3. CSIRO should encourage Jim Scott to ensure public access to teaching materials from GrassGro UNE teaching project. Successful public access should be included as a criterion in the review of project. – discussed.
4. CSIRO should invite Wesfarmers to join GrassGro Advisory Group.
5. Wesfarmers approached with positive response.
6. CSIRO should investigate the value of including in GrassGro a digitised map of Northcote soil classifications across Australia.
7. Under investigation by Andrew Moore.
8. Libby Salmon should include regional templates for soil selection and livestock management as part of the templates that are being prepared. The resource kit is the first development of typical problems.
9. The regional templates are discussed below.
10. Libby Salmon should circulate resource kits, case studies, templates and worked examples to GAG members as they are developed.
11. Completed.
12. CSIRO should continue to promote GrassGro in Western Australia and address any criticisms directly. Follow up the use of GrassGro by WA GrassGro collaborator.
13. Paul Sanford, Agriculture WA, Albany has agreed to be a GrassGro collaborator for WA.
14. CSIRO should ensure they are on DRDC's contact lists.
15. DRDC has currently suspended any funding for modelling work.
16. CSIRO should continue to seek funding from the environmental sector as well as livestock industries and emphasize the ability of DS Tools to quantify the impact of management strategies on grassland systems.
17. Funding strategies discussed above.

Recommendations from GrassGro Advisory Group

1. Templates of typical applications and reports of key outputs should be developed for GrassGro to separate the complexity of its use with the power of its output. For example, Grant Burbidge uses GrassGro to get a 'feel' for the potential.

2. Get the information from GrassGro out to more producers. Enhance the delivery of GrassGro to producers and different teaching sectors (secondary to tertiary and adult learning) by modifications proposed in templating and by delivery via the web.
3. The version delivered via the web could be constrained, in a manner similar to a demo version. There are probably 20 key questions that must be analysed for grazing systems. These analyses could be templated. Users could then expand their access to GrassGro's functionality by paying for a license and training, as appropriate. The software could be centrally delivered and controlled e.g. via a site like The Farmshed. This would enhance quality control and version upgrades. The quality of rural telephone lines may restrict this mode of delivery to farmers. This strategy may greatly expand the number of users who pay a small fee but are exposed to high quality information.
4. Develop "Type farms" ie. GrassGro applications that are specific for a district and delivered via the web. These simulations and analyses would be up to date and provide topical regional information as a basis for comment and recommendations by an advisor in the region.
5. Ensure that GrassGro is not undersold to a web site provider. Place a high value on the high quality product and the high quality information it generates.
6. Consider commercial link to a paddock recording system –as advertising rather than as linked software.
7. Convince potential users in Western Australia that GrassGro has application in both the high rainfall SW and the drier cropping zone, as separate issues. Solving the technical validity of the plant model in these environments will not be adequate to get adoption of GrassGro in WA. Its application to industry problems must be demonstrated there and the political resistance to the model overcome by promoting a champion of GrassGro. Prioritise proposed use of GrassGro for SGS project with Paul Sanford and Steve Clark.
8. Parameterise Dinninup sub clover and kikuyu for use in simulations of Western Australia.
9. Changes to management model:
 - (a) allow retention of lambs as two year old hoggets.
 - (b) sell lambs on a price per head as well as by weight
10. Output of pasture utilization (pasture consumed/pasture grown) and apply this output to analyses of risk and stocking rate optimization. This analysis may be of benefit to the Weed CRC.
11. Funding for NutriAce should be sought on the basis of its prediction of acidity and the research for other nutrients built around this. The submission should emphasize the community benefit rather than the productivity benefit to producers. Policy makers should be very interested in this model as they are making decisions based on much less information than is provided by NutriAce even in its current state of development.

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12. Seek funding from groups that will attract matched federal funding.

Future role of GrassGro Advisory Group

Members will be sent an email asking that they continue as members of the GrassGro Advisory Group.

4:30 Close