

SGS.120

# Review of the SGS National Experiment

*Final Report – October 2000*

On

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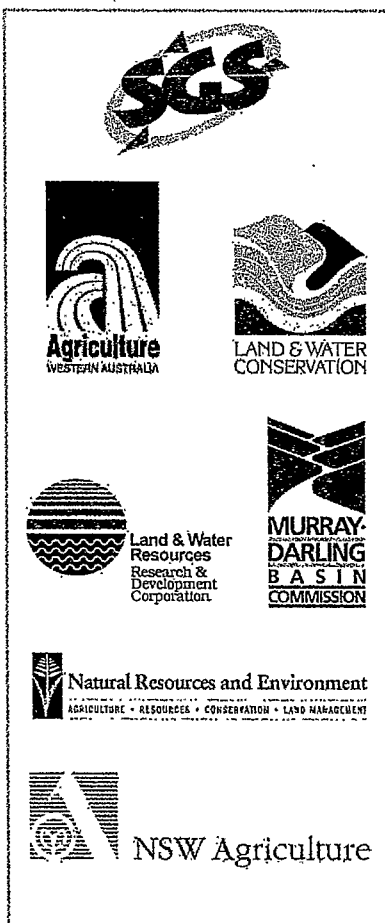
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Feedbase and Pastures

**SUSTAINABLE GRAZING SYSTEMS**

**Review of the National Experiment**

**October 2000**

**Review Team**

**Mr Terrey Johnson**

**Dr Roger Barlow**

**Dr David Freebairn**

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## Readers' Guide

Due to the length and complexity of this review report, the following guide is provided to help readers decide what they need to read, and where they can find it. This guide should be read in conjunction with the table of contents, which follows.

### **Those readers not familiar with SGS**

"Story of SGS" and the "Story of Themes" in Appendix E

Then decide what further reading you want to complete by reference below.

### **Readers with very limited time**

The Executive Summary – two page summary with our conclusions

List of Key Recommendations – the abridged version on pages 7 and 8

### **Readers with more time but without a need for a high level of detail**

As above plus your choice of the following;

Background to the review – contains the review terms of reference and a description of the review process adopted by the review team.

Overview of the SGS Experiment – a discussion paper looking at the structure and concepts behind the National Experiment.

The Review Report – the main review report, which presents our response to the review brief at a strategic level.

### **Readers with an interest in the detail of the review in one or more areas**

Sites - Detailed individual site assessments are presented in Appendix A

Producer input to the review – a summary and individual committee reports can be found in Appendix B.

The integration processes of the experiment – reports on themes, the model, and specific reports on economics analysis and agro-forestry are included in Appendix C.

Whole of Program issues – the harvest year, adoption issues, a discussion paper on the science behind the experiment, and a brief summary of questions to be considered in planning for any following program can be found in Appendix D.

General review information – the detailed review brief, a brief introduction to the members of the review team and the framework (questions) used by the reviewers are presented in Appendix E.

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## Executive Summary

*The SGS National Experiment is well placed to make a significant contribution to the SGS Program, the grazing industry and its communities. It is built from excellent research sites extending across the nation. It is linked through innovative processes. It has clear links with client producers. It is about to embark on a novel product development approach of huge potential benefit to its customers that will stretch its resources to the limits. The review team believes that the program possesses the necessary commitment, planning and management skills required to reach a successful outcome.*

## Review Task

The project brief for this review, including its terms of reference required the review team to carry out a strategic review of the SGS National Experiment (NE). This review is needed to help prepare the SGS Program for a harvest year to follow the contracted finish on June 30<sup>th</sup>. 2001. There is also a strategic imperative to preserve any investments of value to programs that might follow SGS.

This summary outlines the review team's strategic-level response to our brief.

## Research Sites

The sites and site teams are the building blocks of the SGS National Experiment. Each, in its own right, is an impressive research experiment. Collectively, they are poised to make an outstanding contribution to the SGS program.

All sites are on track to meet contracted objectives, but in all cases there are tasks that need to be completed prior to, or during, the harvest year. Completion of these tasks will ensure that maximum value is extracted from each site and the whole SGS NE. These tasks are specifically dealt with in the site reports (Appendix A). Direct measurement of water balance components should be further pursued where possible. Increased familiarity with and use of the model is encouraged. The pre-experimental water balance modelling study should be repeated building on the enhanced understanding achieved through site studies.

As the sites are unique in their original purpose, design and nature, recommendations for the future use of sites are site-specific. In general terms, Albany, in Western Australia, and Orange, in NSW, are recommended for preservation through the harvest year for probable use in future programs. Hamilton, in western Victoria and two of the Tamworth sites in northern NSW, Wicks and Fullers, should continue data collection into the harvest year. Wagga

is separately funded by the M.D.B.C. through to June 2002. Other sites should have completed their objectives and fulfilled their obligations by or before June 2001.



## Integration Processes

Without themes, SGS NE “would be just another large multi-site and multi-organisation experimental program”. The theme concept is an innovative response to the challenges that the SGS goal imposes, and has the potential to change the way we do systems experiments in future. An impressive start has been made, but as data collection necessarily winds down, there is much to be done if this approach is to realise its potential.

The economics theme needs special and immediate attention if the program is to demonstrate the value of the research and provide outcomes and products to its producer clients. The review team saw a range of approaches to farm level financial evaluation of research results, but considers that none adequately address producer requirements for a balanced economic appraisal of alternative management practices and systems.

The SGS database and data protocols represent a bold innovation that is working very successfully in providing common approaches across sites. This has provided secure and professional data management (which will be a valuable legacy) and has facilitated an efficient link to the modelling initiative.

The SGS model is starting to make a major contribution to site and theme analysis and interpretation, even as its development continues. The full potential of this tool is not yet realised, and will require further input of resources between now and June 2001 if the harvest year is to proceed smoothly. Many additional tasks have been suggested to further refine the model. It is essential that use of resources between now and June 2001 be carefully planned and prioritised.

This experiment has confirmed that agro-forestry and nature belts have valuable functional and aesthetic roles in sustainable grazing systems. None of the themes included trees in its initial briefs. It is essential that the value of trees be accounted for in the integration of NE results.

## Whole of Program Issues

The harvest year is an innovative step towards shortening the information supply chain and represents an enormous opportunity for all SGS participants and wider stakeholders, including those who are current participants. Considerable investment of resources will be required. The reviewers believe the potential benefits, combined with the demonstrated capacity of SGS to make this novel approach work, far outweigh the risks involved.

The harvest year can only work if substantial progress is made in both planning and implementation before July 2001. Planning should include the development of a clear and shared vision of what success will look like.

The relationship between producers and researchers within the program continues to develop. Substantial scope exists for further development of these relationships to better research, demonstrate and extend the knowledge and skills to manage pasture systems within landscapes.

## Key Recommendations

### The Future Use of Sites

- The Albany site should be continued until after tree harvest, to explore harvest impact on water balance, and post-tree soil changes.
- Kendanup should preferably collect data for another year, but should be closed on June 30, 2001 as per the current contract unless more secure arrangements can be made.
- Esperance has finished its data collection. Wind up the site on June 30, 2001 as per the current contract
- The Hamilton (Vasey) site should be retained at least until November 2001 and possibly until June 2002 so that data collection can continue in the hope of obtaining a wet winter, and reach pasture equilibrium from pasture treatments.
- Wind up the Maindample and Ruffy sites on June 30, 2001 as per the current contract. Maindample has had a range of run-off events and achieved most of its objectives, while Ruffy is a low run off site with very small treatment differences.
- Continue full data collection at the two native grass sites (Tamworth - Wicks and Fuller) until shearing in spring 2001, to explore potential to increase transpiration – pasture use and reduce water losses (run-off, drainage, evaporation).
- Tamworth - Fullbrooks can finish with the spring 2000 shearing as current objectives have largely been met.
- The Orange site should be considered for continuation beyond the harvest year, for its potential value to any future studies into biodiversity issues in pasture systems.
- The Wagga network of sites needs to be drawn into the SGS fold in a more substantive manner, given the value of its native grass satellite sites and the wealth of data from its catchments at Wagga.

## Themes

- Clarification of the future role and operation of the current theme teams needs to be part of the planning processes recommended for the harvest year.
- The review team believes that theme team activities should be to focus on servicing the needs of the harvest teams during the harvest year.
- Program management should consult and negotiate with theme leaders to ensure that theme research papers are not ignored in harvest year planning.
- Strategies to address the danger posed by competing demands from external sources on researchers involved in site and theme analysis, and harvest team activities should be negotiated with all relevant agencies and research partners.
- All theme teams should review their set of questions now. The review team believes that many of them are too broad and therefore not realistically achievable within the scope and time frame of this experiment.
- Theme leaders and program management should immediately review theme work plans for the period through to June 2001, and ensure that any case for additional resources is assessed and decided in time to achieve desired results.
- That a broadly based review group be commissioned to define what is required for economic interpretation and financial analysis in the harvest year, and report back to the Steering Group.

## The Model

- SGS management, in consultation with the modeller, site and theme leaders, should immediately review and prioritise further development of the SGS model.

## **Trees**

- Agro-forestry and native bush (trees) should be added to the biodiversity theme.
- External expert assistance be sought to expand the knowledge base in agro-forestry prior to the start of the harvest year.

## **The Harvest Year**

- The review team supports the concept of the harvest year, and strongly recommends it to the SGS investors as an essential strategy to rapidly deliver the information and knowledge required for extended practice change to occur within and beyond the SGS network of producer clients.
- Detailed planning for implementation of the harvest year should be completed as soon as possible.
- Once there is an agreed vision and a detailed plan in place, harvest teams should be appointed without delay. An early start will assist greatly.
- A clear, realistic and shared vision for the harvest year should be developed now before planning processes advance much further.

## **Researcher – Producer Links**

- That the RPN start planning now to develop demonstration sites that take up key messages and treatments emerging from all NE sites.
- That all NE sites recommended to continue through the harvest year, include producers from the RPN in their planning for the future of each site beyond June 2001
- All sites should involve producers from the RPN in the development of NE site products and messages for their clients.

## **Background to the Review**

### **Overview**

This review was commissioned by the SGS Steering Group on behalf of the investors in SGS. The investors, who include industry (Meat and Livestock Australia), the Federal Government (L.W.R.R.D.C. and M.D.B.C.) and three State Governments (NSW Agriculture, Victoria DNRE and Ag. WA), are planning a 'harvest year' (see below) for SGS to be followed by a new program.

The purpose of the review of the National Experiment is to help this planning process by assessing the progress of the existing experiment, and then recommending what needs to be done to ensure the experiment fulfils its objectives, is prepared for and ready to participate in the harvest year, and that the investments in this program are protected for any new program, where appropriate.

The full project brief is included in Appendix E. For readers' convenience the terms of reference are presented below.

### **Terms of Reference**

The investors in SGS are seeking a review of the National Experiment in general, and the individual sites in particular. The sites in the National Experiment are funded till June 30, 2001, with the winter/spring of 2000 suggested as the final data collection period. Specific terms of reference are:

1. Review relevant background documents on SGS, the National Experiment, the individual sites, including site and theme reports.
2. Develop a set of rules or guidelines that will be the framework against which the outcomes from the National Experiment and its constituent sites will be assessed.
3. Assess the progress (against objectives) for each of the sites, and for the National Experiment as a whole (including themes' performance).
4. Meet with Regional Committees and seek their input into the assessment process at each site.
5. Assess the contribution of each site/team in terms of:
  - Scientific rigour and merit of the research program (science)
  - Input into the 6 SGS themes (integration and interpretation)
  - Input to the Regional Producer Network (value to producers)
6. Assess the value (costs and benefits) of the SGS concept of linked sites, themes and organisations, including links to producer networks.

7. Recommend for each site how the time between the review and the end of current funding (June 2001) can best be used to meet SGS goals
8. Recommend for each site, the extent to which an extension beyond June 2001 is justified. The recommendations for each site must be accompanied by the detailed reasoning from the panel, including how maximum value can be obtained from sites that are not recommended to continue.
9. For each site that is recommended to continue beyond June 2001, suggest how the site might be mothballed (integrity maintained, but data collection and scientific input reduced to a minimum) so that the research team can focus on analysing the data collected to date, and on contributing to the collective processes in the harvest year.
10. Recommend any changes to the format or functioning of the National Experiment that will assist the researchers and the producers in the Regional Network to collaboratively evaluate the outcomes from the National Experiment and the Regional Sites, especially during the Harvest Year.

### **Approach Taken by the Review Team**

As a strategic review, rather than the more normal 'investigative' review, the team saw the possibility of expanding the strategic knowledge and thinking power available to perform the review. We did this by emphasising the strategic nature of the review at the start of each site visit, and then inviting the site team to join the review team to perform their site review.

This strategy was achieved through the use of a standard set of pre-circulated questions, which the researchers were asked to address in their presentation to the review team. The research team and the review team then separately completed a S.W.O.T. study (strengths, weaknesses, opportunities and threats) of the site and its research.

The teams then presented the results of their SWOT analyses to each other with immediate and open discussion of areas of agreement and disagreement. The researchers took the reviewers' SWOT as immediate feedback. Both SWOT analyses were combined to produce a joint assessment of that site's research program.

At each site visit the reviewers met with the local Regional Producer Committee. (RPN as used through the report refers to the Regional Producer Network, which has eleven producer committees). The producers met prior to the above meeting to prepare answers to a set of questions posed by the review team. Their answers were presented by the committees to the review team, in a closed meeting with the reviewers.

Site reports were prepared from all input to the review, including the replies to the review team's questions and the combined SWOT. Drafts of the site reports were sent to site team leaders inviting comment to complete a final feedback loop. Comments, corrections or clarifications with which the review team agreed were then included in final drafts.

The sets of questions put to the research teams and the RPN committees can be found in Appendix E.



## **Overview of the SGS National Experiment**

### **Report on TOR 6: "Comment on the value of the SGS concept of linked sites, theme and organisation, including links to producer networks".**

The SGS NE has a number of unique features that deserve special mention.

#### **Multiple sites and organisations, linking themes**

The concept of a range of sites and organisations provides some logistical challenges: the tyranny of distance, different organisational environments, and traditional independence of the research community. Having a binding structure across sites and themes provides a vehicle to allow for value adding either through an issue or discipline focus. In the SGS NE case, a disciplinary focus has been adopted. While themes were seen by the review team as being formative at this stage, they offer great potential for cross-site comparisons, enriching any analysis that traditionally would have been done on a site by site basis. A common database and model are keys to facilitating this technically, but early negotiations within the SGS NE team about a philosophy of data sharing was central to theme development. This approach of sites and themes is novel and holds promise of being a showcase of how to organise research into systems.

#### **Data protocols and database.**

While it is not unique to have a number of sites run by different organisations focused on a common issue, it is uncommon for such sites and organisations to be so closely linked through common methodology and analytic approaches. Indeed, it has been a very purposeful initiative to have common data sets with measurements made using published and agreed protocols and stored in a common database (see the SGS data protocol booklet). What this offers is a) rigorous, peer-reviewed, minimum datasets, b) data that will be managed in a repeatable, and most importantly, a widely retrievable manner and c) a combined dataset that is complete across a range of sites. The SGS NE has set the benchmark for cooperative research in this endeavour.

#### **Models as value adding tools**

A rather bold initiative of the SGS NE was the decision to develop its own model, as a tool to integrate across disciplines and sites, and also to provide data stretching capability from what is still a few sites' results over 3 to 4 seasons. Key features of the model development activity have been: direct linkage of the model to the SGS database (the typically 50-80% of modelling effort involved in

data preparation has been reduced), development of the model in close collaboration with the field experimental teams, and the aim of having the site and theme teams be independent users of the model.

The SGS model is not the only model being used within the NE. This diversity is healthy, and special attention is needed to ensure lines of communication are kept open between various modelling approaches. Also, model capability needs to be kept in perspective – models are tools to support experimentation, and with time, add value to datasets such as the NE is collecting. They do not replace rigorous experimentation. Models can also be effective tools for facilitating different disciplines to exchange perspectives. Early success in the impact of the SGS model in cross-discipline interaction is very encouraging.

### **Harvest year**

In today's competitive funding environment for agricultural research funds, the concept of providing a funded period for cross - site analysis is very forward looking. Typically researchers will be seeking the next round of funding during a current project, with synthesis and interpretation spread over several years after funding has ceased. This chasing-the-tail behaviour leads to long delivery times for some research, and in some cases research is never reported completely or effectively. To facilitate cross - site analysis, explicitly part of the theme structure in the SGS NE, a "harvest year" approach would seem essential. Of course this apparent generosity, which we hope will occur, will put pressure on both researchers and management. The concept of a harvest year, when successful, will set a precedent for future large-scale, integrated, research initiatives.

### **Links to Regional Producer Networks (RPN)**

While there was a discontinuity between the producer planning teams and the current RPNs, the concept of direct linkage of site and theme teams to RPNs provides a strong focus on the research being directed to issues of direct relevance to producers. While this might seem self evident, it should be recognised that traditional research is often done in isolation to producers, even though they are generally involved in setting research direction through various representative structures (MLA Board and committees as examples).

The NE – RPN link represents a move toward a more collaborative approach to R, D and E, and there appears to be no reason why the movement can not continue to a point, particularly for systems research issues, where research becomes a true partnership between producers and scientists, with each partner doing what they do best, with shared interpretation of results. Such a partnership will improve both the research, and its application.

### Organization and management support

The above attributes of the SGS NE could not have happened spontaneously! Momentum is a strong force in R, D and E organisations, and producers typically have a view that they do the producing, and researchers do what ever they do, and at the end of the day, provide new technology. Such an approach is effective and efficient when all the technology can be packaged in something like a seed or improved animal genetics, but managing a complex system such as grazing in a whole farm context is rarely if ever dealt with so simply.

We believe it may be useful to other organisations planning such an approach to provide an indication of how resources have been allocated in SGS. Table 1 shows how the funds were allocated in the SGS NE initiative. One point to be derived from these data is that the empirical research costs are approximately 75% of the total allocation. Integrative research activities such as themes, database and model development and MLA coordination occupy the remainder. While there is no magic formula on resource allocation, it should be noted that managing a complex activity such as the NE requires significant resources. It is the review team's opinion that this is a well balanced program, and that the extra value of a coordinated program will be forthcoming though enhanced relevance and delivery of information and improved skills in the grazing community.

**Estimate of distribution of resources across the SGS NE.** (This estimate includes inputs from research providers such as the state departments of agriculture, as well as MLA)

Activity	% Resource
Site experiments	74
Themes (incl economics)	8
Database	4
SGS Model	4
MLA coordination	

5

## Monitoring and evaluation

4

Credit must be given to MLA management, site and theme leaders and indeed the whole SGS NE team. There are a number of innovations discussed above, all which have taken people out of their normal modes of operation. While all of the advantages are not yet realised, there is ample evidence of good will and enthusiasm for the approach being adopted. There is little doubt in the review team's mind that the SGS NE is indeed a bold and imaginative move in the right direction for systems R, D and E.

### Outcomes

- A network of researchers has been built, that uses common techniques and shares a common language – this represents a key asset for southern grazing systems.
- A database has been developed, and is being used by a group of research teams across sites.
- The SGS database will be a lasting legacy of the NE.
- A common model across sites that is allowing researchers to explore interactions between system components
- Increased ownership of research outcomes has been developed by RPN's, with keenness to be further involved.
- Knowledge of how grazing systems work, and the role of management in improving production and resource management has been significantly improved.
- There is evidence of change in producer practice in some instances – a future survey will determine the extent of these changes.

### Questions for the future

- Can legitimate research be done with producer involvement? Can it be done without producer involvement?

Uncertainty exists in the research community as to how involved farmers want or need to be in the research process, and how much involvement threatens “scientific integrity”. Clearly this interacts with learning (who is supposed to be doing the learning?), and the rate of effective practice change.

- How much detail should models be expected to deal with in supporting grazing systems research?
- How to evaluate the effectiveness the SGS NE in delivering new information and change in practice?

## Report Conclusions and Recommendations

### Approach

This review has looked at a diverse and extensive experiment, using innovative processes to link a multi-site experiment across the nation and the SGS network. The complexity of the review has led to the production of a diverse range of detailed reports from the review team.

For ease of reading, the main strategic level recommendations are presented below in three sections: **conclusion** (boxed) followed by the **rationale** and **recommendations**.

### The Review of Research Sites

#### The Sites and Site Teams

The sites and site teams are the building blocks of the SGS National Experiment. Each, in its own right, is an important and independent research experiment. Collectively, through theme analysis, the sites are poised to make a significant contribution to the SGS Program, meeting high priority industry and community needs.

All sites have been well planned and executed, and are visually impressive. They provide the focal points for researchers and producers to expand their understanding toward more sustainable and profitable grazing management. Their design, locations, treatments and scale have expanded their function well beyond their primary role of research, in that they are being used as powerful extension tools.

The site teams have demonstrated a high level of professionalism. They exhibit a remarkable range and depth of talent, and demonstrate ownership and pride in their research activities. They have enthusiastically supported and assisted the development of all the many novel features of the experimental program, as evidenced by their collective determination to solve potentially divisive issues such as data ownership and data sharing protocols.

All teams have extended their value and influence through their willingness to embrace the linkages to producers and other researchers through the SGS network, and by proactively seeking out site partnerships with Universities, (staff and PhD students), and other agencies and research bodies.

The review team congratulates all research teams and individual members on their contribution to the SGS National Experiment. The sites and site teams bring great credit to the whole program, and by doing so add greatly to the chances of the program succeeding in meeting its goal.

**Recommendation:**

Nil

### Site Progress against Objectives

All sites are on track to meet objectives, but in all cases there are tasks that need to be completed prior to and during the harvest year. Completion of these tasks will ensure that objectives are met, and that maximum value is extracted from each site through value adding in the themes framework.

In a program of this scale and diversity it is natural that there have been differences of approach, issues, needs and timing, which have impacted on individual site progress. This is recognised by the reviewers and accounted for in the extensive individual site reports, which can be found in Appendix A. Some common elements are discussed below.

Excellent data are being collected across a diverse range of disciplines and geography. There would be few if any studies that could claim to be attempting to deal so comprehensively and holistically with grazing systems across such a wide range viz. grazing management, soil and water dynamics, impacts of trees and deep rooted perennials, impacts on litter and soil biota.

Closing the water balance has proven to be a challenge at most sites, and the model will underpin interpretation in most cases. There are flow-on consequences for tracking nutrient flows. In many cases, estimates of drainage are dependent on modelled or estimated evaporation and transpiration, with only rainfall and runoff being measured directly. This strong reliance on models will result in uncertainty in estimates of water balance components. Where understanding the role of management on deep drainage is a key objective, direct measures of all major components should be attempted wherever possible, to improve confidence in management options, and model estimates for other situations.

Analysis and interpretation have yet to begin in earnest. The combination of replicated and non replicated studies, focused on larger scale system issues, using a data base and model developed in parallel with the conduct of empirical experiments, is potentially a very powerful and innovative approach. While this approach remains unproven, there is sufficient basic science behind the study to provide an adequate safety net.

Sites show a varied degree of familiarity and use of the model, as opposed to the database, which has been generally embraced as a normal tool of trade. An issue common to a number of sites is the limited number of staff familiar with the operations of these tools - this is especially the case with the model.



## **Recommendations**

Detailed recommendations are included in each site report (Appendix A). Recommendations for the future of each site are made in the following section. The review team makes two generic recommendations for the consideration of all sites.

- 1) Every effort should be made to increase the confidence in model outcomes in relation to the water balance by direct measurement of evapo-transpiration (ET) where possible between now and the close of each site.
- 2) All sites should seek to increase their use of the model through expansion of the number of staff familiar with its use. In all cases this should involve at least one senior scientist

## **Future Use of Sites**

Each site was designed to address different issues associated with sustainable grazing, and each has special challenges. Therefore we have suggested different actions to optimise results across the sites and themes.

The rationale behind each site recommendation is given with the recommendation. Where sites are recommended to continue beyond June 2001, recommendations to reduce the extent of data collection are included.

In making these recommendations the review team in effect was assessing the potential of each site to contribute further significant input to SGS knowledge through either additional data collection, or future value beyond the harvest year. This latter point clearly involves an element of crystal ball gazing.

The recommendations are in no way a comment on the performance or value of sites recommended for closure. Indeed it should be seen as a compliment for achieving all objectives and potential of that site.

Orange represents many challenges to the research team in that it has embraced real world variability. The diversity of the site combined with the range of pasture treatments from low to high input, makes it an ideal outdoor laboratory for studying biodiversity. This aspect of pasture research is in its infancy when compared to other themes in this program.

Albany is novel for its examination of the interface between tree-lots and pastures. The site is well sited for use as the flag bearer for the integration of agro-forestry and nature reserves into pasture systems across the nation. There is extensive interest in following this site through to harvest of the trees and examination of the environmental legacies of such management options.

Hamilton is recommended for data collection through to the harvest year. The reviewers see it as having great potential to lead the debate on the sustainability of high input systems. There is a genuine need for continued data collection on nutrient flows, and pasture composition as stability from treatment effects has not been reached yet.

The Ruffy and Maindample sites have been effective in defining the role of different soil types on water flow in the environment. The Wagga catchments have a legacy of 20+ years of base data on runoff, and also present challenges in interpretation due to natural spatial variability. While experiencing below average rainfall conditions, the Tamworth sites have focused on water losses from evaporation, and how this might be moderated by litter management. These three sites have made excellent progress in better defining the impact of management on water balance components.

Security of tenure is an issue for all sites recommended for future use, as it is for Kendunup. The catchment studies at Kendunup, due to a late start, should continue into the harvest year to expand data, but pasture management issues and tenure need to be resolved to justify persistence with this site.

## Recommendations

- 3) The Albany site should be continued until after tree harvest, to explore harvest impact on water balance, and post tree harvest soil changes.
  - a) Capture data for the coming summer then switch from plot based to transect based pasture measurements only.
  - b) Reduce animal measurements to the minimum that satisfy animal ethics requirements
- 4) **Kendanup** should preferably collect data for another year, but should be closed on June 30, 2001 as per the current contract unless more secure tenure arrangements can be made.
- 5) **Esperence** has finished data collection and can end on June 30, 2001 as per the current contract
- 6) The overall recommendation for **Hamilton (Vasey)** is that it be retained at least until November 2001 and possibly until June 2002 so that data collection can continue in the hope of obtaining a wet winter.
  - a) The 80/20 rule should continue to be rigorously used to reduce data collection to a minimum
- 7) **Maindample and Ruffy** should finish on June 30, 2001 as per the current contract.
- 8) **Tamworth (Wicks and Fuller sites)** should continue full data collection until shearing in spring 2001. The Fullbrooks site should finish with the March 2001 shearing **as current objectives have been largely met**
- 9) **Orange** *should be considered for continuation beyond the harvest year, for its potential value to any future program, given its unique attributes in relation to design, location, native pasture and biodiversity values.*
  - a) The proviso is that the investors need to ensure that there is a much greater commitment of time from leadership and at least one other professional at this site. This needs to be addressed prior to the harvest year.
  - b) A review, in the form of a workshop involving researchers and producers (see site report) should be held prior to the commencement of the harvest year to address future methodology and data collection needs through the harvest year and beyond.

- 10) The **Wagga** network of sites needs to be drawn into the SGS fold in a more substantive manner, so that a constructive collaborative relationship can be developed. The reviewers see this site as a mini – SGS approach with its native grass satellite sites and the wealth of data from its catchments at Wagga. (Note that this site is funded by MDBC for full data collection through to the end of the harvest year.)

## Integration

### The Potential of Themes

Without themes, SGS NE “would be just another large multi-site and multi-organisation experimental program”. Themes promise considerable added value to SGS research findings through the synergy of multiple perspectives derived from the wide environmental and disciplinary spread of sites and researchers.

Theme teams have developed a common data collection protocol used by all sites. This has allowed the development of a common database structure for all sites, which in turn acts as the data entry point for the SGS model. This represents an innovation which will support model application for both researchers and model developers.

Theme questions have provided a focus for theme teams to address the principles of sustainable grazing management across environments. Theme teams, in addressing these questions, will perform the cross-site analysis and interpretation to produce the science outcomes from the national experiment.

The role of the broader based harvest teams, as we understand it, is to use theme and site derived science to develop practical and useable ‘products’ for the producer clients of SGS.

The harvest year, with its need for rapid progression from data analysis, to interpretation, to development of harvest products, at both site and national levels will impose huge demands on the time and skills of all involved. The roles of all teams will need to be clearly defined, along with highly effective communication and co-ordination processes.

The themes approach to systems research planning needs to be evaluated by investors and the science community. The planned research papers from the theme teams, with subsequent peer review processes, will play a vital role in achieving this.

**Recommendations**

- 11) That clarification of the future role and operation of the current theme teams needs to be part of the planning processes recommended for the harvest year.
- 12) The review team believes that theme team activities should be kept to the bare minimum required to service harvest teams with necessary analysis and interpretation of data during the harvest year. This means that there will need to be an acceleration of data analysis between now and early within the harvest year.
- 13) Program management should consult and negotiate with theme leaders to ensure theme research papers are not ignored in harvest year planning.
- 14) Strategies to address the danger posed by competing demands from external sources on researchers involved in site and theme analysis, and harvest team activities should be negotiated with all relevant agencies and research partners.

## **Theme Progress**

The theme approach is an innovative response to the challenges that the SGS goal imposes, and has the potential to change the way we do systems experiments in future. An impressive start has been made, but as data collection necessarily winds down, there is much to be done if this approach is to realise its potential.

While the themes have considerable strengths as discussed above, there are weaknesses and threats involved in the initiative.

Themes take researchers out of their comfort zone and can be seen as an unwelcome diversion from researchers' focus on their own sites. Data ownership was obviously a considerable issue to overcome.

It is seen to be complex in its approach, with no prior examples of the approach to follow. The discipline based approach combined with fairly broad theme questions lacks certainty compared to well defined site objectives and hypotheses.

There is some concern in that the model may lose accuracy as it moves from soil based parameters to pastures to animals. There are obvious implications for financial assessments that depend on animal outcomes for treatment analysis. (This issue is dealt with elsewhere in this section.)

Despite all this, there are good signs of emerging understanding of the methodology to be used for the analysis and interpretative tasks of the various teams, together with increasing levels of support within the theme teams. The expansion of professional networks has been greatly appreciated.

## **Recommendations**

- 15) All theme teams should review their set of questions now. The review team believes that many of them are too broad and therefore not realistically achievable within the scope and time frame of this experiment.
- 16) Theme leaders and program management should immediately review theme work plans for the period through to June 2001, and ensure that any case for additional resources is assessed and decided in time to achieve desired results.

### **The Economics Theme**

The economics theme needs immediate attention if the program is to succeed in demonstrating that it has reached its goal of the adoption of more sustainable and profitable grazing practices by its client producers.

The review team saw a range of approaches to financial evaluation of research results. Currently, no one approach has been adequate in addressing producer requirements for a balanced economic appraisal of alternative management systems, while the broader resource economic issues were not covered by the review team.

It was clear that the discipline area of farm management economics had not received sufficient attention, and there appeared to be few links with the longer term resource economics issues. A common approach (or framework) that accounts for both short and long term benefits and costs for all farm outputs and resources, that can be used to quantify financial outcomes from change in practice at farm level would be of immense benefit

### **Recommendations**

- 17) That a broadly based review group be commissioned to undertake the following tasks and report back to the Steering Group to:
  - a) Describe exactly what resources and skills are available to SGS for economic interpretation and financial analysis at present
  - b) Define what additional resources and skills will be needed for the harvest year
  - c) Define what tasks and resources are required to deliver the required resources by February 2001



### **The SGS Database**

The SGS database and data protocols represent a bold innovation that is working very successfully in providing common approaches across sites. This has provided secure and professional data management (which will be a valuable legacy) and has facilitated an efficient link to the modelling initiative.

The SGS database is well developed, and strongly supported by all sites, although some sites were slower to appreciate its value than others. It is, by itself, a powerful interpretative tool through its data query routines that allow quick and efficient quality control of data collection and some analysis. Colin Lord, its developer, continues to work with site and theme teams to expand its capability and usefulness.

### **Recommendations**

18) Database development and support should be maintained.

### **The SGS Model**

The SGS model is starting to make a major contribution to site and theme analysis and interpretation, even as its development continues. The full potential of this tool is not yet realised, and will require further input of resources between now and June 2001 if the harvest year processes are to proceed smoothly.

The database and model together form the key to understanding and managing the complexity across the range of sites and issues.

The model provides the framework to explore experimental data, as part of quality control, and to explore interactions in the system. This is a form of "virtual" experimentation, without the logistic challenges and costs, and is ideal for broadening disciplinary links.

The use and acceptance of the model is somewhat tentative at this stage, but given the novelty of such technology to most researchers, the value-adding potential is well recognised, and enthusiasm is building for the model's application at most sites. Some sites will need extra assistance if they are to become competent users of the model. Variability of some sites, such as Orange, will provide challenges in application of any model. Since most models being considered are "point" models, consideration for what is considered a "plot" will require further consideration.

There is a need for some risk management processes to be considered. Knowledge of the SGS model and responsibility for training and extension of its use lies completely with one person. Broader exposure of the SGS model to peer review is necessary. SGS should repeat the pre-experimental water balance modelling with the advantage of new information and insights gained as a result of the extensive experimental program.

There are advantages in encouraging the use of other models to support the SGS model. This may be especially relevant in the pasture and animal theme areas, where inaccuracies in simulation could be expected to accumulate given that the model starts with soil and climate data.

Like the database, there are continuing requests from both site and theme teams to defining the limits of model development and to prioritise tasks between now and June 2001.

### **Recommendations**

- 19) SGS management, in consultation with the modeller, site and theme leaders, should immediately review the modelling effort to;

- a) Define and agree on the scope and expectations of model development for the balance of this financial year
  - b) Assess the need for special assistance and training to improve modelling skills to ensure that theme and harvest year requirements are met from all sites
  - c) Institute risk management policies detailed above by completion of model documentation; by broadening current narrow expertise and personnel; by repeating pre-experimental modelling; and by encouraging the use of alternative models to test and verify the SGS model
  - d) Consider the balance of the attached report (Appendix C) in conjunction with the above, and plan and prioritise all modelling tasks to be implemented prior to the commencement of the harvest year
- 20) A group should meet as soon as possible to determine, across SGS, what modelling options can be best used during the harvest year. Use of different models is both a strength (diversity and ability to triangulate between "opinions") and a weakness (dilution of effort). This tension needs to be actively managed.
- 21) Repeat Pre Experiment Modeling for all sites using the SGS model as part of the harvest year, or preferably before the harvest year (at least for the three sites previously modeled - Tamworth, Hamilton and Albany). This activity is necessary to protect the SGS initiative from outside criticism. This will require the ability for long-term runs to be carried out, using daily weather records.

### **Agro-forestry and Nature Lots**

Trees have both a functional and aesthetic role in sustainable grazing systems, and for these reasons it is essential they be brought fully into the balance of this program and its harvest year.

It is recognized that our knowledge base is small in this arena. For landscapes with high drainage rates or salinity risk, better management of pastures may not be sufficient to reduce drainage losses to a sustainable level. Trees, being perennial, and having high water use capacity (large leaf area, deep rooting habit), may be an essential element of a hydrologically balanced landscape.

Ideally, trees can form an integral part of a farm's economic performance, although aesthetics can be sufficient motivation if the woodlot or nature vegetation enterprise is close to cost neutral in terms of impact on adjacent pastures. Economic reward from tree belts can be achieved through timber harvest, salt and carbon credits (still hypothetical at this stage), and environmental services to the landscape.

There is high support in the RPN from the west to the east, for further investigation in future programs of the role of trees and other woody perennials in pasture systems. Currently, no theme has agro-forestry in its charter despite the extensive work at Albany and additional work on isolated trees at Hamilton, Mandampla and Wagga.

### **Recommendations**

- 22) That agro-forestry be added to the biodiversity theme in acknowledgement of its direct and indirect contribution to biodiversity (harbour and feeding sites for a wide range of species) and their multi-functional roles in maintaining sustainability and profitability of pasture systems.
- 23) That, given the low knowledge base in SGS, that external expert assistance be sought to expand this knowledge base prior to the start of the harvest year, and assist the interpretation of all information for use by the appropriate harvest teams.
- 24) That the recommendations contained in the attached tree report (Appendix C) be commended to the planners of any new program.

## **Whole of Program**

### **The Harvest Year Concept**

The harvest year is an innovative step towards shortening the information supply chain from the completion of research to delivery of research outcomes to its customers. The harvest year represents an enormous opportunity for all SGS participants to derive the key outcomes rapidly from a large and complex national experiment. Considerable investment of resources will be required and can only be justified through superior delivery of tangible products across the SGS program. The reviewers believe the potential benefits, combined with the demonstrated capacity of SGS to make this novel approach work, far outweigh the risks involved.

SGS planning clearly documents the driving forces behind the need for rapid practice-change within the grazing industry. The SGS goal addresses the need for more sustainable and profitable grazing systems to halt and reverse the declining trend lines for these twin objectives. Community and national interests are in line with industry needs. The need to achieve the goal, and to achieve it rapidly, is undeniable.

The activities of SGS have created strong demand from a large section of grazing industry practitioners. Knowledge is being sought to guide positive change.

Traditional supply chains for delivery of agricultural knowledge need to be accelerated to meet current demand. As producers become more aware of the research environment through RPN's and steering committees, they are driving the pace of innovation, and exposure to new findings. Therefore innovative approaches to learning, technology transfer and adoption need to be explored.

### **Recommendation**

25) The review team supports the concept of the harvest year, and strongly recommends it to the SGS investors as an essential strategy to rapidly deliver the information and knowledge required for extended practice-change to occur within and beyond the SGS network of producer clients.

### **Harvest Year Planning**

The harvest year can only work if substantial progress is made in both planning and implementation before July 2001.

This conclusion is both obvious and well recognised by past and continuing program direction and management initiatives.

It is sufficient for us to state that the harvest year is novel and untried, that it is not yet well understood (but remarkably well supported) through the large and complex SGS network, that time is short and there is high potential for competing and distracting demands at all levels from within and outside the program.

### **Recommendations**

- 26) Detailed planning for implementation should be completed as soon as possible, and should include provision to;
- a) Use current champions and create new champions, right across the board (from steering group to researchers to producers) to lead and drive the process
  - b) Enable site teams to free up time for harvest year activities at both site and cross-site (national) levels.
  - c) Reduce the organisational and leadership demands placed on key researchers as SGS moves to June 2001 and beyond
  - d) Clearly delineate the respective roles and tasks of harvest and theme teams from now until the end of the harvest year
  - e) Develop effective communication pathways between harvest teams, with clear links from harvest teams to site teams and the RPN
  - f) Establish procedures for leadership and management to communicate with harvest teams and constantly monitor their progress
  - g) Deliver some early successes, e.g. products
  - h) Ensure the excellence and continuity of management at all levels
  - i) Provide adequate resources to complete the job

- j) Create links to the planning process for the new program to share talent and co-ordinate operations

27) Once there is an agreed vision and a detailed plan in place, teams should be appointed without delay. An early start is highly desirable.

### **A Harvest Year Vision**

While considerable planning has already taken place (and continues to proceed during the course of this review), there is no clear and shared vision of what success will look like, or how to achieve it.

As stated above, there is strong and near universal support for the harvest year even though there is no clear idea yet of how it will be achieved. The review team believes that this support comes from a universal acknowledgement of the need and demand for this initiative as recognised in the arguments above.

What concerns us is that we could see no evidence of a shared and clear picture of what harvest year products are needed, other than the broad terminology of the 'principles, best practice, best bets, hunches and indicators' that support and demonstrate sustainable and profitable grazing systems.

Better definition of agreed end points before commencement of the project will assist planning and support the development of the level of commitment and ownership needed by those directly involved in implementation.

### **Recommendations**

28) A clear, realistic and shared vision should be developed now before planning processes advance much further, to accommodate the following points;

- a) Development should involve as many of the key players as is realistic in the short time available (RPN's, researchers, extension specialists, agribusiness, agency management)
- b) The vision should take the form of defining 'what success will look like' for the end of the harvest year.
- c) As such it, it should outline what products and outcomes need to be developed through the year, and may suggest how they will need to be used, developed or packaged in the next phase of SGS



### Researcher and Producer Links

The relationship between producers and researchers within the program continues to develop from a reasonable start. The interest, support and appreciation of the value of this relationship and the opportunities that it presents for future research and adoption processes are clearly evident. Substantial scope exists for further development of relationships between producers and researchers to form genuine partnerships in learning how to better manage pasture systems within landscapes.

The producer groups with SGS national experiment sites within their regions show strong ownership of and support for the sites and site teams. This has developed from a slow start in that all site research planning was completed before RPN's could have any real input into design and treatments. Researchers and producers alike regard this as a missed opportunity that should not be repeated in future experiments.

The level of support and ownership is a little variable among individual members of supporting groups. It is low to non-existent in those Regional committees where there are no national SGS sites. It was not surprising to observe that support and ownership of the experiment and related SGS processes (eg. themes) appeared to be directly related to the level of involvement of each individual in SGS forums and activities.

Ongoing involvement and observation of site progress by producers has been valuable in supporting research while improving general awareness of research findings, even if only tentative results are available. The combination of the sites, treatments, researchers and co-operators (often adopting treatments on surrounding land) has been very powerful in its extension value. Provision for extension within original planning took this power to a higher level again.

The challenge is to extend these active learning and extension opportunities to a far wider audience of producers.

There is mutual interest from researchers and producers in further developing strong links between research sites, research outcomes and RPN demonstration sites. There is a belief that research sites have been undervalued (or under used) for their extension value (see above), and RPN sites underestimated for their research value.

The review team has made recommendations for the future of all sites that will impact to varying degrees on their future use for extension. At continuing sites there is an opportunity to use, or better use, producer involvement in planning for the harvest year and beyond. These sites include Albany and Orange, where planning for extension of the site through and beyond the harvest year is

recommended, and Wagga, a MDBC site that is funded for another year and where SGS producer linkages could be improved.

### Recommendations

29) To recognise and manage the impact of the review teams variable site recommendations:

- a) That the RPN start planning now to develop demonstration sites that take up key messages and treatments emerging from all sites. This planning should involve researchers as well as producers, and extension professionals where possible.
- b) That all sites recommended to continue through the harvest year, for whatever reasons, include producers from the RPN in their planning for the future of each site beyond June 2001

30) That all sites strongly consider involving producers from the RPN in the development of site products and messages for their clients.

31) That those planning the extension of this program beyond the harvest year consider all relevant points included in the appendices in connection with this conclusion, but in particular the following;

- a) WOW factors need to be worked up and marketed, within sites and perhaps themes
- b) The need and opportunity to further develop and use the links between research and RPN sites
- c) Producers should be involved in research planning from the start to increase site ownership and use, and all site plans should include planning to use the extension value and opportunities presented by the research.
- d) Successes in sustainable grazing should be promoted through the broader community.

**SUSTAINABLE GRAZING SYSTEMS**

**Review of the National Experiment**

**Appendices**

**Review Team**

**Mr Terrey Johnson**

**Dr Roger Barlow**

**Dr David Freebairn**

## Overall Site Report

As an overview statement it is clear that sites are the engine room of the National Experiment, and they also represent the comfort zone for researchers. As such researchers have great ownership and pride in their own sites, and in the results being produced. This pride is well justified with high level planning and execution clearly evident in all locations.

Terms of Reference 3,5,7,8 and 9 are addressed for each of the six sites in the individual site reports and follow this report in Appendix A. Presented here is an overview of the key features over all the sites.

### **Progress against objectives (TOR 3)**

Most sites are tracking very well. Wagga still has two years of MDBC funding left to go. The modeling efforts for this site are still to be developed, but there is confidence in the proposed approach.

Orange had a delayed start, due to a sowing failure. Data have been generated over a limited range of seasons at a few sites, but there is an adequate range of seasons across sites.

Where there has been a dependency on the SGS model to interpret or extrapolate from data, this is generally running behind, (given that the model was being developed in parallel with the NE). Similarly assessment of nutrient movement has been dependent on defining water movements, and associated modeling studies.

Closing the water balance has proven to be a challenge at most sites, and the model will underpin interpretation in most cases. There are flow-on consequences for tracking nutrient flows.

An area that is lagging across the board is the financial analysis of results (This is covered elsewhere in the report integration sections)

**Contribution of sites (TOR 5) to:**

- **Science**

Excellent data are being collected across a very diverse range of disciplines and geography. There would be few if any studies that could claim to be attempting to deal so comprehensively and holistically with grazing systems across this range viz. from grazing management and soil and water dynamics through impacts of trees and deep rooted perennials, to gems like litter and soil biota

The SGS NE represents a bold organizational experiment in its own right. Putting together a number of teams (in effect more than just the 6 sites, as some sites have multiple locations) with a common focus, the development and support for a common database and model has achieved a more cohesive approach than would normally be achieved.

This approach has the potential to leave a very valuable legacy a) a comprehensive data base, b) a group of research staff who have developed new ways of managing and looking at research data (database and model synergy), and c) a shared vision of what cooperative research can achieve. The research teams and MLA management should consider this as a very successful development in research management.

Analysis and interpretation have yet to begin in earnest. The combination of replicated and non replicated blocks, focused on larger scale, system studies, using a data base and model developed in parallel with the conduct of empirical experiments, is very powerful, and an innovative move. It is as yet unproven as an approach but there is sufficient science behind the study to provide an adequate safety net.

An additional opportunity that is being utilized at a few sites is to employ and train post-graduate students.

- **Themes**

All sites are using the database and collecting the minimal data set. Each site is collecting data to further contribute to one or more themes. The fact that the model was developed during the project has meant that delays have been inevitable for using the model to assist interpretation in some disciplines. The Tamworth group has done a marvelous job for the NE in piloting the development of the database and model.

The Wagga group is on the periphery and needs to be brought into the SGS fold to contribute more effectively.

- **Regional Producer Network**

Four of the six sites have a very strong relationship with their RPN, with the other two needing to strengthen this interface. All sites have real contributions to make, and are dealing with important issues for regional graziers.

Lack of a consistent and credible framework for economic and financial analysis is an Achilles heel when interpreting and providing information for graziers. While this is a common failing of biophysical scientific groups, it must be redressed. The economic analysis required is at the farm management level, not high level resource management economics.

Across the board the effective integration of farmer 'demo' sites with the NE has yet to be realised.

Tamworth is providing an interesting model for SGS to watch in bridging the researcher/grazier interface.

**Recommendations:**

1. **How the time from now till June 2001 can be best spent (TOR 7)**
2. **Extent to which an extension beyond June 2001 can be justified (TOR 8)**
3. **For sites recommended to continue beyond June 2001, how can the assets be protected, and data collection reduced to a minimum during the harvest year (TOR 9)**

The primary recommendations can be summarised as follows:

Western Australia:

**Albany**

- Capture data for the coming summer then switch from plot based to transect based i.e. pasture measurements only.
- Animal measurements to meet Animal ethics requirements
- Continue part or all of current data collection into the harvest year but with the primary purpose of assuring the site is available for the new program

This site has the basis for a long-term tree by pasture interaction, and is the only agri-forestry site in SGS. This provides an opportunity to monitor through to tree harvest and follow residual impact of trees.

**Kendanup**

- Wind up the site on June 30, 2001 as per the current contract unless more secure arrangements can be made.

There is uncertain tenure, and an unwilling collaborator at this site.

**Esperence**

- Wind up the site on June 30, 2001 as per the current contract

Data collection is complete.

**Hamilton:**

- The overall recommendation for this site is that it be retained at least until November 2001 and possibly until June 2002 so that data collection can continue in the hope of obtaining a wet winter (see below)
- The opportunities for strengthening this team's extension capability need to be examined as soon as possible with a view to capitalising on the marvelous demonstration value of the site, the strengths of the research team and the many messages that will be emanating from this site.

This will also aid in optimising the researchers' time until the end of the harvest year. This team has a pivotal role to play in data synthesis and interpretation.

**NE Victoria:**

**Maindample**

- Wind up the site on June 30, 2001 as per the current contract

This site has achieved most of its intended objectives, with a range of water supply years sampled –some high runoff years.

**Ruffy**

- Wind up the site on June 30, 2001 as per the current contract

Sites differences are well established, and treatment differences are small. There seems little point leaving the run-off equipment on such a low run-off site.

**NW Slopes (Tamworth):**

**Wallaby grass and Red grass sites**

- Continue full data collection at the two native grass sites until shearing in spring 2001.
- Increase emphasis on ET manipulation, to explore the potential to increase transpiration and pasture production and reduce losses from runoff, drainage and evaporation.

**Phalaris site**

- Finish this site with the spring 2000 shearing as current objectives have largely been met
- Transfer resources to the transpiration/evaporation study at Red grass site

This recommendation may be adjusted for the run-off plots if another year's data is essential for PhD requirements.



**Orange:**

- *The overall recommendation is that this site be considered for continuation beyond the harvest year, into SGS 2 given its unique attributes in relation to design, location, native pasture and biodiversity values*
- The proviso is that the investors need to ensure that there is a much greater commitment of time from leadership and at least one other professional at this site. This needs to be addressed prior to the harvest year.

Currently all professionals including the leader appear to be involved in a range of other activities and are very much part-time on this project. Leadership has changed during the project.

**Wagga**

- The overall recommendation is that this network of sites needs to be drawn into the SGS fold in a more substantive manner, so that a constructive collaborative relationship can be developed.
- SGS should capitalise on the obvious synergies between native pasture work being conducted at the satellite sites and the work being conducted at both Orange and Tamworth
- The long term water data set at Wagga is an asset that SGS cannot afford to ignore
- Ways of bringing this site's people into the theme teams should be explored
- Linkages with the RPN need to be strengthened

## Western Australia sites report

### Progress against contract objectives

The research team demonstrated high competence in planning and implementation of some challenging research objectives. Milestone reports reflect that most objectives are well on track and will meet contracted obligations. Producing the dual needs of peer scientific review and producer acceptance on new technology will require careful allocation of resources in the coming years – there are more tasks than resources available, so careful prioritisation will be required.

#### Specific objectives

- Quantify the effect of Tasmanian blue gum belts on pasture and sheep meat production, water use patterns and profitability – *on target, with large differences in water use by trees, and summer active pasture (kikuyu), and relative small differences in production close to trees.*
- Quantify the impact of summer active kikuyu on water use patterns compared to annual only pastures – *proceeding well, with kikuyu producing extra feed in critical feed periods due to wider water use pattern in conjunction with sub clover, and deeper rooting habit. Model studies required to fill gaps.*
- Quantify cattle meat production, water use, nutrient loading and profitability for kikuyu and phalaris pastures compared to annual pastures at the paddock scale – *shown effectively (farmer adopted) at the farm scale the value of kikuyu in the farm system. Appears that inclusion of summer active pastures in a whole farm plan has great potential for improved profit and water use - the only beef production system in SGS.*
- Contribute to the National experiment by collecting the minimum data sets - *data being entered into the SGS database, and database being used for site and theme analyses.*
- Report findings to RPN's – excellent interaction with RPN members – *the site is a beacon for exploring and discussing pasture management options for improved profit and water management.*

## **Assess contribution toward**

### ***Science***

- Experimental design using an established tree belt has provided an excellent venue to explore tree/pasture/animal interactions. Use of heat pulse and humidity domes to directly measure ET, in conjunction with other water measurements is innovative.
- On farm studies of cattle/pasture systems provided a real world test of alternative pastures, with economics at the farm scale included
- The tree study represents a major contribution to the debate on water use of alternative systems (trees, and alternative pasture management options).
- Summer active grass pastures (kikuyu) have capacity reduce recharge (cf phalaris), and increase animal production
- Trees have maintained high water deficits within their narrow area of influence
- Trees have had less impact on pasture and animal production than expected. A simple model of trees/pasture on animal production and water balance has been constructed.
- Drainage has been measured directly at one site – not a common achievement in the suite of SGS experiments!
- Simple water balance models appear to provide credible analyses
- The SGS model has been parameterised for the sites.

### ***Themes***

- The sites compliment the national experiment with special emphasis on trees, cattle, and summer active pastures in a strongly Mediterranean environment.
- Data sets collected will compliment other sites, particularly in soil water, pasture, and animal production.
- The Albany site provides important insights into the role of trees (belts) in the landscape –these studies will most likely be needed in other environments.

### ***RPN's***

- Demonstration of principles appreciated more than recipes
- Linkages with producers has provides strong support for and interaction with scientists, with joint ownership of results.
- Exposure of scientists to real world issues, at the farm scale has been valuable to farmers and researchers – exposure of “warts and all”

- Producers were impressed that trees had less impact on pasture and animal production than expected – sufficiently benign to be considered as part of a farm system, even from an aesthetic viewpoint!
- Demonstrated at the macro level the commercial reality of options being explored (e.g. kikuyu pastures)
- Recognition that packaging of information is about establishing learning settings, not just information.
- Professionally executed trials sites act as a focus for regional interest in production and sustainability – revitalised confidence in the grazing industry – many positive stories coming out of the research, even if not entirely new or unexpected.
- The SGS sites are valuable source of expertise (education, extension) for the region

### Recommendations

Summary of individual sites

Site	Comments
Albany	<p>Long term tree X pasture interaction, Only agri-forestry site in SGS. An opportunity to monitor through to tree harvest and follow residual impact of trees.</p> <p>Capture data for the coming summer then switch from plot based to transect based ie pasture measurements only.</p> <p>Animal measurements to meet Animal ethics requirements.</p> <p>Continue part or all of current data collection into the harvest year but with the primary purpose of assuring the site is available for the new program</p>
Kendanup	<p>Uncertain tenure, unwilling collaborator, Wind up the site on June 30, 2001 as per the current contract <u>unless</u> more secure arrangements can be made.</p>
Esperance	<p>Data collection mostly complete, Wind up the site on June 30, 2001 as per the current contract</p>

***Until June 2001***

- Develop a plan on how the sites can be managed with minimal input pending further planning, and to facilitated HY activities
- Inclusion of forestry specialists in overview of results and interpretation - as peer support, and to link to agro-forestry programs in WA issues such as post harvest strategies.
- Database entry to be brought up to date, and management of databases put in the hands of technical staff.
- Continue the initiative in integration of water balance and production using a range of model approaches. Staff at this site (all three in WA) can play a leading role in water balance model development, testing and application.
- Tree component is unique and valuable SGS resource. This element of SGS may need to be replicated at other sites to generalise findings.
- Tree/pasture interactions should be continued until Autumn 2001. For the harvest year (HY) measurements can be reduced to minimum measures, with removal of fences to simplify animal management.
- Contact an in house economist to support production and resource economics analysis. An alternative may be to use a common template developed across SGS for whole enterprise economic analysis of alternative grazing systems.
- Ground water hydrology expertise should be consulted to support drainage and ground water studies at the three sites
- Kendenup - Review site closely after this season – review team concerned about undefined resolution of pasture access. May be better to re site the experiment unless assess and tenure can be secured. Explore expected results based on model analysis. If model suggest no difference, either stop or change focus.
- The Kendenup site may deserve more exposure – not well known
- Project management training for senior staff

***Extension beyond 2001***

- The Albany site should be continued until after tree harvest, to explore harvest impact on water balance, and post tree soil changes.
- The Albany site has much to offer as an extension asset for WA Agriculture and the grazing and agro-forestry industry (other sites also, but not seen by the review team)
- Kendenup – if tenure and management issues are not resolved, this site may be discontinued. If continued, this site needs greater exposure to RPN and extension staff.

### ***Harvest year***

- Considerate scope exists for reducing animal measurements to facilitate resourcing HY needs
- Repeat pre experimental modelling exercise
- Apply the SGS model and AgET to all sites, and explore strengths and weakness of alternative models (accuracy, flexibility, explain ability).
- Recruit an in house economist to support production and resource economics analysis
- Recognise the opportunity for continuing the experiment through to tree harvest, to explore what will happen to pasture and soils after harvest?
- Develop a clear publication strategy to achieve the most from the high level experimental foundation work carried out to date.
- Publish findings in a range of venues from scientific journals to popular press and extension forums.


### ***Beyond harvest year***

- Tree component is unique and valuable SGS resource. This element of SGS may need to be replicated at other sites to generalise findings.
- The experimental sites have increased our understanding of soil water and production dynamics. These broad findings will require fine tuning and adaptations for inclusion in broad production systems across a wider range of soils and climates.
- Economic value of alternative pasture species and management options needs further development.
- Need for a broader range of summer active perennials.
- Capture the extension opportunity that the site presents.
- Need to consider the ecological issues associated with monoculture tree belts – are there other options?
- Need further economic evaluation of the role of trees in farming systems
- Explore how is land rehabilitated after tree harvest (will this be necessary?)
- Demonstrate to the wider community agricultures endeavors to control recharge and salinity

### ***Other observations***

The team has a clear focus on issues that are shared by the farmer groups. Obviously the threat of salinisation is real, and answers are needed urgently.

The three sites in WA showed a range of approaches that are complimentary (from detailed measurements to a paddock comparison in a whole farm setting). The skills of staff are broad allowing the team to develop a number of



approaches (different element of the water balance, different approaches to modelling).

## Western Victorian Site Report

### Progress Against Contract Objectives:

- Quantify components of pasture and animal production – good progress, but only a small seasonal range, at the dry end of the spectrum
- Determine the soil water profile under treatments and derive the key water balance variables – the site team is relying on modeling to achieve this objective
- Collect the minimum data set – on track, though data entry onto the national database needs to be given priority from here on
- Meet with, and report to, the Regional Steering Committee – there has been reasonably good interaction between the research team and this committee
- Quantify water use by mature remnant trees – this is being done well with a limited number of trees (2). These data will need to be pooled over sites
- Three areas of scientific investigation have been classified by the team as “still emerging” (see below)

### Assess contribution toward:

#### Science

- This site is making a sound contribution to the understanding of animal/plant /nutrient dynamics and relationships under different grazing systems and fertilizer regimes; the production potentials under rotational grazing; and is making a key contribution to the impacts of water use by spaced trees
- Three areas that are still emerging are: an improved understanding of productivity potential; management impacts on pasture composition; and the underlying mechanisms for this in Australian environments
- Training opportunities for Ph D students have been well exploited through the linkage with the University of Melbourne
- Publication of interim results in conference proceedings has been excellent
- A larger rainfall event is needed to allow the P runoff results to be useful



## Themes

- The major contributions from this site are toward the animal and pasture themes, with some additional emphasis on the nutrient theme also
- The progress from this site regarding the animal and pasture themes has been somewhat delayed by the later development of these components of the SGS Model, slower data entry into the database, and lack of some capability in the data base to extract data in appropriate forms
- Other models will be tried at this site, eg GrassGro, to complement the SGS model. Site team capability is excellent in this regard
- The minimal data set is being collected across all themes
- It was noted that this site is the only one that has two theme leaders (animals and nutrients), which has both advantages and disadvantages (demands on time) for the site work

## RPNs

- This site is dealing with issues of real relevance to farmers in the forms of both production and resource management
- This gives the site a real opportunity to lead in the area of the balance between productivity and sustainability
- There is good evidence of uptake by farmers of the key productivity findings already (as well as by the site cooperator)
- Clearly the relationship between the research team and the RPC is excellent, as is the complementarity between the research site and the regional sites
- The research site adds considerably to the credibility of the total effort, while the regional sites are able to try "variations on the basic theme"
- Economic analysis needs to be strengthened from here on to place the site information properly into the whole farm context

### **Recommendations:**

- The overall recommendation for this site is that it be retained at least until November 2001 and possibly until June 2002 so that data collection can continue in the hope of obtaining a wet winter (see below)
- That the opportunities for strengthening this team's extension capability be examined as soon as possible with a view to capitalising on the marvelous demonstration value of the site, the strengths of the research team and the many messages that will be emanating from this site.

This will also aid in optimizing the researchers' time until the end of the harvest year. This team has a pivotal role to play in data synthesis and interpretation.

### **Until June 2001**

- Enter data onto the database as a priority
- Continue data collection (and pray for a large rainfall event!)  
Develop the capability and procedures for economic analysis
- Repeat the pre-experimental modeling for water balance using the SGS and perhaps other models. Steve, Ian Johnson and others need to look at the modeling options that should be used during the harvest year
- Develop a marketing and extension strategy
- Test the value of replication to the conclusions from this site to provide guidance for designs in future programs
- Develop a clear site plan for delivery of site outputs
- Plan for publications

### **Extension beyond 2001**

- Continue the site for one more year, and continue to apply the 80/20 rule rigorously to the frequency and type of data collection
- Assess the need to collect more data in November 2001, in relation to seasonal events to that point. It may be that there is little point in continuing data collection beyond weaning

## Harvest Year

It is recognized that the West Vic team will have a key role in the harvest year both at site and theme levels

- Greater integration of information and demonstration from the national and regional sites is required to drive out the full value of the investment
- Extend the current work to develop:
  - Publication of results to gain credibility
  - Sustainability indicators
  - The role of grazing management tools at farm level, including financial analysis
- Establish the principles and limits to geographic application
- Link information across sites to strengthen the conclusions (eg trees)
- Turn the site information (along with other data) into extension messages and package it appropriately
- Capture other groups and resources to assist with the harvest year tasks Actively provide a national focus for dialogue about the balance between productivity and sustainability
- Provide sound project management through the data analysis phase to gain the greatest advantage from it, including training opportunities
  - Regional committees need to be encouraged nationally, to set up demonstrations based on the Hamilton results

## Beyond the harvest year

- Define limits to high input pasture systems
- Researchers to support the RPN farm-based sites in a partnership/co-research
- Extend current work to:

Other grazing systems, including ryegrass, tall fescue, kikuyu

Biodiversity (associated tree belts) and soil biology  
Phosphorus and nitrogen attenuation (plot to stream)  
Link more strongly with leading edge producers, to push the limits

- Increase focus on sustainability

**Other observations**

- Need to overcome problems of  
Minimising the time allocated to data collection in the harvest year

White-anting by the McKinnon group: this issue was raised by farmer representatives, and warrants some thought as to the strategy that needs to be adopted to minimize possible damage to the credibility of SGS messages. The combination of a powerful research team and an equally capable RPC provides a real basis for pushing the frontiers on a partnership footing

- The big opportunity is to lead the science and debate regarding the balance between productivity and sustainability in high input systems
- The team is particularly well placed to make significant contributions to the modeling work in the harvest year

## North East Victorian Site Report

### Progress Against Contract Objectives:

To develop more profitable and sustainable management systems for low, medium and high input pastures running ewes and lambs by active management strategies that aim to do the following:

- (i) quantify the components of the water balance for three pasture types (measure and modeled) (30 June 2001) - - carried out at two sites with three catchments. Alternative approaches are still being tested (Bowen ratio, logged piezometers).
- (ii) quantify the losses of N and P in water from the catchments by measurement and modeling, and monitored key soil properties related to soil acidification. - *partially achieved. The Ruffy site does not appear to yield significant runoff, therefore losses will be via drainage (not quantified).*
- (iii) measure pasture productivity and botanical composition and develop relationships with other sustainability measures (30 June 2000) - *achieved, but not a major focus of this site*
- (iv) measure animal performance on the three pasture types do a financial analysis. (30 June 2000) - *partially achieved, financial analysis needs to be more transparent.*
- (v) quantify soil moisture deficits under different pasture and tree combinations and test models. (30 June 2000) - *partially achieved. It appears that treatment differences at each site are relatively small (a genuine result), and the clear message is that soils perform differences*
- (v) provide basic information to help answer 'what if' questions on the effect of different grazing managements, soil types and land classes, fertiliser inputs, pasture types, seasonal variations and trees on water use and nutrient flows, tree configurations. (30 June 2000) - *given this generalization of results requires application of a tested model, some way to go in achieving this objective.*
- (vii) contribute to the National experiment by collecting the minimum data sets required to support each of the national themes -*achieved*
- (viii) report findings to the NE Victoria Regional Steering Committee, including financial analyses of the costs and benefits for producers. - *achieved, but more follow up on financial analysis required.*

## **Contribution toward:**

### ***Science***

- This site is making an important contribution to the understanding of water dynamics on two contrasting soil types. The impact of pasture fertilizer and grazing management is less clear at this stage.
- Nutrient movement at the small catchment scale is better understood – rates of movement are small compared to application rates, but may still be of concern to water quality in surface and ground waters.
- The site has quantified water use of several spaced trees. While this work requires further analysis, this data will be valuable in quantifying water balances at the landscape scale. This innovative work is challenging to implement.
- Bowen ratio equipment has been installed to provide a direct measure of ET – necessary since ET is a large component of the water balance.
- Use of logged piezometers may be a valuable direct measure of accession to perched water tables – need to continue to sort out methodology issues.
- Publication of interim results in conference proceedings has been excellent.
- Economics needs to be link to producer needs.

### ***Themes***

- The major contributions from this site (co theme leaders) are toward the water theme, with some additional emphasis on the nutrient theme.
- SGS Model and the Uni Melb model, used in concert will hopefully provide alternative estimates of water balance. Good interaction.
- Other models are being explored at this site, to complement the SGS model. Site team capability is excellent in this regard.
- Management of the database on track and the minimal data set is being collected for all themes.
- It was noted that this site has two theme co-leaders (water), which has both advantages (logistics) and disadvantages (need to include other key water sites) for theme development.

### ***RPNs***

- This site is dealing with issues of relevance to farmers in the forms of both production and resource management, but with a focus on the latter.
- Linkages between the RPN and scientists could be strengthened. The RPN appears to need to develop a more shared understanding of key issues, and its relationship with the National site (and vice versa probably)

- The site is acting as a focal point for discussion of sustainability issues, with discussion between scientists and producers being as valuable as data outcomes to date.
- There is evidence of uptake by farmers of some key productivity findings.
- The research site adds considerably to the credibility of the total SGS effort, and will require data from other sites to form more generalized understanding of water movement. This interdependency is a key strength of the SGS model
- Economic analysis needs to be strengthened to increase the relevance to producers.

**Recommendations.**

A summary of site plans is listed in table below

Site	Comments
Maindample	This site has achieved most of its intended objectives, with a range of water supply years sampled –some high runoff years.  Wind up the site on June 30, 2001 as per the current contract
Ruffy	Sites well established, treatment differences small. Is there any point leaving the run-off equipment on such a low run-off site?  Wind up the site on June 30, 2001 as per the current contract

***Until June 2001***

- Data collection needs to be tailored to facilitate the harvest year, to coordinate with other sites and exploration across themes.
  - Continue data collection at least to the end of this season, and prepare a plan for either mothballing the sites, or at least cutting data collection back to water and some bulked nutrients –animal and pasture measures could be halted.
  - Seek expertise in groundwater hydrology to put small catchment results in context with regional hydrology, and develop general knowledge on broader approaches (link small scale hydrology to the broader catchment hydrology fraternity)
  - Bob White, Ian Johnson (SGS Model), Steve Clarke (GRASSGROW), David Hall (AgET) Craig Beverly, and Queanbeyan modeler (Narendra) to meet to look at modeling options that could be used during the harvest year. Use a number of model approaches to on some key data sets to explore; robustness of models (triangulation).
  - Determine long term estimates of water balance components (in a similar vein to pre-experimental modeling –but now with the added advantage of better characterization of soils and water use patterns) need to be generated using both the SGS and simpler water balance model.
  - Use modeling to verify that a reasonable sample of seasons has been achieved (see Modeling section in report)
  - Maintenance of database remains a priority
  - There seems little reason why grazing management could not be optimized to a rotational system as long as all management is



recorded. This may be an opportunity to increase treatment differences and will increase relevance and credibility with farmers and RPN.

- Develop the capability and procedures for economic analysis at the enterprise level. This may be supported by a whole of SGS template.
- Scope to use simple approaches such as AgET? With the gained understanding of soil properties (soil water stores, conductivity estimates, water use patterns) such models may provide useful insights into water balance components, and would compliment the SGS model outputs.
- Develop visualisation of model dynamics for simpler models (bridge understanding gap) (e.g. see Ag ET, SGS model as examples).

### ***Extension beyond 2001***

- The Mairdample site may be justified to be mothballed until modeling is used to clarify whether a reasonable sample of seasons has been captured.
- Logged piezometers and Bowen ration equipment needs to be given a chance to deliver potential high benefits, being the most direct measures of drainage and ET respectively.
- Assess the need to collect more data in November 2001, in relation to seasonal events to that point. It may be that there is little point in continuing data collection beyond winter high water season.
- There appears to be potential to rationalize pasture measurements after the current growing season.

### ***Harvest Year***

- Greater integration of National and Regional Sites (combined with non-SGS information) to drive out principles, applications, filling gaps, more learning. It is recognized that the NE Vic team will have a key role in the harvest year both at site and theme levels
- Opportunities for cross-site analysis of tree water use (see Vasey site), and general water and nutrient balance a high priority.
- Produce a schema for characterization leaky and non-leaky soils, and assess the effects of various grazing management options on the level of leakiness. The product could be a more generalised description of hazard recognition, and solutions.
- Developing a set of guidelines for each potential audience (for each theme perhaps we need to answer - what are the messages for producers?, what are the messages for the

environment? and what are the policy implications to balance the competing demands?

- Provide a check list of practicalities and economics of HIPS
- The site has potential for continuing as a focus for debate on the balance between production and sustainability in these landscape types.
  - Implement plan for publications
  - Develop processes for exploring with farmers indicators for sustainability (profit and resource conservation)
  - Establish the principles and limits to geographic application of results from the experiments (modesty in measuring and modeling.
  - Link information across sites to strengthen the conclusions (eg trees)
  - Turn the site information (along with other data) into extension messages and package it appropriately
  - Actively provide a national focus for dialogue about the balance between productivity and sustainability
  - Provide sound project management through the data analysis phase to gain the greatest advantage from it, including training opportunities
  - Simple water balance could be presented in as a more dynamic tool (not just a scientists tool eg SGS model).

### ***Beyond the harvest year***

- Review key issues with RPNs and peers.
- Define limits to high input pasture systems.
- Explore opportunities for collaborative research with the RPN's.
- Explore, with the vision of hindsight, what the most efficient approaches (defensible science, and as a learning approach for farmers and scientists) to participatory action research.
- Explore how researchers can support demonstration sites in a partnership/co-research approach.
- Consider moving from form the paddock scale to whole farm (see NZ sustainability monitoring farms report).
- Extend current work to other soils and grazing systems (see whole of project issues for discussion on approaches).
- Explore phosphorus and nitrogen movement through scales (plot, catchment).
- Use of remotely sensed data, soils and geology using GIS technology.

## Opportunities

The site has established water and nutrient balance principles for two contrasting soils/landscapes. This information needs to be put in context with regional hydrogeology.

To date, there appears to be only a partial understanding of baseline hydrology (pre settlement). Therefore, some baseline measurements need to be either developed from literature, models or measurement. Such information would appear essential for longer term catchment and landscape planning.

The impact of grazing management on water balance remains unclear for this environment. This may mean there is little scope for recharge management at any location. What are the implications of such an outcome?

## Wagga and Satellite Sites Report

This project is largely funded and resourced by DLWC and the MDBC, with funding up to June 2002. Inputs from SGS are modest.

These unique features made it difficult for the site team to address the review team's standard set of questions, in the same way that other site teams were able to do.

### Progress Against Contract Objectives:

- *How can the range of grasslands that occur in the MDB be managed to optimize carrying capacity, while maintaining biodiversity?*
- *How can productivity be improved through management and exotic annual legumes to achieve medium levels of N while maintaining a desirable perennial grass base?*
- *How can pastures be best managed to effect desirable environmental and resource use outcomes for catchments?*

As far as the review team could judge the research team is on track to address the above questions, with almost two years of funding still to go. Whether acceptable management solutions will be found is as yet unclear, as trends are only just emerging.

### Assess contribution toward:

#### Science

- These sites are at the forefront of the brave new world which is looking at large scale systems questions. Traditional approaches are not appropriate in isolation.
- As such there is a high degree of model dependency required to unravel effects and resynthesise them for the catchment studies, and there will be a question about how well the available models will be able to deliver on this.
- The satellite studies on the other hand have more traditional replicated designs, which will permit conventional analyses as well

- This combination will be powerful for considering native pasture productivity and dynamics, given sufficient time for effects to “shake out”

### Themes

- The major contributions from these sites will be toward the water and nutrient theme, the pasture theme, and probably the biodiversity theme
- There appear to be some problems with these sites being inclusively involved in the theme teams. The research team is of the view that its contribution is being undervalued, and is feeling like an appendage rather than a real part of SGS
- It will be important to address these issues as these sites have much to offer

### RPNs

- The relationship between these sites and the RPN is in need of rejuvenation
- There are difficulties to overcome, because of the range of demands on mixed farmers in the RPN, but now that the sites have something tangible to offer there is a real opportunity to develop a better partnership.
- The new RPN facilitator appears willing to embrace this challenge
- There is also a project steering committee that needs to have consistent representation on it from the RPN. There have been problems with this in the past. (This is a potentially confusing arrangement in its own right and care will need to be taken for both committees to have clear and non-overlapping functions; else dissatisfaction is bound to arise about one diminishing the value of the other)

### Recommendations:

- The overall recommendation is that this network of sites needs to be drawn into the SGS fold in a more substantive manner, so that a constructive collaborative relationship can be developed.
- That SGS should capitalise on the obvious synergies between native pasture work being conducted at the satellite sites and the work being conducted at both Orange and Tamworth
- That the long term water data set at Wagga is an asset that SGS cannot afford to ignore
- That ways of bringing this site's people into the theme teams be explored
- That linkages with the RPN be strengthened

### Until June 2001

- Formalise the framework for composition change. This could be from simple approaches such as conceptual frameworks, to models like STELLA
- Use the satellite sites to focus debate on native pasture management
- Capture a resource economist when the time is right to attempt to put "values" and costs on achieving the environmental outputs and outcomes
- Further develop the whole farm financial analyses of productivity changes
- Begin to explore the possibilities for greater use of CSU students in the harvest year and beyond
- Is there a possibility of measuring Et at the satellite sites, to enhance the core data set?
- Continue and further develop the excellent start on use of models to integrate experimental studies and results
- Apply best bet management rules to a catchment.

*The review team was advised that a start had been made on this, in which case this will be an excellent site for demonstration and focusing debate on the issues.*

- Improve synergies and networking with SGS.  
This is a two way street and there are some key issues that need to be worked through between the SGS management team and the Wagga consortium. These include a clear statement of what's in it for both sides and what resources will be contributed by SGS; ownership of IP and of the data and its use for SGS purposes, particularly in theme development.
- Opportunities and needs for skill development and training of members of the team should be recognized and developed in preparation for, and during conduct of the harvest year

### Extension beyond 2001

These sites are already funded until June 2002 as indicated above, and so data collection will continue through the harvest year, perhaps in a reduced form (the extent of this reduction is as yet unclear to the review committee).

## Harvest Year

- Participate fully in the harvest year, including staff at the satellite sites  
*(see above for more detail about the negotiations required prior to this being possible. The fact that data collection will not have finished for some studies will make the harvest year tasks that much more difficult)*
- Develop and present clear messages and principles for producers
- There is an opportunity for this site to make a significant pragmatic contribution to the economics theme
- Publish both scientific and “extension focused” papers/publications to provide credibility and to give a clear focus on the needs of target audiences, (not the least of which are the employers of the research staff)

*An issue here will be the extent to which the various studies have finished the data collection and are in a position to analyse and report results*

### **Beyond the harvest year**

- Scale up to farm and catchment levels, and extrapolate to longer time-frames
- Influence policy through use of empirical and modeling outputs aimed at answering catchment-scale questions regarding resource outcomes from management manipulations
- Use historical data to better predict/model outcomes from applying management options to catchments  
DLWC are already committed to the scale up to catchments, but farm-level scale up is not as clearly on the agenda
- Measure pasture dynamics on real farms
- Develop genuine on-farm research in partnership with farmers as part of the next phase of work
- Further collaborative research opportunities should be captured in the next phase of SGS

## **Other observations**

- The configuration of the physical resources is a “central” site at Wagga on the DLWC research center (unreplicated catchments with an intensive measurement regime), with four satellite sites (with replicated smaller “plots” and a lesser number of measurements) at Eugowra, Yass, Bendigo and Harrogate.
- This is a very powerful geographic spread and in some ways this is a mini SGS national experiment in its own right



## Carcoar Site Report, Orange, NSW

### Progress Against Contract Objectives:

Sub objectives:

- (A) Reduce weeds and improve persistence and % of native perennial grasses in a naturalised sward
- (B) Test and develop strategies to increase the water transpired and minimise erosion and surface runoff
- (C) Test and develop strategies that capture and use more nitrogen to minimize the development of acid soils
- (D) Develop management systems that produce lambs with at least 80% reaching required market specifications and marketable in May-July
- (E) Quantify the impact of treatments on biodiversity

Also

- Collect the minimum data sets for themes
- Report findings at the end of each production year
- Meet with and report regularly to the CTRSC

This site has only been functional for three years due to a sowing failure in the first year. This has made it difficult for the research team to obtain reasonable differences or convincing trends, particularly for biodiversity parameters.

Despite this, the marketing objective for lamb has been met in every year, and treatments, particularly resting of pastures, do indicate effects on perenniality. Similarly a clear effect of biomass on runoff is evident, as three good years of rainfall have been achieved. Nitrogen measures are confined to start and end of the study so this should be achieved, though there is uncertainty about the size of differences.

### Assess contribution toward:

#### Science

- This group has the potential and the resources to lead the way for SGS regarding biodiversity, and the pathway from native pastures to more highly managed systems, in terms of productivity and pasture "stability".
- The dynamics of perenniality and plant biodiversity in relation to management strategies and inputs should be further elucidated,

although the method of “active” grazing management, and confounding with stocking rate, confuses the story somewhat.

- The actual mechanism for increased perennality – increased plant size or number - has yet to be ascertained
- The water run-off data in relation to biomass and ground cover are promising and will be improved with further interpretation in relation to differences in slope etc. This is important given the perception that this is a major recharge area for the MDB
- The picture in relation to partitioning water movement and the impact of deep-rooting plants on moisture extraction is less clear. The final nitrogen data have yet to be collected.
- This is the only site where a market-focused system for animal production has been examined in tandem with other elements of the farming system.
- As part of this the role of chicory in such a system is a useful addition to the SGS armory.
- No site has attempted to “close the nutrient balance”, but this one can attempt the theoretical estimates in terms of inputs and animal outputs, providing by difference the amounts to be accounted for elsewhere in the system.
- There is the potential at this site to tie together the economic methodology for evaluating productivity and resource management shifts

### Themes

- The main contributions of this group into themes are for biodiversity, animals, pastures and economics
- This group should be able to make strong contributions to all these themes, as indicated above
- The theme leader for biodiversity is based here
- The animal theme will benefit greatly from these data and expertise
- A real concern is the amount of time that any of the professional staff has to devote to this pursuit, given the thin spread apparent even at the site level

### RPNs

- There is a nice spread of messages that will be coming out of this site’s work, from simply “shutting the gate” to strategic use of a higher input that includes chicory
- The fact that rotational grazing has not been considered, and the uncertainty regarding stocking rate effects, provides difficulties in giving comprehensive grazing management advice

- The economic interpretation of results will need to be given special attention; it is confusing at present, but the team is aware of this now
- There is an urgent need for greater on-going dialogue to occur between the researchers and the RPN and extension workers, to ensure that the interpretation of data and future direction are credible among potential stakeholders

**Recommendations:**

- *The overall recommendation is that this site be considered for continuation beyond the harvest year, into SGS 2 given its unique attributes in relation to design, location, native pasture and biodiversity values*
- The proviso is that the investors need to ensure that there is a much greater commitment of time from leadership and at least one other professional at this site. This needs to be addressed prior to the harvest year.

Currently all professionals including the leader appear to be involved in a range of other activities and are very much part-time on this project. Leadership has changed during the project, and the task has now fallen to David Michalk, who can be away for extended periods.

**Until June 2001**

- The suggestion of a joint workshop between the producers, workers and researchers should be grasped; to review progress to date, and clarify the key messages for science and producers, as well as the future questions that need to be answered. This should involve the Southern Tablelands and Monaro producer group as well.
- More producer involvement in interpretation and presentation of results.
- There is an opportunity to alter the design in 2001, to provide more relevant information regarding grazing management, and farming systems. The opportunity here is to save at least a year.

It will be imperative that project management is in sound shape prior to making this decision, as considerable attention will be diverted from harvest year activities toward planning and data collection.

### Extension beyond 2001

- See overall recommendation above

### Harvest Year

- Make the most of the harvest year – demonstrate overtly to funders and farmers the high value of the site (producers are hungry for information)
- Involve farmers and extension workers in this phase
- Lead the low input route to profit and sustainability and provide a focus for the debate on the balance between production and sustainability
- Pioneer a novel high input system such as chicory
- Build in a **wow** factor –this is a marketing opportunity
- Integrate across the themes at this site (strength in pastures, animals, economics and biodiversity), thus demonstrating within a site what is possible across sites
- Integrate this site's work with Denys Gardens' work
- Clarify economic messages
- Build production and resource economics into simple integrated messages
- Water data offer novel insights; make use of this opportunity
- Simple water balance could yield some early insights.
- Estimate off-site impacts of water and nutrients
- Develop novel methodology for pasture systems research (alternative statistical approaches that can be considered in any new programs)
- Test and apply the SGS model. This will be important if the confounded effects in relation to grazing management and stocking rate are to be unraveled
- Explore the value of other simple models eg AgET)
- Develop ecological model of pastures

### Beyond the harvest year

- Close the water balance in future studies
- Test the impacts of further steps up the management staircase
- Link the SGS model to GIS framework (but need to make it clear to what benefit)
- Integrate National and Regional Sites (combined with non-SGS information) to drive out principles, applications, filling gaps, better learning
- Obtain data on the impact of the “maturing” phase of pastures on productivity and sustainability

## North West slopes (Tamworth) sites report

### Progress against contract objectives

The research team has demonstrated a very high level of competence in planning and implementation of research objectives. The site is clearly leading in development and use of the SGS database and model. Three sites have been developed to represent Red grass, Phalaris and Danthonia pasture communities, providing a broader geographical spread for research findings and extension. Milestone reports reflect that objectives are on track and will meet contracted obligations. Producing the dual needs of peer scientific review and producer acceptance is well in hand. The site showed excellent linkages with extension personnel and RPN's.

### Specific objectives

- Measure relationships between ground cover and runoff – *events measured support published data, awaiting storm rain to test the hypothesis, but importance of runoff now reduced cf evaporation losses*
- Test and develop grazing and fertilizer strategies to maintain ground cover, minimise runoff, erosion and nutrient loss, and improve animal productivity – *alternative grazing strategies have shown large difference in cover maintenance, with the potential to reduce water losses from the system while improving the resilience and productivity of three pasture communities. The sites are beacons for a renewed extension message.*
- Quantify management impacts on soil biology – *the sites have shown large soil biota changes associated with improved grazing management. These sites have broadened the perspective of scientists and producers in include soil biology as an important aspect of sustainable grazing.*
- Collect minimum data set and participate in theme development – *this site has lead the way in use of the SGS database and model.*
- Report findings to RPN's – *excellent use of the sites have been made for extension and linkage to RPN's. The demonstrative nature of the sites make them ideal forum for extension. The team have also supported RPN demonstration sites.*

## **Assess contribution toward**

### ***Science***

- Replicated pasture management sites have been established at three contrasting sites. These sites have demonstrated the impact of management options.
- Pasture and animal production responses have been clearly demonstrated. Contrast between sites has highlighted that not all soils and pastures respond in a similar manner.
- The role of pasture management on soil biology has been clearly demonstrated, and represents a more holistic view of grazing systems.
- The role of litter in water balance moderation has been demonstrated. It has been confirmed that soil cover controls runoff, and that litter is an important element of a pasture sward to moderate evaporation and runoff.
- The potential to modify evaporation and drainage toward increased transpiration is being explored and presented some exciting possibilities.
- Drainage is not being measured directly, although the more direct measurement of runoff, and ET will lead to model estimates being more reliable.
- The SGS model has been parameterised and applied for the sites.

### ***Themes***

- This site has lead the development and application of the SGS database, and uses this database as its primary data storage and extraction tool.
- The development of the SGS model with IMJ has proceeded well, with several users familiar with the model.
- Use of the database and model is providing the research team with the capability to a) quality control their data; b) explore interactions between soil properties and pasture responses
- The model has been tested on measured data (soil moisture, runoff, grass production) and initial tests are very promising (exciting from the research teams perspective).

### ***RPN's***

- Professionally executed trails sites act as a focus for regional interest in production and sustainability –revitalised interest in what is an old issue – pastures improved with super and sub clover – many positive stories coming out of the research, even if not entirely new or unexpected.
- Demonstration of principles of how soil/pasture management influences on the fate of rainfall (runoff, evaporation, transpiration, drainage) using

innovative action learning approaches (Pasture Health Kit, demonstration tools).

- Producers would like to be involved earlier in site selection and research design
- Linkages with producers has provides strong support for and interaction with scientists, with joint ownership of results.
- Focus on soil biota appreciated (e.g. for each sheep, equivalent to 4 sheep in microbe biomass in the soil).
- The SGS sites are valuable source of expertise for regional sites

## Recommendations

The table below summarises recommendations for the three studies at this site.

Site	Comments
Wallaby grass	Continue full data collection at the two native grass sites until shearing in spring 2001.
Red grass	Increase emphasis on ET manipulation, to explore the potential to increase transpiration and pasture production and reduce losses from runoff, drainage and evaporation.
Phalaris	Finish site with March 2001 shearing as current objectives have largely been met – transfer resources to the transpiration/evaporation study at Red grass site – this recommendation may be adjusted for the run-off plots if another year's data is essential for PhD requirements.

### *Until June 2001*

- Potential for the sites' personnel to mentor other sites in use of the SGS database and model.
- Further develop experimental support for the hypothesis that more rainfall can be directed through transpiration by manipulation of grazing and fertilizer management. This may require more emphasis on direct measures of E and T as they are major elements of the water balance.



### ***Extension beyond 2001***

See overall recommendations above

### ***Harvest year***

- Exploit the advantage of the up to date SGS database to further develop skill in use of the SGS model.
- Repeat pre experimental modelling exercise using the SGS model using the attained better understanding of soil and pasture dynamics.
- Use the model to explore what if scenarios for grazing management. Such “model studies” will to focus on where increased effort is required to close the water balance (i.e. direct measurement priorities), and also to explore the likelihood of management responses in the longer term (data time stretching).
- While the review team did not see the economic tools developed, it is recommended that such tools be further developed with strong producer input. The spreadsheet discussed may be a template for SGS across sites.
- Initiatives on soil biology will be important to the development of the biodiversity theme.
- Demonstrate Action Learning tools developed around the pasture extension initiatives associated with the sites to other SGS teams. tools, processes, principles, indicators and hunches
- Develop a clear publication strategy to achieve the most from the high level experimental foundation work carried out to date.
- Publish findings in a range of venues from scientific journals to popular press and extension forums.

### ***Beyond harvest year***

- The success of the experiments to date present many opportunities. The breadth of data that has been collected, as well as the depth of experience in the research team will allow the team to move into some new approaches to research, as well as continue to explore some basic principles for modifying water balance, production and resource management aspects of grazing systems in the region. “New” approaches could include genuine co-research with key producer groups. Such participative research is a challenge for both producers and researchers as the rules of engagement may need to be redefined.

- Research findings will require further tuning and adaptations for inclusion in broad production systems across a wider range of soils and climates.
- Opportunity to explore the role of a broader range of perennials including sub tropical species in pasture systems..
- Tools to evaluate the economic performance of alternative pasture species and management options will need further development.
- Demonstrate to the wider community agricultures' concerns and endeavours in controlling recharge and reducing salinity risk.
- Action learning tools offer improved approaches to improving management skills in producers. Demonstrated linkages between research and extension staff should be maintained and enhanced.

## **SGS Regional Producer Network**

### **Summary of Input to the National Experiment Review**

The input of the producer network has been enormously valuable to the review team. While this input has been woven into all sections of the report, we felt that a summary of the input should be made and presented in the body of the report to reflect its value. This summary is supported by the inclusion of each committee's written response in this appendix.

There are no recommendations included in this summary. The producer's input has helped to frame recommendations throughout the report, but particularly in the *site* reports, in the *adoption* report in the integration section, and finally in our recommendations and observations for consideration in planning *for the new program*.

### **Approach**

The reviewers posed a common set of questions to all Regional Producer committees (see appendix E). The committees met and prepared their responses and, in most cases, then presented their response directly to the reviewers as part of the procedure followed at each site visit. (There were some variations to the above process, as not all regions have a national site in their area). The review team used this interactive input to help make their site assessments and recommendations.

### **Summary of the Regional Producer Response**

Many issues came up as responses to more than one question. As appropriate they are included in this summary. Where possible, direct quotes are used.

## **What have you learnt or do you hope to learn from your National site?**

Given the variations in climate and research focus at all sites, there was a wide range of responses, but some common threads emerged.

- The importance of building relationships between producers and the research team, and the action-learning value of the combination of researchers, extension professionals, and producer co-operators on site.
- Grazing management can influence pasture composition, but producers want to know more about its use, and want to see more 'cutting edge' type approaches used
- The importance of soil type and its influence over water movement pathways. "The improved understanding and realisation of the complexity of the hydrology of pasture systems and the overriding influence of geomorphology were seen as important outcomes with potentially important implications for management".
- We should "litter Australia". The win-win approach of capturing and using more rainfall for production, while reducing the sustainability problems such as deep drainage and water erosion is seen as a real opportunity.
- The interaction of trees and pastures, and the importance of trees in grazing systems; but there is much to learn about how best to use trees.
- "Biodiversity is relevant to agriculture but the links are complex and still unclear".
- The need for long term research when studying the interaction between sustainability and production.
- Observing the progress of trials is a valuable learning experience in itself and research mishaps (eg. worm build up in sheep grazing green pasture through summer) can be just as valuable in this regard as research successes through reinforcement of 'real life' on farms

## **What difference will this make to your business?**

- A common theme was one of increasing the confidence of producers to make changes or fine tune existing practices
- "There is potential to improve the bottom line without costing a fortune"
- SGS is a powerful impetus to make changes, e.g. "SGS has put me in touch with people who question current practice" and the national experiment site "has challenged me to change by creating dissatisfaction".
- The national sites have greatly assisted extension professionals, and given leading producers "the chance to go out and hold farmers hands and lead them down the high production road"
- "There are huge potential gains to be made by the many producers who have yet to adopt perennial pastures and improved grazing management".

## **What difference will this make to your community? [We noted that 'community' was interpreted in different ways by various groups]**

- "Enhances the image of farmers in the community by demonstrating farmers are caring for the land"
- "There will be no impact on the community unless it has a support and mentoring system for producers, and challenges leaders to look for new ideas"
- "All good results at a business level flow through to the community"
- "It will positively complement" other community programs such as Landcare.

## **Looking back, what has worked well at this site?**

- Relationship between researchers and producers has been very valuable to both parties where it has been mutually embraced and developed
- The increase in scale of research in the experiment, and the move by researchers to start to look at whole systems rather than components
- Multi site research (e.g. Tamworth, N.E. Victoria and Albany, with common treatments) has added to producers' confidence in outcomes in those regions. "Two sites on two different soil types....lent authenticity to the experiments"
- Research sites are great extension tools
- The sites have helped SGS earn other agency respect, improved linkages and generally raised the profile of SGS

## **Looking back, what could have gone better?**

- Many sites were planned and designed before producer committees were formed to the stage where they could be involved in initial planning.
- This is reflected in producers questioning many of the treatment levels and constraints. For example there was widespread belief that the forms of rotational grazing used were generally conservative in relation to emerging district practice.
- The need to improve links to regional sites, to make better connections between research and demonstration, and seize the opportunities for extending the scope and scale of the research.
- There is a need for more and improved financial analyses of outcomes.

- Greater involvement and consultation with producers through the trials, with a greater degree of flexibility to 'tweak' treatments would have added to the relevance of some experiments.
- There is a need to move from single treatments to demonstrate the synergies obtained by combining treatments, into farming systems e.g. improved grazing management and fertiliser.
- All sites need a 'WOW' factor built into them to grab the attention of producers who are constantly bombarded with information sources

**What will be the important questions to be answered in the next stage of SGS, beyond the 'Harvest Year'.**

As for the initial question, there was a wide range of responses, which will provide valuable information for those planning beyond the harvest year.

- Start putting the treatments together. Start looking at whole farm systems.
- Look under the soil at organic matter, at soil biota. Why and how are they important, and what effect does grazing management have on them?
- "We have established a 'sponge'. How do we keep water in the sponge for as long as possible, and stop it leaking", and then use it to drive production.
- There is a need to look for, and at, new deep rooted species in our systems, including summer growing perennial grasses, trees and browse shrubs.

**This summary ends with a quotation from North East Victoria, in response to the last question, which indicates how high the stakes are. The need for knowledge and action are great.**

**"Is the community prepared to take areas, that have been shown to be fragile and difficult if not impossible to manage sustainably, out of production or to change the production systems of these areas to ensure sustainability?"**

## **SGS National Experiment Site Review - Western Australia**

### **WA SGS Regional Committee response to NE sites in WA:**

#### **1. What have you learnt and hope to learn from NE sites?**

- Demonstrated plant/livestock management for perennial pasture system
- Demonstrates at a Macro-scale the commercial reality that producers take notice of in the real world and overcome the challenge (e.g. worms on Kikuyu)
- Look at trees to complement grazing systems and agriculture
- Producers gaining a good reflection of the pasture/animal interaction
- Value of green summer pasture feed from perennials being demonstrated
- Trials have demonstrated the optimum management of Kikuyu and impact of poor management (inadequate grazing pressure)
- Demonstrates that it takes some time to develop a new grazing system
- Need for the grazing pressure to maintain the annual pasture
- Need for an annual legume component in Kikuyu pastures (may need other annual species as well)
- Trees will have a limited impact on livestock production on an average farm
- Impact of tree orientation on pasture production/ growth
- Results vary between Kikuyu and Phalaris based pastures at Esperance
- Grazing management has created limitations in data
- Perennial (Kikuyu) pastures are site specific and area specific
- Climatic limitations in WA for Kikuyu establishment and growth
- Good model for similar work on other perennials
- Better grazing systems available than only annual pastures
- SGS RPN is asking more questions about grazing management
- Now able to demonstrate that production and sustainability go together
- SGS enables researchers to develop hunches
- Can use data to demonstrate good and poor grazing practices
- Demonstrating principles/ best bet rather than recipes
- Understanding of the impact of trees on pasture/livestock as an answer to "What If's"

2. What difference will this make to:

*Your business*

Information from the national experiment will impact on:

1. Adoption on perennial (Kikuyu) pasture systems by
  - : extending the growing season to give better all round farm productivity; reduced risk & supplementary feeding requirements & better marketing options.
  - : reinforcing the need for a legume component in a perennial pasture system
2. Establishing tree belts in perennial pasture systems by:
  - : reinforcing the need to plant deep rooted perennial plants to reduce/control deep drainage.
  - : by providing greater producer confidence in establishing tree belts
  - : by providing greater overall knowledge about the principles of the tree pasture system. (NB. Knowledge is still required on incorporating tree belts into the whole farm system
3. Agricultural Extension by providing valuable support information to extension projects/programs.
4. Increasing producer confidence – that they can grow grass more efficiently and manage the pasture better for greater profitability & sustainability.
5. Improve wool quality (lower micron, higher fleece weights, better yield & tensile strength through the adoption of the principles of perennial pasture grazing systems.
6. Highlighting the importance and the vital role of grazing management in gaining benefits from perennial pasture systems.

HOWEVER : The impact will vary among producers who have adopted perennial pastures and have control or rotational grazing management. BUT the principles can be used to “fine tune” existing management systems.

**\*\* There are HUGE potential gains to be made by the many producers who are yet to adopt perennial pastures and improved grazing management.**



**Your community**

**Positive Impacts:**

- Revitalizing confidence in grazing as a sustainable industry
- Enabling producers to demonstrate to the wider community that integrated grazing systems can maintain the ecological balance.
- Producing benefits to rural communities by retaining infra-structures i.e., agribusiness, schools, rural support services etc.
- Protecting wetlands & other sensitive environments when perennial systems are widely adopted at the catchment scale.

**Potential Negative Impacts:**

- **there is concern that higher input systems may impact on valuable wetland areas and there is a need for a more integrated agency extension approach and networking between SGS & SRD, LCD's, Landcare etc.**

**3. Looking back, how have things gone on this site?**

**a) What things do you think have worked well?**

- National Experiment (NE) researchers are a great educational resource to Regional Producer Network (RPN)
- Interaction between scientists/ producers and impact of the NE plan on producers practices
- RPN was involved through the growth phase of NE sites
- Usefulness of "poor" results of 1998 is real world
- Research is coming up with the principles, versus the recipes, of grazing management which is then demonstrated
- Whole farm scale of Integrated research at Esperance
- Having 3 WA sites is a strength as integrated results demonstrate the concept works at a number of sites
- Researchers starting to look at whole system rather its components
- That there are better grazing systems available than only annual pastures
- There is now a higher profile for SGS in Region/Southern Australia, so don't change the name
- Now able to demonstrate that production and sustainability go together
- SGS enables researchers to develop hunches
- Whole farm scale (farmlet) demonstrations

**b) What things would you do differently with the benefit of hindsight?**

- Need for nutrient loss information or monitoring at Esperance
- Albany only has 2 years of solid data and introductory year- need 3-4 years (an extra year needed)
- Implements other grazing strategies in NE, i.e. Rotational grazing
- Need sound economics to be applied to research
- Basing recommendations on only 2 years solid data is not ideal, 3-4 years is more credible/reliable
- Build a WOW factor into the project design to compete for producer attention from many other information sources
- Don't overlook the value of "poor results"
- Over emphasis on Kikuyu

**4. What does your committee suggest will be the important questions that need to be answered in the next stage of SGS, beyond the "Harvest year"?**

- Look at trees to complement grazing systems and agriculture
- Identify economic and ecological value of green summer pasture feed from perennials
- Need for an annual legume component in Kikuyu pastures (may need other annual species as well), what % and how do you maintain it?
- If "Shadow effect" of trees extends beyond 10 meters of shade area is the effect due to water and nutrients?
- Need for nutrient loss information or monitoring at Esperance
- Sheep worm (internal parasites) data not analysed or understood, how to manage worms in a perennial pasture
- Research focus only on Kikuyu versus annual pasture in wetter areas- should include other species.
- Understanding of low pH under trees
- How to improve collaboration with agencies that have similar interests/clients/research
- Higher profile for SGS in Region/Southern Australia, so don't change the name
- Demonstrate to urban (government) community that producers are responsible land managers/ control recharge through grazing and natural resource management
- Does the next stage repeat the SGS NE model of producers/ researchers working together
- How do we attract other funding bodies to new program
- How do we spread SGS outside High Rainfall Zone

- How do we packaging the SGS information accurately beyond the Harvest Year
- SGS enables researchers to develop hunches
- Can we set up Regional Sites based on NE information (All Australia)
- Can we implement other grazing strategies in NE, e.g. Rotational grazing
- Need sound economics to be applied to research
- Don't relax- keep challenging

**Strengths:**

- National Experiment (NE) researchers are a great educational resource to Regional Producer Network (RPN)
- Interaction between scientists/producers and impact of the NE plan on producers practices
- RPN was involved through the growth phase of NE sites
- NE data collection will produce answers to questions on a broad basis at Albany and Esperance sites
- Demonstrated plant/livestock management for perennial pasture system
- Demonstrates at a Macro-scale the commercial reality that producers take notice of in the real world and overcome the challenge (e.g. worms on Kikuyu)
- Look at trees to complement grazing systems and agriculture
- Producers gaining a good reflection of the pasture/animal interaction
- Value of green summer pasture feed from perennials being demonstrated
- Trials have demonstrated the optimum management of Kikuyu and impact of poor management (inadequate grazing pressure)
- Usefulness of "poor" results of 1998 is real world
- Demonstrates that it takes some time to develop a new grazing system
- Need for the grazing pressure to maintain the annual pasture
- Need for an annual legume component in Kikuyu pastures (may need other annual species as well)
- Research is coming up with the principles, versus the recipes, of grazing management
- Gaining an understanding of the limitations of the production system

**Limitations**

- Results vary between Kikuyu and Phalaris based pastures at Esperance
- Grazing management has created limitations in data
- Perennial (Kikuyu) pastures are site specific and area specific
- Climatic limitations in WA for Kikuyu establishment and growth
- Need for nutrient loss information or monitoring at Esperance
- Albany only has 2 years of solid data and introductory year- need 3-4 years (an extra year needed)
- Class of livestock used at Albany (wether weaners) makes relating to breeding sheep enterprise difficult
- Sheep worm (internal parasites) data not analysed or understood
- Research focus only on Kikuyu versus annual pasture in wetter areas
- Understanding of low pH under trees
- Packaging of information into SGS products
- Lack of good collaboration with agencies that have similar interests/clients/research
- Albany and Esperance sites are representative of areas to be sown to commercial Blue Gum plantations
- Nature of collecting research data has limitations for interpretation of results
- Albany (tree) site does not have dryland salinity problems- no water table close to surface under trees
- Understanding of the impact of trees on pasture/livestock as an answer to "What If's"

**Opportunities**

- Good model for similar work on other perennials
- Better grazing systems available than only annual pastures
- Can use existing sites for extension
- SGS can offer results/principles to other organizations
- Higher profile for SGS in Region/Southern Australia, so don't change the name
- Extend research east and north in WA
- Demonstrate to urban (government) community that producers are responsible land managers/ control recharge through grazing management
- SGS RPN is asking more questions about grazing management
- Repeat the SGS NE model of producers/ researchers working together
- Now able to demonstrate that production and sustainability go together
- Attract other funding bodies to new program
- Spread SGS outside High Rainfall Zone
- Packaging the SGS information accurately in Harvest Year
- Remember honesty when packaging information
- SGS enables researchers to develop hunches
- Set up Regional Sites based on NE information
- Can use data to demonstrate good and poor grazing practices
- Demonstrating principles/ best bet rather than recipes
- Whole farm scale (farmlet) demonstrations
- Implements other grazing strategies in NE

**Threats**

- Other perennials species may not operate the same as Kikuyu pastures on south coast
- Need sound economics to be applied to research
- Basing recommendations on only 2 years data
- Competition for producer attention from many information sources
- Changing logo in new program
- Don't relax- keep challenging
- Cutting corners in developing the new program
- Overlook the value of "poor results" to producers
- Farmers like recipes
- Over emphasis on Kikuyu
- Lack of information on other classes of livestock
- Acceptance of established paradigms (e.g. worms on Kikuyu pastures)
- Extension Package too advanced for audience

## Western Victoria & SE South Australia Regional Committee 16/08/2000

### 1a. What we have learned

- Grazing management can be used to manipulate pasture composition
- Importance of building relationships between scientists and farmers

In theory rotational grazing can be profitable

We can develop production systems to match our pasture & production system

Learnt how powerful this relationship can be in promoting change

To balance sustainability & production issues is important

Can increase productivity by changing the grazing management

Rotational grazing = more product per Ha, not more product/head (ie lambs are lighter)

Potential for increased production on poor soils – impact of research on these soils enormous

Demonstrates a systems approach – not single issue research

### 1b. What we hope to learn

- Nutrient run-off & movement – What impact does this have on the environment & community. Make this information available to the wider community.
- Learn about impact of grazing systems on soils & biodiversity
- Integrated system that will maximise the use of water & nutrients in order to minimise their loss to the production system

Proving that if you change your grazing management there is a future in the livestock industry

Keep on proving Best Bet management options

The specifics of timing of rotations ie. more information on timing

Nutrient movement in relation to organic matter

Information on integrated production system to produce more production per ha & a

high value product

Is time controlled/planned grazing/cell grazing more sustainable & profitable

Changing attitudes

How to successfully combine set stocking & rotational grazing

2a. What difference will Vasey (Hamilton) research make to our Business

- Expanded business options & relationships
- SGS has put me in touch with people that question current practice

Confidence from proven results

Pushed the grazing system & improved profitability

SGS has made me more aware, increased profitability & feed utilisation

Vasey (Hamilton) has challenged me to change by creating dissatisfaction

Vasey (Hamilton) has created awareness of what needs to be done BUT where do I start

Vasey (Hamilton) has given me the chance to go out and hold farmers hands & lead them down the high production road

SGS opened up new opportunities through the perception of 'being good operators' by being involved in SGS

SGS has helped relationships with Banks and gained their support & endorsement

2b. What difference will Vasey (Hamilton) research make to our Community

- There will be no impact on the community unless it has a support & mentoring system for producers and challenges the leaders to look for new ideas
- To impact on the community it needs to influence the education system in Agriculture & change attitudes

Has the potential to make communities more viable & sustainable if researchers investigate sustainability & profitability issues mentioned before

If research gets to Vasey (Hamilton) it will be accepted and have an impact on the community

Attitude change & willingness to look at new things

We suspect that there is an 'underground' flow-on effect to the community

3a. What worked well at Vasey (Hamilton)

- Catalyst & support for Regional Sites
- Relationships between Research Team & Regional Committee developed well
- Site selection – located away from PVI research station and on challenging country & soil type

Dissemination of results in 1999

Comparison of Site grazing systems versus district practice is obvious

Continues to support Regional Sites

Site seemed to partially change with input from producers

Good relationship developed with private advisors

Scale is realistic, good demonstration

Demonstrates a broad base of grazing systems

Hard phalaris Site – but it is persisting under rotational grazing management

Good comparison with 'traditional' paddocks next door

Willingness to host visits to the Site

Integration with the Regional Sites in the National FarmWalk in 1999

Despite lack of rain, the water run-off treatment has still raised the awareness of water as an issue

3b. What we would do differently

- Be more open to feedback from leading edge, commercial grazing systems
- Have a farmer Committee around the Site
- Focus more on soil biology, micro-organisms & other sustainability issues

More stock the rotational grazing treatments – push the system more

Address Time controlled/Planned/Cell grazing issues

Identify a key driver of the grazing system

Apply a livestock production system more in context with the local area

Keep up more with farmer needs

Be more flexible (scientific constraints holding it back)

Regional Sites are 'researching' ahead of the National Site due to their 'flexibility'

More 'applied' research at a bigger scale

Hold 'open' days more frequently and advertise better in SE South Australia

Target information more at agribusiness technical advisors



4. What are the important Questions that need to be answered
- What is the role & importance of Organic Matter % in the soil in relation to Water & Nutrients
  - What is the role & importance of Ground Cover in the production system
  - What is the role & importance of Soil Biology (microbiology) in the production system
  - Sound information on alternative/non-traditional forms of plant/soil nutrients (US research)
  - How to maintain the research capability of Vasey (Hamilton)

As a traditional grazier "Where do I start"

How do we do 'low cost' research

Refer to responses to Question 1b. – What we hope to learn

## Central West Victoria Regional Committee 25/08/2000

Only six members of the Committee had visited the Vasey (Hamilton) National experiment Site which is not considered to be easily accessible to the Region. Those producers who have made a visit to the Vasey (Hamilton) Site reported it exceeded their expectations and that the Region can learn from the results.

### 1a. What we have learned

- ◆ Impact of rotational grazing
- ◆ Pasture composition changes through grazing management
- ◆ The Vasey (Hamilton) Site provides a response to treatments, not a true grazing system
- ◆ The Vasey (Hamilton) results are in-parallel in providing a sound basis for the observations from commercial operations in the Region eg. Phalaris becomes more dominant under rotational grazing; Sheep camps are being eliminated

### 1b. What we hope to learn

- ◆ Effect of soil biota on drainage from the Set Stocking & Rotational Grazing treatments
- ◆ How to practically scale-up to a commercial sized operation on an integrated farm
- ◆ The impact of the various grazing systems on Wool Quality and Tensile Strength
- ◆ What is the effect of a 'wetter' season, compared with the 'drier' run of seasons that the Site has experienced since the NE began
- ◆ How to take-home from the research to adapt and adopt new practices in grazing management

### 2a. What difference will Vasey (Hamilton) research make to our Business and the Community

- ◆ Rotational grazing results in a more intensive Business, with more livestock being run on the property. This can take up more management time and may lead to less social time being available for Community based activities
- ◆ Best Management Practice = less Stress and Makes more money. More profitable farms improves the general health of the Community
- ◆ Building confidence in the adoption of more productive and sustainable grazing practices will have an impact on the Community

3a. What worked well at Vasey (Hamilton)

- ◆ The demonstration of the impacts of rotational grazing
- ◆ Changes in pasture composition from grazing management
- ◆ Although there is little information about run-off because of the drier years, there is the potential to better understand run-off from the experiment
- ◆ The tree information and the micro-climate around the trees

3b. What we would do differently

- ◆ Have the research at a larger scale farmlets with more stock in each treatment
- ◆ Use a recognised breed of terminal Sire
- ◆ Have Regional Committee input into the development of the Site
- ◆ The Vasey (Hamilton) NE results are part of a total package – not the total answer. The results need to be scaled-up under commercial conditions in decentralised satellite Sites throughout the Region for producers to take more notice.

4. What are the important Questions that need to be answered

- ◆ Better understanding of Soil Health and the impact of Biodiversity at the farm level
- ◆ Impact of Liming on pastures, the grazing system and animal production
- ◆ How to gain wider Adoption of more productive and sustainable grazing management practices at the whole farm scale
- ◆ How to scale-up from the results to commercial practice and integrate livestock and cropping systems on the farm
- ◆ How to build Community Health & Wealth through the integration of Social, Economic, Environmental and Production systems at the farmer level of society
- ◆ Time management – where is the best return on an investment in time!

North East Victorian Regional  
Committee

**Minutes of responses to special review team questions 22/8/2000**

**Present:**

Roger Strong, Lisa Warne, Rob Chaffe, Pat Zerbe, Paul O'Sullivan, Hillis Houston, Doug Lithgow, Ron Briggs, Glen Lyon, Norm Stone, Ian Simpson.

**1a. Looking back, how have things gone at the Mairdample and Ruffy sites. What worked well.**

**Key responses:**

- The fact that the experiments occurred at all is the outstanding feature. *It happened.* Farmers, researchers and others were all involved in excellent well run sites with a previously unheard of level of data exchanging occurring
- The level of co-operation from the site owners was of particular significance and a determining factor in the success.
- The variation on the result from the different soil types produced interesting and unexpected data.

**Other comments:**

- The general recognition of its importance to the farming community
- Produced information that was unexpected regarding nutrient leakage and the nature of soils.
- The fact that there were two sites on two different soil types created a special profile amongst the producer community ... it lent a authenticity to the experiments.
- Because the sites were so well run there was a positive impact on farmers.
- Both sites were high profile and therefore attracted attention amongst producers. Following from this attention came discussion and learning that would not have otherwise occurred.
- High attendance at the NFW.

**1b. What things would you do differently with the benefit of hindsight.**

**Key responses:**

- For the future the data should be clarified, simplified and more readily available.
- For the future the stock management should be different, e.g. rotational to reflect best practice trends.
- It should be insured that the experiments are reproducible elsewhere so that the results can be truly said to be portable.

**Other comments:**

- There should have been a comparison of different stock management options so that improved pastures could have been also assessed.
- For the future better, more representative years should be chosen. (*Joke!*). Dry seasons and poor product returns have had a great influence on the results.
- There should have been better signs with more information as to what was happening..
- While the level of communication was good it would have been improved by regular media updates for example.
- The experiment design should have included more perennials including trees.
- For the future the design could include more modelling and less actual measurement to save costs.

**2a. What have you learned from the National Site (or National experiment).**

**Key responses:**

- The significant differences in water movement in different soil types making certain grazing practices sustainable on some soil types but not sustainable on others.
- The committee felt strongly that more interpretation of the results was needed.

**Other comments:**

- The importance of improved pastures.
- Appropriate grazing management and inputs can increase sustainability **and** productivity without negative results.
- Good informative research regarding catchment issues leading to profitability and sustainability has been ignored in the past..
- Graziers can manage high input pasture systems and avoid negative consequences.
- The level of importance of soil type and management flexibility in sustainability of high input systems.
- Fragile, low stocking rate areas need flexibility as do more stable high stocking rate areas.
- Sustainable grazing is possible and achievable and that this puts the grazing industries in a positive context in the water catchment.

**2b. What do you hope to learn from the National Sites**

**Key responses:**

- How to stay profitable and sustainable.
- How to extrapolate the results from the paddock size experiments to the farm level and also translate the information to different soils areas and climates.

**Other comments:**

- What levels of inputs can be used before the balance is tipped from sustainable to unsustainable.
- Long term results ... we must be confident that the *Best Bets* are indeed **best**.
- How to lift the public profile of grazing ... change public attitudes to a more positive impression.
- More on the importance of soil types.
- How to get the message out.
- How can we be better involved in research and communication.

**Q3. What will be important Questions that to be answered in the next stage of SGS.**

**Key responses:**

- Is the community prepared to take the areas that have been shown to be fragile and difficult if not impossible to manage sustainably, out of production or to change the production systems so as to ensure sustainability?
- Are the nutrient losses serious enough to make changes in management practices?
- How are we to discover the best practices and the level of inputs for **the whole farm** and ensure that these can be replicated in other areas?

**Other comments:**

- Are we effectively transferring knowledge and are we being cost effective?
- If the outcomes that we already have are the best bet options, how do we deal with the negative results on a farm basis and on a community basis?
- How do we make certain that the information and the practices are the right ones?
- How can we keep the results in context? For instance we must not write off Roger's granite country altogether because that was not the design of the experiment.
- How to make certain that we and others do not jump to conclusions?
- How to make certain that we are not producing black and white answers to grey problems?
- How to effectively disseminate information.

**4a. What difference will this make to your business**

**Key responses:**

- It will provide concrete, *can do* examples for people to follow ... this is not waffle.
- The experience of interaction with the scientists and the way they investigate and assess has increased flexibility and the level of observation in many of those who have come into

contact with the experiments. On a business level this is certain to increase for the future.

**Other comments:**

- Adopting the management practices emerging from the experiments has had a significant and positive impact on biodiversity and weed control. These in turn will make the business more sustainable and therefore more profitable in the long term.
- Native pastures have more room than was previously thought.
- There is plenty of room for nutrient inputs.
- Have more confidence to continue with practices already adopted.

**4b. What difference will this make to your community**

**Key responses:**

- It will positively complement, Prograze, SGS, FM500, Landcare and other community programs.
- Have been made aware of the manner in which information from the various programs and experiments can be manipulated and taken out of context so as to appear to endorse to opposite of the actual recommendations or conclusions.

**Other comments:**

- Make graziers more conscious of the impact of the farming practices on the environment.
- CMA's have visited the sites and have acknowledged that they have the ability to become appropriately involved. All that is needed now is to take the politics out of catchment management.



## **Southern Tablelands & Monaro Region**

### **Response To Key Questions 4/9/00**

The Region wishes to respond to the questions in two ways first to National site then to the National Experiment

#### **National Site**

The Region has had little interaction with the national site at Carcoar consequently little was learnt from the site. It was recognised that the communication problem was a two way issue and the Region will establish a process to ensure better interaction between the site and the Region.

The Region believes there is potential to be gained from the site and wishes to see the site continued

#### **National Experiment**

1. What have you learnt or hope to learn from the National experiment?

- has provided valuable practical information
- producer input has been invaluable
- needs to run longer

2. What difference will it make to your business?

- potentially very positive
- adds more information to and confirms management practices
- gives greater confidence
- helps make better decisions

What difference will it make to the community?

- all good results at a business level flow through to the community
- enhances the image of farmers in the community by demonstrating farmers are caring for the land
- gives producers confidence to pass on the positive things that are happening as a result of the National Experiment

3. Looking back, how have things gone on the site and what would you have done differently?

As listed previously the Region felt disconnected to the national site at Carcoar and will take steps to establish a process to remedy the problem. The TTAG was seen as the communication link and when this was discontinued the Region felt denied the opportunity to follow the progress of the site. This problem was compounded by the fact that NFW in 1999 was condensed into a week for all Regions and they were unable to visit the site on that occasion because of their full week of activities.

4. What does the Committee suggest will be important questions that need to be answered beyond the harvest Year

- sustainability issues, particularly salinity and water issues
- establishment of links between sustainability and economics/profitability
- define grazing management as being profitable as well as accounting for the broader environmental issues

**CARCOAR (Orange) SGS NATIONAL SITE REVIEW**

**CENTRAL TABLELANDS REGIONAL STEERING  
COMMITTEE**

*5 September, 2000*

**1. What have you learned, or what do you hope to learn from the National site?**

**Learned**

***Grazing management:***

- Grazing management has a critical effect on pasture composition
- Now I think, "Why is that plant there, and what have I done to put that plant there?"
- Some possible solutions to plant composition problems.

***Experimental design:***

- How difficult it is to initially set parameters for a trial
- Paddock variability has a great effect on the treatments applied.
- How difficult it is to structure large sites to test theories on grazing management, etc.

***Long-term experiments:***

- Experiments investigating sustainability are long term
- Time is a critical element – the longer the national experiment continues, the more information will get out. The Carcoar site is only just "assembling the bottom rung".
- Just beginning to get some information on sustainability, water runoff, treatment differences. This information has been limited to wet years and has only been collected over a short time span.
- The Carcoar site is reinforcing what we already know. Getting meaningful results will take some time.
- The site has reinforced the idea that superphosphate favours annual systems. What is the long term effect?

***Individual learnings:***

- "What I have learned at my national site has been dynamic for my business, although the knowledge has mostly been gained through being on the committee rather than on individual visits or farmwalks at the national site."
- Mites attack unhealthy (= unsupered) plants versus healthy (= supered) plants at the Rushwood regional site.
- "Observation is my most important management tool (and it's free!)."
- "Soils impact on pastures which impact on animals which impact on profit."

- “Unless the environment is healthy, we cannot be profitable.”
- Reinforced my previous positions/opinions/practices.
- “SGS is a vehicle to help the community improve the condition of the resource.”

***Other learnings:***

- Biodiversity is relevant to agriculture but the links are complex and still unclear.
- “Science has a role in increasing awareness that land management and degradation are community issues and will continue to go that way.”

***Hope to Learn***

***Grazing management:***

- Need to know a little bit more of the same, ie, the relationship between grazing management and insects/microorganisms (is there any effect? What will this mean for profitability/sustainability?)
- What will the different treatments and grazing management tell us about soil acidification?

***Long-term experiments:***

- We should be researching, with producer input, for at least 20 years.

***Extension:***

- “Simple, useful take-home messages”.
- What is “best practice” (for the extension message)?
- What sustainability indicators we can use to check where we are going on our own farms?

***Linkages:***

- What is sustainable, in terms of economics and the environment?
- Establish some links between sustainability, profitability and economics.

***Future individual learnings:***

- Learn more about ground water accession.
- How can biodiversity be made more relevant and acceptable to producers on the ground?
- What drives the differences between paddocks and landscapes?
- What effect will superphosphate have on mite populations?

## 2. What difference will this make to your business/community?

### Business

#### ***Extension:***

- Better quality extension messages to extend to farmers/community.
- What we have learned will play a role in improving the standard and quality of products and services we deliver, eg, Section 10 projects, Salinity Strategy, etc.
- Appropriate choice of pasture type x management to suit the landscape for production and sustainability (this needs to flow onto the community as well).
- There is potential to improve the bottom line without costing a fortune.
- There is potential to develop simple messages regarding management.

#### ***Individual businesses:***

- "I am about to expand my business, and plan to use what I have learned in this expansion. My country is similar to that at the National Site at Carcoar. I plan to move from set stocking to some form of rotation. The information coming from the site will help me with landuse classification."
- "From what I have learned in the past five years, I now know I can effect changes with animals rather than buying inputs."
- "From the SGS network, I have learned that without much more input, I can improve animal quality through grazing management and improve my profits, environment, soils, etc."
- "I can spend more money on better quality animals and less on fertilizer etc."
- "I have an increased awareness of using grazing animals to improve land quality/performance, eg, can use 1000 workers (animals) on the ground instead of paying workers to slash paddocks, spray weeds, etc, or buy inputs."

### Community:

- There is little or no difference as the message is not getting to them. If we can't get the message out, there will be no impact on the community. We need to use bait, like Bruce McKay (NSW Ag livestock officer) to attract those looking for the "animal story."
- Opportunity to overcome misinformation (being fed to the community).
- Some better information on sustainability (water use issues) to dispel some incorrect information regarding biodiversity, etc.

## 3. Looking back, how have things gone at this Site? What things do think have worked well, and what things would you do differently with the benefit of hindsight?

***What worked well?***

***Individual learnings:***

- Great (visual) results are just starting to happen as we now have had two good seasons, but we probably need dry years to test it.
- The lamb breeding and finishing enterprise has worked well considering the class of country.
- The wide range of activities worked well, especially in introducing new concepts and theories, eg, insects, biodiversity, etc

***Water use and movement:***

- Water movement testing data will be useful for farmers
- Awareness of the role of pastures with respect to water movement and runoff, etc, is increasing.

***Promotion:***

- Promotion and awareness raising has worked well, eg, the National Farm Walk, mailouts, getting producers to visit the site and participate.
- Has helped lift the profile of SGS.
- The feedback/comments from the National Farm Walk were overwhelmingly positive.

***Linkages:***

- The site has earned a degree of agency respect through its research activities.
- Participation of various groups, not just SGS crowds is increasing, eg, Farming for the Future groups, multiple agencies, community groups, eg, Stipa Native Grasses Association, etc. All these add value to the Carcoar site.
- The Carcoar site has been a real joint effort, eg, Ag, DLWC, MLA, producers, etc.
- Carcoar is a focal point for agencies, etc.

***Experimental design:***

- The site has demonstrated the difficulty in setting parameters for such trials, and the difficulty in scaling up information from small plot trials.
- Information from small plot TPSKP trials has been successfully implemented at a larger scale.
- The treatments are appropriate in that they demonstrate a wide range of production systems.

***What would you do differently?******Producer ownership:***

- Next phase, we should have an open day/chat fest on what are the next steps. This should increase producers' ownership of phase two.
- Reduce agency ownership of the site, eg, "Dept of Ag site", government "baby".
- The site must be more relevant to producers. Comments from producers who have visited the site, such as "who sows a pasture and doesn't graze it for a year" suggest little ownership.
- There is no ownership of the Carcoar site by producers. They have not had a chance to own it.
- During the planning and implementation of the national experiment, researchers guided the Steering Committee. We could have had more input if we desired it. We were a bit "green" (new) then. We could probably add more value now.

***Extension:***

- Put more resources into how take-home messages can be simplified for farmers.
- Put more effort into extension.
- Make the message more relevant, then there will be more acceptance of it.
- Producers need to know the *effect* of what the researchers are doing, not *what's behind it*.

***Grazing management:***

- There is confusion between grazing systems and stocking rates. Can you directly compare systems of grazing? Are grazing days the same, or are some treatments only using different grazing systems but also more leniently stocked on average? Can we clear this up? We need simple comparisons to avoid this confusion in science.
- Need more and different grazing protocols. "Food on offer" decisions are interesting, but there is more interest in still more active grazing management.
- Maybe the trial designers would like to see the highly improved pastures be the most successful system? They're not ready to take the next step, which may be a tentative step towards time control grazing.

***Water use and movement:***

- Gather more water balance information (re: Salinity Strategy), eg, lateral flow, nutrient movement, evapotranspirometers, etc.

**Economics:**

- Sown pasture and economics. We have to work out how to manage and deal with these in relation to pasture productivity and sustainability.
- What are the economics of the off-site impacts?

**Experimental design:**

- Don't move the goalposts.
- Need full control of funding and to look more thoughtfully at the time-line for implementation, ie, the delayed start to the trial (would have been a better situation if the funding release had been better planned).

**Long term experiments:**

- The length of the experiment is insufficient. We have only had good years, so there has been no challenge to the pastures.
- It is very important this trial continues.

4. What does your Committee suggest will be the important questions that need to be answered in the next stage of SGS, beyond the "Harvest Year"?

**Water use and movement:**

- We have established a "sponge". How do we keep water in the sponge as long as possible, and *stop it leaking*?
- How can water be retained and harnessed to drive production?
- What are the off-site effects of retaining more water and lifting production, ie, not just the benefits for us as producers?
- The political arena wants to identify and address leaking agricultural systems. Over the next 10 years, we need to know more about the role of grazing management in agroforestry, and the role of grazing animals in plantations.
- How complex is the "sponge"?
- We need to know more about more efficient use of water.
- Start looking for plants that use the majority of nutrients in water – that act as filters, eg, in Oberon, we physically cannot use all the water.

**Grazing management:**

- Are the semi-native, lower input systems more long-term and sustainable with poorer management (are we trying to sell high input systems to producers with poorer management skills which will be unsustainable in the long term?)? Can this experiment prove this?
- On poorer replicates/less responsive (tougher) country, is the rate of pasture decline *faster*?
- Are the pasture growth/animal responses as high for the high input systems, and can these be maintained over time?
- Are we trying to work out how to stop degradation?
- If inputs are reduced, how quickly does decline occur? What happens?



- What will a “grazing system” look like in 20-50 years?
- Develop a set of management *principles* not recipes, because each area of Australia is different. If common principles apply, then these need to be made known to producers and the general public, based on the sustainability data.
- Simple two-paddock comparisons need to be used as demonstrations of the total experiment, once we get some more data over a number of years, eg, pasture *decline*.

**Community issues:**

- What is the nutritional quality of the food products turned off each of these systems?
- We need a more complete (holistic?) summary of the results of the experiment, not just “extracts”, ie, a summary of the social AND economic AND environmental findings.

**General Comments:**

- The Carcoar National Experiment needs to continue.
- There are problems with extending the messages coming from the site. The message is not clear. An extension strategy needs to be planned and implemented to present the “unpolluted” version of the results to the “consumer”. Links could be made with agency education and extension officers.
- At this stage, any messages from the trial won’t be finalised until the trial winds up. Are we trying to make researchers use extension skills that maybe they don’t have, by getting them to present the messages?
- “I think the Regional Committee has been the most successful part of SGS. We’ve got trials running and are getting responses.”
- Researchers don’t have to be sustainable – they are sustained! Producers are the ones who have to be sustainable!
- We should start working with other organisations such as “Sydney Water”. They are increasingly focusing on land management by farmers, and are very supportive of SGS.
- We gain as much from our failures as from our successes. It is the responsibility of the Steering Committee to let the researchers know this.
- **“We (those involved in SGS) have gone from guinea pigs to pigs – we want more!”**

## North West Slopes Regional Committee Response

### 1. a What have you learnt from the National Site?

'Litter = Water'

'Positive reinforcement but no startling new developments'

'It has reinforced and bought home the importance of grazing management and ground cover. I hadn't previously realised the importance of Litter'

'Litter Australia'

'We have some region specific challenges- i.e. the intensity of the rainfall, high evaporation. The Phalaris site may be important from a national perspective but it is a species that is not relevant to NW Slopes'

" Ground cover and runoff- Des Langs work has been talked about but the demonstration is powerful.

Litter- we knew litter was good but we didn't realise just how good. Also that litter disappears.

We've learnt how to take steps to manage evaporation.

Stocking rate is critical but its very hard to lock in on one rate .

We have known sub clover and super are important but we didn't realise how it impacts on the system e.g the microbes

Length of the roots of perennials

You can't beat farm trials

We might have been able to align our Regional sites around the National sites if the National sites had been set up earlier'

### 1b What do you hope to learn from the National site?

'Financial information- improved pasture vs fencing vs rotational grazing'

'Economics- just how much more economic is it?'

'How to make a taxable income from sustainable grazing'

'How to make use of unavailable water- particularly in dry times'

"Information to help make better decisions for dry years'

### 2 a What difference will it make to your community?

'\$ struggles on the farm lead to marriage problems, suicide, kids not staying on the farm- if it makes farming more profitable it will impact on the community '

'Runoff- erosion and catchment health can eventually impact on the community. If sustainable practices aren't adopted there will be a negative impact on the community'

'improved \$ flowing into more viable communities'

### 2b What difference will it make to your business?

'Making pasture decisions to manage evaporation allows more effective use of rainfall and reduces impact of rain on the business'

'Litter will help manage low rainfall'

- 'Sound info to make better business decisions'
- 'Improved \$ flowing into more viable communities'

## 2. 3a What has worked well?

- 'Results from different sites complimented each other , even though they were set up without producer input'
- 'Networking with other organisations e.g. Nundle site local producers showed limited interest but good attendance with Landcare'
- 'Dramatic visual differences produced at Wicks and Fullbrooks'
- 'Results coming out of sites underpinned Pasture Health kit and demos.'
- ' Choice of Wicks as a site- typical of surrounding area and farm not regarded as different'
- 'Excellent venues for field days- a picture is worth a thousand words'
- 'Coolatai site in close proximity to Wicks site allowed value adding to visits by producers'
- '2 Manilla sites- ground cover, litter ,microbes ,earthworms 'story'- info on how they are relating. Earthworms a simple indicator'
- ' Not all soils are performing the same way. i.e dramatic differences at Wicks not seen at Forrests. Tells us a recipe doesn't work for all situations'
- 'Flexibility that researchers have at responding to items that 'pop up' e.g earthworms.'

## 3b What would you do differently?

- 'Fullbrooks Phalaris site- form a producer group'
- 'Use producer committee to help plan and set up all sites'
- 'Probably not set up Phalaris site'
- 'Perhaps set up a northern site on coolatai grass'
- ' let the sheep die at Wicks when the feed runs out instead of supplementary feeding. Lost its relevance to producers and the integrity of the trial'
- 'Stock being removed from Wicks site unfortunete. Keep stock on trial site for full year. ? Extra replicate/paddock"

## 4. What will be the important questions to be answered in the next phase of SGS?

- 'SUBTROPICALS- impact on water use etc etc etc '
- 'Further research on natives and naturalised grasses(e.g. coolatai) to make them more productive'
- '?Utilisation of water currently not available to existing plants through deep rooted browse shrubs and trees. ?Impact on salinity ? Accessing funding for salt research.
- '? Combination of grazing systems- need flexibility but when and where-rotationally, combination, how long do you need to rest for, new species.....

"Hand holding' to build on momentum already generated e.g. paired paddocks, groups, regional sites'

**SGS National Experiment review, 7<sup>th</sup> September 2000**  
**Submission from SGS Northern Tablelands**

The SGSNT Committee does not have a site of the National Experiment in its region. Consequently, for the purpose of this review, the Committee's comments are directed at a broad overview of the wider National Experiment, with illustration drawn from sites which it has visited, namely Nundle and Carcoar, and the outcomes presented to the National Forum in Armidale (hunches and talks). Certain members have visited Vasey (Hamilton), Ruffy and Maindample as well. In order to consider the questions posed by the Review Team, a tele-conference was conducted on Tuesday 29<sup>th</sup> August. A week prior to the tele-conference, a recent report from the Tamworth group, and the outcomes (hunches) from the National Forum were circulated to the Committee. The presentation is a synthesis of comments from the tele-conference, with additional comments from the research presentations and field inspection on Wednesday 6<sup>th</sup> September.

Responses to questions presented.

*1(a) Looking back, how have things gone at the Site? What worked well?*

*1(b) What things would you do differently with the benefit of hindsight?*

**SGSNT members expressed interest in the findings over much of the NE in general, and on the NW Slopes (NWS) in particular, about grazing needs of perennial and native pastures and the role of grazing rotations for enhancing persistence of perennial grasses and for accumulating litter and thereby improving infiltration. Effects of grazing practices on hydrology were seen as an important beginning, but with the realisation that there were many more unexplored aspects to water management.**

There was also an appreciation of the role of fertiliser evident from Carcoar and NWS work. The attempt to encompass broad acre variation was an admirable feature of the Carcoar programme. Even though this variation makes interpretation more uncertain (and interesting) and extrapolation more challenging, it assists the project to encompass some of the variation challenges faced by broad-acre producers in the real world. From a producer viewpoint, inter and intra-paddock variation is part of every day life.

The information from Nundle on the impact of the underlying geology on the level of infiltration and runoff was seen as a dominating influence that has not been emphasised much in the past.

The problem of encompassing broad acre and whole farm issues was seen as a major challenge. Some members felt that researchers and producers need to try harder to pull together with common goals rather than apparently setting off in different directions. An often-repeated example was the tendency (not universal) of the NE to treat grazing management and nutrient application as separate isolated technologies, and members felt strongly that there was a need for a concerted effort to reap the synergies likely from combining them, both at

research and technology transfer levels. Some of our Regional Sites have highlighted this problem and potential.

Another example was the need to incorporate the suggested chicory into the whole farm, and provide guidelines on how such a crop/pasture might be integrated.

Some members were concerned that grazing treatments were not sufficiently closely related to local practice; hence the need for consultation with practitioners (producers) prior to setting up treatments. Interpretation of effects and extrapolation to the real world was another area which might be enhanced by consultation with practitioners. Earlier consultation was clearly perceived as essential for any new programme. One member mentioned the need for outcomes to be based on longer-term results than presently available from the NE.

There was a plea for consideration of the complex problem of the interaction of all of the factors impacting on the farm, including production in the short term and environment (the resource and lifestyle base) in the longer term.

The tendency to re-examine established findings was a concern. No-one was surprised that runoff was related to above-ground cover or herbage biomass. It was pointed out that Lang published on the subject in the 1970's and that existing literature probably needed more exposure.

Native grasses were examined at relatively low stocking rates in the predominantly red grass site (NWS), and it was felt that native grasses in general may have been misrepresented by association, highlighting a need for explanatory presentation.

Finally, the difficulty of extrapolation of many of the findings from a winter to a summer growing season was well illustrated by the presentation of a 70% ground cover recommendation being suited to the NWS, and complete utilisation of herbage being an objective in Victoria. Both these benchmarks are inappropriate on the Northern Tablelands.

*2(a) What have you learned from the site or the wider National Experiment?*

*2(b) What do you hope to learn from the site or the wider National Experiment?*

**Much of what was learned and what is anticipated was covered in question 1.**

The improved understanding and realisation of the complexity of the hydrology of pasture systems and the overriding influence of geomorphology were seen as important outcomes with potentially important implications for management. Producers learnt that the valuable role of perennial pastures was not necessarily the complete answer to prevention of deep drainage, and that other factors probably needed consideration as well. It was pointed out that the emerging salinity 'juggernaut' was associated with infiltration and hence biomass levels. An understanding of these issues is mandatory before we begin a hugely

expensive correction programme. Again, enhanced understanding is necessary for influencing recharge – before we begin pumping it out again with trees. The best learning has been through discussion with other members, but the NE has provided a venue or a subject focus.

One important and widespread concern was that we still seemed to be choosing single technologies for solutions rather than combining them and benefiting from the synergistic effects. A 'whole farm' approach or a package of technologies was considered essential, while the investigation and presentation of single technologies in isolation was seen as requiring essential integration to prevent misleading conclusions.

The further investigation and understanding of ground water movement was encouraged as part of understanding the maintenance of stream water quality. No measurement of soil biota has been conducted, despite its obvious importance, especially for sustainability but also for plant growth. Its role needs illuminating, and its relationship with litter might be helpful.

3(a) What difference will this make to your business?

3(b) What difference will this make to your community?

*Some members felt that their exposure to the various findings and association with the programme has probably influenced their approach in a gradual way. The NE adds credibility to new approaches to grazing management and to moving away from monocultures as well as to the whole SGS programme. Economic results were not available, but a pasture based on chicory might be interesting. Members would like information about management to increase microlaena and managing other native species, building on work begun in the TPSKP.*

*For the wider community, pasture spelling figures might well encourage people to modify their grazing management.*

*Also for the wider community, biomass and groundcover are very important for water quality, and the extensive publicity arising from the NWS work must have increased awareness of the effects of management on water quality and its importance.*

4. What will be the important questions that need to be answered in the next stage of SGS, beyond the 'Harvest year'.

*All the points offered are included below. They are combined where appropriate.*

- Incorporate the technologies of grazing management and nutrients (and any other good ideas) into best bets, avoiding the tendency to develop competition and polarisation between various technologies. The object would be to provide an enhanced return to producers but also a better return for the environment.

- There was considerable support for a whole farm approach, putting it all together.
- One member raised the problem of tying it all together. The problem might be that any "system" put up might not fit other situations, all of which are different. It was then pointed out that the tying of it all together was not to simulate a farm system, but to extract principles and have an understanding of the *interaction* between various inter-dependent factors.
- Need to expand the information about the interaction between grazing animals and various sustainability factors, including subterranean factors (especially biota).
- Need the true economics of management options.
- Still need information on effects of defoliation on plants, taking into consideration their growth habit and phenology, as an extension of work commenced in TPSKP and elsewhere.
- Plant architecture might be an interesting field of endeavour for enhancing water use efficiency and hence eventually, deep drainage.
- Impact on the wider community and environment have to be addressed.
- Comparative effects of grasslands and trees (e.g. tagasaste) on water tables and deep drainage - building on the Vasey (Hamilton) red gum work.
- A new programme would need to improve its credibility in the wider community to accelerate adoption.
- Education was seen as a major process for adoption.
- As "seeing is believing", the technologies need to be established on local farms (the SGSKP model). We need to get more information and measurements, including economics, *on farms*.
- Should consider new strategies of adoption.
- Sustainability needs to become the responsibility of the whole population, integrating all stakeholders, both rural and urban. It is bound to have links to farm production and on-farm management.



## Field Trip Impressions: 6<sup>th</sup> September

On the 6<sup>th</sup> September the Facilitator & two Committee members (Tony Gaudron & Wal Whalley) participated in the field trip the Ross Wick's Redgrass National Experiment Site. The following comments are an addendum to the thoughts of the Committee expressed in the teleconference.

- The Redgrass Site appears to have excellent extension value, and
- has been well utilised for extension by the local District Agronomist who is a part of the research team
- The information about evapotranspiration was excellent as far as it goes but needs further dissection to account for 'evapo' as a loss and 'transpiration' as a gain.
- The data collected and conclusions emerging from Redgrass Site at Manilla has been applied to pastures with less than 100% ground cover. We support the modeling of all the factors involved in water movement to facilitate an understanding of 100% ground cover situations. We understand that the hydrological modeling will take account of a range of ground covers, soil types, slopes etc.
- The results circulated on the field visit about the liveweight changes in winter 2000, would have been strongly enhanced by the inclusion of the 'Rotational grazing' treatments as a 'low cost' comparison

## Appendix C

### The Integration Processes

#### Overview

The SGS research component is referred to as a single national experiment. This description is justified and achieved through the creation of theme teams (see "Story of Themes" in the introduction), who, aided by various tools, provide the intellectual power to perform cross-site data analysis and interpretation.

The tools of this cross-site analysis are the SGS database, which stores data from each site in a common format, and the SGS model, which is designed to use data from the SGS database to simulate the bio-physical processes under study. These tools are supported by common data collection protocols developed by each theme team, and in use at all sites.

This approach has rarely been attempted in Australian R & D before, and if it has, almost certainly not on this scale, where it is being used to link a series of experiments stretching from northern New South Wales to southern Victoria and across the nation to southern Western Australia.

The SGS database is well developed, and strongly supported by all sites, although some sites were slower to appreciate its value than others. It is, by itself, a powerful interpretative tool through its data query processes that allow quick and efficient quality control of data collection and some analysis. Colin Lord, its developer, continues to work with site and theme teams to expand its capability and usefulness. The review team acknowledges its vital role, is well satisfied with its level of development, and **recommends that it continue to be maintained and developed as required.**

This appendix presents the review team's assessment of progress of the themes and an evaluation of the approach with recommendations. Three special 'theme' reports follow; with the first covering the economic theme area (a theme that needs considerable early attention); the second looking at the SGS model (progressing well but has a way to go yet); and finally a report on trees (which recommends bringing the topic of agro-forestry into the biodiversity theme).

## **Themes Assessment**

### **Overall assessment of the progress of themes against objectives**

Specific assessments of each of the five bio-physical themes are presented in the following pages.

The review team found it difficult to assess progress of the themes in comparison to the individual sites. The difficulty is probably a reflection of the novelty of the approach to the reviewers as well as researchers, and to natural sequence in progress of the experiment. Site teams are responsible for data collection, and the site teams are starting to be able to give a good account of both progress and potential outcomes. Themes, after initially designing and setting data collection protocols (there one outcome to date), have been wrestling with the approach to be taken to analysis.

Given all of the above, our assessment is that themes lag behind the progress of sites, and that this is to be expected at this stage. From the evidence we have seen, we are not in a position to state that they are on track to achieve all desired outcomes, but we do recognise considerable progress has been made, and much experience gained. Given the limited extra funding allocated for themes, and the fact that they were virtually created as 'add on' to initial site contracts, progress, support and commitment from the teams has been better than could be reasonably expected.

Considerable effort will be required from here on in, if themes are to meet objectives. Theme progress and performance also varies. There are reasons for this, and these teams will need to be given extra assistance if all themes are to reach a common desired end point at the same time.

### **Individual Theme Assessments**

#### **Theme 1 - Animal performance and productivity**

It is the objective of the animal theme, that by the completion of the SGS research, stockholders will be able to determine which grazing system or systems are appropriate to achieving an acceptable economic return without threatening long term production and causing irreparable damage to the environment.

#### Theme questions:

1. What is the most suitable (economic and sustainable) grazing system for each site
2. How do we define the relationships between changes in animal production and impact on the land and water resources

3. To what extent can grazing management influence the relationship between animal production and the natural capital resource
4. What is the optimum/socially acceptable combination of animal production versus natural resource protection, i.e. what are the management strategies that promote sustainable grazing?
5. How does the potential animal production for a region vary according to pasture and animal type, grazing system, and seasonal conditions?

The animal theme appears to be the least advanced of the themes at this stage. There are a number of issues behind this.

- The questions are very broad, without real focus, making it difficult for the theme to give precise answers to. (The team recognises this.)
- There is wide variation between the animal systems used at the various sites, which highlights the need for standardised units in the data base. (To be done)
- The questions, as posed, will rely on the model, which has been until recently lagging in this theme area.
- While there is an element of time and sequence in the development phase of both the theme and model, a model which starts with soil and climate input will inevitably accumulate errors as it moves from simulation of water movement to pasture to animals.
- The methodology of assessing the economics of sustainability is poorly developed in comparison to that of assessing the economics of profitability, making the first question almost impossible to answer. (See below in Economics report)
- The impact of high stock density from rotational grazing systems has not been assessed for its impact on the soil to date.

### **Recommendations**

As the productivity "end-point" this theme is central to SGS being able to demonstrate profitable and sustainable outcomes from grazing.

1. The program needs to carefully assess the case for additional resources to assist this theme meet its objectives.
2. A concentrated effort will be needed to develop the model and an economic framework that accounts for resource sustainability as the tools of integration for this theme.

## Theme 2 - Pasture production, composition and quality

It is the objective of the pasture theme to define the principles of how to manage pastures to ensure productive and profitable grazing systems, where the pastures are stable, and protect the land and water resources.

### Theme questions:

1. What is the effect of farm management on pasture production and stability?  
[Pasture stability is defined as the persistence of a given botanical composition through time]
2. What is the impact of climatic and edaphic factors on pasture productivity and stability?
3. Which combinations of pasture and management in different edaphic and climatic zones provide productive and stable grazing systems?

The theme believes it is on track to answer its theme questions, provided that:

- Late development of the pasture section of the SGS model fulfils cross site integration needs to allow extraction of 'best bets' and principles – *we agree, but this is an important qualification given our comments on the model in the animal theme*
- Selected sites (Tamworth, Orange, Wagga and Vasey) continue their work at least into the harvest year to allow pasture stability from treatment differences be achieved – *our site recommendations allow this to occur, but when will pasture stability be reached? Very few producer practitioners believe there is 'such a state'.*
- Question 3 above is viewed as an issue for the harvest year, in that it relies on a level of integration across themes – *we agree, but this raises the question of sequence and interdependence in all themes. For example, question 1 of the animal theme and question 3 of the pasture theme are essentially the same question from a different perspective.*

### Recommendation:

That the theme leader and team develop a clear plan for progress to meet the contracted reporting date (June 2001), and that this include provision for analysis and interpretation of data collected after June 2001. (The harvest year can not afford delays in analysis in one theme because there is a strong chance this will have a ripple effect through the balance of the program.)

### **Theme 3 - Water use, deep drainage and runoff**

#### Theme Objective:

Water is the key driving force for pasture and animal production, and the lack of rainfall is often a major limitation. Unfortunately, water is also the key driving force for many of the sustainability problems (eg rising water tables & salinity, soil acidification, erosion, and nutrient run-off into rivers and streams). The water theme aims to understand the interactions between all these positive and negative issues relating to water, and then to provide the principles and guidelines that will result in grazing systems where as much as possible of the rainfall is used to promote pasture growth, while as little as possible is left over to cause sustainability problems.

#### Theme questions:

1. What is the impact of vegetation type (pasture and other vegetation types) on the quantity of water used by the grazing system; and for that water which is not used by the grazing system, what are the pathways of movement in the landscape?
2. What effects do different management practices (grazing management, fertiliser use, fodder conservation) have on the quantity of water and its pathways of movement in the landscape?
3. What are the best combinations of vegetation type (pasture with and without trees) and management practices to maximise water use by the grazing system, to achieve profitable and sustainable production?
4. What do producers need (in terms of information, skills and knowledge) in order to adopt management practices that make better use of water, and what policy guidelines should be developed to encourage the adoption of these practices by a significant number of producers?

This theme believes it is on track to deliver answers to all of the above questions, given that Questions 3 and 4 rely on successful answers to the first two. This assessment is based on the use of the protocols and methodology set at the start of the experiment, and that cross-site analysis through use of the SGS and other models would compensate for some data deficiencies relating to the lack of extreme run-off events at some sites.

The review team is concerned with the level of reliance on indirect measurements of the water balance components. Deep drainage, is typically measured by balance after measuring other uses of rainfall (run-off, lateral soil sub-surface flows and evapo-transpiration (Et)). Et usually represents the largest component of use, but is itself rarely a direct actual measurement. Basing conclusions about treatment effects on balance where one or more of the other balance factors are calculated rather than measured has obvious dangers.

The above issues are not new to hydrologists and soil scientists. Direct measurements of these fractions of water use are very difficult and highly expensive to obtain.

**Recommendation:**

Little can be realistically done within the life of this experiment to correct the absence of direct measurement of deep drainage. Appropriate research sites should be selected, and resourced if necessary, to obtain direct measures of Et wherever possible before the conclusion of each site's experiment.

## ***Theme 4 - Soil and Nutrient use and losses***

### **Theme Objective.**

Like water, nutrients are both a key driving force, and a potential threat to the sustainability of grazing systems. Also, like water, the objective for this theme must be to keep the soil and the nutrients in place, maximising the opportunity for their beneficial use, while minimising the chances of them moving off site and causing 'downstream' problems for waterways, and the acidification of the soil caused by the leaching of nitrogen from the soil. This theme is extremely closely linked to the water theme because in the high rainfall zone, the movement of soil and nutrient is nearly always with water – wind erosion is only significant in small areas of the high rainfall zone.

### **Theme questions.**

For the range of major climatic regions in the high rainfall zone where temperate perennial pastures are an important land use, quantify the positive and negative effects of Nitrogen and applied Phosphorous, both on and off site on:

1. Pasture and animal productivity
2. Soil acidification
3. P and N concentrations in runoff waters

The nutrient theme believes it is on track to answer the theme questions. The review team is **less sure** and makes the following comments.

1. The questions are again very broad, and, in the words of one reviewer, "may set the theme up for failure" when outcomes are judged against the questions.
2. Our concern with the model's 'accuracy' at the pasture and animal interface has already been raised. In addressing question 1 there should be a wide range of supporting data from numerous sources to draw on to allow the team to answer this question successfully.
3. Qu. 2 (acidification) is only drawing on data from North East Victoria in this experiment. The review team's attention was drawn to the considerable knowledge already existing on this subject such as that gained from the TPSKP program and through the current Acid Soils program of NSW Agriculture. The review team is unable to form an opinion on the extent and strength of this supporting evidence.
4. There have been insufficient saturation runoff events at some sites to answer Qu. 3 with complete confidence. Only time can correct this. In the absence of such events the theme will need to rely on cross-site analysis. Note also that the SGS sites involved (Vasey, Orange and Tamworth) will have the chance to collect data beyond June 2001 under the review



team's recommendations for those sites, and Wagga is funded until June 2002.

**Recommendation.**

Soil acidification is regarded as the major resource impediment to productivity in many of the areas that SGS covers. Given the apparent limited focus on acidification in this experiment, this team will need to develop clear plans to access supporting information and to use it to ensure that they can answer this question adequately.

## ***Theme 5 - Biodiversity and nature conservation***

### **Theme Objectives**

Biodiversity is a very new concept, compared to the other themes. At this stage, we have little idea regarding either; the definition of biodiversity we should use in grazing systems; or whether we should apply the concept to districts, farms or individual paddocks.

### **Theme questions:**

The biodiversity theme will significantly contribute to:

- An understanding of the impact of using land for grazing on biodiversity,
- An understanding of the relationships between biodiversity, productivity and sustainability of grazing systems
- Development of management tools to monitor and manage biodiversity

**These are very broad questions, embracing much more than SGS is able to address. To reduce the scope to something manageable, the main focus is on plant species biodiversity and productivity in relation to management treatments.**

**In addition to the plant biodiversity information, a Ph. D student is studying the impact of intensifying a pasture system (from native through to fully improved) on the soil fauna. Also, earthworm numbers will be measured at all sites in early-spring 2000.**

This theme is rather small, in terms of both expense and attention, when compared to its high focus companions. This is no criticism of the team. Biodiversity has had next to no attention in previous production focussed pasture work. The small effort here could have large spin-offs in changing grazing management attitudes, and therefore in shaping future research.

After a slow start, the theme is well placed to start answering its first aim; to develop an understanding of the impact of using land for grazing on biodiversity. This study is exclusively aimed at plant biodiversity.

Pasture data collection, under the review team's site recommendations, will continue at selected sites into the harvest year. There would be an opportunity to collect further species information, but this needs to be carefully balanced against each site's need to reduce data collection. Carcoar, the major biodiversity site and location of the theme leader, is one of these sites.

Given the original nature of this work (in Australia at least) it will be surprising and a bonus if any real progress can be made with the last two questions. These

are issues that need to be reviewed, and probably pursued with some vigour in future research.

The review team noted the high interest shown by producers in both the biodiversity and abundance of soil micro-organisms and their relation to build up of soil organic matter as well as the existing plant species work. There is an opportunity to build on this interest and, along with the almost certain need for re-introducing trees into our grazing lands, further lift the profile of this very important theme in future SGS work. The across the boards diversity (slope, aspect, pasture treatments, plant species range) evident at the Carcoar site make this a valuable asset for future theme studies.

**Recommendation.**

As discussed in the special report below in this appendix, we recommend that agro-forestry (trees) be added to this theme for the balance of this program and harvest year. The reviewers recognise the late start and low level of the SGS knowledge base in this area, and have also recommended that external assistance be sought to help prepare for the harvest year.

### **Evaluation of the themes approach**

The strength of this approach lies in its potential to link researchers and disciplines across a wide geographical area to search for answers to major issues that are common in their relevance across the study area. As well, it provides a major stimulus to early and strong data analysis and interpretation and gives site teams the opportunity of a second opinion in the analysis of their own data. (Expansion of professional networks, working with common tools, is recognised by researchers as a significant side benefit of the process.)

Its major weaknesses are that:

- Researchers are primarily interested in their own sites
- There is no model or agreed methodology to follow for managing themes
- The issues being addressed by themes appear too large and diffuse, and so are not as easy to deal with as well defined site questions and hypothesis.

The logistics of dealing with diverse teams spread across such a distance, dealing with the complex and important twin issues of sustainability and profitability in the grazing industry are immense. It relies on a high level of commitment, which is not a foregone conclusion given that theme involvement uses valuable time, and diverts focus from the sites, which the themes, in turn, depend on for their data.

Insufficient resources (committed talent, time and funds) represent a real threat to its success, along with the problems of data ownership and sharing. The novelty of the approach combined with its complexity mean that it is not easily understood by those not involved, but whose ongoing support (producer customers and funding bodies) is so vital to programs of this size.

The opportunities are immense. Themes can provide the basis for a whole of industry response to key issues such as deep drainage, and a framework to capture other nationally focussed audiences or service providers for the industry. The key outcomes required are the general principles that drive sustainable and profitable grazing systems across the high rainfall zone of southern Australia. Showing how these principles can be applied to whole farms would add a powerful 'WOW' factor to the experiment and its approach. This in turn would help to provide convincing evidence that this is an incredible way to do R, D & E.

### **Recommendations**

The theme teams have played a pivotal role in preparing for analysis and interpretation of the experiment and its constituent sites across the nation. Protocols for data collection were established and plans and action towards cross-site analysis are now well underway. The teams are starting to work well

together. Publications have been outlined. Final theme reports are scheduled for June 2001.

SGS planning for a harvest year is well underway, and includes 'harvest teams' to perform seemingly similar roles to the theme teams. Differences include broader membership and an apparent focus on developing practical outcomes and products for producers, drawn from knowledge gained from both the research and regional producer sites.

While the differences are obvious the similarities are equally clear. The threats of confusion, overlap and duplication of effort are real.

We therefore recommend that:

- 1) Clarification of the future role and operation of the current theme teams needs to be part of the planning processes recommended for the harvest year.
- 2) The review team believes that theme team activities should be kept to the bare minimum required to service harvest teams with necessary analysis and interpretation of data during the harvest year. This means that there will need to be an acceleration of data analysis between now and early within the harvest year
- 3) Program management should consult and negotiate with theme leaders on delivery of plans for theme research papers. The importance of these papers to SGS in demonstrating and verifying the theme approach of cross-site analysis and interpretation to extend findings beyond sites, should not be overlooked.
- 4) Strategies to address the danger posed by competing demands from external sources on researchers involved in site and theme analysis, and harvest team activities should be negotiated with all relevant agencies and involved research partners.
- 5) All theme teams should review their set of questions now. The review team believes that many of them are too broad and therefore not realistically achievable within the scope and time frame of this experiment.
- 6) For a number of reasons, theme leaders and program management should immediately review theme work plans for the period through to June 2001, and ensure that any case for additional resources is assessed and decided in time to achieve desired results.

### **Economics Theme: Review Team Reflections and Views**

The review team considered that the economics theme needed special mention,

- firstly because it is such an important final integrator for all the technical themes,
- secondly because the credibility of the entire SGS output hinges on credible economic interpretation and
- thirdly because they had concerns about its capacity to deliver in the harvest year

It is evident that the financial analyses of each site's results to date is being handled in quite a range of ways. This has led to an inconsistent and generally superficial approach, (which is perhaps not surprising because they have been dealing with interim results). It has also had the advantage of testing different ways of analysing and presenting information, and the response of target audiences to these approaches.

For example the Wagga group is attempting to incorporate the impact of "level of management expertise" on the returns that are likely to derive from pasture improvement. The Tamworth group is working with Fiona Scott's interactive spreadsheet model to assess long-term profitability of various pasture improvement options. Most other sites are using simple gross margin analyses to look at costs and returns at particular points in time.

It is also apparent that SGS has a range of talent available across its network, some of which is yet to be tapped. Another observation was that only one site had a truly market-focused animal production system in place, which means that most sites will have to simulate data for outputs at different market endpoints.

## SGS philosophy and analytical needs

The clear emphasis in SGS of dealing with productivity and sustainability issues within an integrated framework places a requirement on the economic analytical framework to interpret outputs from SGS in an integrated way also.

The review team did not meet with the economics theme team (Stoneham et al), but had access to their 1998/1999 report to MLA. It is clear from this that the primary aims of the team have been to deliver an integrating framework for economic analysis and interpretation, and to do this through modelling using dynamic programming. The outputs from this work should be very useful but it is pitched at a bigger picture level for resource use and policy issues.

Randall Jones is developing a useful methodology for pastures, based on his work in the Weeds CRC. It is underpinned by the assumption that if pastures are treated as a resource stock rather than as a production input, there will be more sensible allocation of resources in relation to sustainability of the system. This is pitched at the strategic decision of how to optimize long-term sustainability and short-term profitability.

What appears to be required for the harvest year to aid in the economic interpretation of SGS outputs is a framework for analysis that:

- Deals with the short to medium term costs and returns that can be attributed to changes in productivity, while accounting for the changes in the underlying resource base (ie additions and withdrawals)
- May not bring everything down to a common denominator of dollars, and so is flexible enough to use a range of units for resource items in particular
- Is simple and easily understood
- Is able to be applied consistently across sites and perhaps themes by existing research staff

### Recommendations:

- That a broadly based review group be commissioned to undertake the following tasks and report back to the Steering Group by 30 November 2000:
  - Describe exactly what resources and skills are available to SGS for economic interpretation and financial analysis at present
  - Define what additional resources and skills will be needed for the harvest year
  - Define what tasks and resources are required to deliver the required resources by February 2001

## SGS Model

### Comments on the role of models (linked to the SGS database) in the SGS NE

#### *Rationale for the inclusion of models in an experimental program*

The following points are offered as a basis for the inclusion of a modelling component in any multi site and multi-disciplinary research effort.

- Experimental data are site and time/season constrained (i.e. can only measure at a few key sites, and results can be strongly biased by the run of seasons). Ideally a mechanism is needed to generalise results between experimental sites, and to stretch data to a broader sample of seasons.
- Provide a framework to link different disciplines – a social tool for scientific discipline interaction, a common meeting ground.
- Provide a framework to explore experimental data, as part of quality control, and thereafter to explore interactions in the system. This is a form of ‘virtual’ experimentation, without the logistic challenges and costs, and is ideal for broadening disciplinary links.
- After a model has achieved satisfactory functionality or credibility (both quite subjective issues), alternative scenarios can be explored efficiently. Occasionally new insights are gained from interaction between a model and its users. These “learnings” can then be tested in the real world, either using traditional experimentation or on farm testing. This is where a model really gets put to work in helping solve real world problems – iterations of interactions between experimental data, established relationships from other research, historic weather data, and imaginative multi-disciplinary teams.
- A model linked to a database provides for efficient model development and testing, and remains a key to understanding and managing complexity across the range of sites and issues.

#### **Key Recommendation** (summarised from general recommendations below)

SGS management, in consultation with the modeller, site and theme leaders, should immediately review the modelling effort to:



- Define and agree on the scope and expectations of model development for the balance of this financial year – careful prioritisation of tasks will be required using the 80-20 rule.
- Assess the need for special assistance to improve modelling skills and use to ensure that theme and harvest year requirements are met from all NE sites – expanding the personnel base recommended below would assist greatly here also.
- Institute risk management policies detailed above by completion of model documentation; by broadening current narrow expertise and personnel; by repeating pre-experimental modelling; and by encouraging the use of alternative models to test and verify the SGS model.

### ***General Recommendations***

1. A group should meet as soon as possible to determine, across SGS, what modelling options can be best used during the harvest year. Use of different models is both a strength (diversity and ability to triangulate between “opinions”) and a weakness (dilution of effort). This tension needs to be actively managed. Suggested group to include Bob White (Uni Melb model), Ian Johnson (SGS Model), Steve Clarke (Grass?grow), David Hall (Ag ET) Craig Beverley, and Narendra (DLWC - Queanbeyan).
2. Review of the scope and expectations of the model within the SGS team to assist with alignment between expectations and reality. Questions to be asked of the models needs to be clearly stated - only then can the detail of the model be determined, ie likely model applications.
3. The modelling approach needs additional resources to capture opportunities. Some sites need to commit extra resources if they are to make any real progress and take on ownership of database and model application. Modelling and database need ongoing support from across the program
4. Repeat Pre Experiment Modeling for all sites using the SGS model as part of the harvest year, or preferably before the harvest year (at least for some the three sites previously modeled - Tamworth, Hamilton and Albany). This activity is necessary to protect the SGS initiative from criticism from outside. This will require the ability for long-term runs to be carried out, using daily weather records.
5. The Pre experimental modeling could easily be repeated using simple models such as AgET.
6. In many cases, estimates of drainage are dependent on modelled or estimated evaporation and transpiration, with only rainfall and runoff being measured directly. This strong reliance on models will result in uncertainty in estimates of water balance components. Where understanding the role of management on deep drainage is a key objective, direct measures of all

- major components should be attempted wherever possible, to improve confidence in management options, and model estimates for other situations.
7. Develop a strategy that overcomes the perception that the modeller needs to be on site for satisfactory progress to be made. More formalised training is needed as modelling is a new technology for many scientists, and requires significant extra commitment and resourcing. Workshops will be required to specifically upgrade skills in this area asap, and no later than early in the harvest year
  8. The SGS model needs to be presented publicly to the modelling world for peer review – applies to testing and applications.
  9. The SGS model needs to be documented for internal and external review.
  10. There is a strong case for a scientific paper that describes the model to be prepared.
  11. There is need for a strategy that will speed up the broadening of ownership from IMJ to the research teams – maybe a name for the model would be part of this strategy.
  12. Need for more across SGS interaction on model use and application, peer support and review.
  13. More interaction with other modelling efforts, particularly the pasture modelling groups is needed for cross fertilisation and synergy (DNR Indooroopilly, CSIRO Canberra and Adelaide).
  14. The issue of model detail being in balance with the questions being asked of the model, and the data available as input for modelling needs to be debated. Are the models balanced in terms of detail throughout (ie is each set of processes being dealt with at a similar level?). There is some indication that while water is being modelling at a detailed level (using first principles, and 1 hour rainfall inputs), pasture growth and animals are necessarily treated much simpler. The question is raised –is the detail in water processes necessary, or are plant and animal processes being dealt with too simplistically?
  15. Need to explore the proposition that shorter time steps may be needed to successfully model certain processes (e.g. runoff). It is possible that this is a model structure issue. Runoff and erosion have been successfully modelled at a daily time step in a number of cropping system models. There is little evidence that more detailed models improve accuracy, although a case can be made for added complexity being needed to address specific issues.
  16. Scope exists to use simple approaches to water balance modelling such as AgET as introductory tools. With gained understanding of soil properties (soil water stores, conductivity estimates) such models may provide insights into water balance components, with a lesser investment in training.
  17. Improved visualisation of model dynamics for simpler models such as the Melbourne Uni model would enhance communication (see AgET). The SGS model sets the pace in this regard.

18. Alternative modelling tools such as STELLA may be useful, particularly when designing prototypes of ecology models such as pasture composition and grazing management.

### ***General observations***

- Database (concept and actual common structure) accepted and applied strongly by the whole team - a major achievement. The database interfaces directly with the SGS model. This data structure ensures minimum data sets, uniform procedures (mainly), and purposeful and reliable storage and retrieval.
- Use of models and databases functioning well - a great challenge and one of the best examples of a cross discipline research activity available in Australia. This integration needs continued support.
- The concept of triangulation - coming at a problem from several directions has been proposed by some team members. This appreciation needs to be generally held by the team for models to be accepted in a realistic manner.
- General confidence in SGS that data will stand by itself, and that models add value.
- Data protocols may have led to some less than efficient data collection (e.g. concept of measuring more when things are happening quickly, and less when dry may not be applied due to the regular nature of protocols)
- Not clearly presented how models will be applied beyond getting the model to mimic measurements. There remains a clear separation between measuring and modeling at many sites.
- Diversity of model approaches (e.g. Ian Johnson and Bob White using different approaches, and communicating between) is healthy and appropriate. While the SGS model needs to be a common link between sites and most themes, alternative approaches will strengthen analytic capability, and through triangulation, greater confidence in models as support tools within the team. Other modeling efforts within SGS need to be brought to the table.
- When models have interacted with data, data errors have been recognized and remedied. The interaction of models and data is an efficient process for data quality control
- The need for documentation of the SGS model is becoming more important with time -as more things are added, and more users are coming on board. Also important as a communication tool internally and externally.
- High dependence on a few (one) key personnel in both database management and modeling has important risk management implications – there is a need to broaden current narrow expertise and personnel to provide longer term security in this key element.

- Development pathway not clear beyond building confidence in model capability. What are the applications?
- Issue of using model(s) to estimate longer term scenarios not thought through at this stage
- The SGS team is having the same discussions regarding parameterisation that goes on wherever models are being used - I am yet to see any resolution to this issue, here or elsewhere. Need a steady supply of pragmatism to avoid this being a distraction.
- A dangerous reliance on indirect measurement of Evaporation, transpiration and drainage. This has been found to be a serious weakness in water balance estimates in irrigated and dryland systems in northern Australia, where salinity risks are now being considered. David Hall presented the only direct and convincing measurement of drainage - and he was uncertain about it!
- A convincing case that spatially explicit modeling is needed, or desirable has not been made. Question of escalating technology being applied because it can be done, not needs driven needs to be addressed.
- Who is thinking of using the model(s) to explore other management options? Harvest year issue?
- There is scope to use model to back calculate nutrient balance at the system level, at some sites
- Explore how model can be set up for long term runs -as a data stretcher. Currently this may create problems with unavailability of long term

### ***Sequence of events in interaction between models and data***

The following steps are listed as a general guide to linking measurement and models in a feedback cycle.

1. Plan experimental program using a conceptual model as a basis for designing a minimum dataset.
2. Develop a data structure (and database) to manage data collection.
3. Collect data.
4. Develop model based on conceptual model, and informed by data.
5. Test models ability to reproduce physical systems dynamics.
6. Adjust the model through iterative exploration of data and model structure until a reasonable goodness of fit is obtained.

## **The role of agro-forestry and nature lots in Sustainable Grazing Systems**

The review team saw very interesting research in progress at Albany, Hamilton and Rutherglen and Wagga where water use by isolated trees or a woodlot were being studied. It is recognized that our knowledge base is small in this arena. For landscapes with high drainage rates or salinity risk, better management of pastures may not be sufficient to reduce drainage losses to a sustainable level. Trees, being perennial, and having high water use capacity (large leaf area, deep rooting habit), may be an essential element of a hydrologically balanced landscape.

Ideally, trees can form an integral part of a farm's economic performance, although aesthetics can be sufficient motivation if the woodlot or nature vegetation enterprise is close to cost neutral in terms of impact on adjacent pastures. Economic reward from tree belts can be achieved through timber harvest, salt and carbon credits (still hypothetical at this stage), and environmental services to the landscape

### **Recommendations**

The review team recommend that agro-forestry and nature lots (trees) be added to the biodiversity theme for the balance of this program and harvest year. As discussed above trees have a functional and aesthetic role in pasture systems. They contribute greatly to the biodiversity of such systems, and this theme seems the most natural home for it.

The reviewers recognise the late start and low level of the SGS knowledge base in this area, and recommend that external assistance be sought immediately to add to the SGS knowledge base in this area, to help prepare for the harvest year.

It is recommended further that;

- The tree studies in WA be given long term support through to harvest and beyond to determine post harvest impacts on grazing and soil quality.
- Similar studies may be considered in eastern Australia
- Institutions who are involved in mainstream commercial agri-forestry should be brought into the SGS experiment, at least in an advisory capacity, with potential for co-funding
- Specialists in water balance/salinity risk assessment, and the role of agri-forestry be consulted to broaden engagement across institutions and disciplines (e.g. CSIRO, State Forestry Departments).

- The economics of tree lots be analysed with consideration given to off-site benefits including landscape aesthetics.
- Explore the role of natural and planted tree belts for their potential environmental services role to pastures and the landscape. Single trees role in biodiversity maintenance should also be considered.
- The methodology developed within the NE needs to be communicated across SGS, and the role of simple instrumentation for other sites be explored

## Appendix D

### Whole of Program Issues

#### Overview

The review team was asked, in TOR 10, to recommend any changes to the format or functioning of the experiment as SGS prepares to collaboratively evaluate outcomes from the experiment and regional sites in the harvest year. Main recommendations, of strategic value, have been included in review report. This section presents recommendations, insights and evaluations in full detail, which address 'whole of program' issues.

The harvest year, as described to the review team, is to be loosely based on the themes approach, but with more broadly based 'harvest' teams that include producers and researchers. A single 'integrating' (or synthesis) team will collect the output of the harvest teams, and build them into principles, best practice, best bets and hunches for use or further development by producers and SGS Phase Two.

The reviewers used a 'De Bono' hats approach to develop a collective review team appraisal of the concept, as it exists, and from that developed recommendations directly addressing the planning of this important innovation and opportunity. The evaluation and recommendations follow this overview.

Mr Ken Lamb, the Producer chair of the Steering Group, asked the review team to make some observations on adoption (of research and development outcomes) gained through the review. These observations follow next, but please note that many of the points, together with additional comments relating to adoption, appear throughout the report. All participants in the review have contributed to our ideas. This program is quite clearly focussed on getting the knowledge gained through internal and external sources adopted by its client producers.

The reviewers became aware of the need to have a closer look at the experimental methodology of the experiment. SGS, with its blend of replicated and non-replicated research trials, and use of cross-site links and tools to drive out cross-site products, is a non-traditional experiment that is bound to be examined closely by the scientific community. It was considered timely and appropriate that the two external reviewers be asked to comment on this issue, given their collective experience as senior research scientists. Their comments are recorded in the discussion paper on the SGS experimental approach.

The final report draws together the team's main observations that may be useful to those planning for beyond the harvest year.

## The Harvest Year

### Assessment.

#### **What's great about this approach, and why will it work?**

It has a wow factor

- Innovative, never been tried before
- Puts producers and researchers together for product development
- It will be a lot of fun and exciting
- Promises to slash the time between research and adoption.

Planning started early, giving good lead time.

- SGS has a good record of planning and making things work
- There is a huge pool of talent in the National Experiment and RPN.
- It's going to be well resourced.

Expectations are high

- Producers are well primed and demanding product
- It has captured everyone's imagination, and enthusiastically received without any real planning detail as yet.

Therefore we have created a tiger, seized it by the tail, and must make it work!

#### **What could go wrong, and what would we see?**

##### **There is no common focus**

- No shared vision
- Hundreds of agendas

##### **The SGS human resource is stretched to the limit**

- The time frame is too short for realistic delivery against expectations
- The demands on researchers time will be immense, given the need for concurrent data analysis and development of site papers, and in some cases continued data collection
- Senior scientists time will be eroded by competing demands from employers

##### **The harvest year won't deliver**

- There is no model to follow, it is a new and completely untested approach
- Dispersed teams will lose commitment when they return home
- We may not get the strong leaders required to make the harvest teams work
- The process departs from the KISS principle – it is too complex



- There are not enough incentives to capture the talent that the Harvest Year needs

### **The integration tools don't work**

- The SGS model can't provide cross site or cross issue analysis

### **Given the above what do we feel about it?**

"It's going to be like the Olympics, short time frame, high expectations, small issues will be blown out of proportion, with high risk, but it's a worthwhile challenge, SGS will make it work, and the external reviewers would love to be part of it"

### **Recommendations**

#### **What are the key things that need to be done to make it work?**

In presenting the following recommendations we acknowledge that many of the issues are already covered to some or a large extent by planning that is already well underway.

- 1) A clear, realistic and shared vision should be developed before further planning leads to decision making.
  - a) This vision should take the form of defining 'what success will look like' for the end of the harvest year.
  - b) As such it, it should outline what products and outcomes need to be developed through the year, and may suggest how they will need to be used, developed or packaged in the next phase of SGS
  - c) The latter point has implications for the planning of a new program.
- 2) Detailed planning for implementation should be completed ASAP, and should include provision to;
  - a) Use current champions and create new champions, right across the board (from steering group to researchers to producers) to lead and drive the process
  - b) Enable site teams to free up time for harvest year activities at both site and cross-site (national) levels
  - c) Develop outstanding communication between harvest teams, with clear links from harvest teams to site teams and the RPN

- d) Deliver some early successes, e.g. products
  - e) Establish procedures for management to communicate with harvest teams and constantly monitor their progress
  - f) Ensure the excellence and continuity of management at all levels
  - g) Provide adequate resources to complete the job
  - h) Link to the planning process for the new program to share talent and co-ordinate operations
- 3) Once there is an agreed vision and a detailed plan in place, teams should be appointed without delay. An early start will assist greatly.

**What else could be considered to help make it work?**

- Use the harvest year vision to assess the need for the continued existence of the current theme teams.
- Harvest teams could focus on **issues** rather than **themes**
- Assist the harvest teams by the provision of a facilitator and training
- Explore processes for assisting dispersed groups to work cost effectively
- Co-ordinate meetings of the harvest teams to allow cross-team reporting and the start of integration
- Once there is a clear vision and plan, test the process by taking one issue and one harvest team, and lock them up for as long as it takes to develop an outcome.

## **Adoption and Communication: Review Team Reflections and Views**

There was no specific request in the terms of reference for the review team to consider the adoption processes interfacing with the national experiment. However, with prompting from Ken Lamb, the Producer Chair of the Steering group, the team did make a number of observations that it felt should be recorded and which fit comfortably within Terms of Reference 10. There are lessons to be learned from what has gone before, and from other experiences outside of SGS. R&D without a pathway to uptake and change by graziers is a poor investment.

Having said this it should be noted that most of the team's observations derived from feedback from RPN producers and researchers, and not from a serious study of the rate and efficacy of change among the clients of SGS. In this sense the observations are more about communication strategies and tactics than about adoption per se, and the primary audience is taken to be livestock producers of meat from grazing enterprises.

The team did observe a huge range in communication strategies across the national sites, but it does recognise that SGS management has already made considerable progress in this area.

### **What are the things that should enhance adoption of NE results?**

- Producers are highly motivated, committed and extremely talented/capable
- Overall there is now reasonable producer ownership (by RPN) of the National Sites
- There is pent up demand among graziers
- The National Experiment is dealing with real issues, real challenges, and it is recognized that there is plenty of room for improvement
- Where there is effective producer involvement and participation, the RPN members are really benefiting
- There is as much power in seeing what not to do (along the way), as in seeing the end results. Learning from others' mistakes is very rewarding.

A major challenge is how to extend this effective action learning (where producers are in close proximity to the national experiment), to the producers who do not enjoy the same close relationship.

### **What factors could be inhibiting adoption?**

- Generally there was little if any involvement of producer committees in initial site design and setup which meant that ownership was off to a slow start
- Often there has been a loss of continuity from early producer input to established regional committees
- There is variable producer awareness, commitment and ownership of the National Experiment, within and between sites, for a range of reasons
- There appears to be poor integration between the national experiment and what is being done at regional (demo) sites
- Researchers are generally not effective communicators with farmer audiences, (but do get kudos from trying), and often consider that the old model of getting messages to farmers via an extension agent brought in at the end of the experiment should suffice
- There are not enough runs yet on the board, and those that are there are not well communicated

### **What should help to improve the uptake of information?**

- The great potential to link the national experiment with the RPN has yet to be fully realized
- Bringing producers into site interpretation and packaging of results; and planning for the future
- More active but constructive critiquing within and across sites by producers
- Move more into participative research with producers
- Get the good stories out, both within the network and outside
- More active demonstration of principles (eg the pasture health kit, at Tamworth), and use of simple tools
- Work on building credibility outside of SGS
- Work on extending the network through other service providers and organizations
- As far as possible – keep it simple

### **What are the success factors?**

- Must be tangible products from sites and themes (ie from all parts of the program) and these must be delivered locally
- Credible but easily understood farm level/enterprise level financial analyses
- Clear communication plan for the design and delivery of products
- Re-invigorated and increased producer involvement in all aspects of the program

- WOW factors need to be worked up and marketed, within sites and perhaps themes
- Credible science and models
- Active evaluation at all levels

### **Process considerations to enhance success**

- Producers and researchers need to be put together at sites and in theme teams for effective product development
- Themes are capturing everyone's imagination, and are being enthusiastically viewed without any real detail as yet. Expectations need to be realistic.
- A clear, realistic and shared vision needs to be developed, with a clear and jointly owned plan to get there
- Outstanding communications are required from harvest teams with strong links between harvest teams and the RPN/site teams
- Plan to ensure some early successes, and maybe early products
- Champions are needed right across the board (from Steering Group to individual producers and researchers)
- Skills of researchers need to be considered in this area when developing training programs

### **Are there other opportunities?**

There certainly are opportunities to look at what is working well outside SGS and to learn from others mistakes for example. But also there will be opportunities to cross fertilise between sites within SGS say using a tool or gimmick to get messages across more effectively.

There may be as yet untapped opportunities, such as using the SGS model or parts thereof as a farmer learning tool and maybe eventually to work up decision support tools.

### ***Experimental approaches adopted in SGS NE –a discussion***

The experimental approaches adopted in the SGS National experiment have been developed to capture production and natural resource systems responses at a range of scales (from point to farm). The philosophy implemented is one of exploring physical responses as well as a search for statistical differences, which may or may not have “farm management” significance.

Some sites have replicated treatments and plan to use traditional statistics in their analysis, while other sites rely on being able to attribute responses to measurable characteristics through the use of simulation models. As a collective, the SGS National Experiment has accommodated a range of philosophies , reflecting the broad range of disciplines and approaches adopted – an attribute that reflects a systems approach at the organisational level.

This diversity should be regarded as a strength, but does require some evaluation to determine the relative advantages of alternate approaches.

As an example of an alternative approach to research, the tree/pasture study (Albany), while not truly replicated, has created a wide range of treatments (distances from trees, perennial and annual pasture) within an existing grazing paddock/tree belt layout. Water use and pasture dynamics are being measured to explain production responses and to infer changes to the water balance. In this study, water balance and production differences appear to be reasonably large, thus relaxing the need to control error terms inherent in experimental design. Where differences in treatments may be smaller, or uncertainty in measurements or model estimates is high, the best we can do is, through informed judgement, may conclusions based on knowledge of processes, supported by model and measured estimates.

In many real world situations, if differences are not large, it is only of academic interest to show a small but statistically significant difference. Thus the need for balance between traditional statistical design and more systems based studies.

A major philosophical difference between these systems studies and traditional replicated studies is that there is an attempt to link a measured cause to an effect, without the stricture of determining error terms with such tools as ANOVA. Design seeks to explore interactions. This implies that direct links can be made between cause and effect. Replication is via measurements being repeated for a number of positions along the continuum of a proposed response curve rather than controlling the treatments to a few positions. Regression is a common tool in such studies whereas ANOVA may be a more common approach for traditional experimental designs.

A more powerful tool is the comparison of each systems response to that predicted by a model, which has been structured to capture the important

processes under consideration. Such as process is by nature iterative, with many comparisons between measured data and model predictions. While a model is no less subjective than any other form of analysis, it is better suited to the inclusion and exploration of alternative explanations.

To progress confidence in a model, it is necessary to describe the requirements for the model for different purposes, from planning and design, through doing and interpretation, to evaluation and extrapolation]

In studies of systems, it is common that there will be too many variables involved to rely on controlling some variables and fixing others. Such comparisons are unrealistic when studying issues at a field or catchment scale, where the key physical processes require larger scales to be expressed (eg runoff and sub surface flow patterns may operate at 1-10 ha, where high spatial variability is a constraint for traditional designs (replicates needed would be prohibitive to implement).

The challenge, which is being addressed at sites and will be further explored by themes, will be to link across sites, using data exploration and model analysis tools. Models are used to explain and explore interactions between treatments where multiple variables are being manipulated, either explicitly, or implicitly as a consequence of treatment or systems comparisons.

Another element for consideration is that of relevance to the ultimate client group –producers. Since the management options being studied have to be implemented on farms, the logistics and practicality of implementation at this scale needs to be examined. The paddock comparisons at Esperance (cattle production – two soil types on either perennial or annual pasture) is a case in point where the whole farm result (a management system) is more important to the farmer than analysis of each process alone.

The table below lists some of the attributes of alternative research approaches.

**Table Attributes of different styles of research**

<b>“Traditional” experimental approach [ie non regression designs]</b>	<b>Systems oriented methodology</b>
Fewer well controlled treatments	Treatments broadly defined, many factors uncontrolled, deals with complexity and natural variability
Replicated	May not be replicated in the one location
Controlled experimental conditions and treatments, few interactions	Only partial control over treatments, many interactions

<p>Small scale</p> <p>Constrained to small plots, amenable to replication</p> <p>Amenable to statistical analysis (ANOVA)</p> <p>Scale of study generally chosen to limit variability</p>	<p>Can range in scale, typically natural units of management unit size eg catchment, paddock,</p> <p>Real world</p> <p>Typically interpreted using a physically based model, or rely on large sample survey, using regression analysis,</p> <p>Many processes operate in the real world at scales that can't be sensibly replicated.</p>
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<p><b>Strengths and weaknesses (<i>in italics</i>)</b> Note:- this judgement is subjective</p>	
<p>Can detect small differences</p>	<p><i>Generally need large differences in treatments to be confident in results, or need many repeated results (replicates) over space or time</i></p>
<p>Treatments well controlled and easy to describe</p>	<p><b>Often many elements not known or well described</b></p>
<p>Scale small enough to control treatments and variability (typically plots), <i>but may not allow physical processes be fully expressed</i></p>	<p>Bigger experimental units used to capture processes that operate at larger scale (eg erosion, sub surface water flow, grazing behaviour)</p>
<p><i>Generally can only be managed by a research group</i></p>	<p>Amenable to management by real world practitioner (eg farmer), therefore can capture richness of management skills not available to scientists.</p>



Examine a sub set of a system	Explores whole system
Small scale makes interpretation by farmers more difficult – credibility gap	Real world, easy to link to farmer practice, as long as causes and effects can be described
<i>Amenable to traditional statical analysis, which is well accepted by the scientific community</i>	Reliant on models for interpretation, <i>(these models are not as well understood by the broader scientific community)</i>
Results often constrained to the one or few sites, difficult to extrapolate	<i>If “system” behaviour is well explained by a physically based model, then results are amenable to extrapolation to other sites and management options</i>

## SGS – Beyond the Harvest Year

The review terms of reference do not require the reviewers to comment on planning issues for any new programs that may follow the harvest year. However, during the review, assisted by the review teams questions to researchers and producers, a number of points were made and ideas developed which the review team believes could be of value to those planning post-harvest year programs.

The comments and recommendations recorded here have a research bias, given that they come from a review of the research component of SGS. The planners will obviously need to balance these views, if taken up, with the needs of the extension and adoption effort of SGS. In making them we also presume that the goal and scope of a future program will be similar in concept to SGS.

The site and producer appendices to the report are the source of most comments made below. Those appendices are the source of a large portion of the total report, leading to a natural overlap with other sections of the report proper.

Broadly speaking, the reviewers see four questions of importance arising from the review with relevance to future programs. These are:

### 1. What are the research questions that arise from SGS work?

The appendices reveal a great number of areas of interest. Key issues to the reviewers include;

- Soil characterisation emerged as the key determinant of the degree of deep drainage in grazing systems. What further research and development is needed to enable grazing managers to assess and develop appropriate practices for all soils represented on their farms?
- What species of deep rooted summer growing perennials, including trees and browse shrubs, are suitable for inclusion in grazing systems of the temperate high rainfall zone, and how best do we use them?
- Further exploration of the role, value and impact of biodiversity and nature conservation in grazing systems
- Closely allied to biodiversity is the interest in increased knowledge on the impact of grazing practices on the soil organic processes and micro-organisms, and how producers can use this knowledge for personal and community gain.

2. What are the important lessons and experiences to be gained from the integrating processes (themes – database – model) of SGS that can be used in the design of a future program?
  - The review team sees tremendous potential in the themes based approach to integration
  - As a first attempt, the approach has worked remarkably well, but there is a large potential for further development and fine-tuning.
  - We suggest that at an appropriate time, a workshop would be an appropriate way to review and brainstorm the approach for future use. This workshop should ideally include at least two participants from each theme, the model and database developers, management, and producer representatives.
3. What is the best mix of research sites, producer sites and other opportunities to answer the research questions of a future program, and how should they be linked?
  - Review questions and discussions with researchers and producers showed a common belief that regional sites can be better linked to research sites and outcomes
  - There is a belief among producers that regional sites are undervalued in terms of their potential to add to science knowledge, and that their true potential is not being fully utilised. The reviewers agree with this proposition
  - Other concepts such as monitor farms and monitoring successful (and non-successful?) farm systems were advanced in various forums. As SGS moves inexorably up the scale to whole farm systems, traditional research, based on controlled application of treatments, becomes less and less appropriate, and new ways of gathering knowledge need to be assessed and used.

4. How can the next program make better use of the powerful extension value of the research program demonstrated in SGS?
- Producers have a high regard for the value of researchers in extension, both on and off their research sites
  - Quick adoption of research treatments by co-operating producers at research sites sends a powerful message to fellow producers
  - The scale of SGS research sites (large plots through to paired paddocks, surrounded by real farms) made them a valued extension resource
  - The incorporation of extension into initial site planning, combined with early and ongoing involvement of extension professionals, magnified the value of the above three points immensely at one site. This approach is strongly recommended as a model for research design in the future.

## **Review of the SGS National Experiment Project Brief**

### ***Background***

The SGS Steering Group have recommended that instead of attempting to begin a new Program on July 1, 2001 (the day after SGS finishes), SGS should be 'extended' for 12 months before any new Program begins. This will involve a joint venture (called the harvest year) between the Corporation investors, the agencies, and producers that will:

- continue those aspects of the National Experiment which either need an additional year for completion, or which offer the prospect of adding real value into a new Program
- allow time for pausing, reflecting, testing, modelling, cross-Theme analyses, to develop robust rules, guidelines and Best Management Practices from SGS information
- provide a process for bringing the scientists from the National Experiment together with the producers from the Regional Committees to collectively address the interpretation of the information collected from Regional and National sites.

The SGS National Experiment consists of six sustainability themes (water, nutrients, pasture, animals, economics and biodiversity) operating across southern Australia. The information to support these themes collectively comes from six sites, located near Albany (3 sub-sites), Hamilton, Benalla (2 sub-sites), Wagga, Orange and Tamworth (3 sub-sites). Each site has a grazing systems experiment, but with different aims and designs, from replicated grazing trials, through to catchment scale investigations of water and nutrient movement. The sites and themes are supported by database and modelling projects that facilitate rapid data analysis, compatibility of data between sites, and examination of the exploration of data across sites. Thus, while each site is a self-contained experiment, the National Experiment is an interactive matrix of sites linked via the themes held together with database and modeling 'glue'.

### **Purpose of the SGS Sites Review**

The collaborators in the SGS National Experiment have agreed in principle that in order for the research teams to participate fully in the 'harvest year', then data collection needs to either stop, or be reduced dramatically at all sites. However, all the sites represent a major investment, and all offer some prospects for providing further value if continued into the new Program that will follow SGS. Therefore, the purpose of this review is to

- Assess the performance of individual sites and the contribution they have made, and can make to the theme outcomes
- Assess the scientific merit/rigour at each site and the extent to which individual sites have met the site objectives, have collected data over a sufficient range of seasons to make robust conclusions, and have the flexibility to offer additional value to a new Program
- recommend how the harvest year can achieve a balance between continuing site operations, and freeing up the site teams to focus on the interpretation needs of the harvest year.

### Terms of Reference

The investors in SGS are seeking a review of the National Experiment in general, and the individual sites in particular. The sites in the National Experiment are funded till June 30, 2001, with the winter/spring of 2000 suggested as the final data collection period. Specific terms of reference are:

11. Review relevant background documents on SGS, the National Experiment, the individual sites, including site and theme reports.
12. Develop a set of rules or guidelines that will be the framework against which the outcomes from the National Experiment and its constituent sites will be assessed.
13. Assess the progress (against objectives) for each of the sites, and for the National Experiment as a whole (including themes' performance).
14. Meet with Regional Committees and seek their input into the assessment process at each site.
15. Assess the contribution of each site/team in terms of:
  - Scientific rigour and merit of the research program (science)
  - Input into the 6 SGS themes (integration and interpretation)
  - Input to the Regional Producer Network (value to producers)
16. Assess the value (costs and benefits) of the SGS concept of linked sites, themes and organisations, including links to producer networks.
17. Recommend for each site how the time between the review and the end of current funding (June 2001) can best be used to meet SGS goals
18. Recommend for each site, the extent to which an extension beyond June 2001 is justified. The recommendations for each site must be accompanied by the detailed reasoning from the panel, including how maximum value can be obtained from sites that are not recommended to continue.
19. For each site that is recommended to continue beyond June 2001, suggest how the site might be mothballed (integrity maintained, but data collection and scientific input reduced to a minimum) so that the research team can focus on analysing the data collected to date, and on contributing to the collective processes in the harvest year.
20. Recommend any changes to the format or functioning of the National Experiment that will assist the researchers and the producers in the Regional Network to collaboratively evaluate the outcomes from the National Experiment and the Regional Sites, especially during the Harvest Year.

## Organisation and Conduct of the Review

The review will be conducted by a review panel (likely to be three members), with the process managed by Warren Mason (SGS Coordinator). The review panel will consist of:

- ◆ A Producer Chair (from the SGS Steering Group)
- ◆ Two independent experts, who together cover as many aspects as possible of the spectrum of disciplines included in sustainable grazing systems – ie, water, nutrients, pastures, animals, economics and biodiversity.

### The Story of SGS

A major factor in pasture decline in the higher rainfall zone has been the loss of perennial grasses. These grasses are both highly productive and ecologically important. The result has been lower returns from livestock production, and increased rates of land degradation. Unfortunately, while animals drive the profitability of grazing systems, in the short term, they are not a good indicator of the sustainability of a system. In other words, land degradation can be well advanced before there is a noticeable decline in animal production.

**SGS was set up to address the issues of declining pasture productivity and sustainability in the grazing systems of the higher rainfall zone of southern Australia (annual rainfall >600 mm). Rather than the traditional approach where research works independently to develop and package information for producers, SGS has pioneered an attempt to bring researchers, producers and extension agents into a partnership to collectively improve the productivity, profitability and sustainability of grazing systems in the high rainfall zone. There are three interacting elements within SGS:**

1. PROGRAZE<sup>®</sup> to provide training and skills development for producers;
2. a network of 11 regional producer committees to determine local issues and priorities for action, and then to manage local delivery; and
3. a national experiment to develop the principles, tools and indicators that are needed for assessing and improving the profitability and sustainability of grazing systems.

A 1994 survey of producers showed that 44% expected their sown pastures to weaken and disappear within five years of sowing (80% in 10 years). As it takes 5 to 8 years to recoup the costs of sowing a new pasture, producers have greatly reduced their sowings.

The survey also highlighted confusion over the potential role for grazing management in maintaining or improving the composition of pastures, and the



very high value producers place on local information when assessing grazing management. Preferred sources of information on grazing management were; to see the method working on a local property (78%); talking to a local producer who is already using the method (64%); or seeing the method working at a local field day (61%).

To make SGS relevant to producers, there has been extensive involvement built into the program at four distinct levels:

1. **Planning:** A Producer Planning Group was formed with 10 producers from across southern Australia. The group inspected grazing management research and extension in Australia and New Zealand and developed the basic plan for SGS, setting the structure of the Program and the emphasis on producer input.
2. **Program Management:** In a partnership approach, SGS is managed by a board, with producers, funding corporations and research & extension agencies equally represented.
3. **Regional Committees:** To achieve local relevance, the SGS zone was divided into 11 regions – each with a producer committee that identified the critical local issues and decided the activities that would be needed to address them. Local activities (called 'Regional Sites') range from seminars, training programs, on-farm demonstrations, discussion groups and field days, to monitor farms and replicated grazing sites.

## The Story of Themes

The research in SGS is being undertaken from Albany in the south west of WA, right across the high rainfall zone of southern Australia, to Manilla on the north west slopes of NSW. Instead of a series of independent experiments, a single, national experiment has been established to provide the total research input into SGS. There are seven sites (South West WA, Western Vic, NE Vic, Wagga, Central Tablelands of NSW, and NW Slopes of NSW), all working within one experiment.

Traditionally researchers would focus primarily on collecting data to learn as much as possible about their individual site. This process provides few insights into the principles that apply right across the high rainfall zone. The SGS experiment is truly national, and focuses on developing principles, guidelines and management practices that producers can utilise to make their grazing systems more profitable and more sustainable, no matter where they operate in the high rainfall zone.

There is no chance of a 'recipe' for grazing management, or put another way, there is no grazing system that suits all combinations of pasture type, stocking rate, animal type and performance targets, while at the same time meeting the needs of environmental sustainability. Sometimes set stocking is appropriate, other times a pasture rest is essential. Therefore the focus for SGS is to provide the principles and management guidelines that producers can adapt and use within their own grazing systems.

*The research teams were selected on a competitive basis to ensure SGS attracted the top grazing systems scientists in southern Australia. The teams then collectively designed the national experiment to explore all the major production and sustainability issues within the following objectives:*

- to demonstrate that grazing management can increase pasture productivity and longevity
- to identify strategies that optimise animal production and profitability but are sustainable
- to develop grazing systems which maximise water use and minimise rising water-tables, salinity and acidity
- to determine the management needed to provide critical ground cover for erosion and soil health, and to reduce nutrients in run-off to streams and wetlands
- to determine the impact of grazing systems and management activities on biodiversity.

**Table 1. A brief description of each of the sites in the national experiment**

<b>North-West Slopes, NSW</b>	<b>3 sites (2 native and 1 improved pasture), focussed on ground cover, runoff, soil and nutrient loss, water infiltration, soil microbial activity and carbon cycling, and how these interact with productivity and profitability.</b>
<b>Central Tablelands, NSW</b>	<b>A native pasture site with a range of strategies, from low to high input (physical as well as managerial) to allow assessment of the productivity, profitability and sustainability of each option, and the impact of intensification of pasture systems on biodiversity. This site incorporates a lamb production and finishing system to produce large lambs out of season</b>
<b>Wagga, NSW</b>	<b>A core site at Wagga, with a range of satellite sites in NSW, Victoria and SA to determine the extent to which native grass pastures in the Murray Darling Basin can be managed for improved profitability and sustainability. The key focus is water use to reduce groundwater recharge</b>
<b>North-East Victoria</b>	<b>2 sites, each with three unreplicated catchments (3-15 ha) to focus on catchment scale water and nutrient movement. Pastures at each site are set stocked and comprise treatments of: 1 – a typical unsown pasture with mostly annual species and some native grasses,; 2 and 3 are improved perennial grass based pastures with either high or medium fertiliser application (<math>\approx 10</math> and <math>20</math> kg P/ha).</b>
<b>Western Victoria</b>	<b>A single site to optimise water use and animal production by managing interactions between grazing management, nutrient use, green leaf production, water use and animal nutritional requirements. This site incorporates a lamb finishing systems.</b>
<b>Western Australia</b>	<b>2 sites at Albany and 1 at Esperance strongly focussed on the role of perennial pastures to increase profits and water use. The biggest sustainability issue is dryland salinity, so a major focus on forestry in grazing systems. The Esperance site includes the only beef production site in SGS, a comparison between beef production systems on annual or perennial pastures.</b>

Because of the distances involved, a mechanism was needed to allow the research teams to focus not just on the information they were collecting at their own site, but to integrate the information right across the experiment. "Themes" were adopted as the best way for individual researchers at any site to interact with other researchers at other sites– and these coincide nice nicely with producers' main areas of concern, too. There are 6 "Themes" running across the national experiment. These are:-

1. Animal performance and productivity
2. Pasture production, composition and quality
3. Water use, deep drainage and runoff
4. Soil and Nutrient use and losses
5. Biodiversity and nature conservation.
6. Economics

There is a team of researchers for each theme, (each team has at least one researcher from every site) with the initial roles of:

- establishing a cross site network of technical specialists
- specifying the experimental protocols so that sites collecting the same information, use the same methods and the same recording system so data can be easily shared and interpreted across sites
- specifying the minimum information that must be collected at every site for every theme
- agreeing on the balance of research across the sites so that every theme has at least one site where there is a major emphasis on that theme.

As the experiments develop, each theme team have the responsibility for reporting annually on progress within their theme, and then for developing the principles, guidelines and indicators for delivery to PROGRAZE and the regional producer network for delivery or local demonstration. The theme teams are budgeted for these roles independently from the site/experimental budgets.

Table 2. The matrix of sites and themes for the national experiment

Sites	Themes					
	Animal s	Pastur e	Water	Nutrient s	Biodiversit y	Economic s
NW Slopes	x <sup>1</sup>	xxx <sup>2</sup>	xxx	x	xx	x
Central T'lands	xxx	xxx	xx	x	xxx <sup>2</sup>	xx
SW Slopes	x	xx	xxx	xx	x	x
NE Victoria	x	x	xxx <sup>2</sup>	xxx	x	x
Western Vic	xxx <sup>2</sup>	xxx	xx	xx <sup>2</sup>	x	xx
WA	xx	xxx <sup>2</sup>	xxx	x	x	xx

<sup>1</sup> x, xx and xxx indicate a low, medium or high degree of focus on the theme at that site. x represents the minimum data set.

<sup>2</sup> Location of the leader of the theme team

## Key Questions to ask the Site Teams

1. What are the key achievements that the site team proposes to deliver by 30 June 2001, with respect to the site objectives? What will be the value or contribution of these to:

Themes  
Science  
Producers  
The team

and what links are there to the RPN?

2. What is the current state of progress toward meeting the site objectives, and what plans are in place to deliver the achievements (described in (1) above) by 30 June 2000?

3. What plans are in place for use of the database and the model?

4. Looking back, what things have worked well, and what things would the team do differently with the benefit of hindsight?

5. What aspirations does the team have for the harvest year?

6. What does the team suggest will be the important questions that need to be answered in the next stage of SGS, beyond the harvest year?

## Key Questions for the Regional Producer Networks

- 1) What have you learned or what do you hope to learn from the National site?
  - a) What new knowledge have you learned, or expect to learn from your site or sites?
  - b) Is this what you expected to learn when the site was set up?
  - c) Does it address any major knowledge gaps for your business or community?
  - d) Themes have been widely reported in Prograzier and discusses at SGS Forums such as Armidale. Do you expect to learn anything from them.
- 2) What difference will this learning make to your business?
  - a) Have you or are you planning to trial or use any new knowledge from this experiment?
  - b) Is the knowledge in a form that you can understand, use and have confidence in?
  - c) Do you expect it to improve your farm sustainability, your farm business profit, or both?
- 3) What difference will this learning make to your community?
  - a) Does this learning have impact for your neighbours, your catchment or your community?
  - b) If so, what impact could it have?
  - c) How potentially valuable is this impact?
- 4) Looking back, how have things gone at this site? What things do you think have worked well, and what things could have been done differently with the benefit of hindsight?
  - a) Given the SGS goal, and with hindsight, was this sight addressing issues or real importance to producers?

- b) Were you involved at all in the planning of this site? If you were not involved, could this have made a difference? If so, how could it have made a difference?
  - c) What linkages exist between you're your committee and the local research team?
  - d) Have you given any thought or preparation to how you or the program could identify which of your regional sites may be able to add to theme knowledge?
- 5) What does your committee suggest will be the important questions that need to be answered in the next stage of SGS, beyond the harvest year?
- a) Is there any work at this site that you wish to see extended?
  - b) Are there any questions that your regional sites, or your community have identified, that this site with its existing site assets could be used to explore?

### **SGS NE Review Team**

The review team was lead by Terrey Johnson, a producer member of the SGS steering group, and supported by Dr. David Freebairn and Dr. Roger Barlow.

**Terrey Johnson.** is a beef cattle producer from the Central Tablelands of New South Wales. He has some 33 years experience with both meat sheep and beef production and management, and recently added a wine grape enterprise to his business.

His property has been converted entirely to a low input intensive rotational grazing system within the last ten years. This interest and approach led to him being selected as one of ten producers on the Producer Planning group, that planned the extension arm of SGS, and eventually to selection as one of six producers on the SGS Steering group.

He has a degree in Rural Science (UNE), and has a strong interest in agricultural systems and their relationships with the environment.

**Dr. David Freebairn** is employed by the Queensland Department of Natural Resources. He is currently a co-leader in the Agricultural Production Systems Research Unit, based at Toowoomba. He is also Regional Science Coordinator for the south west region of the department.

David has been actively involved in research and extension programs to improve the sustainability of dryland cropping and pasture production systems in the tropics and sub-tropics for 25 years. He has extensive experience in Queensland and India where he has conducted training courses and extension programs, and is currently playing a leading role in GRDC, LWRRDC and ACIAR projects investigating sustainable soil management practises on semi-arid farms and watersheds.

His educational qualifications include B.Sc.Agr. (Hons) (Sydney); M.Sc.Agr. (Sydney); and a Ph D from the University of Minnesota, U.S.A.

#### ***Dr. Roger Barlow***

Dr. Barlow is self-employed as a consultant to R&D bodies servicing the livestock industries, specifically the Dairy Research and development Corporation (DRDC) and Animal Health Australia (AHA).

Prior to commencing to work as a consultant he held numerous positions with New South Wales Agriculture. He is a former General Manager (Meat, Dairy and Intensive Livestock Products Program), which involved him in the role of Research, Development and Extension management of a professional team



working across a range of livestock industries. He came to this position from a Senior Research Scientist background, working in the field of understanding the relationship between genotype and the environment (particularly pasture type), in beef cattle.

Roger completed an HDA from Hawkesbury Agricultural College, before studying for and receiving Bachelor (Hons) and Master degrees in Rural Science (UNE). He completed his education with a Ph D from Trinity College, Dublin