

Native Grass Strategy for South Australia

Broadacre Adoption and Seed Production of Native Perennial Grasses in Agriculture



Australian Government

Department of Agriculture, Fisheries and Forestry
National Landcare Programme



Government
of South Australia





This Strategy is funded by the Australian Government's National Landcare Program (NLP074423), through the Upper North Farming Systems Group.

This report to be cited as Reseigh, J., Brown, W., Laslett, T., Foster, P., Myers, R.J., and Carter, M. (2008) Native Grass Strategy for South Australia; Broadacre Adoption and Seed Production of Native Perennial Grasses in Agriculture, Rural Solutions SA, Adelaide. ISBN: 978-1-921399-19-0.

Disclaimer

Rural Solutions SA and its employees do not warrant or make any representation regarding the use, or results of the use, of the information contained herein as regards to its correctness, accuracy, reliability, currency or otherwise. Rural Solutions SA and its employees expressly disclaim all liability or responsibility to any person using the information or advice.

© Rural Solutions SA 2008

This work is copyright. Unless permitted under the *Copyright Act 1968* (Cwlth), no part may be reproduced by any process without prior written permission from Rural Solutions SA. Requests and inquiries concerning reproduction and rights should be addressed to the Business Manager, Business Development & Marketing, Rural Solutions SA, GPO Box 1671, Adelaide SA 5001.

i ACKNOWLEDGEMENTS

This Strategy is funded by the Australian Government's National Landcare Program (NLP074423), through the Upper North Farming Systems Group.

The Reference Group and the authors of this Strategy wish to convey special thanks to the following individuals who consented to and gave generously their time, spirit, knowledge and experience to assist in the development of this document.

We thank:

Ian Chivers - Native Seeds Pty Ltd.: for his time and energy in answering questions, arranging site visits, provision of information including maps, pictures, samples, economic information, technical information and written materials.

Tim Bardon - Ko-warra Native Grasses: for his time and energy in answering questions, site visit, provision of information including pictures, samples, economic information, technical information and written materials.

Rob and Helen Mizzeni and family – W. Mizzeni and Sons (Seed Men: Growers, Processors and Distributors): for their time and energy in answering questions, visits to and guidance around seed processing machinery, provision of information including allowing photographs, samples, economic information, technical information and written materials.

Wal Whalley - University of New England: for his time and energy in answering questions and provision of information including references, technical information and other written materials.

Ian Cole - NSW Department of Primary Industries: for his time and energy in answering questions, our near site visit, provision of information, samples, economic information, technical information and written materials.

Joan Gibbs - University of South Australia: for her time and energy in answering questions and provision of information including technical information and written materials.

Greg Lodge - NSW Department of Primary Industries: for his time and energy in answering questions and provision of information including technical information and written materials.

Cathy Waters - NSW Department of Primary Industries: for her time and energy in answering questions and provision of information including technical information and written materials.



Chris Findlay – Revegetation Consultant: for his time and energy in answering questions and provision of information including technical information.

Tim Zwierson – Outback Native Seeds: for his time and energy in answering questions and provision of information including technical information.

Chris Penfold – University of Adelaide: for his time and energy in answering questions and provision of information including technical information and written materials.

John Stafford – Native Vegetation Services and Native Grass Growers Group (Adelaide Hills): for his time and energy in answering questions and provision of information including technical information, photographs and written materials.

Tim Edginton – Native Grass Growers Group (Adelaide Hills): for his time and energy in answering questions and provision of information including technical information.

David Vincent – Grower for Native Seeds Pty Ltd: for his generosity in allowing a site visit.

Will and Prue Pyke - for their generosity in allowing a site visit.

Jess Gardner - Greening Australia: for her generosity in organising site visits.

The grass enthusiasts of South Australia, who completed the Native Grass Directory, attended workshops, completed questionnaires and supported the project in numerous other ways.

Special thanks to the Reference Group for their vision, guidance and support:

Neville Ferme - Advisory Board of Agriculture (ABA);

Michael Wurst - Upper North Farming Systems Group;

Anne Brown - Mid North Grasses Working Group (MNGWG);

Chris Penfold - Native Grasses Resources Group (NGRG);

Wayne Brown - Adelaide Hills Native Grasses Growers Group;

Bob Myers - Upper River Torrens Landcare Group;

Dr Andy Sharp - Department of Environment and Heritage (DEH);

Neil Ackland - Eyre Peninsula NRM Board;

Dr Paul Foster - Rural Solutions SA;

Tegan Laslett - Rural Solutions SA; and

Dr Jodie Reseigh - Rural Solutions SA (Project Leader).

Special thanks to:

The Upper North Farming Systems Group for their continued support, enthusiasm and vision.



The Native Grass Resources Group (SA).

The Native Grass Growers Group (SA).

Thanks also to:

The South Australian Museum for facilitating copyright approvals for illustrations.

The State Herbarium and Bioknowledge SA, for facilitating copyright approvals for illustrations particularly

Piers Brissenden, Branch Manager, and
Tony Kanellos, Cultural Collections Manager.

Rural Solutions SA home support team for graphics, formatting and marketing of the document particularly:

Jackie Emes, Consultant, Project Administration, Rural Solutions SA;
Brooke van Hemert, Business Development and Marketing Consultant, Rural Solutions SA; and
Terry Price, Media and Communications Consultant, Rural Solutions SA.

Business support and guidance from:

Bev Voigt, Business Manager, Environmental Design and Management, Rural Solutions SA;
Brett Bartel, Business Manager, Resource Protection Development, Rural Solutions SA; and
Keren Sutton, Team Leader, Environmental Design and Management, Rural Solutions SA.

Rural Solutions SA CANDID team for facilitation and planning of workshops:

David New, Senior Consultant, Rural Solutions SA (Keith workshop); and
Paul Erkelenz, Principal Consultant, Rural Solutions SA (Mt Pleasant and Waite workshops).

Administrative support from:

Ros Toynton, Environmental Design and Management, Rural Solutions SA;
Daniel Guadagnin, Environmental Design and Management, Rural Solutions SA;
and
Simon Cheers, Environmental Design and Management, Rural Solutions SA.



ii CONTENTS

I	ACKNOWLEDGEMENTS	I
II	CONTENTS	IV
III	EXECUTIVE SUMMARY	V
IV	STRATEGY FRAMEWORK	VIII
	Project context	viii
	Strategy vision and direction	ix
V	GLOSSARY OF TERMS	XII



iii EXECUTIVE SUMMARY

The *Native Grass Strategy for South Australia*, a major component of the project funded through the Upper North Farming Systems Group (UNFS) in 2007/2008 from the Australian Government National Landcare Program (NLP). The aim of the project was to gain recognition for the potential role of native grasses in broadscale agriculture within South Australia to address landscape change. The project was developed around a framework based on three major strategy *themes* of consideration:

- **Native grass seed industry;**
- **Sustainable economic production and native grasses;** and
- **The use of native grasses in land management.**

This has been enabled through an extensive review of the literature; interviews of key native grass researchers and practitioners; and surveys of key people affiliated with native grasses in South Australia. The *Native Grass Strategy for South Australia* (hereinafter referred to as the *Strategy*) provides a review of the native grass seed industry, the role of native grasses in sustainable economic production and their use in addressing land management issues. The working *Strategy* document integrates, directs and enhances broadacre adoption and seed production of native perennial grasses in agriculture. Future stimulation of acceptance and uptake of the *Strategy* will be facilitated by implementation of recommendations and 'best practise' approaches reviewed within the *Strategy*.

Native grass seed production is arguably similar in process to many other industries concerned with plants, food or agriculture. Nevertheless, parts of the native grass seed industry process are complex in their biology, ecology, and technology and consequently economic, socio-political and commercial aspects associated with these. The native grass seed industry is in early development in South Australia, yet has a long history in indigenous Australia, albeit in non-mechanised form. Commercial viability has been achieved in countries such as the USA and Canada on a large scale, but has only been established on a small commercial scale in Australia. In considering the development, establishment and viability of an Australian native grass seed industry at a commercial level, the following key issues emerged from the literature review, interviews and State-wide workshops.

- Provenance of native grasses in relation to local use requires clarification in terms of both policy and practice;
- The lack of an effective and commercially viable native grass seed industry may be negatively influencing implementation programs in broadscale agriculture, amenity, mining and biodiversity conservation restoration programs;
- Quality, variety and availability of native grass seed are significant issues in native grass establishment and implementation programs;
- Research is required on the biology, ecology, chemistry and production aspects of native grass seed; and
- Extensive knowledge gaps exist in relation to the native grass seed industry.



The role of native grasses in **sustainable agricultural economic production** enterprises in rural South Australia has been recognised since the commencement of European settlement. However, the recognition and significance of native grasses to pastures and the landscape, diminished with the increasing establishment of introduced pastures and legumes, along with the application of fertilisers, cultivation and cropping. Only in recent decades have some landholders and the associated community recognised the importance of native grasses to production enterprises. The current recognition of the value of native grasses to agricultural production remains limited in its understanding, is poorly accepted in rural communities, is dogged by scepticism and myth even in some professional primary agricultural and private industry agencies, and is slow to be adopted or even trialled by producers or primary users. Benefits of the use of native grasses in sustainable economic production have multiple outcomes including increased productivity returns from a resource which is adapted to local conditions. Native grass pastures are able to rapidly respond to short or long term changes in the climate and the environment, and are based on a native resource which provides additional benefits including those related to biodiversity conservation. Social, economic and environmental benefits in respect of managing a native resource for production outcomes may promote sustainability. The key issues emerging from a review of native pasture production are:

- Best practise grazing management regimes for native grass pastures;
- The production and economic benefits of fertiliser application to native grass pastures;
- Appropriate herbicide application for weed management in native grass pastures;
- The production and economic benefits of legumes and/or other pasture species in native grass pastures;
- Knowledge gaps related to the application of native grasses to sustainable agriculture.

Land management issues have plagued agriculturalists since grazing and cropping began in South Australia. The agricultural community faces continuing problems of drought and rainfall irregularity, and increasingly important issues involving climate change. The literature reviewed recommends the use of native grasses in preventing, ameliorating or reversing land management issues. Changes to traditional land management practices and principles, such as improvements to soil health, regenerative management to increase groundcover in pastures, pasture cropping in suitable areas, use of 'no-till' farming, reductions in the use of fertiliser and herbicides, and increased use of pasture phases in cropping areas are advocated. The key issues to emerge are:

- The application of native grasses in relation to water quality, runoff management, salinity and soil erosion;
- The role of native grasses in ameliorating soil health;
- The application of native grasses to landscape processes and managing landscape change;
- The role of native grasses in managing fire; and
- The extensive knowledge gaps related to the application of native grasses to land management issues.



The *Strategy* framework is comprised of six *principle areas* which arise from the *Strategy themes*:

- Research and research support i.e. the need to identify areas of required research and develop mechanisms to fund, initiate, implement and continue research;
- Communication and education i.e. the need to communicate effectively messages and information related to native grasses, as well as effectively educate groups and individuals associated with agriculture, the seed industry and landscape management;
- Industry monitoring and support i.e. the need to investigate and monitor the industry in relation to structure and economic viability, including future market potential;
- Policy and legislation change i.e. the need to identify areas requiring development or change in government policy related to native grasses e.g. in relation to native vegetation or with respect of seed standards including seed quality and contamination control measures;
- Technical support i.e. the need to identify areas of required technical extension or expertise and develop mechanisms to fund, initiate, implement and continue the provision of technicians or technical support; and
- Landholders, seed grower and seed industry incentives i.e. the need for financial or other support as a means of implementing change related to native grasses.

From these *principle areas*, *general* and *specific recommendations* have been developed. The detailed recommendations of the *Strategy* are presented in Chapter 5.



iv STRATEGY FRAMEWORK

Project context

Why a Native Grass Strategy for South Australia?

This document, *Native Grass Strategy for South Australia*, is the major component of the project funded through the Upper North Farming Systems group (UNFS) in 2007/2008 from the Australian Government National Landcare Program (NLP). The aim of the project was to gain recognition for the potential role of native grasses in broad scale agriculture within South Australia to address landscape change. This has been enabled through an extensive review of the literature; interviews of key native grass researchers and practitioners; and surveys of key people affiliated with native grasses in South Australia. The result is this comprehensive document the *Native Grass Strategy for South Australia* which provides a review of the native grass seed industry, the role of native grasses in sustainable economic production and their use in addressing land management issues.

The project also brings together the current activities and knowledge of a number of groups and projects such as the Adelaide Hills Native Grasses Growers Group; two active native grasses groups (the Mid North Grasslands Working Group and the Native Grass Resources Group); industry affiliations such as the Advisory Board of Agriculture; and other groups or organisations affiliated with native grasses such as the Upper North Farming Systems Group, Eyre Peninsula NRM Board, Upper River Torrens Landcare Group and Department of Environment and Heritage.

The project and the Native Grass Strategy have been directed by a Reference Group¹ which scoped the following Project Vision:

Recognition, acceptance and uptake by communities, governments and industry of perennial native grasses (and associated species) of their economic, social and environmental value in agricultural systems

- ***Reducing bare landscapes with year round ground cover incorporating native perennial species***
- ***Viable, integrated part of agricultural systems.***

This Project Vision has underpinned the project and the development of this document.

¹ Reference Group Members:

Neville Ferme - Advisory Board of Agriculture (ABA);
Michael Wurst - Upper North Farming Systems Group;
Anne Brown - Mid North Grasses Working Group (MNGWG);
Chris Penfold - Native Grasses Resources Group (NGRG);
Wayne Brown - Adelaide Hills Native Grasses Growers Group;
Bob Myers – Local Expert;
Dr Andy Sharp - Department of Environment and Heritage (DEH);
Neil Ackland - Eyre Peninsula NRM Board; and
Dr Jodie Reseigh - Rural Solutions SA (Project Leader).



Areas not covered by Native Grass Strategy for South Australia

This Strategy is focused on production and sustainability benefits of native grasses and their seeds in broadacre agriculture and associated industries in South Australia. Horticulture and associated industries, including small scale agricultural production is not the primary focus of this document and therefore is excluded from this strategy. Biodiversity conservation of native grasses in South Australia is not specifically addressed in this Strategy except where overlapping benefits and issues arise. A subsequent project "*Management of Native Perennial Grasses for Sustainability and Biodiversity Conservation*" will address biodiversity conservation in a more comprehensive manner.

Native Grass Strategy for South Australia Aims

The Native Grass Strategy for South Australia aims to:

Develop a working document the *Native Grass Strategy for SA* which integrates, directs and enhances broadacre adoption of native perennial grasses into farming systems.

This Strategy will signpost a coordinated and strategic approach to implementation and establishment of the native grass seed industry; identify further education, technical support and research and development needed in regard to native grasses in broad scale agriculture. Future stimulation of acceptance and uptake of the *Native Grass Strategy for SA* will be facilitated by implementation of recommendations and 'best practise' approaches reviewed within the Strategy.

Strategy vision and direction

The project was developed around a framework based on three major strategy themes of consideration arising from the aforementioned vision:

- Native grass seed industry (Chapter 2);
- Sustainable economic production and native grasses (Chapter 3); and
- The use of native grasses in land management (Chapter 4).

In order to determine key issues and identify key needs, these strategy themes were subject to: a review of the literature including conference and workshop proceedings; discussion with local community members in workshops; discussion with key people via phone interviews; canvassing of views via internet questionnaires; discussion with key people in small group meetings; face to face interviews with key people, business and organisations; and site visits with persons, businesses and agencies actively involved.

The framework (refer diagram) recognises six principle strategy areas arising from these broad strategy themes of consideration:

- Research and research support i.e. the need to identify areas of required research and develop mechanisms to fund, initiate, implement and continue research;
- Communication and education i.e. the need to communicate effectively messages and information related to native grasses, as well as effectively



educate groups and individuals associated with agriculture, the seed industry and landscape management;

- Industry monitoring and support i.e. the need to investigate and monitor the industry in relation to structure and economic viability, including future market potential;
- Policy and legislation change i.e. the need to identify areas requiring development or change in government policy related to native grasses e.g. in relation to native vegetation or with respect of seed standards including seed quality and contamination control measures;
- Technical support i.e. the need to identify areas of required technical extension or expertise and develop mechanisms to fund, initiate, implement and continue the provision of technicians or technical support;
- Landholders, seed grower and seed industry incentives i.e. the need for financial or other support as a means of implementing change related to native grasses.

The principle strategy areas allow for the development of:

- *General recommendations* (Chapter 5) which encompass the broad themes of consideration and their overlapping aspects; and
- *Specific recommendations* (Chapter 5) which details the broad themes of consideration individually.

The recommendations, both general and specific, recognise the need to identify:

- Key issues;
- Specific objectives associated with the issues;
- Key strategies that need to be adopted to achieve objectives;
- Key agencies, groups or individuals associated or are recommended to be associated with the recommendations; and
- Timelines to achieve the recommendation.



The Native Grass Framework Strategy, as it pertains to this document, is summarised below.

Native Grass Strategy Framework

Strategy themes							
Native grass seed industry (Chapter 2)		Sustainable economic production and native grasses (Chapter 3)			Native grasses and land management (Chapter 4)		
Principle strategy areas							
Research and research support	Communication and education	Industry monitoring and support	Policy and legislation change	Technical and technical support	Grower and industry incentives		
General recommendations (Chapter 5)							
knowledge technical, applications, cost benefits, economics		awareness and education landholder, community, professional, private industry		legislation and policy standards controls monitoring		industry viability, structure, economics, marketing, industry monitoring	
Specific recommendations (Chapter 5)							
Provenance of native grasses in relation to local use	Commercial and economic aspects of native grass seed industry	Quality, variety and availability of native grass seed	Application and knowledge of grazing management regimes re native grasses	Process and mechanisms replanting - enhancing native grass pastures; cost benefits; inputs required	Nutrition, toxicology and production of native grass species for domestic animal production	Application of native grasses to landscape change processes including climate change	Knowledge gaps and applications of the uses of native grass in land management issues



v Glossary of Terms

Accession: a sample of a plant variety collected at a specific location and time.

Ameliorate: in land management, to improve the condition of a site, particularly with reference to salinity and other toxic contaminants of soil and/or water.

Annual: a plant that completes its entire lifecycle within the space of one year.

Arable: land that is capable of being farmed productively.

Arid: an area that receives less than average rainfall of <250mm per year.

ASCAS: Australian Soil Carbon Accreditation Scheme.

Awn: a slender, stiff bristle appendage at the tip of some grass seed structures.

Basal diameter: diameter of a plant at its base.

Biodiversity: the number and variety of living organisms in the ecological complexes in which they naturally occur. The term biodiversity includes genetic diversity, species diversity and ecosystem diversity.

Biomass: the total weight of all living organisms and in a biological community.

Broadacre: an Australian term used to describe land suitable for farms practicing large-scale crop (agriculture) operations.

C₃ grasses: winter active grasses that photosynthesise using a biochemical system that fixes carbon in molecules containing three carbon atoms, or the C₃ pathway.

C₄ grasses: summer active grasses that photosynthesise using a biochemical system that fixes carbon in molecules containing four carbon atoms, or the C₄ pathway.

Carbon cycle: the process by which carbon, the chemical foundation of living organisms, circulates throughout the natural world. This is one of several different biogeochemical cycles.

Carbon dioxide: a gas important in the carbon cycle. Plants absorb CO₂ during photosynthesis, and plants and animals produce it as an end product of respiration. It has an important role in controlling the earth's surface temperature.

Carbon sequestration: the removal and long term storage of carbon from the atmosphere through the use of natural carbon sinks, such as storage underground, in the form of standing plant biomass, in oceans or in soils.

Caryopsis (caryopses): the mature fruit of a grass; often dry, dehiscent and attached to a seed coat.



Catchment: The area from which a river, stream, lake or other body of water receives its water.

CEC: Chemical Electrical Conductivity.

Cell grazing: grazing animals within a 'cell' consisting of a large number of paddocks of a size which permits a high stocking density to be applied to each paddock for a suitably short period. Grazing and rest periods are determined according to available herbage and estimated rate of recovery of desired pasture species.

Chemical fallow: allowing crop land to lie idle for a period of time prior to sowing a crop by controlling growth of plants with herbicide application.

Climate change: A change in climate caused by human activities or natural phenomena.

CO₂ enrichment: adding CO₂ to the atmosphere of a grow room to speed growth.

Continuous grazing: grazing by stocking at a consistent density or rate throughout the year, whether or not by the same animals.

Cool-season grasses: grasses that grow in cool, wet or dry areas and fix carbon in molecules via the C₃ pathway.

Culm: flower stalk.

Cultivar: short for cultivated variety, or a variety of a plant species that has been bred artificially to enhance a desirable characteristic, and does not occur naturally in nature.

Cultivation: preparation of soil by tillage for crops.

Defoliation: removal of leaves from a plant.

Denitrification: removal of nitrogen from the soil either naturally by soil bacteria in changing nitrates to simpler compounds (nitrites, ammonia), or by other means such as raised water table levels dissolving and removing nitrates.

Direct drill: a farm implement/method for planting seeds which forms a small furrow, deposits the seed in dribbles, covers the seed, and packs soil over it. It can also deposit fertilizer, lime, or other amendments into the soil, alone or with the seed.

Domesticate: to naturalize a plant species or variety and bring under some form of human control; to remove by selection the 'wild' characteristics of a plant species.

Dry weight: weight of any plant part after removal of moisture usually by drying.

Ecosystem function: the processes and interactions that operate within an ecosystem.

Ecotype: A population within a species that has developed distinct physiological characteristics (e.g. herbicide resistance) in response to a specific environment which persist even if individuals are moved to a different environment; a subgroup within a species, which is genetically adapted to a habitat type that is different from the habitat.



type of other subgroups of that species. It normally has a large geographical distribution.

Ecovar: as for ecotype.

Edaphic: plant communities that are distinguished by soil conditions rather than by the climate.

Environmental weed: any species that is recognised as difficult to control or contain and proclaimed as creating a negative environmental impact; includes both exotic plants and native plants.

Exotic species: introduced species, not native.

Floret: a flower of a grass, generally including the lodicules, ovary and stamens but also associated lemma and palea.

FOG: Friends of Grasslands – ACT.

GA: Gibberellic Acid.

Genus (Genera): a subdivision of a family. Each genus is made up of many species.

Germination: the start of growth of a seed or other reproductive cell after a period of dormancy.

Glomalin: constituent of soil that binds carbon.

Glume: one of two (usual) bracts at the base of a spikelet.

Holistic: approach that tends to form a whole that is more than the sum of the parts by ordered groupings.

Improved pastures: pastures sown with introduced species of grasses and or legumes.

Indigenous species: species native to an area.

Inflorescence: flowering head.

Interstitial: occupying small spaces between larger items e.g. grass tussocks.

Leaf blade: in a grass the part of the leaf that folds away from stem.

Leaf ligule: in a grass, the joint between the blade and the sheath.

Leaf sheath: in a grass, the part of the leaf that clasps the stem.

Legume: any member of the dicot family Leguminosae e.g. wattle, clover; used in agriculture to improve the nitrogen content of the soil through nitrogen fixing bacteria in root nodules.

Lemma: the outer of two bracts surrounding each flower.



Marginal lands: lands where rainfall, nutrition or water is less than ideal and plant survival is compromised.

MNGWG: Mid-North Grasses Working Group – SA.

Monoculture: cultivation of a single crop or product to the exclusion of other crops or products.

Morphology: the general form of an organism not including the internal structure.

Native species: organism eg plant, that has evolved in a particular area; opposite to introduced or exotic.

Naturalised: organism eg plant, that has been introduced and become established - reproducing, propagating and evolving in a natural manner ie without human intervention

NGRG: Native Grass Resources Group – SA.

NLP: National Landcare Program.

Non-arable: land that is unable to be cultivated or farmed.

No-till: planting crops without prior seedbed preparation, into an existing cover crop, sod, or crop residues, and eliminating subsequent tillage operations.

Noxious weed: often used restrictively for an invasive weed (introduced [= non-native] plant) that is considered undesirable and has been formally designated by federal, state, or local statute as detrimental and that must be eradicated, controlled, or managed according to specific regulations.

Outcross: the crossing of two unrelated members of a species, to produce seed that is as genetically variable as possible, or to selectively breed for.

Palatable: pleasing to the taste, tasty; tolerable, acceptable.

Panicle: a branched inflorescence; spikelets of grasses are treated as equivalent to the single flowers of most other plant families.

Pastoral: rural, usually associated with people, crops and animals.

Pasture cropping: the direct seeding of an annual C₃ crop, primarily winter cereal crops such as wheat or oats into a permanent, perennial native pasture (often summer growing C₄ pastures that are dormant through winter).

PBR: Plant Breeders Rights.

Pelletised seed: seed coated with a protein covering and sometimes other additives to protect the seed, enhance germination and in some cases provide a uniform size to improve sowing.



Perennial: a plant which continues to grow beyond one year and does not die after first flowering and fruiting. Some herbaceous perennials (grasses).

Persistence: continues to grow and survive in an area under adverse conditions.

Phylogeny: evolutionary history of an organism.

Piosphere: the area of plant and soil change around a watering point e.g. a dam

Planned rest grazing: a grazing regime that involves planned periods of grazing followed by regular planned rest, and encompasses rotational and cell grazing.

PLS: Pure Live Seed.

Poaceae: family of grasses which includes native and exotic grass species.

Polyculture: mixed cultures or mixed ingredients.

Pre-European: prior to European settlement in Australia.

Provenance: place of origin; derivation.

Pulse grazing: grazing a paddock at a high stock density for a short period of time.

Recharge: the replenishment of water in the ground, e.g. through injection or infiltration from surface water into groundwater aquifers.

Remediation: the action taken to clean up, contain, or remove the risk posed by contamination at a site.

Remnant: the portion that remains after the main part no longer exists, usually referring to native vegetation.

Revegetation: the planting of native species in areas that have been cleared or highly modified. The mix of species may or may not be the same as originally occurring in that patch of vegetation.

Rhizome: usually elongate, horizontal underground or subsurface stem, usually rooting at the nodes.

Rotational grazing: a paddock is not set stocked continuously; rather it is grazed and rested regularly, either on a set time schedule or intermittently as required.

Seed dormancy: the resting or inactive phase of plants or seeds. Dormancy of shoots is usually in response to unfavourable environmental conditions.

Seed purity: describes the total seed of a particular species in a seed sample. A required component of seed tags in some countries.

Seed viability: a relative measure of the number of surviving individuals of any given phenotypic or genotypic class of seed.



Semi-arid: an area that receives between 250-500mm average rainfall per year.

Senescent: senescence refers to the biological processes of a living organism approaching an advanced age (i.e., the combination of processes of deterioration which follow the period of development of an organism).

Set-stocking: grazing systems in which stock remain in one field or paddock for a long period.

SOM: Soil Organic Matter, also referred to as soil organic carbon.

Species richness: the number of different species that exist within a given area or community. Compare species abundance.

Spelling: with reference to pastures, is the planned absence of stocking or cropping to rest the area from agricultural stress.

Spikelets: a component of the grass inflorescence.

Stocking density: the number of animals per unit area of land at a point in time; the number of dry sheep equivalents (DSE) in a paddock at any one instant.

Stocking rate: the number of animals per unit area over a given period; the total number of dry sheep equivalents run per hectare (DSE/ha) on a farm or paddock averaged over a calendar year.

Stolon: a stem that runs above the ground often producing roots and sending up new aerial shoots.

Stubble retention: retention of the part of a crop left after harvesting.

Sub and super: application of superphosphate and subclover.

Summer-active: see C₄ grasses.

Sustainability: the quality of a state or process that allows it to be maintained indefinitely; the principles of sustainability integrate three closely interlinked elements—the environment, the economy, and the social system—into a system that can be maintained in a healthy state indefinitely.

Temperate: region in which the climate undergoes seasonal change in temperature and moisture. Temperate regions of the earth lie primarily between 30 and 60 degrees latitude in both hemispheres.

Tetrazolium: TTC, or simply Tetrazolium chloride is a redox indicator commonly used in biochemical experiments especially to indicate cellular respiration. It is a white crystalline powder, soluble in water, ethanol and acetone but insoluble in ether.

Tiller: a tiller is a stem produced at the base of grass plants. Tillers are segmented, each segment possessing its own two-part leaf. They are involved in vegetative reproduction.



Transpiration: the process by which water vapor escapes from the living plant, principally the leaves, and enters the atmosphere.

Tussock: a compact, densely tufted growth form of some grasses and sedges.

UNFSG: Upper North Farming Systems Group (SA).

Warm-season grasses: grasses that grow in warm, wet or dry areas and fix carbon in molecules via the C₄ pathway.

Winter-active: see C₃ grasses.

