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**“Delivering multiple benefit messages – A partnership with NRM”**

a GRDC funded project being delivered by Ag Excellence Alliance

**Highest common priority issues that affect grain production and natural resource management (NRM) across regions in south eastern Australia and opportunities for collaboration and investment**

*Ag Excellence Alliance is leading an innovative project to bring together grains industry and natural resources management (NRM) people to work together in extending sustainable farm practices on key production issues that have clear environmental outcomes. The project is working with seven NRM/CMA/LLS regions and five farming systems groups across South Australia, Victoria and NSW to identify their production issues, and then to develop and deliver an extension and communications program to address the issues.*

**Background**

A series of nine facilitated workshop were conducted across key grain growing districts of South Australia, Victoria and southern New South Wales. These workshops were arranged in collaboration with the respective natural resource management regions in each of the states. Further details of workshop dates and locations are listed in Appendix 1.

Workshop outcomes included -

1. identified and prioritised the issues that affect both grain production and the management of the natural resources in this region
2. depicted the desired the mutual (production and NRM) outcomes
3. described the required practice change(s) that are required to achieve the desired outcomes
4. developed program logics (using MAKAT tool) and action plans to achieve the identified outcomes and practice change(s)
5. brainstormed existing and prior work that has been or is being undertaken to address these issues
6. identified opportunities for investment and collaboration to deliver outcomes for the grains industry and our natural resources
7. nominated key organisations and individuals to work together to progress the identified opportunities

Workshop participants represented a range of stakeholder groups, including -

* grain growers
* grower groups – committee members and staff
* agronomists, consultants and advisors – consultants and resellers
* Natural Resource Management (NRM), Catchment Management Authority (CMA) and Local Land Services (LLS) - management and operational staff members
* NRM, CMA and LLS Board members
* State government agencies – Department of Environment, Water and Natural Resources (DEWNR), Department of Economic Development, Jobs, Trade and Resources (DEDJTR), Victoria and NSW Department of Primary Industries (NSW DPI).

**Summary of the highest common priority issues and opportunities for grain production and natural resource management (NRM) for key grain growing regions across south-eastern SA.**

1. Strategies and IWM packages to manage herbicide resistant weeds across the landscape
2. Specific management strategies based upon land capability to maximise productivity and protect environmental assets
3. Understand the long term impacts of farming practices on soil health and long term productivity and sustainability
4. Regional strategies to adapt to seasonal variability and longer term climate change
5. Community understand and value the investment and commitment of growers to protect and enhance NRM assets
6. Break crop to increase the diversity of farming systems to increase sustainability and profitability
7. Management of cropping systems to reduce local seeps and salinity loads of groundwater recharge (\*)
8. Access to skills and knowledge to provide a more holistic systems approach to farming
9. Increasing levels soil acidity (\*)

 (\*) = regionally specific issues across a number of regions

Further details are described below.

The highest common priority issues for grain production and natural resource management (NRM) based upon outcomes from nine regional workshops are described below.

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| **Strategies and IWM packages to manage herbicide resistant weeds across the landscape** |
| Issue Description | * rapid development and increasing extent of glyphosate is of critical importance given that it is fundamental tool for managing agricultural and environment weed species
* glyphosate was a tool that has revolutionised weed management and conservation farming and dramatically reduced wind and water erosion
* while glyphosate resistance is of foremost concern the development of herbicide resistance in Brome Grass and other important grass and broadleaf weed species are also of concern
* cost of control strategies is the major constraint to adoption
* opportunity is to improve effectiveness of current management practices and include additional tools to further prevent weed seed set and drive down weed seedbanks
* long term cost of increasing herbicide resistance and weed populations is often not recognised until current practices are no longer effective and growers and advisors are forced to change attitude and practices
* herbicide resistance is not limited to farming systems but is also a major issue for natural resource managers e.g. preventing incursions or managing herbicide resistant agricultural weeds in native vegetation
* herbicide resistant weeds are an emerging issue that threat the biodiversity and quality of remnant vegetation
* growers are increasingly adopting cultural control strategies, including cultivation, grazing and the growing of break crops to manage the increasing herbicide resistance (levels, modes of action and weed species)
* identified threat is that increasing the use of cultivation, burning and grazing will have consequences for the land resource, e.g. reduce groundcover will mean that soils will be exposed and prone to erosion and/or structural decline of soils
* it is important that growers and advisors are aware of new and alternative cultural control options (other than cultivation) that can be incorporated into IWM packages e.g. crop-topping, alternative chemical options, harvest weed seed destruction and windrow burning
* agronomists and consultants are the key to influencers that are capable of directly influencing decision-making that will directly affect weed management practices
* weed management practices on non-agricultural lands is part of the problem, e.g. continual and regular use of same chemical groups to control weeds on roadsides and railway corridors which then become a nursery for herbicide resistant weeds that then spread into adjoining agricultural lands
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| Desired outcomes and required on-farm practice changes | Growers and land managers adopt integrated weed management packages that will prolong the effectiveness of herbicide options and slow the extent and rate of developing resistance.Growers and land managers work collaboratively to ensure that there is a concentrated effort to manage herbicide resistant weed populations in all situations for mutual benefit. |
| Required actions and investment to address this issue | * investment in R,D&E is required to develop, adapt and promote farming systems and management strategies to minimise the development of glyphosate resistance and manage herbicide resistance
* validate, demonstrate and extend effective weed management strategies under local conditions
* develop local weed management guidelines to support growers and advisors to adopt best management practices
* promote the strategic use of cultural control e.g. windrow burning, cultivation, cutting of hay and grazing strategies to ensure adequate groundcover is maintained
* cost-benefit analyses of a range of management strategies and packages to quantify the impact on weed seedbanks and populations and financial outcomes is required to motivate practice change
* a communication strategy must deliver messages that are tailored to discrete target audiences, i.e. growers and agronomists and NRM/land managers
* NRM organisations to work with growers to stop the spread of new or emerging weed species into national parks and agricultural paddocks
* awareness and education for landholders and managers
* further R&D is required to develop new and progress alternative weed control tools
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| **Specific management strategies based upon land capability to maximise productivity and protect environmental assets** |
| Issue Description | * long term and continuing shift in land use from grazing and mixed farming systems toward intensive cropping systems
* farm size, scale and intensity of cropping systems continue to increase and therefore the need for growers to achieve greater economies of scale to improve efficiencies
* an increase in the size of farm machinery and paddocks or the aggregation of paddock to create large paddocks or blocks have become commonplace
* consequence is that land use, crop type, systems and management practices are applied across to a broader area and often a range of land classes and soil types

 * impact and consequences on environmental assets under this management regime is exacerbated and includes - an increased risk of erosion and more generally the long term impacts on soil health, scattered or isolated paddock become unviable and the accelerated decline in the health and long term sustainability of patches of remnant vegetation and loss of native grasslands and ephemeral wetland ecosystems are being degraded or lost
* conflict between scale and the protection or the deleterious impacts on environmental assets
* protect and minimise impacts of farm management practices on natural ecosystems, including remnant vegetation (patches and scattered paddock trees, native grasslands and ephemeral wetlands)
* land use and management needs to be based upon land capability and key environmental assets are protected
* increase in scale compromises the ability to optimise production, manage risks, capture opportunities and margins across a range of variable land classes and soil types
* the pragmatic approach is to first identify discrete management zones within paddocks or blocks which would then enable management to be prescribed based on the capability and potential
* specific management strategies provides the opportunity to deliver targeted and variable crop inputs to exploit opportunities, minimise risks, maximise the efficiency of crop inputs and optimise returns

 * available precision agriculture (PA) tools have the capacity to identify, map and deliver targeted and variable crop inputs
* generally growers are not extracting the full potential of the capacity of existing and available technology
* confidence of growers use technology and the lack of required support services is considered to be a major barrier to adoption
* a range of innovative technologies have recently been released or in the commercialisation that will revolutionise farm management
* shift attitudes and paradigms so that growers will value the environmental assets on their farms and will develop a balance between the scale of cropping and machinery and the capability of land and environmental assets
* financial incentives for growers to protect or forego agricultural production and income is the most effective mechanism to enable growers to recognise the value of environmental assets or natural ecosystems
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| Desired Outcomes | Land use is based on land capability and management strategies and inputs are customised to specific zones to optimise financial returns and protect natural resources and ecosystems. |
| Required actions and investment to address this issue | * use farmer case studies to model and quantify the cost-benefit of approaches to management, i.e. whole paddock versus zones
* critical review of PA tools for growers based upon a range of criteria e.g. ease of use, cost, compatibility, support systems etc. to share knowledge and experiences
* communicate tangible production, financial and NRM costs and benefits to provide motivations to drive adoption
* training and support for growers to develop the required skills and confidence to use technologies that provide the capability to customise management to land zones
* establish networks to provide farmer to farmer coaching and support to accelerate rates of adoption
* important to include local development (validation or adaption) and extension (demonstrations and case studies) to ensure that principles are relevant for local conditions
* important to Identify and sell the NRM benefits e.g. reducing off-target impact that technology can deliver
* explore opportunities to adapt or apply innovate technologies that will further assist management e.g. virtual and selective access fencing, digital recognition and detection of weed and insect pests and modular robotic farm machinery units etc.
* financial incentives for growers to forego agricultural production to protect natural ecosystems
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| **Understand the long term impacts of farming practices on soil health and long term productivity and sustainability** |
| Issue Description | * What is a healthy soil?
* How do management practices and amelioration techniques affect soil health?
* Is there a relationship between soil health and productivity?
* Can we quantify the long term effects (> 5 to 10 years) versus short term (< 5 years) of soil health on productivity
* What is the balance between profitability and sustainability?
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| Desired outcomes | Growers and advisors understand the impacts of farming practices on “soil health” and the long term productivity and sustainability of farming systems.Growers and advisors are able to understand and quantify the impact of soil improvement techniques on soil health and farm productivity and profitability. |
| Required on-farm practice change | Adopt farming practices that have long term beneficial impacts for production and soil health and environmental amenity. Required practices will vary depending upon environmental conditions and may include, liming, tillage practices, growing legumes to provide organic nitrogen, sub soil manuring, cover crops, spading and controlled traffic farming |
| Required actions and investment to address this issue | Identified knowledge gaps -* ability to assess the long term effects of management on long term soil health
* understanding of the relationships and interactions between a range of different management practices
* evidence (data) to quantify the impacts of soil amelioration (including sub-soil amelioration techniques given a range of environments and soil characteristics
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| **Regional strategies to adapt to seasonal variability and longer term climate change**  |
| Issue Description | * climate – seasonal variability and long term climate change are key drivers of farm business incomes which in turn influences farming practices and investment in NRM
* How will climate change affect the long term viability of farming systems and businesses
* How will climate change impact the natural resources of our regions?
* need a proactive approach to ensure that we can protect our natural assets
* analysis and interpretation of regionally specific climate data to understand and quantify the impacts of climate variability and climate change
* important that growers and advisors are aware of projections for climate change
* important to plan and adapt our farming systems and practices in response to predicted changes in climate
* risk management will be the critical element to deal with increased volatility
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| Desired Outcomes | Growers can access and use local climate data and forecasts to manage the production and financial risk and opportunities given a more variable climate. Growers understand the predicted consequences of climate change and are able develop strategies and farming systems to adapt to a changing climate. Regional NRM organisations lead an adaptive approach and co-ordinate activities to improve the resilience and sustainability of environmental assets.  |
| Required actions and investment to address this issue | * improved accuracy and confidence in seasonal forecasts to enable growers to make informed decisions to maximise profitability
* communication products and activities to enable the wider community to understand the likely scenarios of climate change and impacts at a regional level
* growers are able to comprehend predictions, impacts and strategies to adapt farming systems and management to climate change
* education and training for growers and advisors to improve farm business and risk management skills which will be fundamental skills for managing climate variability and change
* R&D to develop tools and systems to ensure the viability of farming systems and environmental assets in the regions
* resourcing for NRM organisations and stakeholders to implement on-ground projects that are vital to the long term sustainability of important environmental assets (land, water and biodiversity) in the region
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| **Community understand and value the investment and commitment of growers to protect and enhance NRM assets** |
| Issue Description | * wider community does not understand or appreciate the commitment and financial resources that growers invest in protecting and enhancing natural resources
* value of ecosystems services that provide for the greater good of the environment and the public needs to be recognised
* diminishing terms of trade, increased debt levels and the lack of financial for ecosystems services are contributing to a change in attitude and that threatens the Landcare ethic
* legislation to prohibit or enforce management practice is only required for a very small percentage of landholders and is not considered to be an effective mechanism
* financial incentives for farmers are an effective tool that will provide direct action and outcomes that will ensure that the protection and improvement of our natural assets
* financial incentives are also consider to be an effective tool that will change attitudes and provide the motivation for growers to value natural assets and their commitment to NRM works
* financial incentives are an essential mechanism to recognise the public good and value of NRM related works or the value of the potential for (farming) income sacrificed will have enduring benefits
* devolved grants and/or market based incentive programs have been successful in the regions but always over-subscribed given inadequate funding
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| Desired Outcomes | The role and value of grower investment to protect and enhance natural assets is promoted to the wider community and government. Financial incentives are available to motivate and support growers to deliver on-ground actions to address regional priorities.  |
| Required actions and investment to address this issue | * grower networks and peak farming organisations are resourced to widely promote the role and value of growers in managing our natural resources to the wider community and government
* incentives or off-sets are made available to growers to recognise the public good and value of ecosystem services and protection
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| **Break crop to increase the diversity of farming systems to increase sustainability and profitability**  |
| Issue Description | * break crops provide the opportunity to increase the diversity of farming systems
* break crops provide a range of rotational benefits and are an effective tool for managing weed populations and disease levels
* break crops are not widely grown in many of the production zones but is most evident in low rainfall environments
* break crops are considered to be unreliable and a high risk crop option and is recognised as a major barrier to adoption
* break crops increase the risk of erosion
* stubble retention and inter-row sowing are tools that to reduce the erosion risk
* pastures are seen as a proven and more reliable break crop option but the common view is that value to a farm business is limited by a lack or absence of livestock in many businesses
* a range of existing and collaborative projects to address this issue

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| Desired Outcomes | Growers recognise the value of break crops in the farming system.Growers are able to confidently and reliably grow adapted break crops using improved management packages that increase the profitability and sustainability of farming systems.  |
| Required actions and investment to address this issue | * extend existing knowledge and information on break crop options and best management practices
* identify and develop an improved range of suitably adapted, profitable and less risky break crop options
* R,D&E is required to better understand how to manage break crops to increase profitability and optimise the rotational benefits
* NRM organisations and their networks can play an important role in disseminating information
* cost-benefit (financial impacts) of break crop options needs to be calculated and extended
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| **Management of cropping systems to reduce local seeps and salinity loads of groundwater recharge** |
| Issue Description | * annual cropping systems are a significant contributor to groundwater recharge, discharge seeps and off-site salinity
* increases in dryland and groundwater recharge and salinity levels is again emerging as an important issue in a number of catchments
* two distinct issues of concern –
	+ rising groundwater salinity in creeks and rivers
	+ discharge seepage and scald patches
* important that growers and advisors are aware of this issue, causes consequences and management strategies
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| Desired Outcomes | Growers optimise the productivity potential of soils to maximise water use across the whole farm to prevent discharge into seepage areas and regional groundwater.Growers are able to measure and interpret plant available water (PAW) information in strategic and tactical decision-making to optimise water use to increase productivity while managing financial risks and off-site environmental impacts on discharge. |
| Required actions and investment to address this issue | * land use and management practices, including crop and pasture rotation are based upon land capability and productive potential
* growers and advisors use PAW data in strategic and tactical decision-making
* growers use best management practices to increase the productivity and water use
* R,D&E to develop improved tools and farming systems to maximise water use
* R,D&E to better understand and develop effective amelioration practices to overcome soil constraints and improve water use
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| **Access to skills and knowledge to provide a more holistic systems approach to farming** |
| Issue Description | * diminishing R,D&E services in the State Government sector
* delivery of extension services is evolving
* advice provided by private consultants and agronomists is generally focussed or confined to production issues at the enterprise level and does not fully consider the whole farm system and business
* need to develop stronger connections between R&D providers and extension and advisors/consultants/agronomists and growers
* value of research and benefit are not being fully realised
* important to understand and address barriers to on-farm adoption
* information is often developed and delivered to address specific issues and does not necessarily consider the big picture (i.e. longer terms impacts for a diversity of whole farm businesses)
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| Desired Outcomes | Growers adopt best management systems and practices that are profitable and sustainable.Mechanisms are established to ensure that current and locally relevant information is extended to the needs of growers. |
| Required actions and investment to address this issue | * greater collaboration between the GRDC and its R,D&E providers, NRM organisations, grower groups and the advisory sector
* local development and extension is critical for on-farm practice change
* communicate clear, concise and consistent messages so that growers and advisors understand reasons for change and how to implement change
* use a range of communication tools and networks are used to extend information
* a repository for storing to enable growers and advisors to access relevant and quality controlled information
* quantify and promote how improved farming practices can deliver multiple benefits that provide both production and NRM outcomes
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| **Increasing levels soil acidity** |
| Issue Description | * increasing rate, levels and depths of soil acidity is reducing the health and productivity of soils
* growers do not appreciate the long term impacts and cost of soil acidity
* a regular liming program is the most cost effective strategy to manage declining pH levels
* opportunity to increase returns on investment by targeting lime applications based on soils (pH) maps
* ameliorating acidity at depth is emerging as a significant issue that is affecting productivity and soil health
* ameliorating acidity at depth is a major challenge given that amelioration applying lime at the surface is variable and an extremely process
* sub-soil amelioration will require significant investment by growers given that delivering lime at depth will require deep tillage
* past awareness campaigns have been an effective strategy that have resulted in increased liming rates
* use existing knowledge and soil maps to identify areas most and risk to then deliver a targeted extension campaign via a diverse range of networks and using a range of tools
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| Desired Outcomes | Growers recognise the impacts and cost of soil acidification and implement a preventative or maintenance liming program that is targeted to address soils based upon risk of acidification.Innovative techniques are able to deliver lime at depth to ameliorate and sub-soil acidity.  |
| Required actions and investment to address this issue | * use existing knowledge and soil maps to identify areas most and risk to then deliver a targeted extension campaign via a diverse range of networks and using a range of tools
* extension campaign is needed so that growers and their advisors are aware of the cost of soil acidification to motivate growers to act
* investment in R&D to develop innovative strategies, such as engineering solutions that can cost-effectively address the issue of sub-soil acidity is required
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**Appendix 1 – Regional workshops**

Regional workshop locations and dates that were conducted in the key grain growing regions across South Australia, Victoria and southern NSW –

* Northern Victorian and South Australian Mallee, Lameroo – 12 March 2014
* Eyre Peninsula, South Australia, Lock – 16 April 2014
* Northern and Yorke, South Australia, Crystal Brook – 26 June 2014
* Southern Victorian and NSW Mallee, Mildura – 10 April 2014
* Wimmera, Victoria – Horsham - 13 March 2015
* Northern Victoria and NSW Mallee - Buronga, NSW – 24 March 2015
* North Central Victoria – Bendigo, Victoria – 25 March 2015
* Central West of NSW - Condobolin, NSW – 27 March 2015
* NSW Riverina - Wagga Wagga, NSW - 26 March 2015