Southern Regional Cropping Solutions Network (RCSN) - LOW Rainfall Zone

Categorised list of issues (opportunities and constraints) which have the greatest impact on the profitability of growers in the Low Rainfall Zone of the Southern Region

as at January 2020

Issue outside of GRDC remit, not aligned to GRDC purpose and/or strategy or commercial issues identified

Rank No.	Issue	Description
2	Potential for external societal influences to affect farmers ability to produce in an effective manner e.g. biased consumer attitudes	Increasingly discerning consumers and external societal influences are placing increasing demands for more transparent and environmentally friendly agricultural systems on all aspects from production through to transport and marketing. While these are often directed by minorities and are often of emotive nature rather than being scientifically based, they have the potential for substantial negative impact. Australian agriculture needs to be proactive in ensuring we met reasonable expectations but also in promoting our ability to produce sustainable and healthy products including the use of appropriate animal welfare systems. Appropriate use of social media is just one aspect. GRDC may have a role in generating appropriate data to support a clean and green image.
5	As the global trend for pesticide regulation based on hazard rather than risk continues, deregistration of affordable active ingredients will cause an increase in pesticide costs and erode profit margins	In the low rainfall zone, pest and weed management is often based on the use of low cost generic products. Several of these are under the threat or are about to be deregistered. The application of the precautionary principle (hazard based assessment) may restrict access to commonly used cost-effective chemicals with the need then to use more expensive options. There is the need to advocate for the protection of farmer's interests in any attempt to deregister active ingredients.
31	The lack of low cost open pollinated canola varieties is contributing to the reduction in canola area in the low rainfall zone	
38	Cost of compliance to meet occupational, health and safety (OH&S) legal obligations could be reduced by making simples and practical safety guidelines and templates which could be adapted for an individual business or situation	
40	Lack of particularly seasonal farm and agribusiness labour-improving the image and promoting the opportunities to attract the next generation to a career farming and agriculture. Educating the wider community and particularly school aged children to appreciate the importance of	

	agriculture and gain an understanding of issue is important for building the capacity of the industry	
54	Control of grasses in cereal based pastures creates a feed deficit at certain time of the year	
58	Re-visit old chemistries (efficacy, crop safety and maximum reside limits) for control of weeds in vetch hay and fodder crops	
74	Powdery mildew is reducing medic production	

New or additional GRDC investment in R,D&E

Rank No.	Issue	Description
14	Predicting flowering time and manipulating crop development to reduce exposure during high risk periods to mitigate impact of frost	The ability to predict flowering time and the risk of frost (and heat stress) given sowing date for different locations across the Southern Region would mitigate the risk of losses caused by frost. A greater understanding of the effectiveness of techniques to manipulate development, flowering and maturity of varieties which can reduce exposure to high frost risk periods.
21	The opportunity to use big data to improve grower profitability in the low rainfall zone	Growers are unsure of what constitutes big data and if this provides opportunities to improve productivity and profitability in the low rainfall zone.
31	Local data for Russian Wheat Aphid risk factors (volunteer species, aphid flights) is scant	
38	Increasing awareness of nitrogen (N) removal and cycling may improve N management, lower risk and increase profit in the low rainfall zone	
51	Populating the Flower Power Decision support tool with varieties and locations relevant to the GRDC Southern Region will help mitigate frost risk	
62	Overcoming highly alkaline and saline sub-soil constraints would increase rooting depth and access to plant available water	

70	Soil acidity is an emerging and under-recognised issue which is limiting the productivity of legumes and even precluding the growing of legumes	

Current GRDC investment in R,D&E

Rank No.	Issue	Description
3	Improved pulse varieties to increase the profitability of farming systems in the low rainfall zone	The development of high value pulse varieties, especially lentils and chickpeas, which are better adapted to low rainfall environments and farming systems would increase the area sown to pulse crops and thereby increase long term profitability. Improved varieties of pulses for situations where high value pulses are not suited would also increase in the area sown to pulses and thereby enduring profitability of growers in the low rainfall zone. Identified issues and traits of improved varieties include, lupins tolerant of free lime and high residue field peas which provide protection of soils from wind erosion.
4	The loss of glyphosate as a major tool through either regulation or resistant weed species would significantly impact on the profitability and sustainability of farming systems in low rainfall zone	Our farming systems are heavily reliant of the use of Glyphosate, both as a crop establishment knockdown and for fallow weed control, pasture topping and crop topping of canola, feed barley and sometimes wheat. The loss of this chemical would substantially impact the farming systems in LR areas. While the withdrawal of regulatory support is considered unlikely, loss of efficacy, through increased resistance poses a significant threat. It raises the question of whether it is possible to farm without glyphosate and what techniques would be required. The pressure on glyphosate in the EU was behind the question about ongoing regulatory support.
6	Increased model skill in seasonal forecasts provided from March to May and better forecast utilisation by growers and advisers presents an opportunity to improve decision-making management risk more effectively	In low rainfall areas, there can be considerable benefits in adopting alternative seeding plans depending on where the season is heading. It would be highly advantageous to have access to more skilful seasonal outlook forecasts at the time of planting. Coupled with this is the need for improved methodology for utilising forecasts of varying skills in effective decision making.
6	Potential for climate change to become a significant constraint due to increasing spring heat, shorter growing seasons and possible increased frost incidence	Climate change is potentially having a significant impact on crop production through: • frost potential increasing • increased spring heat shocks • less rain in season due to shorter growing season • increased evaporation due to increased heat Considerable adaptation is already occurring with varieties, sowing time etc. Likely to be covered under existing investments. However, there is a need to ensure that a climate change lens is put over any GRDC investments.

		New Future Drought Fund will make funds available. Does more work need to be done on long term policy around drought? Potential for long term soil carbon decline to become more of an issue Impact on land value due to increased risk due to climate change?
8	Farm business management skills are essential to improving long term profitability	Improved farm business management skills will improve long term profitability of grain growers in the low rainfall zone. Identified farm business skills which are essential to enduring profitability include risk management, economics of machinery investment, understanding the trade-off between investment in machinery and labour, tools and skills for better farm decision making, people management, assessing farm business performance, business planning, farm business succession, farm business models and pathways for entry into farming. Peer farmer learning groups are seen as an effective vehicle for improving farm business management skills.
10	New and novel methods of weed control e.g. microwaves	There is a need to develop alternatives to herbicides to control weeds where control with herbicides is no longer effective, and to prolong the life of existing herbicides.
11	The risk (either perceived or real) of herbicide residues accumulating in sandy soils in low rainfall environments is reducing returns	Herbicide residues appear to be persisting longer than label indications, particularly on sandy soils. The evidence for this is anecdotal and creating uncertainty. There may be low level yield losses and reduction in returns or on the other hand, the perceived risk may be leading to decisions that reduce returns. The situation needs to be clarified.
12	Limited knowledge, skills and experience of growers and advisers new to pulse growing increases production risk of pulses in the low rainfall zone	The expansion of lentils and chickpeas into new areas and further into the low rainfall zone in the past 5 years has boosted profitability. Pulses are complex to manage and poorly managed crops pose a risk to profitability of inexperienced growers. Field peas and lupin areas have also expanded. There is a lot of interest in growing pulses in low rainfall areas but knowledge, skills and experience is limiting the ability of growers to successfully grow profitable pulse crops in the low rainfall zone. There is also the need to refine pulse management techniques from higher rainfall areas to make them more relevant for quicker finishing and less reliable rainfall districts. The interest in pulses is leading to increased plantings so growers are intending to plant them while lacking knowledge, skills and experience, which is likely to result in reduced returns.
23	Barley grass and Brome grass control	Selection pressure for later germination and the development of herbicide resistance have caused Barley and Brome Grass to become significant weeds which constrains the profits of growers in low rainfall areas.
16	The sustainable use of cost-effective herbicides and the development of alternative management tools are critical for effective weed control and profitability of cropping systems	The over reliance on Group B herbicides for grass and broadleaf weed control, increasing herbicide resistance in broadleaf weeds such as Indian Hedge Mustard and Sow thistle, and the selection for resistance in a range of other weeds as a consequence of exposure to herbicides will continue to limit cost-effective chemical weed control and the profitability of growers. The development of a range of alternative chemical and non-chemical weed control strategies, such as new or additional herbicide

		tolerance for a greater range of crop options and varieties and develop new and novel cultural technologies.
17	R,D and E capacity in the low rainfall zone is diminished by retraction of public investment in infrastructure and human resources and the exit of experienced professionals	There has been a steady decline in the R, D and E capacity across agriculture, particularly in low rainfall areas which may not be highly attractive areas of work and careers against other alternatives. Included is the need for a mentoring program to support staff at remote research facilities.
21	Economic thresholds for insect control in the low rainfall zone are poorly defined which causes the over-use of insecticides	Growers want to reduce the use of insecticides but require evidence or thresholds (for pest and beneficial species) to be confident to only use insecticides when required. Current knowledge and economic thresholds are not relevant for the low rainfall environments where there is a sharp finish to the season finishes and temperatures. The use of insecticidal strategies which minimise impact on beneficial insects are also seen as important for the integrated management pests and long term profitability.
23	Barley grass and Brome grass control	Selection pressure for later germination and the development of herbicide resistance have caused Barley and Brome Grass to become significant weeds which constrains the profits of growers in low rainfall areas.
23	Managing insects - forecasts and alerts, new pests, thresholds, new insecticide groups and control of resistant populations	Due to logistical considerations, prophylactic applications of insecticide on a broad scale are common when managing insects but there are concerns about resistance, the effect on beneficial insects and the environment. Management of insects could be improved with better forecasts and alerts, thresholds and knowledge and tools to manage resistant populations.
36	Sandy soils - crop establishment and growth, cover crops and amelioration strategies	
40	Better access to profit and production focused precision agriculture (PA) support would increase return on investment in PA	There is widespread perception that the adoption of Precision Agriculture by farmers can deliver substantial long-term benefits. Case studies have supported this (although it is important to recognise that individual circumstances will vary). Currently only a modest proportion of producers (perhaps 20%?) across the LRZ would claim to be adopters of PA (although a broader definition of PA (such as including auto-steer) would see this number increase significantly). It is likely that adoption rates will continue to increase as technologies evolve and producers become more comfortable with the technology. The challenge for GRDC is to identify where support can help break down the barriers to effective and profitable adoption.
48	Crop establishment under marginal conditions - moisture, stubble, precision seeding, discs, chemicals	
54	Crown rot is increasing with changed farming practices leaving stubble crowns intact and not susceptible to break	

	down	
58	There is limited choice of legume pasture species adapted to the low rainfall zone	
63	Mice – improved options that provide effective and long term control of populations	
67	Growers are unaware of recently developed techniques to improve common white snail control and off-label product use is occurring	
69	Variety specific agronomy for irrigated crops	
71	Soaks and seeps	

Past GRDC investment in R,D&E

Rank No.	Issue	Description
1	Herbicide options and tips and tactics for summer weed control because restrictions on the use of important products has meant that spraying may not be able to occur under optimum conditions as the window for spraying has narrowed	
12	Hard to control weeds	Growers have observed an increase and/or ingression of “hard to kill” weed species in low rainfall districts. It is suggested that this may be attributed to a number of factors including seasonal conditions, changes in rainfall and temperatures, modern farming systems and practices, selection and shifts in weed ecology. Important hard to kill weeds include Fleabane, Feathertop Rhodes Grass, Windmill Grass, Button Grass, Gazanea and Statice. These weeds are not well controlled with blanket sprays. Understanding the ecology and cost effective management practices for low rainfall farming systems is required to reduce the impact of hard to kill weeds.
19	The downside risk of highly leveraged, high input, high crop intensity farming systems threatens the economic viability of low rainfall farm businesses	A risk management feature of traditional low rainfall farm businesses has been the adoption of mixed farming practices, in part to minimise the financial impact of poor seasons. High cropping intensity systems adopted from higher rainfall districts can expose low rainfall businesses to higher risk. There is the need to improve the identification, development and quantification of practices which better balance the multiple goals of maximising profit, reducing risk and increasing business resilience.
23	Glyphosate resistant weed populations are developing on	Repeated spraying of fence lines with glyphosate based mixes is placing high selection pressure on

	fence lines	weeds for resistance to glyphosate. While the threat and occurrence of glyphosate resistance in annual ryegrass is recognised, there is a threat of glyphosate resistance developing in other species which are potentially more difficult and costly to control. This could the increase cost and complexity of weed management in the low rainfall zone.
23	Nitrogen management decisions – value of legume contribution and cost vs returns	In the low and variable rainfall environment of the low rainfall zone, growing pulses and applying nitrogen fertiliser increases costs which could result in reduced returns in poor seasons. Quantifying the nitrogen contribution of pulses and the benefit to subsequent crops will enable growers to include the value of the nitrogen contribution when assessing the overall economic benefit of growing pulses. This knowledge can be combined with improved decision making tools to better match nitrogen applications to requirements, reducing the risk of losses when nitrogen is applied when it is not required, and increasing profitability when a return from nitrogen application is likely.
29	Opportunity to improve profitability and long term management of weeds, diseases and soil fertility through better crop sequencing	
31	Real time and rapid tools to measure residual fertiliser/nutrition (N, P and trace elements, particularly Zn), especially after pulses to enable fertiliser rates and timing to be adjusted	
31	Seed banks of problem grass weeds are increasing because harvest weed seed management is not being fully utilised	
40	Fertiliser toxicity	
40	Rhizoctonia – economics of fungicides (seed dressings and in-furrow application)	Growers and advisors have a good understanding and skills in implementing husbandry techniques that manage rhizoctonia damage to seminal roots early in the season, but have less awareness that infection of crown roots later in the season is causing yield loss in some situations. There is no knowledge of husbandry techniques to manage infection of crown roots. It has been demonstrated that in furrow applications of fungicides can reduce damage and provide yield response but the situations where this will provide a return is not defined. Growers and advisors do not use technology as they are uncertain of getting a return on investment.
44	Poorly calibrated moisture probes provide incorrect estimations of Total Available Water (TAW) and Plant Available Water Capacity (PAWC)	

44	Improved integration of livestock - flexibility, economics and animal health	
51	Access to regional soil descriptions would help define management zones in variable soil landscapes	

GRDC investigating issue and appropriate R,D&E response

Rank No.	Issue	Description
9	Robotics provide opportunities to increase efficiencies and profitability of farm businesses	The technology of robotics is advancing rapidly and offers a greater level of automation which may provide significant opportunities to increase efficiencies and profitability of farm businesses.
14	Opportunities to improve the integration and management of livestock into the farming system with site specific grazing are impeded by technology cost and state regulation	Access to virtual fencing could provide substantial advantages for grazing the large areas common in low rainfall areas. Technology is currently uneconomic but it is not possible to do local research given that virtual fencing is currently illegal in SA and Vic. It would also help with managing variable soil types within large paddocks i.e. prevent over grazing of sand hills and the subsequent increase in erosion risk.
31	The soil nitrogen supply is declining as crop intensity increases	
58	Is there an opportunity to increase the productivity and profitability of shallow calcareous soils?	
63	There is limited data on the nutrient use efficiency of calcareous soils	

No action or investment by GRDC

Rank No.	Issue	Description
17	Opportunities to improve profit are missed as new practices are not adopted due to a lack of grower trust in small plot results	Growers tend to be suspicious of the results from small scale trials and would like to see results on a larger paddock scale before adopting the technologies.
19	The strong preference growers demonstrate for peer to peer learning via digital communication (twitter) is an opportunity for effective extension to builds skills and capacity and	This issue recognises the current and developing importance of social media in agricultural extension and seeks to explore mechanisms by which this can be further enhanced.

	practice change	
27	Phenoxy herbicides - alternatives	Broad acre farming systems in the low rainfall zone are reliant on phenoxy herbicides for cost affective weed control but there is a risk of off target damage to horticultural crops. This is a constraint to broad acre farming operations in close proximity to horticultural crops, and could impact on the wider industry through tighter regulatory controls if damage to horticultural crops continues. There is a need to evaluate alternative herbicides that provide cost effective control of winter and summer weeds while reducing the risk of off target damage, and to prepare for tighter regulatory controls.
28	Easy to use decision support tools would enable better use of objective data and reduce grower financial and production risk	Improved decision making remains the holy grail and there have been numerous and well-meaning attempts to improve decision making by objective support through the development of analytical decision support tools. Widespread usage of these remains' poor. Redefined issue? - Adoption of improved decision-making *techniques and processes* which enable growers (and their advisors) to better use available information to arrive at more robust decisions in a risky business environment. Sub-components • Issue is about the process, not necessarily about the tool • Acceptance that the process will always take some effort and this will continue to restrict uptake • Potential gaps- Business benchmarking- already reasonably well covered by industry? • Use of advisory boards • Identification and support for specific techniques and processes which will aid decision making e.g. decision matrix
29	Better adapted cereal and pulse varieties i.e. shorter season varieties with a longer flowering period	
36	Widespread adoption of seed applied insecticide for Russian Wheat Aphid control may harm beneficial insects and soil microbes	
44	Soil biology - understand the value of beneficial microbes and the impacts of farming practices e.g. herbicides and insecticides on beneficial species	

44	There is an opportunity to obtain higher return on investment from sulphur fertiliser by understanding of sulphur dynamics in sandy soils and low rainfall environments	While the sulphur (S) demands of crops such as canola are well known and generally addressed, there is uncertainty amongst farmers and advisors as to the S requirements of other crops and whether supplementation (particularly on lighter soils) is required to maintain yields.
48	Understanding seed zone environment - vertical furrows - need confirmation	
50	The nitrogen supply of sandy soils is being over-estimated	
53	Farm efficiencies	
54	Spot spraying	The use of green on brown optical weed sensing and spraying technology is now widespread but there is a knowledge gap in appropriate chemical mixtures and rates. People selling the hardware generally have poor knowledge. Farmers are experimenting and often applying higher rates than is necessary- often alongside horticulture. There is no education on use by dealers, often selling inappropriate nozzles. Not a lot of products registered- but some are. Need to check permit.
54	Growers are concerned that the erosion risk of bare tramlines may outweigh the benefits of reducing compaction in sandy soils	
58	Do more intensive cropping systems require greater micro-nutrient inputs?	
63	The risk of wind erosion due to inadequate ground cover constrains the use of legumes in low rainfall environments	
63	Is regular use of in-furrow fungicides changing soil microbiology and increasing *Pratylenchus neglectus* populations	
67	Sodic soils are not profitable in low rainfall zones	
71	The potential for improved profitability from retaining more stubble by investing in stripper front disc seeder technology needs to be quantified	
71	Evidence of impacts of regenerative agricultural systems, specifically cover crops in low rainfall environments	

75	Milling oats	
76	Is there potential to use alternative crops such as safflower as a viable rotation option for the low rainfall zone	
77	Irrigated high value crops could improve profitability of low rainfall zone growers who have access to water for irrigation	