

## Southern Regional Cropping Solutions Network (RCSN) - HIGH Rainfall Zone

### Categorised list of issues (opportunities and constraints) which have the greatest impact on the profitability of growers in the high 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
1	Reliable supply of canola seed - is F2 canola an option?	The issue has evolved from one of general seed supply (accepting that Australian demand is at the end of the global seed supply, so are partially dictated by what the seed suppliers have left available) to a question of using F2 hybrid canola if new seed is not available. There is some evidence seed grading and other agronomy can lessen the impacts of sowing F2 hybrid seed. So is F2 canola an option and if so under what agronomy package will it work?
8	Risk with limited stock of canola (no seed supplies)	Description: refer to Issue 1 - Reliable supply of canola seed - is F2 canola an option?
17	Need to use higher rates of Clethodim to control ryegrass in canola	The current maximum label rate of Clethodim to control annual ryegrass in canola is ineffective. Where higher rates have been used, annual ryegrass control is improved. Therefore the appropriate action would be to revisit the current maximum label rate in canola. This has been included in the additional chemical use patterns submitted for consideration, so no further action is required at this stage.
18	Develop new (non-genetically modified) canola varieties	Growers require access to a range of improved canola varieties with a range of traits that are adapted to high rainfall environments. Regulations in South Australia and Tasmania prevent the growing of GM varieties. As a consequence growers in key high rainfall production areas in these States do not have access to GM varieties with a range of improved traits (e.g. herbicide resistance, pod strength to reduce shattering).
30	Improved grain marketing through expanded or differentiated markets (faba beans and cereals) and greater grower marketing skills advice to get a better price	Farm profit is influenced by the price received for a commodity. There is a belief that profit could be improved if (i) there was greater differentiation in markets, especially with cereals and faba beans and (ii) growers had improved grain selling skills (either themselves or in partnership with a grain marketer).  Differentiated markets may also encourage growers to introduce some more novel crops in the rotation, thereby helping manage disease, pest and nutrition. i.e. having markets and favourable prices influences rotation choices.
33	Improving phone/internet services/speeds in rural areas to enable access to services	
36	Managing farmer health	

42	Insufficient information on the grazing value of faba beans	
47	Loss of chemicals and the need for greater grower advocacy around the retention of various herbicides and pesticides	
53	Gaining faster access to pesticides used in Europe and the United States	
60	Conflicting information on the quality and response of natural versus recycled gypsum	
66	Develop practices to reduce electricity costs in irrigation	
70	Managing animal health issues of livestock grazing annual clovers	
73	Corellas or white cockatoos are a damaging pest which affect crop establishment and can cause up to 70% yield losses in windrowed canola	
74	Carbendazim for snail control - does it work, MRL issues, registration of use patterns	
80	Register existing chemicals for use with shielded sprayers	
86	Managing drainage beyond the farm gate	Managing drainage beyond the farm gate

#### New or additional GRDC investment in R,D&E

Rank No.	Issue	Description
5	Spatially specific (real time) assessment data to better inform in-season N decisions in high rainfall environments	Nitrogen (N) management is a key driver of yield and profitability of all non-legume crops in most seasons within the high rainfall zone. Improved technologies and tools to accurately and rapidly measure in-crop N status would enable better in-season tactical N decisions. It would also enable more intensive and frequent measurement of N which would provide the information required to customise N management. Customised and variable rate N applications would increase N use efficiency, return on investment and profit.
12	Determine practices (rotations) to reduce the high input costs required to grow high yield wheat	Increasing investment in weed, pest and disease control, along with nutrition have become an accepted requirement to grow higher yielding wheat crops. Growers (and some advisors) are now beginning to question the sustainability of this approach. Increasing direct input increases downside financial risk, because most of the costs are upfront before the final yield is known and the expenditure is often 'sunk' i.e. cannot be recovered in the next crop if yields are below expectation. Understandably they are wondering if there are other means of supplying these inputs at lower cost, while not limiting the upside potential when growing conditions are favourable. Seeking smarter

		ways to manage and provide the inputs is prudent farm management. It is accepted that farming systems, rotations and individual practices strongly influence weeds, pests, diseases and nutrients. In turn this influences the inputs that are required to grow high yielding wheat crops. Identifying farming systems and strategies which will reduce costs and optimise wheat yields would enable growers manage financial risk and increase profits.
61	Approaches to improve poor water use efficient WUE (hyper-yields and 3 crops in 2 years)	
81	Method to calculate nitrogen (N) loss when soils are above field capacity	

### Current GRDC investment in R,D&E

Rank No.	Issue	Description
2	Identify and develop high value grain crops to complement existing common crops	Most traditional crops grown in the HRZ are bulk commodities which compete with other high volume suppliers around the world. The introduction of new high value grain crops, including pulses (e.g. chickpeas, soybeans peanuts etc.), oilseeds (linseed, safflower, evening primrose and sunflower etc.) and other options would have a positive impact and be applicable to most growers across the HRZ. The direct benefit would be increased profit, with wider gains through diversification of rotations potentially enabling alternative options for weed control, nitrogen accumulation, disease break, soil amelioration and water use. Depending on the crop, new beyond farm gate industries may emerge in handling and processing.
5	Enhanced accuracy of N management decisions	The key nitrogen management decisions are amounts/rates and timing of applications. A range of N budgeting tools which calculate N fertiliser requirements given N demand based on target yield and protein less N supply from mineralisation. The amount of N supplied through mineralisation is highly variable. Hence, the calculated amount of required N fertiliser can only be considered a “guide”. Crop models have not been calibrated for regional conditions in the region which limits the accuracy and reliability of using NVDI information as a tool to estimate N requirements. The development of technologies and tools to measure N rather than rely on estimates of N would increase the accuracy of N management decisions. Improved seasonal forecasts and crop models would also enable growers to adapt tactical N management based on potential yield given seasonal conditions.
9	Improved management packages for multi-herbicide resistant annual ryegrass	Surveys have shown very high levels of herbicide resistance in annual ryegrass (ARG) is widespread across the high rainfall zone. ARG populations in the high rainfall zone have developed resistance to multiple groups of herbicides. The long growing season in the high rainfall zones results in large populations of herbicide resistant ARG which can germinate very late in the season (September to November) after in-crop herbicides have lost their efficacy. The on-going population of ARG reduces yields, limits crop options and less effective and/or increased input costs for weed control which is

		significantly limiting the profitability of farming systems. Improved management packages which provide season-long control of ARG in the high rainfall zone are required.
13	Ensuring long term cost-effective management of important HRZ foliar diseases by prolonging the life of fungicide and varietal resistance	<p>The reliance, prophylactic and repeated use of a limited number of fungicide groups has increased the risk and rate of development of fungicide resistance. The development and adoption of integrated approaches and informed decisions to disease management are required to reduce the reliance and over-use of fungicides as the only means of control. The integrated approach will require a three pronged approach;</p> <ol style="list-style-type: none"> <li>1. Genetic resistance to reduce the reliance on fungicides to manage diseases. The ongoing development of new varieties which provide improved resistance to a range of important diseases is required.</li> <li>2. The adoption of non-chemical control strategies which reduce inoculum levels prior to fungicide applications to (reduce selection pressure).</li> <li>3. More judicious use of fungicides, based on an established need rather than a prophylactic approach.</li> </ol>
15	Disease management package for sclerotinia, blackleg and powdery mildew in canola	<p>Conditions in high rainfall environments favour the infection and spread of foliar diseases in canola crops. Recently growers, agronomist and advisors have encountered an increase in the range of diseases and levels of infection. The main foliar diseases include blackleg - flower, stem and pod infections; sclerotinia and powdery mildew.</p> <p>The current heavy reliance on low cost, simple fungicides strategies may jeopardise the long term control of fungal diseases in canola and a more diverse, integrated approach may be required.</p>
15	Develop harvest and weed seed management techniques to deal with late germinating annual ryegrass	The high levels of resistance and longer growing seasons in the high rainfall zone means that growers do not have herbicide options to effectively control the staggered and late germinations of ARG which cause seedbanks to increase. Weed seed set and harvest weed seed tactics for ARG are required to enable growers to effectively prevent the build-up of ARG weed seedbanks and reduce ARG numbers.
19	Encourage soil testing and how to interpret results (growers and advisors)	Encourage soil testing and how to interpret results (growers and advisors)
20	More accurate weather forecasts	Seasonal conditions are the greatest determinant of yield which has a significant impact on profit. Improved skill of weather forecasts and seasonal outlook forecasts would provide growers with the powerful tools that would enable growers to make better informed plans and decisions which will increase profits.
21	Accelerated development of waterlogging tolerant barley	Large areas of the high rainfall zone are prone to waterlogging which limits yields and profitability. Barley is less tolerant of waterlogging than other cereal crops. The GRDC has invested in research undertaken by the Tasmanian Institute of Agriculture (TIA) which has identified a major gene controlling the tolerance of waterlogging in barley. Further research is required to develop molecular markers which would accelerate the introduction of this gene and the breeding of varieties with

		greater waterlogging tolerance.
23	Improved genetic resistance for Septoria tritici blotch in wheat and Scald in barley	
24	Quantify the optimum yield and inputs to maximise the profit margin (for each grower)	<p>The HRZ has potential to grow high yielding crops, however to achieve this commonly require significant inputs. There is potential for large returns, but because of the inputs required also comes with a high level of risk.</p> <p>The most common type of production response in agriculture diminishes as inputs are increased. If starting from a low point, each additional input provides a return much greater than the cost of the input (a large marginal return for the investment). As inputs increase further, a positive response still occurs but it becomes less than the response from the previous input, i.e. it is diminishing or becomes more marginal. If investment continues, there is a point where further investment becomes greater than the additional response achieved. Given most growers have limited resources available, knowing the optimum yield and inputs to maximise this margin (at an acceptable level of risk) is essential.</p>
24	Determine how optical sensors can be used profitably to inform decision-making	<p>Optical sensors, which use specific wavelengths to collect a range of reflectance data measurements, are becoming cheaper and more common. While they can be shown to collect and differentiate images, the value of the data to inform decision making is unclear. There are suggestions it could be used to inform summer weed control, crop establishment and damage, variable rate nitrogen, validate areas of waterlogging and where drainage is required, crop disease prevalence and crop maturity to determine timing of desiccation or windrowing. None of these suggestions have been well developed.</p> <p>On the surface there appears to be lots of opportunities to use sensor data, but just what this is and importantly how it can be used to improve decisions and profit is unclear. The people promoting the technology are enthusiastic, grower and advisors are curious but the application (and proof it is profitable) is yet to be established.</p> <p>The risk of leaving it to the market is (i) the sensor technologists will assume what growers need – and may not get this right and/or (ii) individuals pursue the potential but then do not share with the wider industry (market failure). This is costly to the individual and the wider grains industry.</p>
38	Determine if cover crops have a profitable impact on soil health	<p>Cover cropping is a relatively new practice that is being tested in some cropping systems. A cover crop is defined as a three to nine month crop that is grown primarily for biomass, i.e. not grain but may or may not be grazed. It could be a monoculture or include multiple species, including nitrogen fixing species. It is not necessarily a summer crop.</p> <p>The primary objective of introducing a cover crop is to enhance 'soil health'. It is assumed improved soil health will lead to greater resilience and greater profit.</p> <p>The enhancement in soil health are thought to be derived from increased carbon sequestration, having longer periods of active material for soil biota to feed on, moderating soil temperature,</p>

		<p>enhancing soil structure and building soil nitrogen. In some locations and farming systems, the cover crop is also seen as a way of controlling summer weeds, extracting soil moisture (to reduce subsequent waterlogging periods) and utilising excess water by growing more annual biomass.</p> <p>In theory the benefits of cover cropping are attractive and the proposition 'make sense' at a general level. However there is very little information to understand what changes cover cropping will have on 'soil health' (and then ultimately to the flow on effects to other parts of the business, impact on financial performance and risk in the farming business).</p>
40	Screen potential milling oat varieties which are adapted to the high rainfall zone and available internationally	
42	Extension on the use of PA tools - which tools are most appropriate for a particular situation (evaluate to remove confusion)	
45	Improving soil water-holding capacity (WHC)	
49	Develop a faba bean and broad bean agronomy packages	The HRZ desperately needs a pulse in the cropping rotation. Gowers and advisors currently dabbling with pulses are finding them often unreliable and not profitable. Yet they believe there is opportunity with pulses, especially with the test yields being reported of newer varieties. Part of their optimism stems from a feeling they are under prepared (need more knowledge, skills, confidence) to apply the right agronomy to realise the potential of the varieties available. i.e. it's not the plant that's the limitation or a desire to use it, rather it's how we manage it that's the limitation.
56	No effective <u>spring</u> control tactics for slugs and snails to reduce harvest contamination and damage to following crops	
56	Improved disease (chocolate spot and ascochyta) resistance in faba beans	
62	Early prediction of disease outbreaks in pulse to inform fungicide management decisions	
64	Understand the opportunities for delving or ripping on sandy soils	
68	Quantify the impact of powdery mildew on canola yields in the Lower SE of SA, Tasmania and Gippsland, Victoria	
70	Renewable or alternative N fertilisers	
77	Feasibility of alternative sources of nutrients e.g. waste	

	water and bio-solids from cities	
79	Development of genetically modified (GM) crops for yield and enhanced management options	

### Past GRDC investment in R,D&E

Rank No.	Issue	Description
4	Opportunity to capitalise on the synergies for livestock and cropping enterprises and increase whole farm profit	There is an understanding of the work that has been done in the Grain and Graze program over the past decade. While the program has improved knowledge and awareness of things like grazing crops and stubble and use of pastures in the rotation, the more difficult question of synergies, integration and whole farm impact remain. It is a complex area and probably requires some different thinking to the extension approach that has been used in the past.
13	Technologies and tools e.g. probes for rapid real time in paddock measurement of nitrogen and other nutrient status	
24	Extracting greater 'value' from spatially referenced data which is already being collected	<p>An enormous amount of data is being captured by growers and their contractors, either consciously (drones, soil testing, EM) or because technology now enables this to happen (yield monitors, satellites). This data includes soil pH, elevation, Normalized Difference Vegetation Index (NVDI), yield and grain quality. Most of the data collected is geo-referenced, potentially enabling different interventions in different parts of a paddock.</p> <p>Extracting 'value' from this data is in its infancy, but on the surface appears to have great potential to improve profitability. For example collected information could be used to assess the impact of diseases and nutrition or provide the opportunity to measure and quantify the financial value of treatments, thus enabling greater value from on-farm trials to be obtained.</p> <p>Typically the data collection is driven by those at the technology end (sensors and data capture) rather than the end user (data user and decision maker). There is a need to understand what data would be valuable to inform the decision maker and then examine what data <i>that is already being collected</i> could meet these needs.</p>
27	Enable quicker access to long season, Northern Hemisphere varieties with superior leaf disease resistance	<p>There is a belief Northern Hemisphere varieties may offer benefits to HRZ growers but access and testing is delayed. There are commercial reasons for this delay, including companies not wanting to prematurely outclass varieties they have invested heavily in and Australia being a small market, with demand at the end of the annual seed supply cycle.</p> <p>Despite these realities, it is thought by creating a more 'inviting' pathway, seed companies may accelerate access to new varieties. Possible ways of creating these favourable pathways include:</p> <ul style="list-style-type: none"> <li>• Understanding what may be available to provide guidance to companies of traits of interest</li> <li>• Easy access for companies to test through NVT</li> <li>• Independent studies to understand the market opportunity in the HRZ</li> </ul>

		<ul style="list-style-type: none"> <li>• Provide guidance on the phenology sought in the HRZ (e.g. study Penny Riffkin and Roger Sylvester-Bradley)</li> </ul>
29	Increasing herbicide resistance in Wild Radish populations	
30	Implications of variable rate (VR) lime application	
30	Limited choice of linseed varieties, including winter varieties	
35	Growers not understanding and acting to minimise any unintended impacts on the environment through their use of N and P fertiliser.	<p>The risk of nutrient loss is potentially greater in the HRZ, given the rainfall received, nutrients applied and the number of high value wetlands and waterways in the zone.</p> <p>If negative environmental impacts were to occur in the future, it is anticipated there will be an increased call for growers to ‘farm more responsibly’ if they wish to maintain their current social licence to operate. If restrictions were applied (as is the case with N in the NZ dairy industry), it could have a significant impact on grower profitability.</p> <p>Taking a proactive approach is preferable to reacting once an issue has occurred. There is a feeling amongst HRZ members that more could be done to make growers aware of the unintended long term consequences of not taking into account the potential environmental risks when using N &amp; P. Simple education around higher risk applications, including management tips to reduce off site nutrient impacts is warranted.</p>
36	Manage and enhance the research and advisory capacity so growers can access independent advice	<p>The HRZ is a relatively new cropping zone having traditionally been livestock. New advisory services and research capacity has evolved to meet these cropping needs (e.g. DPI high rainfall cropping research, farming groups – SFS, MFMG, AgKI, fee for service agronomists and retailers). However it is speculated the zone may not be as well serviced as other zones in the Southern region.</p> <p>There are multiple views why this situation arises, including:</p> <ul style="list-style-type: none"> <li>• growers not traditionally paying for livestock services (and this mentality has followed into cropping).</li> <li>• the unique nature of the HRZ requires a different skill set that cannot be easily transferred from better serviced, lower rainfall zones</li> <li>• a lack of trust in the advice received from retailers, with some assuming the advice lacks ‘independence’</li> <li>• farming groups and State agencies encountering a lack of continuity in funding, which means staff retention is difficult and turnover is rapid.</li> </ul> <p>These possible reasons lack hard evidence which makes formulating a response difficult. Some market research is required to better understand the operating environment.</p>
38	Identify the reasons for inconsistent nodulation (and subsequent yield loss) in faba and broad beans	<p>It is widely recognised that the nodulation of faba and broad beans in the HRZ is poor and unreliable. This has major implications for growers relying on these pulses, both in direct yield but also the nitrogen fixation achieved.</p>

		Identifying the causes of inconsistent nodulation is the first step to developing effective strategies to improve both the level and consistency of nodulation to improve nitrogen fixation and yields. This is unlikely to be a simple task because product, handling regimes, chemical and rotation history, soil types and the wider farming system are all likely to be contributing factors.
53	Agronomy and varieties to increase energy in grain (for domestic feed markets)	
53	Herbicide package (what works and what's safe) to support the increasing adoption of disc seeders	
58	Manage sub-surface (5-15cm) acidity on land with good surface lime application history	
72	The pros and cons of disc seeder versus tyne seeders	
76	Enhanced spray application to penetrate and provide coverage of wet and/or bulky crops	
78	Potential to use of plant growth regulators (PGR's) for crop management (canopy and grain quality)	
83	Improved management of water and including nutrients and chemicals to conserve moisture and limit runoff	

### GRDC investigating issue and appropriate R,D&E response

Rank No.	Issue	Description
3	Emerging K deficiencies in crops and interactions with other elements -	Potassium is appearing as a deficiencies in a number of crops and there is confusion around what it the best practice approach, including the interaction with other elements
7	Poor harvester efficiency (including grain loss) is impacting on profitability	The set up and operation of the header can have an impact on throughput and how much grain is 'lost' during harvest. Variability in machines, operator skill, crop moisture, canopy structure and weather conditions all impact of harvest efficiency. Setting and adjusting machinery to maximise grain capture while operating at optimum machine performance is a skill. Providing expert advice to growers and contractors would enhance profit by ensuring the maximum amount of grain is captured for the costs incurred, both in expenditure to grow the crop but also to get the crop off in a timely manner.
10	Understanding the potential for using straw either off farm (e.g. biofuels, biochar) on within paddock (e.g. stubble bio-digestion)	Large stubble loads create problems in the HRZ. There is a need to understand the potential of using stubble for alternative uses (e.g. biofuels, biochar) or within paddock (e.g. stubble bio-digestion)

11	Develop new markets for broad and faba beans	A limitation with growing faba beans is the lack of a reliable market. While it is not in the remit of the GRDC to create markets, there would be some value in exploring what value faba beans may have as a protein/energy source in other more intensive markets e.g. dairy, pigs, poultry.
22	Improved establishment of canola	Poor establishment of canola crops in high rainfall environments, particularly when sown into heavy stubble loads limit yield and profit of growing canola. Key opportunities which could improve the establishment of canola crop include stubble management starting with prior harvest, sowing systems (tyne and discs), row spacing, seed row placement, seeding rates, soil ameliorants and fertiliser inputs and placement.
28	Increasing labour demands with cropping systems	
34	Is the increasing use of neonicotinoids building up residues in the soil?	
41	Determine sustainable and profitable management strategies of high volume stubbles	<p>The quest for higher yields has an undesirable legacy – heavy stubble loads. These heavy stubbles create real challenges, in the establishment of subsequent crops, disease and pest carry over herbicide efficacy.</p> <p>The grains industry has been active in trying to find approaches that minimise the negative impacts of high stubble loads, while trying to retain the benefits of retained stubble (groundcover, extra carbon and nutrients). Row spacings, inter-row sowing, no grazing, harvest height, bailing, machinery modification, incorporation are some of the tactics being employed. Burning is another tactic that, although practiced less often than decades ago, is still used because it ‘solves many problems’ easily and quickly (removes the stubble, kills disease, pest harbour, reduce weed seeds etc.).</p> <p>The challenge is to enable growers and advisors to put together a number of tactics into a strategy that is, on balance, are appropriate for the time and the situation. The package of tactics is likely to change from region to region, year to year and even between paddocks with the same year. There is no recipe.</p>
45	Determine practices to alleviate chronic and acute waterlogging	

#### No action or investment by GRDC

Rank No.	Issue	Description
44	Identify winter active rhizobia to improve the nodulation lupins and beans	
48	Yield stability of canola could be improved by selecting and developing varieties which have greater waterlogging	

	tolerance	
49	Identify the species, varieties and agronomy to grow a profitable summer crop	
62	Homogenisation (clustering) of land, rainfall and environmental influences in the High Rainfall Zone is missing (masking) the diversity across the region (when undertaking analysis)	
64	Quality control over data entered into Online Farm Trials (OFT)	
67	Lack of grower attendance at local events	
69	Identify a 'pillar crop' to build a sustainable and profitable farming rotation	
74	Opportunity to use aerial seeding for relay cropping, e.g. aerial sowing millet and/or rape into wheat crops	
82	Understanding how climate change will affect the incidence of waterlogging	
84	Value and response of phosphites as a bio-stimulant which is being used in Europe	Value and response of phosphites as a bio-stimulant which is being used in Europe