

GRDC investments addressing “deep dive” issues – High Rainfall Zone Southern RCSN – January 2019

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Issue No. 19 - 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.

GRDC investments addressing this issue –

<p>Canola Establishment – survey and literature review (BLG110) [NSW Strategic partnership]</p>	<p>The aims of this one year project are to –</p> <ol style="list-style-type: none"> (1) Undertake a literature review on canola establishment, with the purpose of identifying research gaps and providing key recommendations for future research. The literature review will include both scientific and grey literature. (2) Conduct a field survey across 90 commercial paddocks in central NSW, with the primary purpose of evaluating current canola establishment rates and uniformity of plant spacings. The secondary purpose of the survey is to evaluate management trends that affect canola establishment, such as stubble management (burnt, retained or cultivated), seeding system (disc, knifepoint/press wheels, scatter bar/prickle chain), fertiliser (rate, source and placement) and seed type/source/size/sowing depth. <p>The combination of the literature review and survey will ensure future research is well informed and targeted. The literature review will enable clear hypothesis development for a potentially larger investment in year 2-5 of the bilateral, whilst the survey will provide a current benchmark of field establishment and uniformity of plant spacing’s in current farming systems.</p>
<p>Optimised Canola Profitability (CSP00187)</p>	<p>This project has involved physiological and agronomic research across 9 regions from southern QLD to the Eyre Peninsula designed to increase canola profitability and reduce production risk with tactical agronomy advice underpinned by crop physiology insights. In Phase 1 of the project (2014-2016), we have focussed on 3 main strategies to increase canola productivity and profitability</p> <ol style="list-style-type: none"> (i) develop robust, higher-yielding early sowing systems (ii) reduce canola production risk in low rainfall areas (iii) better manage the harvest process to reduce loss and maximise profit <p>The key to (i) and (ii) during Phase 1 has been to firstly identify the optimum flowering window to minimise heat and frost risk at specific sites and to identify the variety x sowing date combinations that achieve the optimum flowering window. In Phase 2 we will seek ways to manage the trajectory of biomass accumulation (of specific varieties) to maximise water-use efficiency, optimise N-use efficiency and minimise the risk of high input costs (e.g. seed costs, N, herbicide types, harvest strategies). Understanding crop development and physiology is also the key to (iii) coupled with the most cost-effective harvest strategies to avoid yield/oil trade-offs.</p> <p>In Phase 2 (2017-2019) we will also conduct further investigations of specific varietal adaptations under specific stress (heat, drought, frost) to further refine further G x E x M synergies that can be captured. We are liaising closely with similar projects in the Western and Southern HRZ regions, the National Canola Pathology Initiative along with breeding companies and NVT outcomes to ensure we capture benefits from other research activities.</p>

<p>GRDC Stubble Initiative Participating Farming systems groups including</p> <ul style="list-style-type: none"> • BCG • Central West • Mackillop Group • Riverine Plains • Yeruga Crop Research 	<p><i>An individual output as part of the investment</i></p> <p>This output will produce outcomes that will contribute to canola establishment in farm systems with retained stubble equivalent to systems where stubble is not retained. Extension of information around different seeding systems, any modifications that are required to make it more suited to seeding canola in the South-East region and KI regions. This will be done by utilising farmer and advisor experiences in sourcing what systems are successfully working, and receiving ‘good’ canola establishment levels across the region.</p>
<p>Optimising the yield and economic potential of high input cropping systems in the HRZ (DAV00141)</p>	<p>This investment will provide knowledge and tools to increase the profitability of canola in the HRZs of the Southern and Western grains regions. An increased understanding of Genotype by Environment by Management (GxExM) interactions will help identify superior, better adapted wheat and canola plant types for the region. This will increase the speed at which new varieties are available to growers either through direct importation from overseas breeding programs or through the incorporation of traits into breeding material specifically suited to the HRZ. Modelling will help quantify the value of new traits to industry. Tools that help understand the risks and opportunities associated with applying costly inputs to crops with high yield potential will be developed through close consultation with growers and advisors.</p>
<p>Optimising plant establishment, density and spacings to maximise crop yield and profit in the southern and western regions (UOA1803-009RTX)</p>	<p>The aim of this investment is to understand crop establishment, density and spacings to maximise canola and pulse yield and profit in the southern and western regions. It aims to determine the typical rates of crop establishment achieved by growers and factors influencing these. This proposed three and a half year investment, starting early 2018, will deliver a survey of crop establishment, a number of seeder demonstration and comparison trials, and small plot field experimental data over three seasons exploring the opportunity of improved sowing, in terms of reduced seed rates and costs, and increased crop uniformity, yield and profit. The concept of more precise seeding will be tested in three crops with contrasting seed size, canopy development and growth patterns – canola, lentil and faba bean in the south and canola, wheat and lupin in the west. The project also includes development and implementation of an extension and communication plan.</p> <p>Expected outcome - by June 2022, growers and advisers have access to sound agronomic knowledge and supporting data allowing them to improve crop establishment and decrease seed costs with conventional air-seeders for canola, lentil and faba bean in the southern region, and canola, wheat and lupin in the western region, and consider the costs and benefits of precision planters. The initial target of this project is a 30% improvement in establishment of relevant crops and a 5% yield increase over 200,000 ha across the southern and western regions.</p>
<p>Improving crop emergence through the better use of seeding technologies. (WMG1802-001SAX)</p>	<p>The timely emergence of crops is a key driver of grain yield for growers. While this is largely influenced by seasonal conditions and the timing of the break to the season, the selection of seeding equipment can also have a large impact on the establishment of crops. The use of paired row seeding configurations has been adopted by many farmers in WA to as a tool to improve crop competition with weeds, but there is anecdotal evidence that this approach can lead to a reduction in the timely emergence of crops due to inappropriate placement of the seed into the soil. In seasons where there is low or variable rainfall, paired row seeding can lead to the seed being placed in the dry sidewall of the crop-row furrow, away from the seed. Conversely, single row seeding can place the seed in the bottom of the seed-row furrow where the soil can dry rapidly and reduce timely crop emergence, indicating that seeding configurations must be matched to the soil type.</p> <p>This project will investigate the impact that seeding configuration has on the timely emergence of crops to grain growers in Western Australia across a number of differing soil types. Demonstration sites will be established across the Northern Agricultural region of WA to test the impact of shallow and deep seeding techniques with single and paired row seeding configurations. The key outcome for this project will be to measure the emergence of crops at 14 days following seeding to indicate the effectiveness of the seeding configuration to improve crop establishment. The outcomes of this project will give greater confidence to WA grain growers to identify the seeding configuration that is appropriate for their soil type and rainfall environment that will maximise the 14-day emergence of crops, and contribute to an improvement in grain yield in WA.</p>

<p>A Review of Seeding Systems that Provide Improved Crop Establishment for Growers in the Western Region (CMP1802-002SAX)</p>	<p>Germination and establishment of crops play a critical role in the overall success of a cropping program, particularly in dry or marginal soil moisture. Growers believe that in 2017, apart from moisture, seeding systems had the biggest impact on whether or not a crop emerged well. The Kwinana West RCSN has therefore nominated seeding equipment as a priority focus area, particularly investigating which seeding equipment enables good crop establishment in dry conditions, especially for small seeded crops. The end result of the project will be a booklet titled: Seeding Systems. Case Studies of Growers in WA: An Initiative of the Regional Cropping Solutions Network.; It will feature at least 25 case study participants (five per zone) who use varying seeding systems. Importantly, Cussons Media will extend the outcomes of the project to relevant stakeholders across the Western Region port zones by working with local grower groups and our broader agricultural network.</p>
<p>Managing early season canola establishment pests in New South Wales – Development of technical content (CES1810-001SAX and FLR1810-001SAX)</p>	<p>The Service Provider is responsible for:</p> <ul style="list-style-type: none"> • The development of technical content • Workshop materials • The evaluation of the investment <p>Providing support to FarmLink Research Limited (FLR1809-001SAX) regarding the delivery of technical content.</p> <ul style="list-style-type: none"> • Key resources developed include: <ul style="list-style-type: none"> ▪ A Best Management Practice Guide in the form of interactive .pdfs ▪ Webinars targeting pests of interest to north, central and south NSW canola growers ▪ Evaluation materials, which will follow the MAKAT model interrogating grower Motivation, Attitude, Knowledge, Ability and Technology

Issue No. 35 - Determine sustainable and profitable management strategies of high volume stubbles

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.

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, baling, 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.).

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.

GRDC investments addressing this issue –

<p>CSP00174 - Maintaining profitable farming systems with retained stubble in NSW South West Slopes and Riverina (Stubble Initiative - Project completed)</p>	<p>Eight commercial harvesters were tested between 2014 and 2016 on farm scale strips across the South West Slopes and Riverina to examine the effect of cutting height (15 to 60cm) on harvest efficiency and grain yield. The harvesters included a Case 7240, Case 8240, John Deere 5680, Case IH1920, John Deere 9770, Case 8230 and New Holland 8090. A prototype Integrated Harrington Seed Destructor (iHSD) was also tested in Temora, NSW in December 2015, Inverleigh in December 2015 and Furner, SA in January 2016.</p> <p>Using a stripper front or harvesting high is the quickest and most efficient method that should result in less residue that needs to be threshed, chopped and spread by the harvester. Harvesting high (40 to 60cm) compared to 15cm increased grain yield and harvester efficiency by reducing bulk material going through the header and reduced harvests costs by 37 to 40%. As a general rule, there is a 10% reduction in harvest speed for each 10cm reduction in harvest height. Slower harvest speed across a farm also exposes more unharvested crop to the risk of weather losses (sprouting, head/pod loss, lodging) during the harvest period.</p> <p>There is substantial evidence indicating wide spread resistance or partial resistance of ARG to a wide range of herbicide groups across south eastern Australia (Broster et al. 2011). Harvest weed seed control (HWSC) which includes narrow windrow burning, chaff carts, chaff lining, direct baling, and mechanical weed seed destruction is an essential component of integrated management to keep weed populations at low levels and thus slow the evolution and spread of herbicide resistant ARG. HWSC requires crops to be harvested low in order for weed seeds to be captured in the chaff fraction from the harvester, and if practiced provides an additional reason to harvest low. The prototype Integrated Harrington Seed Destructor (iHSD) was tested at a constant speed of 4km/hr to compare the efficiency and cost with non-weed seed destruction methods. No significant difference was found in grain yield when harvesting at 15cm compared with 30cm at 4km/hr, but there a 9% increase in engine load and 11% reduction in fuel efficiency. However, when the weed seed destructor was activated, there was a 33% increase in engine load which resulted in a 40% reduction in the fuel efficiency of the header.</p>
<p>GRDC Stubble Initiative — Maintaining profitable farming systems with retained stubble in the South East and KI regions (MFM00006) – completed 2018</p>	<p>In the South-East region, the biggest inhibitor to retention of stubbles is pest control (and in particular snails). This problem once isolated to the more alkaline coastal regions, is now a widespread issue across the region. Ways to try and manage the stubbles in a way that will provide adequate snail control with stubble retention over a medium- long-term (3 - 5 year) period will be the biggest challenge in stubble retention systems. Livestock (hoof activity) may have a role to play in the management of snails; due to the nature of the farming systems, this may also be investigated.</p> <p>These activities will be carried out at 2 main focus sites across the South-East region at Conmurra (650mm rainfall; black calcareous clay/loam soil located near Lucindale) and Frances (525mm duplex soil), where replicated sub-treatments will be overlaid on different stubble management treatments. The areas will be EM38 surveyed to try and reduce the soil variability of the site, as the stubble treatments will be carried out using farmer equipment (and not plot equipment). The pests will only be investigated in the site at Conmurra where an exclusion zone will be created around an area specifically set up to look at snail control. This will be done so that the remainder of the site can be 'protected' from damage, and other outcomes can be successfully achieved.</p>

	<p>AgKI will focus on those issues that are specific to the KI region; demonstration and extension work around snail and slug management with retained stubbles, the effects of stubble loads on canola establishment, nutrition issues with retained stubble management, and the long-term disease issues with different stubble retention methods in a wheat/canola rotation (a common rotation on the Island).</p>
<p>Maintaining profitable farming systems with retained stubble in Victoria and Tasmania (BWD00024) completed 2018</p>	<p>Crop residues or stubble play an integral role in soil health and nutrient cycling in broad acre cropping. For many growers, particularly in higher rainfall and irrigated areas, stubble can cause significant management issues that can affect their profitability. In these situations, many growers are forced to remove the stubble, principally through burning. There are also many other problems or management issues that arise when stubbles are retained from one season to the next. Weeds, pests and stubble-borne diseases can cause significant problems in heavy stubble loads. Most of these issues have some management practices that can be employed which do not involve the removal of stubble.</p> <p>Stubble handling and trash flow the next season has been a significant challenge for growers. Advances in machinery technology has meant there are alternative methods or practices that growers may employ to successfully retain stubble whilst minimising the issues that come with retaining stubbles. Growers have rapidly adopted or incorporated stubble into their farming system. To ensure successful and longer term adoption of stubble retention, a greater understanding how stubble retention will change local farming systems. This understanding will improve grower and adviser awareness of strategies to minimise risks to productivity, profitability and sustainability. This project will aim to increase grower awareness of these new technologies and extensively evaluate them to ensure they can achieve what they claim.</p> <p>The project will be delivered by leading grower groups: Birchip Cropping Group (BCG), Southern Farming Systems (SFS), Victorian No Till Farming Association (VNTFA, Vic No-Till) and Irrigated Cropping Council (ICC) all who operate in the southern region of Australia. Combined, the consortium has over 1,500 farm business members which will allow the project to reach a much wider audience. The project team will aim to increase the number of farmers retaining stubble, breaking the barriers for adoption by developing guidelines that minimise the negatives of retaining stubbles and maximise benefits. This will improve the overall profitability and sustainability of farming businesses and rural communities.</p>
<p>Maintaining profitable farming systems with retained stubble: Component 1 Research support and co-ordination (DAS00145) – completed 2018</p>	<p>Australian grain farms have the highest level of adoption of conservation cropping systems worldwide. These systems are built on three principles of minimum soil disturbance (i.e. minimum or zero-tillage), permanent soil cover (retained stubble, crop/pasture cover), and diversity in rotations. The transition from systems in which crop residues were mostly burnt, grazed or removed to those in which crops are sown directly into retained residues of previous crops has been evolving since the 1980s. Currently most broad-acre grain farms routinely retain a majority of crop residues (GRDC Farm Practices Survey), and it is certainly their ambition to maximise stubble retention provided that any impacts on crop performance and profitability can be managed. High crop yields generate heavy crop stubbles, and cool, wet conditions tend to exacerbate some of the difficulties in managing crop residues. As a result, the GRDC has invested in a focussed Initiative in the Southern Region to take a farming systems approach to maintaining profitable farming businesses with retained stubble. Referred to as the 'Stubble Initiative', a network of 10 projects comprising 14 grower groups across the southern region are undertaking 10 farming systems projects that target the key aspects of stubble management thought to limit the profitability of their farming systems. They have developed R, D and E activities to address those issues within the Initiative with the aim of producing up-to-date locally specific management guidelines for use by growers and their advisers. As part of that process, following a review of the relevant literature ('Scott et al (2013) ' Developments in stubble retention in cropping systems in southern Australia', NSW DPI), two meetings of the Initiative project teams were convened (November 2013 and March 2014) to identify and discuss gaps in current knowledge where further focussed research is required to underpin the development of the locally specific guidelines. A team of CSIRO scientists, most of whom are also part of the grower group project teams, have worked with the groups to identify and plan research that targets these research gaps. The key Theme areas identified for integrated and targeted research with the groups were: (1) Understanding N dynamics in surface-retained stubble systems; (2) A proactive approach to grass weed management in retained stubble (3) Monitoring strategies to assist invertebrate pest management in retained stubble. In each of these cases, significant gaps in current knowledge were considered to limit the development of robust management guidelines and there remained significant risk of reduced profit for growers through</p>

	<p>mismanagement. In each of these Themes, the CSIRO team has developed a network of integrated experimental activities with the regional teams and will provide input in experimental design, measurement, monitoring and modelling to expand the knowledge available to develop the locally specific management guidelines. The outcome will be more profitable farming systems based on new locally specific guidelines to manage stubble in farming systems underpinned by on-farm regional research and development.</p>
<p>Managing eyespot in intensive cereal, stubble retention farming systems in South Australia (DAS1807-005BLX)</p>	<p>Eyespot has been an increasing problem in cereal crops in South Australia over the last five to ten years and our knowledge of the epidemiology and management of this disease under Australian conditions is limited. This project aims to provide eyespot management recommendations to Industry by developing a pot-based screening method for assessing resistance levels in commercial varieties; improving our understanding of the epidemiology of eyespot and the factors affecting inoculum build-up and break-down; and by disseminating findings and management recommendations in written and oral formats.</p>
<p>Seeking experienced farmers and trials in high rainfall production systems with methods to deal with high stubble and trash loads for the following season and new grain markets after record low prices. (GAD9175692) - completed</p>	<p>Growers are experienced in adapting management practices to varying seasons, mostly low rainfall seasons, however in 2016 record yields, record amounts of stubble loads and trash caught many farmers out coming into cropping 2017. Burning was used extensively as an easy, last resort which, if faced with similar issues, farmers would like to avoid. The Wallup Ag Group was supported to visit farmers and experts who regularly deal with high stubble and trash loads to learn from them. The group was also interested in new grain markets following a year of poor prices. Tasmania was selected by the applying group due to being a high rainfall area, importer of grain with established domestic niche markets.</p>
<p>Feasibility of managing high cereal stubble loads at seeding through innovative residue cutting in the Southern Region (Uni SA) completed</p>	