



Southern Plant Systems Report

IREC Annual General Meeting – 8th August 2017

The Southern Cropping Unit has continued to deliver on a number of irrigated cropping projects over the past 12 months. The trial results are again being published in the Southern NSW research results 2017 which will be available as a hard copy or as a pdf via the web site:

<http://www.dpi.nsw.gov.au/content/agriculture/broadacre/guides/>. The flagship rice publications are again being updated and will be published before planting. DPI research results from the Southern Irrigated Cropping team have been presented at a variety of local, regional, national and some international forums.

NSW DPI signed a major strategic partnership with GRDC in Feb 2017. The partnership covers winter crop pathology and winter crop physiology. It is a 10 year agreement of approximately 12 million annual investment contributed to by both partners. This agreement doesn't cover irrigated crops or research, although there will be some benefit from the work on winter cereals and pulses as rotation crops for irrigators. An immediate benefit has been the recruitment of a crop physiologist, Dr Lance Maphosa, to add more depth to our grains physiology research specifically with the Managed Environment Facility and winter grains research.

We have seen continued joint investment into irrigated research at Yanco Agricultural Institute and Leeton Field station. Effort is proceeding to improve Leeton Field Station as an important resource for research into irrigated cropping. After completing the construction of two new sheds specifically to support the irrigated research groups we have commenced improving the irrigation infrastructure at LFS. A concerted effort is also going into updating laboratory and plant equipment where needed. The appointment of Steve Buster to the Cotton Establishment project has added considerable industry experience and networks to this project. With the increase in cotton research based at Yanco we are jointly investing with CRDC in a machinery to enable us to conduct cotton trials on station when the level of control over research experiments is greater than can be reasonably expected with grower collaborators.

NSW DPI Research:

Summaries of Southern NSW DPI projects are summarised in attached table.

New projects and new staff:

Quinoa variety and time of sowing trials were sown this year and will be harvested very soon. Two earlier plantings failed to establish due to high temperatures at germination and in second instance flea beetle attack. David Troidahl is conducting the quinoa trials as part of a RIRDC joint invested project led from WA. Rachelle Ward, cereal chemist, is evaluating the quality of the quinoa harvested in the trial as well as from store bought quinoa. Quinoa quality characteristics are based on the requirements of local processors and current market specifications.

Steve Buster commenced as the research officer on the *Southern Cotton- Optimising seedling emergence* (CRDC 2016-2019) a collaborative project with NSW DPI, CSIRO and CSD E&D team was funded to focus on developing management strategies for optimising seedling emergence in southern production regions. Steve's position is jointly invested by CRDC and NSW DPI and the plan after three years is to create this position as an on-going cotton research officer. Steve is also a collaborator on a joint CRDC and GRDC cover crop and crop sequencing project with research nodes in Queensland and northern NSW.

The cotton *hard to control weeds* project (CRDC/DPI), led by Eric Koetz, has been extended for another 12 months while a new project is being negotiated. Dr Asad Asaduzzaman, a weeds scientist, also currently based in Wagga Wagga is also working on this project with Eric to conduct the weed herbicide resistance bioassays. Eric has recently been appointed as CRDC's Weeds Specialist.



Other staffing

Steve Buster joined NSW DPI late last year, bringing his considerable experience of running Darling Farms, one of the largest northern NSW mixed horticulture and cotton farms. After completing his MSc in cotton agronomy, he designed and taught the first Graduate Diploma of Rural Science Cotton Production course at the University of New England and continued to conduct and support on-farm research during his Directorship of Darling Farms.

Dr Lance Maphosa has recently joined NSW DPI as a crop physiologist to work across the grains portfolio to improve crop physiology research within the agronomy and pre-breeding teams. Dr Maphosa has a background in pre-breeding and cereal genetics as well as plant pathology.

Dr Jixun Luo is on a temporary contract as the Rice Cereal Chemist while Dr Laura Pallas is on maternity leave.

Dr Mark Talbot has continued to bring his image analysis and microscopy expertise to both the rice cereal chemistry and rice breeding team.

Margrit Martin has been training Dr Prakash Oli as her successor in the senior technical officer role for the rice cereal chemistry group. She will be retiring soon from the position.

Dr Sandra McDougall, Luke Gaynor and Deb Slinger
Department of Primary Industries, Southern Cropping Systems



Current Irrigated Cropping Projects

Projects	Notes
<p>Irrigated Cereal and Canola "ICAC Project"</p> <p>DPI Team: Deb Slinger, Luke Gaynor, Tony Napier, Glen Morris, (Dan Johnston), Cynthia Podmore, Tania Moore, Neroli Graham, Brian Dunn</p>	<ul style="list-style-type: none"> ▪ GRDC 3 years, April 2014-June 2017 ▪ Trial sites: LFS, Coleambally, Hillston (Barry Haskins), Murray Valley (RAPL), Central West (CWFS), NW Victoria (ICC), SE Sth Australia (MacKillop Farm Management), Tasmania (Sth Farming Systems) ▪ Evaluate agronomic management practices with an aim to increase average yields for irrigated cereal and canola (target yields of 10 t/ha for wheat and 4 t/ha for canola) ▪ Variety, density, nitrogen, time of sowing ▪ Outputs – baseline data; High yielding cereal database, canola database; VSAP; Irrigated wheat manual; Irrigated canola manual.
<p>Double Crop</p> <p>DPI Team: Luke Gaynor, Tony Napier, Daniel Johnston, (Glenn Morris)</p>	<ul style="list-style-type: none"> ▪ 2014-2016 GRDC – led by ICC (Trials were completed with 2016 winter crop harvest) ▪ Conduct crop sequencing experiments and agronomy research (LFS) ▪ Summer and winter cropping experiments (Wheat, barley, canola, faba beans; soybean, maize, cotton) vs single crop and fallow ▪ Achieving high yields and high profitability per ML water
<p>MEF</p> <p>DPI Team: Katherine Bechaz, Dionne Wornes, Peter Davidson (Glenn Morris)</p>	<ul style="list-style-type: none"> ▪ Service project for water limited and drought prone cereal variety selection ▪ GRDC (2011 –June 17) –extended under the NSW DPI/GRDC bilateral until 2020 ▪ Research collaborators (currently CSIRO and ANU) ▪ Core measurements delivered to relevant research leaders each season ▪ MEF maintained and managed each season
<p>Cotton – Thrips IPM</p> <p>DPI Team: Sandra McDougall, Jianhua Mo, Mark Stevens, Scott Munro, Sarah Beaumont and Emma O’Connell</p>	<ul style="list-style-type: none"> ▪ 3 years CRDC Jul 14-Oct 17 ▪ Primarily to validate thrips thresholds ▪ Compare southern invertebrate pest & beneficials populations to northern systems ▪ Validate mirid and Green Veg bug thresholds – seasons permitting
<p>Cotton – Optimising seedling emergence</p> <p>DPI Team: Deb Slinger, Steve Buster, Andrew Watson, Neroli Graham</p>	<ul style="list-style-type: none"> ▪ 3 years CRDC Jul 16- June 19 ▪ Collaboration with CSIRO and CSD E&D team ▪ Management practices to optimise seedling emergence in Sth cropping areas ▪ Replicated trials and statistical analysis of previous related research
<p>Soybean breeding and agronomy projects</p> <p>DPI Team (Southern): Matt Dunn, Alan Boulton, John Dando, Paul Morris</p>	<ul style="list-style-type: none"> ▪ GRDC 4.5 year 2014-2018, two projects – breeding and separate agronomy project ▪ Southern node for Australian Soybean Breeding Program (led by CSIRO) ▪ Evaluating for high yielding, short season, human consumption quality characteristics, good agronomic traits, Phytophthora root rot and Powdery mildew resistance, and non-shattering ▪ VSAP for new and existing varieties, develop management practices for new irrigation systems ▪ Agronomy trials 15-16: Yanco: Time of sowing, plant density, and fungicide



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<p>Cotton hard to control weeds</p> <p>DPI Team: Eric Koetz, Asad Asaduzzaman</p>	<p>The project will consist of four main components of research to improve the understanding of factors that influence the efficacy of glyphosate and group A herbicides on key weeds in cotton farming systems.</p> <ul style="list-style-type: none"> • Survey work across the cotton growing regions of NSW and Queensland to complement existing datasets collected by other weed scientists. Escape weeds will be tested for tolerance to group A and glyphosate control options. • Understanding key drivers and processes in controlling awnless barnyard grass and other hard to kill weeds. • Investigating the impact of pupae busting on weed control (ACRI). • Demonstration of integrated weed management principles, including the control of large "escape" weeds and the impact on seed set, to aid in the uptake of the research outputs by industry.
<p>Rice Breeding / Stability</p> <p>DPI Team: Peter Snell, Ben Ovenden, Greg Napier, Kim Philpot, Kylie Elliot, Fred Ciccia, Minna Russell, Nathan Doss, Damian Carroll, Esther Van Meeuwen, Tiffany Graham and Dehanne Sparkes</p>	<ul style="list-style-type: none"> ▪ Australian Rice Breeding Partnership II (RIRDC 2015-2020) ▪ Only breeding program that integrates cereal chemistry and direct link to market intelligence ▪ Rice improvement for 7 quality classes and cold tolerance ▪ Explore new classes [low GI] ▪ Marker Assisted Selection for early generation selection and pure seed validation
<p>Rice – Chem / QEP</p> <p>DPI Team: Jixun Luo, (Laura Pallas), Margrit Martin, Prakash Oli, Mark Talbot, Yuki Sims, and Leanne Johnston</p>	<ul style="list-style-type: none"> ▪ Service breeding quality evaluation assessments to assist variety breeding choices ▪ Looking to develop GI assessment and Antioxidant methods in new partnership program ▪ Support farmers, SunRice and Breeders in delivering world class rice ▪ Education on importance of quality in addition to yield
<p>Quinoa</p> <p>DPI Team: David Troidahl</p>	<ul style="list-style-type: none"> ▪ Component of a RIRDC project led by DAFWA ▪ Quinoa variety trials (NSW trials at Yanco, Narrabri & Trangie) ▪ [Potential for follow-on project that includes a cereal chemistry component]

Water Projects

<i>Projects</i>	<i>Notes</i>
<p>Irrigation Max</p> <p>DPI Team: John Smith, Sam North, Donald Griffin, Robert Hoogers</p>	<ul style="list-style-type: none"> ▪ Rural R&D for Profit, CRDC, RIRDC, 3 years, Jul 2016-June 2018 ▪ Collaboration with IREC, ICC and Southern Growers farming groups, Deakin University and Vic DEPI and Murray and Riverina LLS. ▪ Assess the ability of precision irrigation to apply defined irrigation depths on time and determine its potential to reduce deep drainage and waterlogging risk, and increase nutrient and water productivity ▪ Develop irrigation design criteria to allow precision irrigation to occur.



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<p>Impact of irrigation methods and management strategies on nitrogen fertiliser recovery in cotton</p> <p>DPI Team: John Smith</p>	<ul style="list-style-type: none"> ▪ QDAFF lead, CRDC 4.5 years, Jul 2015- Dec 2019 ▪ Investigate how fertiliser nitrogen (N) recovery is impacted by irrigation system, in-crop irrigation management, fertiliser application strategy and product type within irrigated cotton. ▪ Determine the impact of different irrigation systems on nitrogen use efficiency and investigate alternate irrigation practices to improve nitrogen recovery. ▪ Determine the impact of alternative fertiliser practices and product types on the recovery of fertiliser N in irrigated cotton.
<p>Rice variety nitrogen and agronomic management</p> <p>DPI Lead: Brian Dunn</p>	<ul style="list-style-type: none"> ▪ RIRDC July 2015- May 2020 ▪ Determine varietal nitrogen management requirements and phenology information for new and soon to be released varieties
<p>Moving forward with NIR and remote sensing</p> <p>DPI Lead: Brian Dunn</p>	<ul style="list-style-type: none"> ▪ RIRDC July 2015- Jun 2018 ▪ Maintain the NIR Instrument and calibrations used for the NIR Tissue Test ▪ Investigate the use of remote sensing to determine mid-season crop nitrogen requirements without the need for physical sampling of the crop.
<p>Benchmarking water use efficiency and crop productivity in the Australian cotton industry</p> <p>DPI Lead: Janelle Montgomery Robert Hoogers (Yanco)</p>	<ul style="list-style-type: none"> ▪ CRDC July 2014- Aug 2019 ▪ Deliver more accurate crop water use information for weather based irrigation scheduling ▪ Develop the IrriSAT system to provide water management information over large areas at low cost

Horticulture projects

<i>Projects</i>	<i>Notes</i>
<p>Citrus – Managing citrus gall wasps in southern citrus regions</p> <p>DPI Team: Jianhua Mo, Scott Munro, Andrew Creek</p>	<ul style="list-style-type: none"> ▪ HIA Aug 2010- Sept 2017 ▪ Understand the phenology of the local populations of citrus gall wasps ▪ Identify effective and IPM-compatible chemical options
<p>Citrus – National strategies to manage citrus gall wasps</p> <p>DPI Team: Jianhua Mo, Scott Munro, Andrew Creek, Steve Falivene</p>	<ul style="list-style-type: none"> ▪ HIA Sep 2015- Dec 2018 ▪ Identify ‘hot-spots’ of parasitic wasp populations on Citrus Gall Wasps (CGW) ▪ Promote wasp establishment in new incursion areas ▪ Develop forecast models for CGW emergence and egg hatching ▪ Develop IPM-compatible insecticide options



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<p>Citrus- Phenology models for California red scale populations in Australia</p> <p>DPI Team: Jianhua Mo, Scott Munro, Andrew Creek, Steve Falivene</p>	<ul style="list-style-type: none"> HIA Sep 2015- Dec 2018 Provide a degree-day based timing guide to Australian citrus growers on the applications of petroleum spray oils and Aphytis releases to improve effectiveness
<p>Citrus in Bhutan and Australia</p> <p>DPI: Graeme Sanderson, Val Draper (Yanco)</p>	<ul style="list-style-type: none"> ACIAR – April 2012- March 2017 Bhutan focus: is securing germplasm, improving nursery and production practices and the knowledge of key citrus pests and diseases. Australian component: to strengthen the Australian citrus variety and rootstock evaluation program, assess potential new rootstock for mandarins, and improve field- and laboratory-based diagnostics and strategies for major exotic pests and diseases. Some trials at Yanco and production of Mandarin management guide
<p>Advanced production systems for the temperate nut crop industries</p> <p>DPI: Jacquelyn Simpson (Walnuts Yanco)</p>	<ul style="list-style-type: none"> Research for Profit, HIA Jul 2016- June 2020 Develop and demonstrate higher density plantings using superior performing varieties on size controlling rootstocks Managed using efficient water/nutrient supply regimes and harvesting using shake-and-catch technologies.
<p>Hazelnuts</p> <p>DPI: Lester Snare</p>	<ul style="list-style-type: none"> Agri- Australis co-investment with RIRDC 5 years, June 2012- Apr 2017 Assessment of commercial hazelnut plantings in 3 temperate production areas Quarantine plots of imported hazelnuts for establishment of new commercial production in Riverina
<p>Vegetable ICM in Philippines and Australia</p> <p>DPI: Sandra McDougall, Andrew Watson, Len Tesoriero, SP Singh</p>	<ul style="list-style-type: none"> ACIAR 4.5 years Mar 2013- Oct 2017 Philippines: research capacity building, protected cropping, good agronomic practices, integrated pest management Australia: melon disease survey, genetic characterisation of fusarium strains in Australia, melon packing line food safety audits

Biosecurity

<i>Projects</i>	<i>Notes</i>
<p>Combining monitoring and incursion surveillance for grains.</p> <p>DPI Team Mark Stevens</p>	<ul style="list-style-type: none"> Co-invest Plant Biosecurity CRC Jul 2014- June 2017 Simplify the monitoring of established and exotic stored-grain beetles by determining which pheromone lures are compatible for simultaneous monitoring of multiple species on individual insect traps. Improve the effectiveness of <i>Cryptolestes</i> and <i>Sitophilus</i> monitoring by investigating plant and fungal volatiles as co-attractants for use with existing and newly developed pheromone lures.
<p>Rice pest and disease biosecurity</p> <p>DPI Team: Mark Stevens, Andrew Watson, Glen Warren, David Gopurenko</p>	<ul style="list-style-type: none"> RIRDC July 2016- May 2019 Develop better management strategies for rice pests and diseases (armyworms, bloodworms and stem rot) that will allow growers to minimise water use (through repeat cropping, mid-season drainage, etc.) without compromising pest management outcomes.