



Southern Plant Systems Report

IREC Annual General Meeting – 27th August 2018

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 2018 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: Rice Variety Guide, Rice Growing Guide and Rice Crop Protection Guide have again been updated and available. 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's strategic partnership with GRDC Grains Agronomy & Pathology partnership (GAPP) has operated for 12 months and although does not include irrigated cropping research there will be some benefit from the work on winter cereals and pulses as rotation crops for irrigators. The crop physiologist, Dr Lance Maphosa, we recruited last year is now contributing with research into mechanisms of grain-filling related to high temperatures, and greater physiology measurements within the canola and pulse trials to understand genetic x environment x management mechanisms in the different varieties.

We have seen continued joint investment into irrigated research at Yanco Agricultural Institute and Leeton Field station. We hopeful we have the funds to implement our redevelopment plan Leeton Field Station to improve the irrigation infrastructure of this important research facility for irrigated cropping. Our investment into plant and equipment for cotton research means we now have small area landforming, planting and harvesting equipment to ensure that we can conduct research station experiments as well as working on-farm with commercial collaborators.

NSW DPI Research:

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

Staffing:

We have seen unusually high staff turnover in the last 12 months that speaks to a shortage of skilled people in agricultural sectors. All our departing staff are still working in agricultural research and most still within the irrigated cropping region of southern NSW. We are currently recruiting for two cotton researchers, one in water and nutrition to replace John Smith and the other in agronomy to replace Steve Buster. Both these gentlemen have left DPI but as still supporting the southern irrigated cropping research; John with AgriFutures as Manager responsible for rice research investment and Steve conducting research with Rivcott and Summit Ag.

Dr Bert Collard has commenced at Yanco recently as the Rice Technical Specialist and molecular rice breeder to replace Dr Ben Ovenden who has moved to the wheat pathology team based at Wagga Wagga. We have also had a change in the Rice Quality team with the resignation and moving back to USA of Dr Laura Pallas, and retirement of Margrit Martin. Dr Prakash Oli was appointed as the new Rice Cereal Chemist. To support him are two relatively newly appointed Technical Officers, Dr Yakindra Timilsena and the return of Ms Hannah Blackburn; Ms Emma O'Connell has also moved from cotton to the rice research team as a Technical Assistant to replace Ms Yuki Sims moving north. Dr Mark Talbot has taken his image analysis and microscopy expertise to Sunrice but continues to collaborate with the DPI rice team.

Another change includes Matt Dunn moving to Narrabri as a research agronomist with the ending of the soybean agronomy project and likely end of the soybean breeding work next year. Soon we will be recruiting for a cotton plant pathologist and technical officer ideally with some entomology experience to run a new Cotton Crop Protection project that is soon to be contracted with CRDC.



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Andrew Watson, a Plant Pathologist who has serviced the plant pathology needs of all crops in the Riverina over many years has very recently retired and is expected to be replaced. Within the Biosecurity division there is a fruit fly research team that is likely to be based at Yanco in the next 12 months.

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



Current Irrigated Cropping Projects

| Projects | Notes |
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| <p>MEF</p> <p>DPI Team: Katherine Bechaz, Dionne Wornes, Peter Davidson, Glenn Morris Lance Maphosa now has a project within the MEF.</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 DPI) ▪ 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 [project now finished]</p> | <ul style="list-style-type: none"> ▪ 3 years CRDC Jul 14-Oct 17; final report submitted January 2018 ▪ 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 [recruiting for Research Agronomist on 3 year contract; Steve resigned and Andrew retired]</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 [Matt has moved to Narrabri]</p> | <ul style="list-style-type: none"> ▪ GRDC 4.5 year 2014-2019, two projects – breeding (extended until June 19) and agronomy project finished June 18, final report soon to be submitted. ▪ 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 [soon to be published] ▪ Agronomy trials 16-17: Yanco: Time of sowing, plant density, fungicide and herbicide tolerance |
| <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. |



| Projects | Notes |
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| <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 [Bert Collard recently joined, Ben has moved to WWAI]</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 [Yakindra Timilsena, Hannah Blackburn and Emma O’Connell joined team]</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, Rachelle Ward [project led DAFWA]</p> | <ul style="list-style-type: none"> ▪ Component of a RIRDC project led by DAFWA, recently finished ▪ Quinoa variety trials (NSW trials at Yanco, Narrabri & Trangie) ▪ [Potential for follow-on project that includes a cereal chemistry component] |
| <p>GAPP- Canola (Yanco node)</p> <p>Yanco Team: Tony Napier and Dan Johnston [project led by Rohan Brill]</p> | <ul style="list-style-type: none"> ▪ Yield potential of canola ▪ Impact of abiotic conditions during the critical growth period e.g. frost ▪ Selection plant type, sowing date, and canopy management for high yielding environments |
| <p>GAPP – Profitable Pulses (Yanco node)</p> <p>Yanco Team: Tony Napier and Dan Johnston [project led by Mark Richards]</p> | <ul style="list-style-type: none"> ▪ identify lentils and chickpeas varietal traits best adapted to MIA ▪ identify phenology drivers and characterise crop phenology ▪ identify critical growth periods for MIA |
| <p>Cover cropping</p> <p>Yanco Team: Steve Buster & Alan Boulton [Project led by QDAF – Dave Lawrence]</p> | <ul style="list-style-type: none"> ▪ To evaluate if cover crops increase the net water accumulation (Plant available water) in (grain and) cotton systems with low ground cover in the northern GRDC growing region. <ul style="list-style-type: none"> – What is the net water cost to grow the cover crops? – What is the net water gain to the subsequent (grain/)cotton crops – What is the impact on the yield of the subsequent (grain/)cotton crops ▪ Evaluate the relationship between stubble cover/loads and the accumulation of Plant available water in northern (grain and) cotton farming systems. |



| <i>Projects</i> | <i>Notes</i> |
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| Southern Crop Protection Sandra McDougall, need to recruit Plant Pathologist and Technical Officer | <ul style="list-style-type: none"> ▪ Southern disease surveys ▪ Early. Mid and late season case studies of crops seeing with high invertebrate pest or disease pressure (try to understand what contributed to high pressure) ▪ Southern nodes of plant pathology (e.g. BRR) and entomological research (mirids) in collaboration with northern researchers ▪ Tracking fields with early season insecticides and impact on late season pests |

Water Projects

| <i>Projects</i> | <i>Notes</i> |
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| Irrigation Max DPI Team: John Smith, Sam North, Donald Griffin, Robert Hoogers, Alex Schultz [project now complete] | <ul style="list-style-type: none"> ▪ Rural R&D for Profit, CRDC, RIRDC, 3 years, Jul 2016-June 2018 Final report submitted ▪ 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. |
| Impact of irrigation methods and management strategies on nitrogen fertiliser recovery in cotton DPI Led: John Smith | <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. |
| Rice variety nitrogen and agronomic management DPI Team: Brian Dunn, Tina Dunn, Craig Hodges and Chris Dawe | <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 |
| Moving forward with NIR and remote sensing DPI Team: Brian Dunn, Tina Dunn, Craig Hodges and Chris Dawe [project now complete] | <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. |
| Benchmarking water use efficiency and crop productivity in the Australian cotton industry Yanco Lead: Robert Hoogers | <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> |
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| <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 |
| <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>Advanced production systems for the temperate nut crop industries</p> <p>DPI: Jacquelyn Simpson and Jason Lewis</p> | <ul style="list-style-type: none"> ▪ Research for Profit, DAWR, managed by 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>Field and landscape management to support beneficial arthropods for IPM on vegetable farms</p> <p>Yanco team: Jianhua Mo, Scott Munro</p> | <ul style="list-style-type: none"> ▪ HIA 2017-2019 ▪ developing ecological approaches to boost beneficials and check pest build-up |
| <p>Hazelnuts in Australia</p> <p>DPI: Jacquelyn Simpson Stephen Gottschall</p> | <ul style="list-style-type: none"> ▪ Agri- Australis co-investment with AgriFuture June 2012- Apr 2017 (extended until 2019) ▪ 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 [completed]</p> | <ul style="list-style-type: none"> ▪ ACIAR 4.5 years Mar 2013- Oct 2017 Final report submitted March 2018 ▪ 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> |
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| <i>Projects</i> | <i>Notes</i> |
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| Combining monitoring and incursion surveillance for grains. DPI Team Mark Stevens | <ul style="list-style-type: none">▪ Co-invest Plant Biosecurity CRC Jul 2014- June 2017 Final report submitted▪ 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. |
| Rice pest and disease biosecurity DPI Team: Mark Stevens, Andrew Watson, Glen Warren, David Gopurenko | <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. |