Southern Plant Systems Report

This past twelve months has been a challenging one for irrigator croppers and cropping researchers alike. 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 2019 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 in the process being updated and will be available this year on-line. 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 24 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.

We have been renovating the irrigation infrastructure at Leeton Field Station in last 12 months and will maintain it as an active research site for irrigated crops and maintains progress even when potential on-farm research opportunities are drought constrained. Our investment into plant and equipment for cotton research has continued with a fertilizer unit due to be delivered in next few weeks. This last year infrastructural works have developed a 19 ha cotton research block at Leeton Field Station that will be planted to agronomy, nutrition, weeds defoliation and disease management small plot trials this coming season.

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

Staffing:
We recruited Hayden Petty as our new cotton agronomist and Tim Green as our new cotton pathologist. We expect these two young researchers to become key researchers for southern cotton industry into the future. Both had recently completed their honours degrees and have two or three years work experience with cereal phenology and plant pathology research groups at Wagga Wagga Agricultural Institute (WWAI) They have both been out and about extensively meeting local growers and agronomists. They are on a steep learning curve, currently also doing the UNE Cotton Course to build cotton expertise. Josh Hart, a local agronomist, has been recruited into the Water group and has capacity to work on a range of irrigated cropping issues or projects. We have recently employed another young researcher under the Capacity Building project within the GAPP who is working with Tony Napier and the pulse research team for the next 12 months. Gabby Napier has been appointed into the Technical Assistant role to support Hayden Petty. She has worked as a casual Technical Assistant with many of the research groups at YAI over the past three years. Allison Young will soon join us at YAI to support Tim Green and bring extensive cotton entomology experience having worked with Dr Robert Mensah at ACRI for eight years.

The rice breeding, and quality team has settled after the significant staff changes last year. We have recruited Jo Pianca, with her extensive previous rice quality experience to replace Dr Timilsena as one of the quality Technical officers and Michelle Hallam has joined the breeding team as a Technical Assistant.

Dr Bert Collard has settled well into Rice Technical Specialist and molecular rice breeder and has taken a very active role in reviewing our direction, methods and results with view to a third phase of the Australian Rice Partnership. Similarly Dr Prakash Oli has been effective in the Rice Cereal Chemist position in improving the quality evaluation program data turnaround to support the rice breeders' selection decisions. His results from the quality assessments of stored rice has also raised some important issues for the rice industry.

With changes to the Managed Environment Facility (MEF) funding model to a plot fee basis has seen significant changes that has seen Glenn Morris finishing up and Kathryn Bechaz moving into one of the GAPP Capacity Building positions. She will run the soybean variety evaluation project in collaboration with Tony Napier. Alan Boulton is now working on the MEF project with Dionne Wornes and Peter Davidson for this current season. Lance Maphosa is moving into a data analysis role with the Pulse research group and will be based in WWAI.

A Plant Pathologist has recently commenced within the Biosecurity Group who will be involved in surveillance as well as plant pathology research.

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

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Current Irrigated Cropping Projects

Projects	*Notes*
MEF 18/19 DPI Team: Katherine Bechaz, Dionne Wornes, Peter Davidson, Glenn Morris Lance Maphosa had a project within the MEF.	▪ Service project for water limited and drought prone cereal variety selection ▪ GRDC (2011 –June 17) –extended under the NSWDPI/GRDC bilateral until June 2019, now on a fee for service model with our research collaborators ▪ Research collaborators (currently CSIRO and DPI) ▪ Core measurements delivered to relevant research leaders each season ▪ MEF maintained and managed each season
Cotton – Optimising seedling emergence DPI Team: Hayden Petty, Gabby Napier	▪ 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
Soybean breeding and agronomy projects 18/19 DPI Team (Southern): Tony Napier, Alan Boulton, John Dando 19/20 DPI Team (Southern): Tony Napier, Kathryn Becahz, John Dando	▪ 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
Cotton Integrated weed management DPI Team: Eric Koetz, Asad Asaduzzaman	The project is a one year extension of the Hard to Control Weeds project which works on 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. • Cotton Info Weed Technical Lead role • Weed surveys 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. • Ecology and biology of dwarf Amaranth, tall Fleabane, Button Grass • Investigating the impact of pupae busting on weed control (ACRI). • Demonstrations 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.

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Projects	*Notes*
Rice Breeding / Stability DPI Team: Bert Collard, Peter Snell, Greg Napier, Kim Philpot, Kylie Elliot, Fred Ciccia, Minna Russell, Nathan Doss, Esther Van Meeuwen, Tiffany Graham, Michelle Hallam and Dehanne Sparkes	▪ 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
Rice – Chem / QEP DPI Team: Prakash Oli, Hannah Blackburn, (Yakindra Timilsena)/ Jo Pianca, Leanne Johnston and Emma O'Connell	▪ 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
GAPP- Canola (Yanco node) Yanco Team: Tony Napier and Dan Johnston [project led by Rohan Brill]	▪ 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
GAPP – Profitable Pulses (Yanco node) Yanco Team: Tony Napier and Dan Johnston [project led by Mark Richards]	▪ identify lentils and chickpeas varietal traits best adapted to MIA ▪ identify phenology drivers and characterise crop phenology ▪ identify critical growth periods for MIA
Cover cropping Yanco Team: Hayden Petty, Alan Boulton, Gabby Napier [Project led by QDAF – Dave Lawrence]	▪ 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. – 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.
Southern Crop Protection Sandra McDougall, Tim Green, Plant Pathologist and (Alison Young)	▪ CRDC DAN1903 Jan 19-Sept 2021 ▪ Southern disease surveys, Cotton Info Pathology Lead ▪ 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

Projects	*Notes*
Supporting Southern Cotton Production - Cotton Research Officer DPI Team: Hayden Petty, Alan Boulton, Gabby Napier	▪ 3 years CRDC Jul 19- June 22 ▪ Collaboration with CSIRO and CSD E&D team ▪ Management practices to optimise seedling emergence and improve crop agronomy in Sth cropping areas

Water Projects

Projects	*Notes*
Impact of irrigation methods and management strategies on nitrogen fertiliser recovery in cotton DPI Led: John Smith	▪ 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	▪ Agrifutures July 2015- May 2020 ▪ Determine varietal nitrogen management requirements and phenology information for new and soon to be released varieties
Improving mid season nitrogen management of rice DPI Team: Brian Dunn, Tina Dunn, Craig Hodges and Chris Dawe [project now complete]	▪ Agrifutures July 2018- Jun 2021 ▪ 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	▪ 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

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Horticulture projects

Projects	*Notes*
Citrus – National strategies to manage citrus gall wasps DPI Team: Jianhua Mo, Scott Munro, Andrew Creek, Steve Falivene	▪ 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
Citrus - Red scale phenology DPI team: Jianhua Mo, Andrew Creek, Scott Munro	▪ HIA Sep 2015 - Dec 2018 ▪ Predict timing of red scale crawler peaks and male flight peaks ▪ Compare red scale control at different timings
Advanced production systems for the temperate nut crop industries DPI: (Jacquelyn Simpson)/ Mick Lang and Jason Lewis (Jacquelyn on maternity leave)	▪ 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
Field and landscape management to support beneficial arthropods for IPM on vegetable farms **Yanco team:** Jianhua Mo, Scott Munro	▪ HIA 2017-2019 ▪ developing ecological approaches to boost beneficials and check pest build-up
Hazelnuts in Australia DPI: Jacquelyn Simpson, Stephen Gottschall	▪ 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
Vunerability of horticultural crops to climate change DPI team: Jianhua Mo, Kevin Dodds, Jessica Fearnley, Darren Fahy, Brunro Hozapfel, Steven Falivene, Jeremy Bright, Ruth Huwer, Melinda Simpson	▪ NSW Government ▪ Assess the impact of future climate change to the production of key horticultural crops in NSW

Biosecurity

Projects	*Notes*
Rice pest and disease biosecurity DPI Team: Mark Stevens, Glen Warren, David Gopurenko	▪ Agrifutures 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.