no 190, autumn 2014

Irrigation Research & Extension Committee

farmers' newsletter

large area edition

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The IREC Farmers' Newsletter is published by the Irrigation Research & Extension Committee. It is distributed to irrigators and their advisors in the Lachlan, Murrumbidgee, Murray and Goulburn valleys. If you wish to be added to the Farmers' Newsletter mailing list, contact the IREC office.

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Editorial

The IREC Farmers' Newsletter welcomes all suggestions and contributions for articles from irrigators, advisors and researchers in government and commercial sectors. If you have suggestions for articles or wish to contribute an article please contact the Editor.

Please submit articles for the next edition, Spring 2014, to the editor by 12 July 2014.

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Design & production

Richard Howell, TMLC Design. www.tmlc.com.au

Print

Blue Star Print – a Forest Stewardship Council, Chair of Custody certified company. All processes are controlled by an Environmental Management System, certified to ISO14001.

Photography

Cover: NSW DPI Technical Officer, Tina Dunn, determing wheat establishment numbers in a crop following rice. Photo: Brian Dunn.

Unless indicated otherwise, all photographs are attributable to the author of the article in which the photograph appears.

ISSN 0467 – 5282

CHAIRMAN'S REPORT

Welcome to another edition of the *Farmers' Newsletter*.

A lot has been happening at IREC since the decision was made at the AGM, 16 September 2013, to ramp up activities in all things irrigation.

After serving well as Chairman of the IREC committee for over four years, Alan Walsh decided to call an end to his Chairmanship. I would like to thank Alan for his leadership and guidance over a tough period for the irrigation industry. It is due to his leadership that we are in a position to grow into an innovative and progressive organisation post-drought. I now have the privilege of leading IREC forward.

The IREC executive committee has employed an executive officer for two days per week. Iva Quarisa was appointed at the start of this year, and along with Hayley Wordsworth who is continuing her part-time role as office manager, Iva has hit the ground running.

We have an executive committee made up of old and new faces, all of whom share the Vision of IREC—*working together for profitable and sustainable irrigated agriculture*. The executive committee as a whole is committed to the Mission—*to support and enhance research and extension for continual improvement of irrigated agriculture.*

The goals of IREC have been updated and are:

1. Promote new and existing research for irrigated agricultural systems.
2. Provide a network for irrigated research, development and extension.
3. Influence research and extension policy.
4. Be a recognised information hub for irrigated agriculture.
5. Provide a forum for irrigators to share new and innovative research ideas.

The executive committee decided to make the IREC Field Station (formerly known as 'Whitton Common') available for irrigation research projects pertinent to this region. One such project is a 'key learning site' for a range of irrigation layouts and systems. There is also scope for a project looking at the effectiveness of animal manure as a form of crop nutrition and soil conditioner.

Fleabane control measures and cotton variety trials are also being looked at for the site. There will be opportunities to visit the field station throughout the development and roll-out of such projects. Please make sure your membership is current and check your emails and Twitter or the IREC website to take advantage of such opportunities.

In achieving IREC's goals, it is important for us as growers to support not only IREC through membership but also our peak industry bodies representing the rice, cotton, maize, winter cereals, oilseeds and pulse industries. IREC is working closely with the R&D arms of these groups so that we add value through partnerships, particularly working on cross-commodity 'irrigation' issues. These groups are already addressing key industry specific issues such as mid-season drainage in rice, crop protection and pest control, the latest in varietal developments, and precision agriculture.

For irrigators of south eastern Australia to remain the world's best in terms of field practices, I believe we need to continually improve our farming systems. A key component of continued improvement will always be a healthy Research, Development and Extension sector.

Please contact Iva or Hayley at the IREC office to renew your IREC membership:

Telephone: 02 6960 1550 or Email: irec@irec.org.au

I hope you enjoy this edition of the *Farmers' Newsletter* and I look forward to catching up in the next edition.

Rob Houghton

Chairman IREC

IREC LINKING IRRIGATOR NEEDS TO RESEARCH AND EXTENSION

Iva Quarisa
Executive Officer, IREC

QUICK TAKE

- After a drought-driven hiatus, IREC is reshaping to be a progressive and dynamic organisation that will guide irrigated agricultural research, development and extension.
- Whitton farmer, Rob Houghton, is the new chairman of the Executive Committee of IREC.
- Irrigation professional, Iva Quarisa, has been appointed executive officer of IREC.
- IREC conducted a series of breakfast meetings to determine and prioritise research needs of irrigators of the Murrumbidgee Valley, and the executive committee has been consulting key R&D corporations about addressing these needs.

I am very happy to be writing this article as the new part time Executive Officer of IREC. After many years of drought and the loss of key organisations supporting irrigation farmers, it is great to be involved with IREC as it gains momentum with the aim of filling some of the gaps in the services to improve irrigated agriculture.

As an Irrigation Officer with NSW DPI, I was involved with IREC for 18 years as part of the Irrigated Farm Competition, the Irrigation Technologies subcommittee and most recently as the DPI representative on the executive committee. After working with NSW DPI for 21 years I was disappointed to be made redundant, along with all the other extension officers, in August 2013.

As well as working with irrigation-focussed organisations, I have done my fair share of driving tractors and checking water on my family's broadacre farms at Griffith. So having lived and worked in irrigated agriculture my whole life, I am extremely happy to continue working with the irrigation industry in this new role at IREC.

I am looking forward to working with the new IREC executive committee and its new chairman, Rob Houghton. Rob, who has been farming at Whitton for 30 years, brings a great deal of representative and committee experience to his position. He was RGA Yanco Branch chairman for many years and on the RGA Central Executive for over 12 years, some as the Vice President. In 2008 was appointed Chairman of the management committee for the second phase of the National Program for Sustainable Irrigation.

Decline of services

Over the past five years, there has been a serious decline in irrigation related research and extension delivery organisations. In addition to NSW DPI making all their extension staff redundant, the National Program for Sustainable Irrigation finished in June 2012, funding for the Irrigation Futures CRC ended in 2010, and in May 2009 the Federal Government ceased funding of Land & Water Australia.

All of these programs were involved and invested in research and adoption of sustainable irrigation practices. Their demise has seen a huge gap emerge in the area of research, development and extension of knowledge in irrigated agriculture.

In view of this, the decision at the 2013 AGM of IREC to ramp up the organisation's activity after the drought-driven hiatus, was timely as well as necessary. One of the aims of the new executive committee is to be a progressive and dynamic organisation, guiding irrigated agricultural research, development and extension; and helping fill the vast gaps left by the organisations that previously focussed on improving irrigated agriculture.

Field research focus

To kick-start the refreshed IREC, a round of short breakfast meetings for growers and advisors was held in October 2013. One of the purposes of these meetings was to identify and prioritise research concepts that would benefit all irrigated cropping industry sectors in the Murrumbidgee Valley.

The top five reseach ideas were presented to representatives of the Cotton, Grains and Rice R&D corporations, with the intention of providing guidance for investing research dollars. More details about the breakfast meetings and research ideas are in the article by Kieran O'Keeffe starting on page 6 of this magazine.

The breakfast meetings were well attended and provided a great forum for farmers to meet, have their say, learn something new and be back to work, all in two hours. The process proved to be a good one, and IREC will follow this format in future, i.e. hold relevant, timely and succinct activities.

To help achieve some of IREC's aims, the IREC Field Station (previously known as Whitton Common) is currently being resurrected as a regional trial site. The site is being reworked to install up-to-date gravity irrigation layouts and upgrade the existing sub-surface drip and recycling systems. The IREC Field Station will then be the perfect place to run trials and conduct research experiments, on topics such as variety, layouts, manure and herbicides. Farm walks and field days will be held to showcase the findings.

Farm management focus

In February 2014, IREC organised Cotton Financing and Marketing workshops which were held in Coleambally and Griffith. Bendigo Bank kindly provided financial assistance to sponsor the workshops.

Elissa Wegener of Olam/Queensland Cotton—the other workshop sponsor—made an informative presentation on brokering cotton and how cotton prices are determined.

Pete Johnson, the highly-regarded and well-respected manager of commodity marketing business, Left Field Solutions, and creator of the cotton market newsletter, Cotton Compass, shared his insights about marketing cotton. Pete also explained cotton P&D sheets (Premiums and Discounts) and how to read them.

Well-known local, Michael Ryan from Booth and Associates, gave a complete overview on understanding cash flow for cotton.

The workshops were very well received with feedback indicating that the participants' knowledge on all topics improved and that they were likely to use the information provided in their farming businesses.

IREC involvement & membership

The next step for IREC is to re-establish its subcommittee system, which was an integral part of IREC in the past and provided a way for different groups or industries to address specific issues, while working towards the common goals of IREC.

IREC must be relevant to irrigators, so ideally the subcommittees should be largely made up of farmers. Currently, it is anticipated that there would be two meetings a year. The purpose of the subcommittees will be to direct the functions and activities that IREC will run, and provide a priority list of research ideas to guide the executive committee in their role of influencing R&D relevant for irrigators.

Whitton farmer and IREC chairman, Rob Houghton (left), demonstrating web-based irrigation technology to IREC office manager, Hayley Wordsworth (centre), and IREC Executive Officer, Iva Quarisa (right).

The two subcommittees that IREC is looking at forming initially, are the Cropping & Water Management subcommittee and the Horticultural Crops/Permanent Plantings subcommittee. If any grower or advisor is interested in being part of either of these subcommittees, please contact me at the IREC office on 02 6960 1550.

One of the challenges I face is increasing IREC membership. IREC needs a strong membership base to ensure that its activities do improve irrigated agriculture and to demonstrate to funding organisations that research needs are well supported at the grass roots level. Membership also contributes to ongoing IREC activities. The *Farmers' Newsletter* is the jewel of the IREC crown but without a strong membership base, it will be difficult to justify the continued production of the magazine. Annual membership is only $55 and will not only help guarantee the future of IREC and its magazine, but will also enable us to deliver relevant and innovative research and run informative and dynamic activities.

Please contact Hayley or myself at the IREC office for a membership form, or download it from the IREC website: **www.irec.org.au**

You can also follow IREC on Twitter: **@irecnsw**.

I welcome ideas for field days, workshops or tours and look forward to meeting you at one of our future functions.

Further information

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FROM PAPER TO PADDOCK

Kieran O'Keeffe

IREC Executive Committee & CottonInfo Regional Development Officer, Southern NSW

QUICK TAKE

- The recently revitalised IREC conducted a series of breakfast meetings at Leeton, Whitton, Griffith and Coleambally to discuss and prioritise research needs of irrigators.
- A list of research priorities for irrigators was determined and members of the IREC Executive Committee subsequently met with research and development corporations (RDCs) relevant to irrigated agriculture to discuss the priorities.
- The RDCs agreed to meet at least annually in future, to look at what synergies exist with current and proposed projects, with a view to more efficient and meaningful investment in irrigation research.

The Irrigation Research and Extension Committee (IREC) is in the process of ramping up activity and engaging with irrigators in the Murrumbidgee Valley. As part of this process a series of on-farm breakfast meetings was held during October 2013.

Breakfast meetings were held at drawcard sites at Leeton, Whitton, Griffith and Coleambally, so the attendees could look at some current research and different crops. October is a time of high workload for growers, with summer crop planting occuring, so the turn out from growers and advisors was very encouraging.

The purpose of these meetings was to publicise the increased activity of IREC and find out from growers and advisors what concepts for research projects that they saw as having the highest priority. The research ideas were framed around what research would have benefit across industry sectors in irrigated cropping in the Murrumbidgee Valley. The meetings were organised and facilitated by IREC executive committee members Rob Houghton, Iva Quarisa and Kieran O'Keeffe.

Prioritisation process

The process used to aquire the research concepts from the attendees was a format adopted from Ian Plowman, facilitator and author of the book Co-operative Conversations. Growers were asked to individually write their ideas down on paper and these were then written up on butcher's paper for the whole group to view. Though a structured process the groups then voted individually on what ideas were the most important to them.

A summary of what each group considered as the main priorities follows.

Leeton Breakfast

1. Rotation sequencing: cotton/rice/wheat/canola/beans
2. Decision Support System/tool to help make second irrigation/fertiliser application decisions, based upon current prices and $ return and how far can we stretch out between watering for different crops—$return/watering
3. Herbicide resistance and management specific to irrigated farming systems
4. Stubble management cycle/rotation of crops, all encompassing, including weed resistance, layouts, soil improvement, plant back issues
5. Soils—biological additives/biota

Whitton Breakfast

1. Crop rotation to deal with herbicide resistance
2. Automation of surface layouts (measurement of different inputs e.g. depth of irrigation)
3. Manure/nutrition trials linked to soil pH (uptake and efficiency)
4. Soil constraints, e.g. soil pH limits for crops and effect on fertiliser uptake
5. Variety manipulation

Griffith Breakfast

1. Layouts—labour efficiency/crop efficiency, scale/on/off time-flow rates/bay size, yield responses/improvements, gross margin/ML ($ return of different layouts)
2. Herbicide resistance—management and stubble retention (winter and summer crops, e.g. glyphosate resistance in summer crops)
3. Communication—establish a hub with information/results from a range of on farm trials/research projects and the use of Facebook/Twitter
4. Irrigated wheat management
5. Aerial imaging—better access for crop management

Coleambally Breakfast

1. New irrigated crops
2. Herbicide resistance/cropping rotations to minimise resistance
3. Fully irrigated winter crop variety trials
4. Seasonal forecast for allocations and expected crop water requirements
5. Shorter season rice and cotton varieties while maintaining yield

The growers worked independently, with no knowledge of what went on at other breakfast meetings, so it was interesting to see the common research priority areas that came to the top of the lists for each group.

Where to from here?

The priority lists were taken to the three research and development corporations (RDC) that have a direct link to irrigated crops in southern Australia, i.e. Cotton RDC, Grains RDC and Rural Industries RDC, which manages the Rice R&D program. Positive discussions were held with the RDCs, and the groups agreed to meet at least annually to look at what synergies exist with current and proposed projects. Already some of these grower topics have been included in future irrigation project proposals, such as a GRDC project looking at a fully irrigated wheat and canola trial. Further, some of the members of the different RDCs have been invited to provide input into the GRDC project steering committees.

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Irrigators from four locations in the Murrumbidgee Valley were asked to provide their ideas and priorities for research projects to determine a priority list for IREC to pursue.

The format of breakfast meetings enabled growers to participate in the priority setting exercise, have breakfast and a chat, and then return to their day's work with minimal disruption.

WHERE DOES YOUR R&D LEVY GO?

Lucy Kealey
Editor, IREC Farmers' Newsletter

QUICK TAKE

- Agricultural production is levied by the Australian Government and generally, levies are matched by government by up to 0.5% of industry Gross Value of Production.
- Research and development corporations (RDCs), a partnership between government and industry, determine how the levies and matching funds are spent.
- Levies paid by broadacre irrigators in southern New South Wales and northern Victoria pay are managed by at least three different RDCs.
- All RDCs have grower representation on their boards, and a structure of advisory panels and/or networks to help determine research investments that best match the priority of levy payers.

With most truckloads of crops and livestock delivered to market, some dollars per tonne or specified percentage of total value is paid as an R&D levy. Where does this money go? Who decides how it is spent? And can farmers' influence how and where it is spent?

Based on legislation or industry agreements, the Australian Government collects levies on agricultural produce for the purpose of funding R&D and/or marketing. The Australian Government generally matches expenditure on R&D by up to 0.5% of industry Gross Value of Production.

Research and development corporations (RDCs) are a partnership between government and industry. The levies and matching funds are allocated to RDCs who act for one or several industries/crops. The RDCs are a mix of statutory bodies and industry-owned companies and are accountable to both industry and government for their expenditure. This model has been operating in the primary industries sector for over 20 years, under the framework of the *Primary Industries and Energy Research and Development Act 1989.*

Following is some information on the RDCs relevant to the irrigated broadacre agricultural industries.

Rice

Levies raised on rice production are managed by the statutory authority, the Rural Industries Research and Development Corporation (RIRDC), which also manages funds for many other established and emerging industries. Investment in research, development and extension by the Rice Program of RIRDC is guided by the **Rice R&D Advisory Committee**, which comprises six rice growers, as well as technical experts and RIRDC executives. Rice growers can make contact with the Advisory Committee through the Ricegrowers' Association (RGA) office.

Cotton

The Cotton Research and Development Corporation (CRDC) is a government corporation that invests in and manages research, development and extension projects for the Australian cotton industry. Investment in cotton R,D&E is guided by advice from Cotton Australia, the peak body for the Australian cotton industry. Cotton Australia is designated by the Federal Minister for Agriculture to be the representative organisation in the cotton industry to CRDC, to advise on cotton grower priorities in research, development and extension areas, and lobbies research issues on behalf of cotton growers. Growers participate on four **Advisory Panels:** Value Chain, Biosecurity, Farming Systems and Human Capacity to provide feedback and advice to CRDC.

Grains

The Grains Research and Development Corporation (GRDC) is a statutory corporation and covers a wide portfolio of 25 grain crops, which includes winter and summer cereals, oilseeds and pulses. The GRDC is responsible for planning, investing and overseeing RD&E across the length and breadth of Australia, and it has three regional panels (northern, southern and western) and program teams to help the GRDC Board determine research

investments. The **Southern Regional Panel** of GRDC covers the southern irrigation regions of Australia, and comprises grain growers, agribusiness practitioners, scientists and GRDC executives.

To provide advice to the panels, **Regional Cropping Solutions Networks** were created in 2012. There are four Regional Cropping Solutions Networks in the Southern Region and the Irrigation Zone Network is able to provide advice to the Southern Regional Panel on local grain production opportunities, constraints and how best to address these in irrigation areas. The article on page 10 provides information on the Irrigation Regional Cropping Solutions Network.

Where does IREC fit?

IREC is by no means an RDC, nor is it aiming to be one. IREC sees itself as a cross-industry organisation for irrigators, and has already started building networks with all RDCs to focus attention on cross-industry issues such as irrigation systems and efficiency, or management of crop rotations. IREC provides a forum to consolidate issues, and by working with all the existing advisory panels and networks, IREC can help support the case for investment of R&D dollars in the southern irrigation regions.

Related websites and pages

DAFF home: **www.daff.gov.au**
» Agriculture and Food Home » Research and Innovation » R & D Corporations

RIRDC home: **www.rirdc.gov.au**
» Research Programs » Plant Industries » Rice

RGA home: **www.rga.org.au**
» Rice Industry » Research & Development

CRDC home: **www.crdc.com.au**
» About CRDC

Cotton Australia home: **www.cottonaustralia.com.au**
» About Us » Our Roles » Advancing Australian Cotton

GRDC home: **www.grdc.com.au**
» About Us » GRDC Regional Panels
» About Us » Our Grains Industry » RCSN

Advisory panels and networks made up of growers and agronomists are some of the ways by which RDCs gain information to determine investment of research funds. Photo: Iva Quarisa

IRRIGATION NETWORK CHANNELS TOP ISSUES TO GRDC

Deanna Lush
GRDC Southern Region Science Writer

QUICK TAKE

- The research needs of irrigators in southern Australia will be better represented to GRDC with the establishment of a Regional Cropping Solutions Network (RCSN) for irrigation in 2012.
- The irrigation RCSN comprises nine irrigators and agronomists, who bring their own experiences and perspectives, as well as those of their own communities, to the process of determining GRDC investment priorities.
- The RCSN process enables small-scale regional investments to be made within a growing season, allowing information to get back to growers as quickly as possible.

Irrigators of the southern Murray-Darling Basin have a much better opportunity of having their non-rice and non-cotton cropping needs understood and addressed, thanks to the Regional Cropping Solutions Network for irrigation.

In 2012, the Grains Research and Development Corporation (GRDC) established Regional Cropping Solutions Networks (RCSNs). There are four networks in GRDC's Southern Region, one each for low, medium and high rainfall areas and one for irrigation farming systems. The networks are made up of 42 growers, advisers and researchers.

The Irrigation RCSN is coordinated on behalf of GRDC by Irrigation Cropping Council's Rob Fisher and Bree Laughlin. Rob says the network is a diverse group of agriculturalists from across south eastern Australia.

"But there is one thing in common among the group's members—they each have a technical understanding of what it takes to farm in an irrigated environment," he said.

The group met in February to compile a list of new issues currently affecting the irrigation industry. The list included:

- up-skilling agronomists and researchers to boost their knowledge base for advising growers
- improving rotation options after rice is grown
- determining whether durum is suited as a niche irrigated crop and if so, what nitrogen and disease management is required
- assessing market sizes and drivers for irrigated crops and local market opportunities
- updating maize best practice management guidelines
- researching the best time of sowing, establishment and plant populations for soybeans
- investigating options for irrigated pulses
- determining soil management systems to achieve optimal crop productivity.

Irrigation Regional Cropping Solutions Network:

- Facilitators: Rob Fisher and Bree Laughlin, ICC
- Luke Gaynor, NSW DPI, Wagga Wagga
- Damian Jones, Kerang, Vic.
- Kieran O'Keeffe, Griffith, NSW
- Peter Johnson, Forbes, NSW
- David Brown, Naracoorte, SA
- Tony Hamilton, Forbes, NSW
- Adrian Hayes, Coleambally, NSW
- Michael Hughes, Morago, NSW
- Craig Reynolds, Congupna, Vic.
- Geoff McLeod, GRDC Southern Panel member, Finley, NSW
- Keith Pengilley, GRDC Southern Panel chairman, Conara, Tas

IREC hosted the Irrigation Regional Cropping Solutions Network of GRDC on a visit to the Murrumbidgee Valley in February. The network comprises nine irrigators and agronomists, as listed on the page opposite. Photo: Bree Laughlin

Dallas Stott of Whitton explaining the workings of an automated stop to supply water to a bankless channel layout to the Irrigation Regional Cropping Solutions Network. Photo: Bree Laughlin

The Irrigation Regional Cropping Solutions Network inspecting a soybean crop of Whitton farmer and new IREC Chairman, Rob Houghton, Photo: Bree Laughlin

Irrigation Regional Cropping Solutions Network member Kieran O'Keeffe explaining the growth stages of a cotton plant to fellow members. Photo: Iva Quarisa

"The new list is being worked through in close detail, to identify what we believe are the key issues that irrigators would want addressed on-farm, which we will put up for consideration in the GRDC's Southern Panel's research investment decisions," Rob said.

Rob says while not all of the issues can be addressed quickly with short-term investments, there are some issues where there are opportunities to move quickly.

"Small-scale regional investments, called 'fast track projects', will allow for an immediate response to issues experienced during the growing season, so we can get information back to growers as quickly as possible," he said.

"An example of one fast-track project currently in development is assessing the irrigated potential of faba beans."

GRDC Southern Panel member and Finley irrigator, Geoff McLeod has been part of the irrigation RCSN for 12 months.

He says the network is a great opportunity to provide a higher level of detail to GRDC on the issues in the irrigation industry from across the South East of South Australia, Victoria, southern NSW and Tasmania.

"The factors that affect irrigated cropping are, in some respects, a little different to those in dryland and it's important for us to understand where those differences are and how we need to be responding to them," he said.

Geoff says the RCSN provides a detailed understanding of all the issues raised to the Southern Panel, so the panel can consider how the issues relate to the overall priorities for research, development and extension in the Southern Region. The issues listed for irrigation will be prioritised along with the issues identified for the dryland regions to determine which ones are supported and how they can be addressed.

"The strength of the RCSN is instead of just having one of two panel members from a particular geographical area, we've got nine growers and agronomists who will bring their experiences and perspectives, as well as those from their own communities, so it allows us to have a wider net of input into determining what our investment priorities should be.

"Across the whole network, there are now 42 growers and agronomists out there as the ears of the grain industry, feeding growers' issues back into the GRDC."

Irrigated grain growers are encouraged to speak with members of the irrigation RCSN about the short-term and long-term issues affecting their grain growing businesses.

Further information

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TIME TO CONSIDER THE IMPACT OF RE-VALUED WATER

Geoff McLeod

Finley irrigator and GRDC Southern Panel Member

This article is based on a discussion paper presented to members of the Irrigation Regional Cropping Solutions Network of GRDC, prior to the network's meeting in January 2014.

QUICK TAKE

- The increased valuation of irrigation water demands that higher productivity be achieved from its use within the southern irrigation regions. This is likely to lead to fundamental change in irrigated cropping systems in a number of areas.
- Both farm businesses and research investment organisations will need to explore how the farm system can be modified to lift overall returns on water and land. The factors involved will include the interaction of soil management, irrigation application and crop productivity, including crop sequencing for integrated winter and summer cropping.

The 2012–13 and 2013–14 irrigation seasons resulted in a significant increase in the value of irrigation water, as traded on the annual water market.

This increase is considered a direct result of the reduced volume of water now available for irrigation, due to the large volume of water secured by the Federal Government for implementation of the Murray–Darling Basin Plan.

Irrigated cropping is the major use of water in the NSW Murray, Murrumbidgee and Lachlan valleys of southern NSW, and as a result of increased water value, irrigated agriculture is re-evaluating what production systems are adopted in future.

To support change and deliver benefits to irrigated cropping, research investment organisations need to address the challenges created by the 're-valuation' of irrigation water.

Fundamental change

Irrigated cropping is undertaken in six geographic areas of southern Australia: the South East of South Australia, Tasmania, northern Victoria and the NSW Murray, Murrumbidgee and Lachlan valleys of southern New South Wales. Of these areas, over 75% of grain harvested is produced in the NSW Murray and Murrumbidgee valleys.

Prior to the mid-2000s, irrigated cropping within the NSW Murray and Murrumbidgee valleys was dominated by rice production and approximately 60% of the available irrigation water used for rice production. The area of production of other summer crops (maize and soybeans) was small and most of the winter-irrigated crop was akin to dryland cropping with supplementary watering.

There is a fundamental change occurring within the irrigated regions as a result of the Basin Plan and industry developments. The following paragraphs illustrate some of these changes.

Environmental water use

Government has secured for environmental use in the order of 20% of the water entitlements in the Murrumbidgee Valley and 25% of water entitlements in the NSW Murray region. Similar purchases have occurred in northern Victoria and the Lachlan Valley. The annual water market is now trading at levels of around $75/ML (at levels of near 100% allocation). The gross margin for rice production at 2013 commodity values and average yields is around $80–90/ML. With prudent management, a range of other summer and winter crops will generate gross margins higher than returns from rice, however this is often associated with increased labour requirements, higher capital investment in irrigation layouts and increased marketing responsibilities by the grower. These crops are also not as well suited to some of the soil types within the irrigated region.

Expansion of maize

In 2013, around 120,000 tonnes of maize was exported as a result of a concerted market development initiative. There is significant potential for the maize industry to continue to expand based on this and other marketing opportunities.

Double cropping

Australia currently imports around 600,000 tonnes of soybean meal annually for stockfeed. Around 60,000 tonnes of soybean were produced in the southern region in 2013. Soybean is currently the only summer crop of the main four that can be double cropped in rotation with winter crops, i.e. four crops in two years, although with the advent of shorter-season rice and maize varieties and use of drying facilities, these crops may also be successfully double cropped, at least at the intensity of three crops in two years.

Expansion of cotton

Cotton production is expanding within southern NSW. Crop production is higher than originally anticipated by the cotton industry and production is expected to expand as growers gain more confidence.

Potential improvement

There is potential to improve the production and returns on water with traditional crops in the irrigation cropping areas. Winter crop production is generally well below potential, particularly for wheat and canola. Grain yields are expected to improve as growers place a greater focus on these crops to improve their returns from irrigation water use and access opportunities to improve their irrigation layouts from schemes such as the Federal Government's On-Farm Irrigation Efficiency Program.

Gaps in knowledge have been identified in the irrigation context for winter crops, including suitable varieties, agronomy packages for higher yielding canola and the need to include a pulse crop (faba bean) in rotation with the cereal and oilseed crops.

There are four active grower groups within the northern Victoria, NSW Murray, Murrumbidgee and Lachlan valley irrigated cropping areas, each with the capacity to undertake field work on community demonstration blocks. Each group has the capacity to work collaboratively with research and development organisations to improve crop productivity and farm performance.

Cropping solutions network

The Regional Cropping Solutions Network (RSCN) for irrigation has identified a range of issues that warrant investigation to improve productivity and performance of irrigation farms. A number of these focus on tactical issues. The 2013–14 external investment plan for GRDC has supported further work for:

- evaluation of wheat and canola varieties under irrigation
- improved agronomy package to produce higher yielding canola
- evaluation of faba bean as a suitable pulse to be included in irrigated crop sequences
- improved soil management under irrigation conditions.

Field trials will be established in 2014 for the wheat and canola studies, and scoping studies have been commenced for the faba bean and soil management issues to clarify the focus of the new investment.

The 2013 GRDC internal investment plan included a proposed investment into double cropping under irrigation.

An agreement was established late last year with the research and development corporations for grains, cotton and rice that an annual meeting be held to discuss priority issues, explore what synergies exist and where joint investments are warranted in the southern region.

Moving forward

The increased valuation of irrigation water demands that higher productivity be achieved from its use within the southern irrigation regions. This is unlikely to be achieved by 'tinkering' with the current farming systems and is likely to involve a greater focus on a range of summer and winter crops. Rice and cotton will continue to be major crops, particularly on the heavier clay soils, however the whole-of-farm cropping system is expected to become more significant than in the past. This will include an increased focus on the dryland areas as well as the irrigated areas.

Both farm businesses and research investment organisations will need to explore how the farm system can be modified to lift overall returns on water and land. The factors involved will be more complex than improved single crop agronomy alone.

In terms of research investment, the focus may include some of the following issues:

- The interaction of soil management, irrigation application and crop productivity from a systems perspective. This will need to involve consideration of what limitations exist with the common surface irrigation based systems and the merit of alternative approaches.
- Irrigated crop sequencing that considers integrated summer and winter cropping to optimise water use efficiency, managing high stubble loads and the implications of an increased proportion of broadleaf crops with similar disease susceptibility (e.g. sclerotinia).
- Identifying key agronomy and farm business management gaps that are different to those identified for the dryland farming systems. The issues identified by the Irrigation RCSN and those identified by a recent round of IREC grower meetings in the Murrumbidgee Valley provide a sound platform to move forward with.
- How further research and development activities may be taken involving the soybean and maize industries to improve the performance of these crops within the limitations of the farm system.
- Other opportunities that are not currently being captured to meet specialist markets, for example the production of durum wheat or culinary pulses.

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WHEAT AFTER RICE – HOW MANY IRRIGATIONS?

Brian Dunn

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QUICK TAKE

- Two spring irrigations achieved the highest grain yield (8 t/ha) and gross margin ($1309/ha) in this experiment but it will vary between years depending on winter and spring rainfall.
- A wheat crop grown after rice requires high levels of fertiliser—maximum grain yield and protein were achieved with 175 kg/ha DAP sown with the seed and 435 kg/ha urea topdressed in a split application at mid-tillering and early flowering.
- Wheat following rice can be a very profitable crop provided the field layout (drainage) is good, the rice stubble is removed early and the crop is established before the weather gets cold and possibly wet.

Wheat grown immediately following a rice crop can be one of the most profitable crops in the rice farming system. However, growers often face the dilemma of how many irrigations the crop will require to achieve good yields and profits, and/or if water required for an additional irrigation would be better used elsewhere.

In 2013, an experiment was established at Leeton Field Station to investigate the irrigation water requirements of a wheat crop grown immediately following rice and the impact of various levels of irrigation intensity on grain yield and quality, water use and profitability.

The hard-wheat variety, EGA Gregory, was direct drilled (100 kg/ha seed + 175 kg/ha DAP) into moist uncultivated, self-mulching, heavy clay soil after the rice stubble had been slashed and burned. The wheat followed the second consecutive rice crop grown in the field. A full list of cultural practices, their timing and other details are provided in Table 1.

Irrigation & nitrogen treatments

Four irrigation treatments were established:

- zero
- 1 irrigation
- 2 irrigations
- 4 irrigations.

There were four replications of each treatment and each treatment was in a separate bay so water use could be accurately measured. The timing of the irrigations was determined using a combination of evapotranspiration data, crop factors and rainfall, while keeping in mind the necessity for wheat to have adequate available soil moisture during flowering.

The irrigation treatments were split for nitrogen topdressing using urea at rates of:

- zero (0 kg/ha urea)
- 50 kg N/ha (109 kg/ha urea)
- 150 kg N/ha (325 kg/ha urea)
- 200 kg N/ha (435 kg/ha urea).

The urea was spread onto the dry soil in a split application with two timings, both before rain or irrigation (Table 1).

Grain yield

The highest grain yield was achieved by the 2 irrigations x 200 kg N/ha topdressed treatment, with 8.0 t/ha; this was similar to the 4 irrigations x 200 kg N/ha treatment with 7.9 t/ha. Both of these yields were significantly higher than the zero and 1 irrigation treatments (6.8 and 7.4 t/ha, respectively) with the same rate of topdressed nitrogen (Figure 1).

Grain quality

Average grain protein was 10.8% with no significant difference between the irrigation treatments. Increasing nitrogen application rate increased grain protein from 9.2%, with no topdressed nitrogen, to 12.6% when the crop was topdressed with 200 kg/ha of nitrogen (Table 2).

Table 1. Cultural practices timing and details

Practice	Details
Field preparation	Rice stubble burnt – no cultivation
Sowing	7 May – disc drill with 18 cm row spacing
Variety and rate	EGA Gregory wheat @ 100 kg/ha seed
Sowing fertiliser	DAP @ 175 kg/ha sown with seed
Establishment	189 plants/m^2 – no difference between bays
Herbicides	Ally @ 7 g/ha + wetter, no grass weed spray
Top-dressed nitrogen	6 Aug – prior to 10 mm rain, 0, 50 & 100 kg N/ha 4 to 10 Sep – prior irrigation or rain, 0, 50 & 100 kg N/ha
Irrigation dates	1 irrigation – 9 Sep 2 irrigations – 9 Sep, 11 Oct 4 irrigations – 5 Sep, 4 Oct, 18 Oct, 1 Nov

Screenings were similar between irrigation and nitrogen treatments, all very low at 1.3% or less. Grain weight averaged 83.9 kg/hL across the experiment with no difference between irrigation treatments, but increased topdressed nitrogen rate increased grain weight.

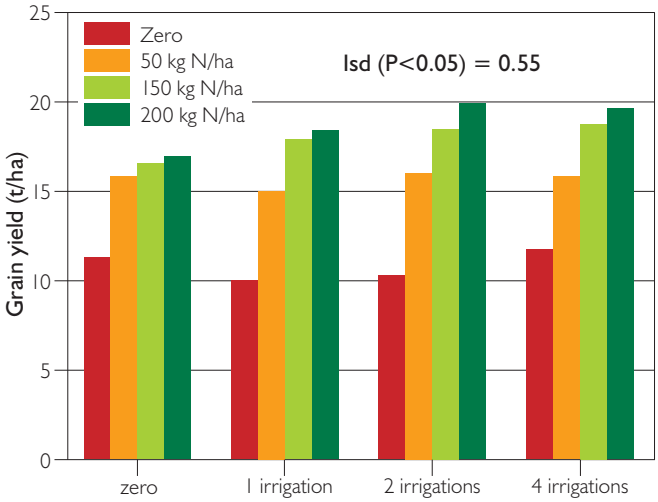

Figure 1. *Grain yield (t/ha) for irrigation and nitrogen topdressing treatments*

The small changes in grain weight and screenings between treatments meant that changes in irrigation treatment had no impact on grade of wheat and therefore grain price.

For all irrigation treatments when the wheat was topdressed with zero or 50 kg N/ha, the lower grain protein resulted in only achieving the ASW1 wheat grade. ASW1 had a $39/t lower price than H2 grade which was achieved when topdressing with 150 or 200 kg N/ha. Additional topdressed nitrogen would have been required to reach the H1 grade (protein >13%) but given the increased premium was only $6/t it may not have been

Craig Hodges and Chris Dawe collecting soil samples and Tina Dunn measuring wheat establishment, during the 2013 investigation of irrigation water requirements of a wheat crop grown immediately following rice.

Flume and waterdepth logger measuring the amount of water supplied to the wheat crop during an irrigation event

The wheat crop at maturity in a 2 irrigations treatment

economically viable. Grain prices used in this article are based on GrainCorp prices delivered Yanco, 4 December 2013.

Water use & water productivity

The zero irrigation treatment received 2 ML/ha as rainfall during the crop growing period, with the 1, 2 and 4 irrigation treatments using 2.9, 3.8 and 5.1 ML/ha respectively consisting of rainfall and irrigation water (Table 2).

A large rainfall event occurred in mid-September when 52 mm was received just as the wheat was beginning to flower; this had a big impact on the results of this experiment. Without this rainfall, coming at such a critical time, it would be expected that grain yield and quality of the zero and 1 irrigation treatments would have been significantly reduced.

Gross margin analysis

The 2 irrigations treatment returned the highest gross margin at $1309/ha, followed by the 4 irrigations and 1 irrigation treatments with $1269/ha and $1184/ha respectively (Table 3).

The gross margin per megalitre was highest for the zero irrigation treatment, which only used soil moisture and rainfall to grow the crop, at $530/ML, followed by the 1, 2 and 4 irrigation treatments at $408/ML, $344/ML and $249/ML respectively.

The gross margin analysis only considers the variable cost of the irrigation water and does not take into account the fixed water costs or the value of the allocation as a tradable item. If these items were included the gross margin per megalitre would be considerably different between the different irrigation treatments (Table 3).

Conclusions

The full soil moisture profile that occurs after rice provides a significant resource for the following wheat crop, which can be successfully grown on a reduced number of irrigations. But good layouts are critical to achieving high wheat grain yields following rice, as any period of extended waterlogging will greatly reduce yield. It is important that the field is not bogged up during rice harvest and that stubble burning or removal and wheat sowing are conducted in a timely manner to get the wheat established before the weather gets cold, and possibly very wet.

Two spring irrigations timed to ensure moisture is available during the critical flowering period provided the best economic returns in a season with average to below average winter/spring rainfall. In wet seasons, fewer irrigations may be required but in drier seasons three irrigations may be necessary.

After a rice crop there is very little nitrogen remaining in the soil and to achieve a high yielding wheat crop, with good grain protein levels, considerable nitrogen fertiliser needs to be applied at both sowing and mid-season.

Acknowledgements

This research was funded by the Australian Centre for International Agricultural Research (ACIAR) and NSW Department of Primary Industries. Competent technical support by Tina Dunn, Craig Hodges and Chris Dawe has contributed significantly to the success of this project.

Further information

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Table 2. Wheat growth, grain yield, water use and grain quality results and wheat grade achieved

Treatment Irrigation No.	Topdressed nitrogen (kg N/ha)	Grain yield (t/ha)	Water use (rain+irrig.) (ML/ha)	Water productivity (t/ML)	Grain protein %	Test weight (kg/hL)	Screenings < 2 mm%	Wheat grade
Zero	Zero	4.5	2.0	2.3	9.6	84	0.3	ASWI
	50	6.3		3.2	9.5	84	0.5	ASWI
	150	6.6		3.4	11.8	85	0.5	H2
	200	6.8		3.5	12.6	85	0.8	H2
1 irrigation	Zero	4.0	2.9	1.4	9.1	83	0.5	ASWI
	50	6.0		2.1	9.5	83	0.8	ASWI
	150	7.2		2.6	11.7	86	1.3	H2
	200	7.4		2.6	12.4	86	0.4	H2
2 irrigations	Zero	4.1	3.8	1.1	8.9	82	1.0	ASWI
	50	6.4		1.7	9.8	84	1.0	ASWI
	150	7.4		1.9	11.9	85	1.0	H2
	200	8.0		2.1	12.8	85	0.5	H2
4 irrigations	Zero	4.7	5.1	0.9	9.1	82	0.8	ASWI
	50	6.3		1.2	9.6	82	1.1	ASWI
	150	7.5		1.5	11.6	84	1.1	H2
	200	7.9		1.5	12.4	84	0.9	H2
lsd (P<0.05)		0.55	0.2	0.15	0.72	n.s.	n.s.	na

Table 3. Gross margin analysis of the four irrigation treatments using the 200 kg N/ha topdressed nitrogen rate which achieved the highest grain yield for each treatment

Treatment	Zero irrigation	1 irrigation	2 irrigations	4 irrigations
Price $/t	$264/t	$264/t	$264/t	$264/t
Grade	H2	H2	H2	H2
Yield (t/ha)	6.8	7.4	8.0	7.9
Total income ($/ha) (A)	**1795**	**1954**	**2112**	**2086**
Variable costs				
Sowing + seed + treatment ($/ha)	81	81	81	81
Fertiliser, DAP + Urea ($/ha)	383	383	383	383
Herbicide, Ally + spraying ($/ha)	12	12	12	12
Contract harvest & bin ($/ha)	105	114	122	121
Cartage ($/ha)	95	104	112	111
Levies & insurance ($/ha)	59	64	70	69
Irrigation* @ $13.27/ML ($/ha)	0	12	24	41
Total variable costs ($/ha) (B)	**736**	**770**	**803**	**817**
Gross margin/ha ($/ha) (A-B)	**1060**	**1184**	**1309**	**1269**
Gross margin/ML ($/ML)**	**530**	**408**	**344**	**249**

* Variable costs only, fixed costs of irrigation not included;
** rain + irrigation

IRRIGATED WHEAT WATERING DECISIONS

John Lacy
John Lacy Consulting, Finley

QUICK TAKE

- Eastern Murray Valley irrigation farmers spread limited water over winter crops rather than using all the water on a few high yielding crops, e.g. 8-tonne irrigated wheat.
- In 2012, wet subsoils led to most farmers irrigating in spring only but in the dry 2013 season, there was a split between 'pre-irrigation (or watering up) and spring irrigation' versus 'spring irrigation only'.
- In 2012, there was little difference in yield and water use efficiency (WUE) between the 'pre-irrigation and spring irrigation' and 'spring irrigation only' strategies.
- In 2013, the 'pre-irrigation and spring irrigation' strategy had only a slight yield advantage at a cost of an extra 1.0 ML/ha over the 'spring irrigation only' strategy, which had much better WUE.

Eastern Murray Valley irrigation farmers have more land than water with a low water intensity of about 2.3 ML/ha. Depending on annual water allocations, farmers make decisions on what crops to grow and irrigate to maximise farm incomes and farm profits.

For most farmers, the crop (pasture) and irrigation choice has always been a trade-off between how much rice and winter crops to grow and how much water is available. Annually this varies according to prices and allocations. With limited water, farmers make winter crop irrigation decisions to maximise farm productivity and profit, such as whether to pre-irrigate (water up) in autumn or to apply 1–2 spring irrigations each season. Although many farmers practiced intensive irrigation with the 8-tonne and 10-tonne irrigated wheat clubs, developed by the author, limited water availability in the last decade has led to farmers using lower risk irrigation management strategies, such as spreading irrigations over most of their winter crops. This strategy is believed to maximise farm profitability rather than the option of using all the allotted winter crop water on fewer high potential crops, and leaving the rest unirrigated.

The water allocated to winter crops is balanced against water required for rice. The reliability of rice yields and income, high income per hectare, rotation benefits and excellent SunRice marketing, have led to farmers always prioritising water for rice in rotation with winter crops.

The 2012 and 2013 winter cropping seasons led to much debate on the irrigation strategies to maximise productivity and water use efficiency. The discussion focussed on three strategies:

- pre-irrigation and 1–2 spring irrigations
- pre-irrigation and no spring irrigation
- no pre-irrigation and 1–3 spring irrigations.

The Finley Discussion Groups benchmark irrigated wheat crops, allowing farmers to compare their practices, yields, WUE (water use efficiency) and water management. The results from the higher yielding and more WUE crops are used to identify practices to lift the productivity and profitability of the entire group. The results can be used to compare the results from the three irrigation strategies. The WUE was calculated using fallow November–March rainfall x 0.3, plus April to October rainfall, less 80 mm evaporation, and irrigation water use added.

The 2012 season

The 2012 season had a very wet January to March period with about 240 mm rain providing excellent subsoil moisture. This explains why only seven wheat crops were pre-watered and why most crops were only spring irrigated (Table 1). The autumn months were very dry with July to October growing season rainfall below to average.

Results

The results show that the 'pre-irrigation and spring irrigation' strategy had a slightly higher yield than other irrigation strategies. The pre-irrigation wetted up the very dry topsoil in April, allowing earlier and on-time sowing. The 'spring irrigations only' strategy

had slightly lower yield with similar WUE to the 'pre-irrigation and spring irrigations' strategy.

2013 season

In contrast to 2012, the fallow period had very low rainfall so by sowing time there was little subsoil moisture. At group meetings during the season, soil moisture probes in dryland crops never detected good moisture below 45 cm. Sowing moisture from May to July was excellent, however with a low rainfall in the last three months of the growing season, the finish was poor.

The dry autumn led to 50% crops being pre-irrigated (or watered up) to ensure good subsoil moisture for winter and early spring, until crops were ready for irrigating in early spring.

Results

The yield response with 'pre-irrigation and spring irrigations' was small compared with crops with 'spring irrigations only' (Table 2). The small yield advantage would surprise many farmers who historically have pre-irrigated or watered up, however the good rainfall at sowing allowed excellent crop establishment and growth through winter for all three strategies, but particularly benefiting the 'spring irrigation only' strategy. Low winter rainfall would have given more advantage to the pre-irrigated crops. The slightly higher yield and higher water use of the 'pre-irrigation and spring irrigation' crops needs to be balanced with the slightly lower yield and higher WUE of the 'spring irrigations only' strategy. The good 'spring irrigation only' yield has been in part due to many farmers using soil moisture sensors enabling timely irrigations and high yield response. In August this timing coincided with access to off-allocation water, which most farmers used.

The results show the 0.3 t/ha response of the 'pre-irrigation only' strategy is worth $74/ha, at a water cost of $30/ha for an extra 1.0 ML/ha, which is profitable. This compares to the 'spring irrigations only' strategy saving of 1.0 ML water, which can be used for an extra irrigation where responses of 0.8–1.0 t/ha, i.e. $196–245/ha are expected.

2014 season

In 2014, at the time of writing in March, there has been patchy rain but most subsoils are relatively dry. There is a lot of uncertainty about rainfall predictions and sowing rains for the optimum mid-April to mid-May sowing window. A strategy that farmers could use is pre-irrigate flatter layouts, i.e. 1:2000–3000, which are risky to water in spring, and then sow. Some paddocks with good layouts could be pre-irrigated in early to mid-April and then sown, guaranteeing these crops get away well. If it rains on time, the other paddocks can be sown and irrigation water saved for spring irrigations.

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With limited water availability, farmers must decide whether to pre-irrigate (water up) in autumn or to apply 1–2 spring irrigations each season.

Table 1. Wheat irrigation strategies for 2012

	Pre-irrigation and spring irrigations	Pre-irrigation only	Spring irrigations only
No. crops	7	1	27
Yield (t/ha)	5.1	4.2	4.7
Pre-irrigation water use (mm/ha)	66	60	
Spring irrigation water use (mm/ha)	150		165
Total irrigation water use (mm/ha)	215	60	165
WUE (kg/mm)	13.8	22.1	14.7

Table 2. Wheat irrigation strategies for 2013

	Pre-irrigation and spring irrigations	Pre-irrigation only	Spring irrigations only
No. crops	16	2	15
Yield (t/ha)	5.1	5.1	4.8
Pre-irrigation water use (mm/ha)	105	100	
Spring water use (mm/ha)	163		160
Total irrigation water use (mm/ha)	268	100	160
WUE (kg/mm)	11.6	18	15.1

IRRIGATED MILLING OATS SET TO ROLL

Trevor Bray
Manager Grain Accumulation & Crop Agronomy, UniGrain Pty Ltd

QUICK TAKE

- The demand for high quality milling oats is growing due to renewed consumer interest in oats for their nutritional and health benefits.
- Oats provide an excellent rotation option for irrigators of the Murrumbidgee and Murray valleys, especially following a rice crop.
- Oats withstand waterlogged conditions better and generally grow well with less inputs than other winter crops.

The humble oat has seen a rebirth in recent years due to growing worldwide awareness of its great nutritional and health benefits. At the same time, Australia has gained a worldwide reputation as a producer of high-quality milling oats for overseas and domestic markets.

Australia produces on average 1.3 million tonnes of oats per year, with a large proportion processed domestically and up to 20% exported as grain. Australia is the fourth largest global exporter of oats after Canada, Finland and Sweden. Western Australia is the largest oat exporting state in Australia, and oats produced in New South Wales and Victoria are predominantly processed domestically.

Australian oats are bright and plump, with low admixture and the varieties grown have been developed for flavour and aroma when processed, as well as for their high milling yield, high hectolitre weight, low screenings and high groat percentage (Table 1).

Research into specialisation of end uses and the development of value-added products and functional foods using the oat kernel will also expand opportunities for the oat industry. One oat mill in Victoria is using oat hulls in stockfeed pellet manufacture, which enables high energy levels and good roughage for ruminant animal diets.

Reliable

The ability of oats to withstand waterlogged conditions better than other cereals makes them well suited to cropping systems in high rainfall regions and on flood irrigation, particularly following rice. In 2013, oats once again showed their tolerance to frost, compared with other cereals in some regions of Victoria and southern NSW.

In the past, oats have been looked on as the poor cousin of other cereals, requiring low inputs and little management. The new higher-yielding, dwarf milling-oat varieties however, will require more careful consideration.

The ideal population for milling oats is around 240 plants/m^2, which may equate to 100 kg/ha of seed but varieties will differ and sowing rates need to be calculated individually. If the sowing rate is too high, high screenings may result, and too low can reduce yield potential.

Table 1. Typical quality characteristics of Australian milling oats

Quality parameter	Average range
Hectolitre weight (kg/hL)	52–56
Moisture (%)	9.0–10.5
Grain brightness	56–65
Protein (%)	9–12
Beta-glucan (db)	4.5–5.5
Groat (%)	70–78
Milling yield	64–66

Source: Australian Export Grains Innovation Centre

Oats require adequate fertiliser at sowing. As a general guide, a 6.0 t/ha crop will remove 15 kg/ha of phosphorus, 120 kg/ha of nitrogen, 18 kg/ha of potassium, and 24 kg/ha of sulphur.

As phosphorus is often tied up in the soil following rice, rates of 20–30 kg/ha of phosphorus in the starter fertiliser are needed. Nitrogen application can range from 40 to 80 kg/ha relative to projected yield, rainfall and planned spring watering. Dwarf varieties like Mitika have a higher nitrogen requirement than other varieties and the application rate should be increased by about 20%. Plant emergence can be reduced if urea is drilled too close to the seed, generally at rates higher than 30 kg N/ha. Split nitrogen applications or all nitrogen top-dressed at early to mid-tillering, prior to a rain event, is the preferred nitrogen application option.

Micro-nutrients (or trace elements) such as zinc, manganese and copper are an important part of total nutrient management, particularly following a rice crop. A plant tissue test can detect any nutrient deficiencies that may need to be addressed, particularly when applying high rates of nitrogen to maximise yields.

New oat varieties have varying resistance to leaf rust and it is good insurance to plan on at least one fungicide application at growth stage 32, and preferably a second application at GS 59. Common fungicide options are available for soil-applied fungicide (with fertiliser) or fungicide applied as a foliar spray.

Once the crop ripens and dries evenly (to less than 12% moisture) direct harvesting is the most economical way to harvest oats. The new varieties thresh easily, so don't hit them too hard.

Oats in the Riverina

The security of irrigated oat production and the high quality of oats produced from the irrigation areas of the Murrumbidgee and Murray valleys is attracting premiums and great interest from processors. Oat receival sites have been established in the MIA, CIA and Murray Valley in recent years and hectare contracts are being offered to encourage more production.

The National Oat Breeding Program has also supported the expansion of oats onto irrigation with the first National Variety Trial (NVT) irrigated oat evaluation at Yanco NSW in 2013 (Figure 1). While oat yields may not be comparable to wheat, cost inputs for fertiliser are usually less.

Oats can withstand waterlogged conditions more than other cereals, making them well suited to flood irrigation systems, and as a crop to follow rice.

Some Riverina irrigators have grown oats for decades, finding the crop a consistent performer and requiring low inputs relative to other cereal crops.

Australia has gained a worldwide reputation as a producer of high-quality milling oats for overseas and domestic markets.

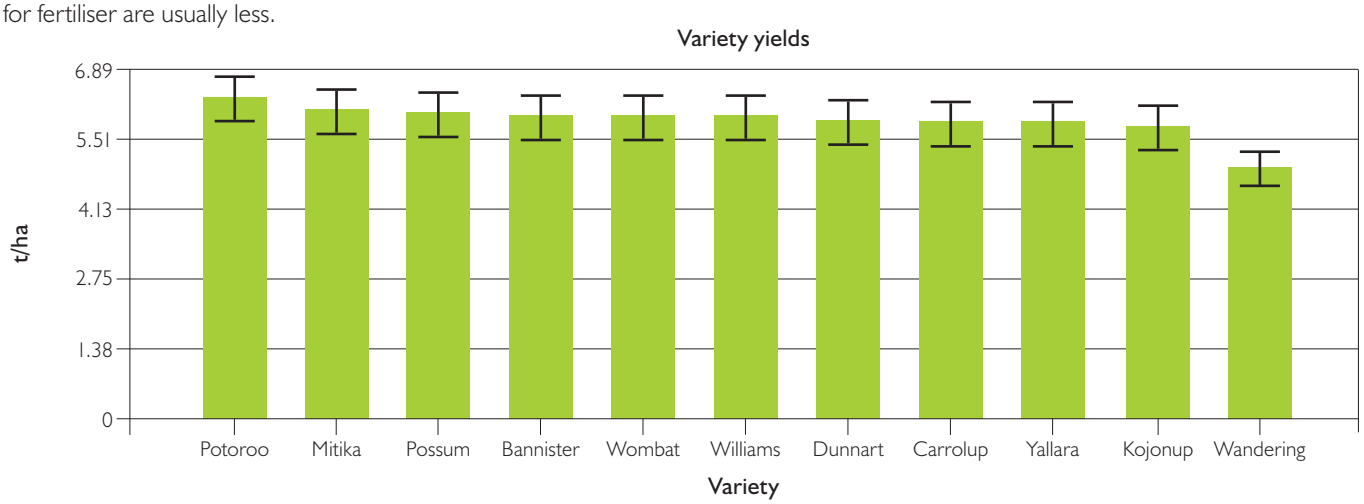

***Figure 1**. Yield results of an oat variety trial conducted at Yanco in 2013. Source: National Variety Trials website www.nvtonline.com.au*

While consumer interest in oats may be renewed, some families have been growing oats under irrigation for decades.

Good rotation fit

Colin and Ian Bryce have grown oats at Finley in the Murray Valley for 30 years. In their experience, oats have a really good fit after rice, particularly after an early maturing rice variety such as Sherpa, or other varieties that are sown early (but within in their sowing window). Early varieties can be harvested while conditions are dry, reducing the risk of wheel tracks after harvest, and enabling a uniform field surface for the oat crop.

The Bryces have 666 ha over three properties, which are mostly irrigated. Their cropping sequence starts with two rice crops and then Mitika oats are direct drilled into rice stubble in May, using an RFM seeder with knifepoints. They also drill oats into pasture paddocks in early autumn, for grazing when they take lambs off rice banks prior to harvest. Two wheat crops follow the oats on what is often weed-free country and the second crop is undersown with sub clover. The pasture will continue for three years for grazing and to finish up to 1500 store lambs from April to July, which are brought in based on available feed and hay produced.

Colin likes growing oats because the crop has relatively low inputs due to the weed- and disease-free field conditions after rice. Therefore herbicides or fungicide applications, other than a seed dressing for smuts and bunts, are not required. The Bryces sow 100 kg/ha of seed with 150 kg/ha of DAP, and at early tillering the crop is top-dressed with 125–150 kg/ha of urea. In-crop rainfall dictates whether a spring irrigation is required, as Mitika is a very early-maturing variety. Yields are budgeted at around 5.0 t/ha, relative to the season and in most instances, the oats make prime milling quality and attract bonuses when delivered locally to Deniliquin. Mitika is a preferred milling variety because the grain has a low lignin content, making the grain also suitable for feed for sheep, cattle and horses.

Low input crop

David and Peter Tyrrell at Widgelli in the MIA have been growing milling oats for over two decades. The Tyrrells have a strong cropping focus, growing rice, oats, wheat, barley and canola on 1400 acres of irrigation. They follow two rice crops with Mitika oats, sown with an RFM seeder but they also use a combine with narrow rows if weed competition is likely to be a problem or if the paddock is damp and timely sowing could be an issue. The Tyrrells often follow oats with two barley crops and the second crop is undersown with sub clover to support the 350 ewes and lambs and 50 cattle they run.

The Tyrrells usually grow 160 hectares of milling oats that is contracted for local delivery. Fertiliser applications involve 80–100 kg/ha of MAP and 100–150 kg/ha of urea at tillering stage. They do not use herbicides and apply one propaconazole fungicide at mid-tillering, as a leaf rust preventative.

They aim for a yield of 5.0 t/ha or greater and budget on one spring irrigation, which is not always required. They trialled a new milling oat variety last year named Williams but its longer maturity required two spring irrigations, compared with one for Mitika, and there was no yield advantage.

David and Peter have found oats to be a consistent performer over many years and the crop requires relatively low inputs for reasonable returns. Their farm is close to a receival site that allows them to deliver the grain at harvest, providing handling and marketing advantages.

Viable new option

The opening of an oat receival centre at Coleambally, combined with the assurance of a minimum price contract for all their production and a fixed tonnage bonus, was good incentive for Trevor and Lesley Lashbrook to start growing oats again in 2013.

Trevor and Lesley grew oats on 40 hectares following a rotation of rice–wheat–rice. Mitika oats were sod seeded into burnt stubble in mid-May at 70 kg/ha of seed with 185 kg/ha of DAP, and the crop was topdressed with 185 kg/ha of urea. Herbicides were applied to control ryegrass and broadleaf weeds.

The crop was watered 26 August and yielded 5.25 t/ha. The fixed tonnage bonus of $15 per tonne more than covered the cost of their urea application to the crop.

Another 20 ha paddock of oats was watered 17 September and that yielded 4.0 t/ha. The second paddock was in grass pasture for ten years prior to one rice crop and had a broadleaf herbicide application.

Promising outlook

Oats have been an integral part of irrigated cropping programs for many irrigators for many years. Not just for their profitability as milling oats, but also because of the rotational benefits and versatility of the crop for grain, grazing and hay for livestock. It is envisaged that irrigation oat production will increase with stable prices and convenience of harvest delivery. There is a new high yielding variety named Bannister that will be commercially available in 2015 and will be evaluated in large-scale trials in all irrigation areas in 2014, along with specific irrigated oat agronomy trials to look at nutrition, moisture testing and seeding rates.

Further information

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Further reading

General information about oats in this article has been sourced from Oats: Australian grain notes published by Australian Export Grains Innovation Centre, www.aegic.org.au/media/17506/aegic_oats_final.pdf, accessed March 2014.

BEANS, BEANS AND MORE IRRIGATED FABA BEANS

Mary Raynes
Industry Development Manager (southern), Pulse Australia

QUICK TAKE

- Faba beans have earned a place in Australia's southern irrigated production systems. Grown with sound agronomic practices developed over 20–30 years, well-managed irrigated crops can yield 5.0–6.0 t/ha.
- There is room in both export and domestic markets for expansion of faba bean production, and the irrigation areas of the Murray and Murrumbidgee valleys are well placed to meet increased demand.
- Faba beans are a good rotation option, enabling use of different herbicides products, compared with those used in cereal crops, and providing a pest and disease break in the farming system.

The Australian market has room for more faba beans, and growers in the Murray and Murrumbidgee irrigation areas are in a prime position to meet the demand.

An expansion of the faba bean growing area by 12,500 ha could raise production to around 50,000 tonnes per year, based on a conservative average yield of 3.5 t/ha. The total area considered suitable for irrigated faba bean production is 15,000 ha (10,000 ha in the Murrumbidgee Valley and 5000 ha in the Murray Valley), however the highest area sown since 1993 was around 10,000 ha in 2005 and in 2012 it was down to 2450 ha.

Sodic subsoils in the Deniliquin, Moulamein and Swan Hill districts are a limiting factor for production in the Murray Valley. These soils are not suited to a bed farming system, which is the preferred method of growing irrigated faba beans to avoid waterlogging problems.

While the human consumption grade of the market offers the highest price per tonne, having an outlet for grain that does not make this grade has made faba bean production a more viable option for irrigators. The human consumption market for high quality grain often escalates due to low supply from other countries and most growers would aim to produce No. 1 grade grain.

A recent development in aquaculture feed rations has seen a reduction in fish meal in preference for more vegetable protein. Up to 25% of aquaculture rations are now made up of pulses, both lupins and faba beans. Lupins provide the main source of protein while faba beans are replacing wheat to provide the 'glue' that holds the pellets together. This has the added advantage of increasing the protein content of the ration. The current demand for faba beans in aquaculture rations is 1000 tonnes per month and all grades are suitable. The beans are dehulled at the Croker Grain facility at Cootamundra and milled to 2–4 mm.

Best practice

Soil type and appropriate management are the major determining factors for faba bean production success in the Murray and Murrumbidgee irrigation areas. Grey self-mulching clays that usually grow 7–8 t/ha wheat crops can produce 5–6 t/ha faba bean crops. On red soils, irrigation practice such as eight hours on/off and the application of gypsum is important. Production on land with sodic subsoils is generally not recommended.

As a legume crop, growers can expect a nitrogen benefit from faba beans of 50–80 kg N/ha over time, however there is a lack of research data to show how long the fixed nitrogen may last.

Herbicide resistance is becoming an increasingly important factor in crop choice decisions and faba beans present an opportunity for growers to use herbicides other than glyphosate to control weeds. Being a row crop also allows for inter-row cultivation, which is not an option with wheat.

Two typical rotations for irrigated cropping are:

- canola–faba bean–cereal–long fallow–summer crop–cereal
- cotton–faba bean–wheat–wheat–maize or sorghum.

Sowing faba beans after a summer crop such as cotton or maize is a good fit, especially in double cropping systems. When sowing after cotton, soil cultivation to expose helicoverpa (heliothis) pupae within two weeks of harvesting cotton is essential. As a result of cultivation, it will be necessary to re-form and roll the beds prior to wetting up in preparation for planting. After maize, no-till planting is recommended.

Experience overcomes risk

Faba beans have a reputation for being a risky proposition but this reputation is not really justified. The 30–50 growers in the Murray and Murrumbidgee irrigation areas who have consistently grown faba beans across a range of seasons in the last 20 or 30 years have developed agronomic practices that remove much of the risk. To be sure, inexperienced growers may face some difficulties but these are not insurmountable and generally, there is good advice available.

Irrigation to support crop establishment is essential. Faba beans can be sown deep (up to 8 cm) and have a vigorous seedling growth provided the soil is well-drained and moist at sowing. The optimum sowing window is mid-April to mid-May and the recommended plant population is 20–35 plants/m^2.

Control of foliar fungal diseases through extended wet periods in spring requires vigilance and planned action. Experienced growers have a planned fungicide program and monitor predicted rainfall fronts. The first protectant spray is required six weeks after emergence and is followed up with sprays prior to each predicted rainfall event, if there is any sign or risk of disease. Aerial application of fungicide is reasonably common practice, does not damage the crop and is effective.

Broadleaf weed management is essential. Pre-emergent herbicides are recommended and post-emergent herbicides for grass weeds are recommended six weeks after emergence. Working with an experienced and knowledgeable agronomist or consultant is advisable to determine the best use of herbicides to gain effective control while reducing the risk of herbicide resistance.

Irrigation is essential before or immediately after planting and throughout spring when the crop is setting and filling pods. Moisture stress at these times will limit production. Water will be required in April or early May, mid-August, mid-September and early October. The last irrigation should coincide with the crop turning colour, so that there is sufficient moisture for the crop to reach physiological maturity without moisture stress.

General nutrition practice is required with special attention to the availability of phosphorus if faba beans are sown in paddocks previously used to grow rice. Phosphorus can be tied up in the soil under the anaerobic conditions of the rice crop, and may not be released quickly enough to meet the needs of the next crop.

Weekly inspections for caterpillar pests are recommended once flowering has begun, and are essential throughout podding. Grub damage to pods, especially by helicoverpa, will limit yield, affect grain quality and cause significant financial loss.

Mary Raynes, Pulse Australia industry development manager, is encouraging growers in the Murrumbidgee and Murray irrigation areas to consider faba beans in their crop rotations.

Irrigated faba beans are proven performers in the Murrumbidgee and Murray irrigation areas, provided attention is given to paddock selection, irrigation layout and timing, and careful monitoring for pests and diseases. Photo: Trevor Bray

Weekly inspection for caterpillar pests is recommended from flowering onwards and is essential throughout podding. Pests such as helicoverpa can cause significant yield losses and badly affect grain quality.

Harvest usually occurs in late November or early December. Flexible pick-up fronts on the header will reduce the harvest losses significantly compared to the 10–15% often seen when conventional header fronts are used.

Do's and Don'ts from experienced growers

- Check that the pH of the soil is above 5.2 ($CaCl_2$).
- Don't plant faba beans into paddocks that have recently been landformed.
- Be prepared to apply gypsum and fertiliser if the soil fertility is marginal.
- Faba beans are sensitive to herbicide damage, so ensure boom spray equipment is triple rinsed before spraying fungicides in faba beans.
- Always inoculate faba been seed with Group F rhizobia.
- Calibrate the seeder after inoculating the seed to establish at least 20 plants/m^2.
- Water-up the beds one or two weeks before planting if possible or irrigate immediately after planting.
- Correct irrigation layout is essential—waterlogging can be a problem on a contour layout.
- Monitor for chocolate spot and ascochyta blight throughout the season and with increased frequency once flowering begins.
- Be prepared to apply two or three fungicide sprays as temperature and humidity rise.
- Aerial spraying of fungicides is successful and does not damage the crop.
- Lodging can be a problem, particularly when faba beans are grown on beds—at harvest it can be difficult to pick up stems from the furrow. To minimise losses, harvest lodged crops in one direction only.
- Protect stored faba beans from insect infestation.

Further information

Fiesta VF is the recommended variety for the Murrumbidgee and Murray irrigation areas. The Fiesta VF Variety Management Package (VMP) provides specific management recommendations and can be found on the Pulse Australia website www.pulseaus.com.au. The direct link is:

www.pulseaus.com.au/pdf/Fiesta%20VF%20VMP.pdf.

Pulse Australia's flagship publication, *Pulse Update Annual*, is now available online and provides information about new pulse varieties and recent research findings. To access please follow this link:

www.issuu.com/cabenjamin/docs/pulseupdateannual2014_744879fcd75e56

Pulse Australia coordinates the Best Practice Management workshops for pulse growers and advisors. Faba bean workshops held in April 2014 will provide participants with access to the latest research and field experience. Growers are encouraged to attend these workshops themselves or to engage agronomists who have completed the workshop.

To register your interest in these or future workshops, please contact:

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Acknowledgement

The author wishes to thank John Sykes, NSW DPI, for his contribution to this article.

SWITCHING FROM RICE TO ROW CROPS USING BEDS IN BAYS

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Geoff Beecher

Research Agronomist, NSW Department of Primary Industries, Yanco

QUICK TAKE

- Ease of water management and labour savings have led to many row crops now being grown on beds in bankless channel layouts rather than on traditional siphon layouts.
- Growing a row crop in the season after a rice crop can result in poor crop growth because of several factors—especially due to rice stubble disorder.
- To ensure a good result when converting from rice to row crops, plan the conversion over about 18 months to properly dry out the soil profile, adjust soil pH (if necessary) and ensure that the soil is aerated.

Careful management is needed if row crops are to be established after rice crops, It will take about 18 months for the soil to be suitable for row crops after the conversion of rice layouts to a beds in bays layout.

In southern New South Wales, there has been considerable interest in bankless channel layouts for irrigation, i.e. a field of stepped bays with water being supplied to the field by a bankless channel at the head of each bay. Conversion to this new layout has been driven by the ease of water management and labour savings, particularly compared with traditional siphon layouts for row cropping.

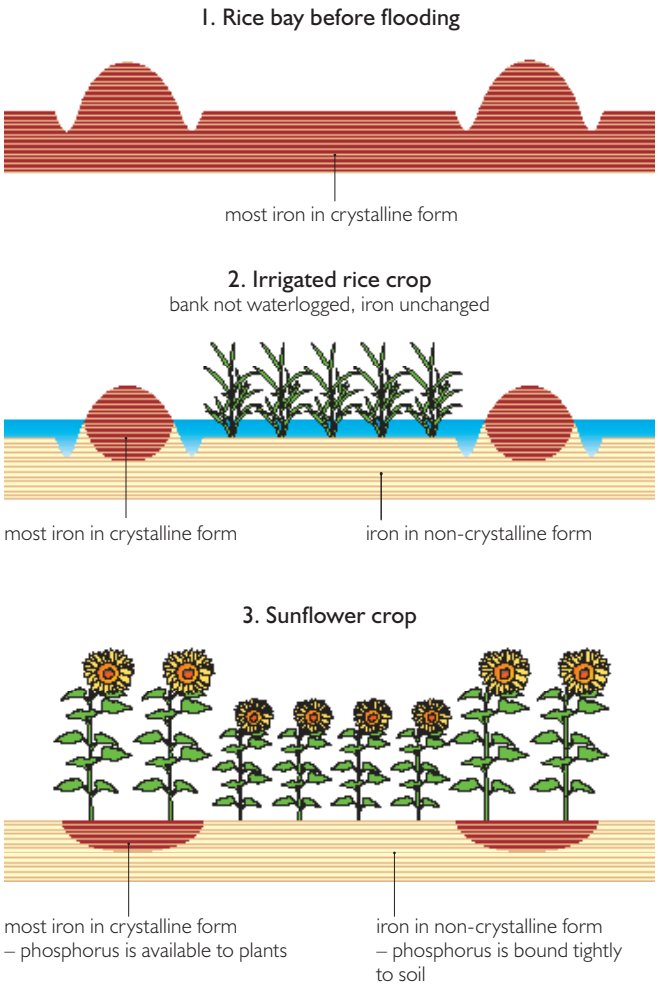
Bankless channel layouts have evolved over the past 15 years and there are now quite a few innovations and variations, in terms of bay size and configuration, delivery (top and side) and automation of water delivery between bays. These variations have been developed to suit individual paddocks and the flow capacity of individual farms.

The bankless channel layouts are also providing cropping irrigators the opportunity to switch between rice and row crops, without wholesale reworking of irrigation layouts.

The 'beds in bays' concept enables row crops to be grown on the same layouts used for rice growing (or land that has been set-up for border check irrigation). Rice-growing soils, particularly, have a lower subbing capacity, i.e. soils that are less likely to allow lateral movement of water, therefore the beds in bays layout enables better water management for row crops on these soil types.

Innovation and variations on bankless channel layouts have been made over 15 years to suit individual farms, water delivery rates and labour resources. Photo: Iva Quarisa

Poor growth of a summer crop planted after rice into a reworked contour layout. Rice stubble disorder was identified as the cause. This photo was taken in the 1970s by Warren Muirhead.



***1**. Most of the iron oxides in the soil are in the crystalline form before the rice bay is flooded. **2**. During the rice crop most of the iron in the bays goes into solution but the iron in the bank remains in the crystalline form. **3**. When the bays are drained, soil iron changes to the non-crystalline form that tightly binds phosphorus.* Diagram and caption adapted from an article by Warren Muirhead 'Rice stubble disorder', *Ricemill News, June 1981.*

While there are logistical advantages of growing row crops on beds in rice layouts, there are some soil chemistry issues to take into consideration—rice stubble disorder, in particular.

Rice stubble disorder

Research during the 1970s and 80s highlighted a problem known as rice stubble disorder. The work reported by scientist Dr. Warren Muirhead, based at the Griffith CSIRO laboratory, showed that after a rice crop, soil phosphorus is less available to subsequent crops. This is because re-aeration of the rice field after flooding causes phosphorus to become tightly bound to non-crystalline forms of iron oxides; whereas in soils that remain aerated, phosphorus is bound to crystalline iron oxide and is readily available to plants.

Crops affected by rice stubble disorder include maize, cotton, sunflowers, sorghum, canola and faba beans. Soybeans are affected to a lesser extent than other summer crops, and winter cereals generally are not affected at all.

Rice stubble disorder (also called phosphorus tie-up) is most clearly observed when the irrigation layout is redesigned after rice. Crop growth on old bank lines (where the soil remained aerated) is unaffected, whereas crop growth in the main parts of the field is poor.

Cotton after rice

Rice fields are selected due to the heavy impermeable nature of their soil types, and in many cases these soils have low pH values. This is in contrast to row crops such as cotton and maize that require good drainage and have pH requirements in the range of 5.5 to 7.0 ($CaCl_2$). In many cases, the soil characteristics of typical rice paddocks may not translate to good soils for row crops.

A number of cotton crops in the 2013–14 season have had poor growth if rice was grown as the previous crop in the paddock. Leaf and soil tests have confirmed low phosphorus levels in the soil and in the cotton plants. The pH levels ($CaCl_2$) were in the range of 4.4–4.7, which is too low for row crops.

There are other factors at play that will cause poor growth of row crops on rice soils, and these need further investigation.

Soil compaction restricts root growth in row crops and the paddock will need deep ripping to open up compaction layers. All farming systems will cause soil compaction, especially when there is a combination of wet soils and heavy harvesting machinery.

Alleopathy, where chemicals exuded from the previous crop impede germination and growth of a subsequent crop, could be part of the cause. In addition, crops such as cotton have a high dependency on vesicular arbuscular mycorrhizal (VAM) fungi for good growth, VAM levels would be lower when the field initially comes out of the rice system. At low levels of available phosphorus, the dependence of cotton on VAM to access phosphorus is increased.

Plan the conversion

If row crops are to be established after a rice-based rotation, careful management is needed.

A number of cotton crops in the 2013–14 season had poor growth where rice was the previous crop. The photo shows the contrast of cotton growth on areas did (bottom right) and did not (top left) grow rice in the previous year. Photo: Kieran O'Keeffe

It will take about 18 months for the conversion of rice layouts to beds in bays layout to be successful. The soil profile will need to be dried out and aerated after rice. It is common practice to grow a cereal crop immediately after rice, and not water it fully so the soil profile dries down.

After the cereal crop is harvested, landforming should be undertaken over the summer months. Soil tests will indicate if pH needs to be adjusted using the appropriate rate of lime. Common practice in past conversions is to apply high rates of poultry manure and in some cases up to double rates of phosphorus to overcome the short-term phosphorus tie-up issue.

The 18-month timeframe allows more time for residues to breakdown and soil biology to come back into balance.

Growers considering the conversion of fields to row cropping out of previous rice rotations, should consult with a crop advisor. The conversion will need to be a staged and well-managed process to get a good result with the first row crop.

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THE VALUE OF BREAK CROPS IN ROTATIONS

Deanna Lush
GRDC Southern Region Science Writer

QUICK TAKE

- A trial managed by the Irrigated Cropping Council at Kerang is investigating the benefits and disadvantages of different crop sequences.
- While successive years of canola is the most profitable rotation, weed and disease impacts limit the longevity of not only the rotation, but also of the variety being grown. Weed and disease issues also were significant after four years of wheat.
- A rotation of canola,barley, wheat and faba beans is not too far behind the canola-heavy rotations in terms of gross margin and it does not have the disease and weed burden.

Outlining the pros and cons of break crops and an improved rationale for growers to plan their crop rotations, is the aim of a GRDC-funded crop sequencing project.

The project is managed by the CSIRO and covers south-eastern Australia, but the Irrigated Cropping Council (ICC) has been running an irrigation component since 2010 near Kerang. Similar crop sequence projects are being run by farming systems groups in other regions.

The project started with 40 m x 45 m blocks of canola, wheat and faba beans in 2010. These were sown in 2011 with wheat, canola (which failed and was left as fallow), barley and faba beans, and again as strips in 2012 to create 40, three-year rotations of each crop sequence.

In 2013, strips of the same crops types were sown at 90-degrees to the previous year's plots, again giving all crop types in all sequences of rotations. Commander barley, 46Y83 canola, Fiesta faba beans and Derrimut wheat were sown across these strips, creating small plot trials (1.5 m x 1.5 m).

140 crop sequences tested

The crop sequences ended up giving 140 different rotation combinations in every possible order of wheat, barley, canola and faba bean, in replicated plots. These were assessed for disease issues and the stand-out problem was crown rot in the cereal-on-cereal rotations.

ICC's Damian Jones said crown rot had not been prevalent in the trial before 2013. In 2011 and 2012 there were dry winters but with wet conditions in mid-June and July of 2013, the disease had appeared.

"Based on the trial observations, it seemed to only take one season out of a cereal to reduce the amount of crown rot inoculum," Damian said.

"The break crop effect lasted for two years of cereals then crown rot became an issue again."

Damian said weeds became an issue where four years of cereals were grown, creating a large resistant ryegrass population.

"Four years of cereals in a row put pressure on Group A herbicides and by the end of the trial, ryegrass resistance had flourished. This was most noticeable in the cereal-on-cereal plots. Imidazolinone-tolerant canola certainly gave us another option to control both ryegrass and amsinckia. The usual culprit of prickly lettuce in faba bean highlighted concerns about the limited broadleaf weed control in the crop."

In 2014, the trial will look at the effect of faba bean on subsequent crops.

"We have seen in some work that faba bean has had a positive effect on nitrogen balance and it seems to have a positive effect on wheat, in that a better quality, higher protein grain is produced, rather than lifting protein with nitrogen fertiliser. In the third year of the trials, wheat went H2 where it was sown after the fabas, instead of APW."

A GRDC-funded trial involving 140 different rotations of canola, wheat, barley and faba bean is improving the understanding of best crop sequences for irrigated farming systems. Photo: Damian Jones

Profitable is not necessarily sustainable

The profitability of each crop rotation was calculated on an annual basis as well as the total over four years. While multiple years of canola featured prominently in what is most profitable, Damian says it would definitely not be the most profitable in the long-term and is not agronomically sound.

"Canola on canola will fall over fairly quickly, as will wheat on wheat. You will end up with weeds you can't control and disease you can't control," he said.

"Growing canola on canola will affect the longevity of the canola variety you are growing and the impacts that blackleg could have on your property.

"You can't base your rotation on making the most money per hectare. The rotational choice shouldn't simply be about money, it must consider the effects of one crop on the next year's crop."

However, the trial did show that a rotation featuring canola, barley, wheat and faba bean equally is not too far behind the canola-heavy rotations in terms of gross margin—and without the disease and weed burden.

The canola-barley-wheat-faba rotation achieved a $4826/ha gross margin (including machinery maintenance) which was only 4.9% behind the top rotation (Table 1).

For 2013, the best rotation was faba beans at 6.51 t/ha and $1836/ha or canola at 3.95 t/ha and $1777/ha. These follow barley in 2012, fallow in 2011 and wheat in 2010.

The worst rotations were wheat after barley (3.23 t/ha) or wheat on wheat (3.54 t/ha) because crown rot reduced yields. In comparison, average wheat yield after either canola or faba beans was 6.88 t/ha.

"The results highlight the contribution of a good canola crop to higher gross margins but it would be poor rotational practice to have canola on canola (in subsequent sequence)," Damian said.

"Faba bean features several times in the 'better' rotations and as well as being a disease break, like canola (leading to a more profitable sequence).

"Faba beans had a positive effect on the gross margins with a reduction in nitrogen inputs for the following crops and as highlighted in the 2012 wheat crops, improving the protein and gaining H2 classification."

Further information

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Table 1. The table shows the top five rotations by gross margin ($/ha). While multiple canola options achieved higher profitability, the gross margin result did not account for future disease issues.

2013 crop	2012 crop	2011 crop	2010 crop	2013 GM $/ha	2012 GM $/ha	2011 GM $/ha	2010 GM $/ha	4-year total ($/ha)
Canola	Canola	Fabas	Canola	1501	1611	450	1500	5062
Canola	Canola	Barley	Canola	1385	1370	668	1500	4923
Canola	Barley	Barley	Fabas	1480	1419	607	1360	4866
Barley	Canola	Barley	Fabas	1506	1370	607	1360	4843
Canola	Barley	Wheat	Fabas	1605	1411	450	1360	4826

Note: Gross margins calculated using an average harvest cash price over the four years for each commodity.

TAX – IS IT UNAVOIDABLE?

Michael Ryan
Principal Consultant, Booth Associates, Griffith

QUICK TAKE

- Businesses not making a profit are businesses going backwards.
- The businesses making a profit have to pay tax—tax is unavoidable.
- It is best business practice to minimise tax. Once all means are legitimately exhausted, tax considerations are largely based on timing of cash flow.
- Don't starve your business of cash.
- Interest rates may have bottomed out, so consider fixing a portion of your debt.

2013 was an outstanding year for grain growers in the western Riverina. The crops were early enough to avoid the frosts that severely impacted grain growers in the east, and a warm winter and good rainfall in September provided well-above average yields across a large area.

Many grain growers forward sold grain in 2013 for good prices. Prices at harvest (especially barley) were unattractive and a lot of grain sales were held over. Grain prices remain strong into 2014, providing good opportunities for the balance of crops to be sold. As a consequence of high yields and good prices, many growers are looking at the prospect of a profit in 2013–14.

Minimising profit

We all know profits mean tax! However, there are different ways of minimising profits such as deferring grain sales, using Farm Management Deposits, bringing forward operational expenses and purchasing capital items. Each of these strategies has their limitations.

Deferring grain sales until July 2014 exposes businesses to the risks of falling grain markets, creditor default and opportunity costs such as warehousing and interest of $5–$15/tonne.

Farm Management Deposits are a legitimate tax management option but interest rates are low and the money is locked away for set periods.

Bringing forward operational expenses, such as pre-purchasing fuel or fertiliser, is a sound option but there is a limit to how much expenditure can be brought forward.

The purchase of capital items is ineffective as they cannot be claimed as a 100% business deduction in the first year. So purchasing a capital item can impact on your cashflow but not assist in minimising your tax liability.

Irrigators may be able to bring forward expenditure on irrigation layouts, such as re-lasering, and claim a 100% deduction in same the year under the Income Tax Assessment Act (1997). This provides a worthy option for future planned works, but options are highly specific and will put pressure on cash flows. This could be a 'short-term pain for long-term gain' outcome, but don't starve your business of cash.

Paying tax

Every business has different circumstances, so individual specific tax advice is best sought from your accountant. In the first instance, carry-forward losses can be used to minimise profits and there other means such as trading through a company which allows for tax liabilities to be minimised. Beyond these legitimate strategies the message is simple "just pay the tax". Bankers desire to have their clients 'repair their balance sheets' when profits are made, in other words pay down debt. If you have no accumulated tax losses then debt can only be paid down post-tax.

I am not an accountant, so my apologies to all those in the profession as I attempt to provide a simple plain English summary!

Farming income varies year-to-year with seasons and markets, as do costs. Over time, if you make losses you can accrue those losses to offset future tax liabilities. If you have no accumulated

Upgrading your plant and equipment will not help minimise tax liabilities in the longer-term, and it can restrict your business of cash flow.

Capital expenditure on plant and infrastructure cannot be claimed as an operational expense to help minimise tax liabilities.

losses and make a profit, you will get a tax bill. If you defer income from one year to the next to minimise your tax liabilities, then all you are doing is deferring the time when the tax liability falls due. In other words, the timing of tax is a cashflow consideration and sooner or later you will get a tax bill. Businesses that record losses year-on-year will never pay tax, but they are going backwards. For a business to progress, it must make a profit and as a consequence will also have to pay tax. Tax is unavoidable.

If you make a profit and pay tax the next year, whilst also recording a loss, that loss can be carried forward to offset future tax liabilities. Tax losses can be accrued so the benefit is not lost by paying tax in any given year.

If you get a tax bill, you must have access to the cash when it falls due. Do not starve your business of cash. Your Financial Statements may not be lodged until March the year after the profit is made and your tax liability will be due before the end of the financial year. You may also be required to pay provisional tax, which means you may get taxed twice in the same year. If you make a loss in the second year, you will get the provisional tax refunded.

As only a portion of profit (for a company 30%) is required to be paid as tax, when you make the profit you should set aside your projected tax liability (as advised by your accountant) for access later. This will vary according to a business' specific situation and could be a variable loan with a redraw facility to reduce your short term or interest costs or a term deposit earning you interest.

Interest rates

The Australian interest rate market reflects the net pressures of world economic conditions and the Australian economic outlook in particular. Traders have diverse views especially in the short term. Some believe there is a chance of yet another fall in official rates but the great majority appear convinced that from now on (March 2014) rates will only rise.

It is not a given but the Reserve Bank of Australia (RBA) appears to be signalling that there is a much higher chance the next official rate change will be up rather than down.

The market is indicating that when rises do occur; the rate of rise will be relatively slow. As a guide, as at March 2014, the futures market has rates flattening at about 1.5% above current rates for the next three to five years, with fixed bank rates now about 0.5% for three years and 1.25% for five years above variable rates.

As expected the interest rate outlook in other countries is mixed and driven by the local economic conditions, in particular in key economies such as the USA, China and parts of the European Union. Belief is growing that the United States of America economy has turned the corner and the pace of improvement is accelerating. In recent times the Federal Reserve has talked about the possibility of rate increases sooner rather than later as part of the process of quantitative easing and controlling the risk of inflation.

Inflation risk

The general belief is the risk of inflation is low, with an outside chance of a bubble burst in the housing sector. Such a burst could see interest rates remain low. There is growing commentary seeing potential for acceleration in interest rates in order to control potential inflation as world economies become more robust and to reduce the value of high national debts around the world.

No one can accurately predict what will happen with interest rates. Therefore good risk management is to avoid having all your financial facilities maturing at a time in the cycle when interest rates are high.

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PROUD TO BE AN AUSSIE FARMER

Antony Vagg
2013 Nuffield Scholar & broadacre irrigator, Moama

QUICK TAKE

- The Global Focus Program of the Nuffield scholarship gave Antony Vagg an opportunity to experience agricultural systems and policies at all levels throughout the world, and appreciate the skills and efficiency of Australian farmers.
- The Australian rice industry may be small in terms of world production, but it leads the way with development of rice varieties and rice production practices.
- Australian rice growers may benefit from US rice growers no longer receiving government subsidies. A US rice grower previously making a profit of $120,000 now will probably make a loss of nearly $80,000 on the same crop.
- Innovation and ability to adapt has kept Australia's agricultural industry alive and prosperous, and Australian farmers continue to be the most efficient producers of food and fibre in the world.

The opportunity to understand agriculture around the globe made me appreciate how well and how efficiently Australian farmers go about their business.

My Nuffield scholarship primarily gives me the opportunity to understand the innovation and technology used by all grain growers, not only rice growers, to manage stubble load and more importantly, to value-add or gain a benefit in sustainability. However, the scholarship also opens the eyes of scholars to agricultural production systems and policy in other parts of the world, through its Global Focus Program (GFP).

My Nuffield experience commenced last June, travelling for six weeks with a group of seven other scholars from Australia and New Zealand. The GFP took us through the Philippines, Hong Kong, China, Louisiana and Washington in the United States of America, The Netherlands, Belgium, France and Ireland.

The Philippines

The International Rice Research Institute (IRRI) was the first stop on our GFP and certainly one of the highlights for me. The work carried out at IRRI not only on rice but on agriculture itself astounded me. Through funding predominately by the Bill Gates Foundation, there was work developing a seed bank and developing varieties for ever changing climates and societies. Looking around IRRI, I had the stark realisation of just how small the Australian rice industry is in terms of world production, yet how important it is in leading the way with development of varieties and production practices. An interesting fact to note is that 80% of the world's diet is reliant on four crops: maize, wheat, potato and RICE!!

China

What can I say about China! It is nothing like I expected. The variation between development and poverty, the production and construction of cities with the ambition of an industry coming along in the future, the smog and urban development tied in with architectural beauty and culture. All this in a country that has a population with a growing hunger for wealth and advancement, yet due to the one child policy, the estimated number of 'hidden children' not accounted for by government is half the US population or just over 150 million people! Truly amazing, yet somewhat scary at the same time.

Where China will be in 10 years time is anyone's guess but it is suspected that growth rates of the economy are only half of those publicised, and while there was a lot of development and production, the markets did not appear to be established. There is worry that China's economy may slow or fall into recession, and as they say, if China sneezes, the world catches a cold!

The contrast of China

USA: Louisiana & Washington

The exceptional hospitality and Cajun-influenced food was a warm welcome to us after China. The good people of Louisiana sure do love their food! The people there were some of the nicest people in the world who don't have the slightest concern about anything outside of their province. I was lucky enough to tour some rice processing facilities and rice production areas. Over the last decade, this traditionally rich cotton-growing region has changed to the point where only two or three crops of cotton were seen in the week we spent there. After talking with locals and industry representatives, it absolutely staggered me the difference in water use and the thinking compared with us here in Australia. A megalitre meant nothing and the only problem with accessing water was when their bore ran dry, meaning they would just have to sink a deeper one. No caps, no government buybacks. Water was free as long as you could pump it!

We then headed to Washington DC for meetings on Capitol Hill. We had arrived at an ideal time—the Farm Bill had been defeated in the senate the day before we arrived. To sit down with Congressmen and highly influential people at this time was fantastic. For politicians to say they had no plan 'B' was something else. As we now know, the bill has been passed and as a result, direct payments to farmers will cease and crop insurance will instead act as the handout.

What surprised me most was that less than 20% of the funding in the 'Farm Bill' actually makes its way onto farms. The vast majority of the finance is to fund food stamps. One of the big losers in terms of government handouts in all this, is rice production in the USA. A lasting memory with me is the budget a rice farmer presented to us. The farmer was making a profit of $120,000 on the crop we were looking at, and without the handout, he would make a loss of nearly $80,000. That is how significant the payment was to this particular farmer. Perhaps a benefit for us rice growers in Australia.

Ireland

What an amazing place and what amazing people! So friendly and so passionate about agriculture. As with Louisiana, agriculture has a loud voice across Ireland and very few political decisions are made without the consideration of how it will affect the agricultural sector. Another dream!

The subsidies received were something that I struggled to accept. The incentive to be efficient, diversify and expand was overshadowed by the government cheque. Cases of a group of farmers sharing a cow so they could all receive the 'cow' handout did not seem right. In discussions, there is little talk of innovation and instead the comparison of handouts are of lead importance. With the European Union lifting the milk quota, Ireland is hoping to almost double milk production in the country over five years, without affecting any other agricultural sector. The scope for expansion is amazing, and gives you a fair idea of current productivity levels!

Nuffield Australia's **Global Focus Program** (GFP) is a significant element of the Nuffield experience. The GFP consists of six weeks of group travel with fellow Nuffield scholarship winners through the global powerhouses of agriculture, including China, Brazil, India, USA and Canada, as well as destinations in Europe, Africa and the Middle East. The itinerary, set by Nuffield Australia, aims to educate, challenge and inspire participants with exposure to all levels of the agricultural supply chain. The cultural impact of the program is also significant as participants tour a wide range of countries in a relatively short period. Following the six-week GFP, scholars then have a further period of individual travel, during which they set their own itineraries and research priorities.

Nuffield scholars inspecting a double cropping trial at IRRI, where corn has been sown into a rice stubble.

Australia be proud

To compare all we saw in the GFP with Australian agriculture, where Australian farmers operate in an industry focused on world prices and our competitors are receiving government subsidies, I was proud to say that we don't rely on government handouts to be profitable. Australian farmers' innovation and ability to adapt has kept our agricultural industry alive and prospering, as we continue to be the most efficient producers of food and fibre in the world.

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DISCOVERING NEW TECHNIQUES FOR DIRECT DRILLED RICE

Peter Kaylock

2013 Nuffield Scholar & rice farmer, Moulamein

QUICK TAKE

- A Nuffield scholarship will give Peter Kaylock the opportunity to study direct drilling techniques overseas, and introduce new ideas to his own practices for direct drilling rice.
- Peter is only partway through his study but has already tried some new ideas on his family's Moulamein property, such as cover cropping with Shaftal clover and rice.
- Peter has also imported a tractor-mounted crop nitrogen sensor that he saw in England, which enables variable application rates of nitrogen to his crops.

Direct drilling of cereal crops is something we have practiced on our mallee country since the mid-1990s but on a visit to Rice Research Australia, Old Coree at Jerilderie, in 2004, what I saw showed me we could apply much the same techniques to growing rice.

The research station manager, Russell Ford (Nuffield 2001), had developed a system of growing rice for variety development plots, mainly to avoid contamination of seed in the sowing process. We had the machinery, the layouts, the chemicals—we just needed to perfect the system for our operation.

So the next year, my neighbour Leigh Vial (Nuffield 2006) and I each grew a small area of direct drilled rice, with promising results.

I quietly persisted with direct drilling through the drought, and now every rice crop grown on my family's farms are direct drilled and we are getting reasonable results. We find that establishment generally is much easier and more consistent than with aerial sown crops, but wild millet is the biggest problem. We have identified savings in water usage, chemical costs and machinery costs, without yield penalties, so we are keen to develop our techniques further.

My father tells me that when he started growing rice, sod seeding was the method used to establish rice in pasture paddocks, but layouts, machinery and lack of useful chemicals, forced them to look for a better way to establish rice crops. For many years, aerial sowing was the best way to sow rice. Now we have addressed all the old problems associated with sod sowing, it is possible to successfully grow direct drilled rice crops again.

But there are some problems still ...

Management of grass weeds is now our main problem. The herbicides presently registered for use in direct drilled rice, won't handle more than several flushings before breaking down. Then we have to resort to mop-up chemicals, which are very expensive, and weeds are likely to become resistant to them with continued use.

Fertiliser requirements of a direct-drilled rice crop are also difficult to assess. Because of the need to flush several times during establishment, there is no point in putting any more nitrogen on than what is applied with MAP, as most nitrogen will be lost with flushing.

Further, because we apply all our fertiliser needs when going to permanent water, it makes interpreting PI (panicle initiation) test results very difficult, as it can be as little as four weeks from a large nitrogen application to PI. Therefore, we need a better way to assess the crop's needs. The growth that a rice crop makes after topdressing/permanent water always amazes me.

Nuffield scholarship

It was at this point I was encouraged to apply for a Nuffield Scholarship, sponsored by the rice industry. I needed a study topic, so settled upon *Direct Drill Systems in Rice and Precision Farming*. Nuffield will give me the opportunity to travel to other countries in search of cropping methods, and the Nuffield network around the world will be invaluable. Already Nuffield has sent us on a whirlwind tour that has taken me to 10 different countries,

on what is termed a Global Focus Program (GFP), looking at agriculture, policy, trade agreements and businesses. After the GFP, I travelled to England and France. We also attended a World Nuffield Conference in Canada, and travelled through the USA shortly thereafter.

Cover cropping

In England, France and the USA, we visited farms that were practising cover cropping and companion cropping. Last year I decided to try cover cropping in our rice, sowing Shaftal clover and oats in March 2013. Then in early October, we cut the paddock for hay, and drilled rice into the residue. The paddock was flushed twice, the rice established well, and no chemicals were applied. The Shaftal outgrew the rice, and a further cut of hay was taken. Urea was applied at a rate of 50 kg/ha, Barnstorm® applied and then we went to permanent water. In February this year, the crop was looking good.

With only two flushes (compared with four for other rice crops), no pre-emergent chemicals, and very little fertiliser, this has got to be a very cost effective rice crop. The amount of pasture residue and the cover the growing Shaftal gave the emerging rice, kept the soil friable and soft, not drying and cracking, held moisture, and allowed the rice to emerge quickly—establishment was excellent.

Precison ag & machinery

In England while looking at cover cropping, I visited Clive Blecker (Nuffield 2004), York, who runs a company called Precision Decisions (**www.precisiondecisions.co.uk**). Clive has been working with the company Yarra for the last 12 years with a product called the "Yarra N Sensor" developed in Germany. The sensor is a roof-mounted set of cameras, taking images of the crop by measuring the light reflectance from the crop, one measurement is of the visible red spectra, which measures the chlorophyll content (colour) of the crop, and the other measures the near infrared spectra, which relates to biomass.

These measurements allow the N Sensor to calculate the amount of nitrogen taken up by the crop, the crop's nitrogen requirement and an application rate. All this information is communicated to the attached fertiliser spreader, so the fertiliser application rate can be varied according to crop requirements, on the move.

I imported and fitted an N sensor unit and have used it twice in my rice this season. The first application was at the three-leaf stage when we applied a base rate of 50 kg N/ha, with a maximum rate of 100 kg N/ha; and then again at mid tillering, applying a base rate of 60 kg N/ha, and a maximum of 200 kg N/ha. As expected the unit applied maximum rates to the thin areas of crop, increased rates to yellow areas of crop, but interestingly, in thicker areas of crop, the N Sensor often applied heaver rates of urea. The sensor can recognise areas of crop that need more nitrogen to maximise its yield potential.

The N Sensor will have potential to improve yield in irrigated and dryland cereals, so will be a permanent fixture to the roof of our spreader tractor. Dryland application may be limited, as moisture stressed crops could affect the measurements and calculated results.

The N Sensor, mounted to roof of the tractor, provides infromation to vary nitrogen fertiliser application on the move.

A Sumo disc seeder capable of handling heavy trash and wet conditions.

Yarra also produce a handheld measurement unit that can give an instant nitrogen reading of leaves, and when referenced against a chart, will indicate the crop's need for nitrogen. We have used this unit in conjuction with PI sampling, and are hopeful that we can get a good correlation between the two tests, which could be a useful tool for predicting crop nitrogen requirements at PI.

Also at York, we visited the machinery company Sumo (**www.sumo1.com**) makes a very heavy duty, robust piece of machinery called a 'Tillage Drill', which is capable of handling heavy trash and wet conditions. The unit had excellent flotation, independent parallelogram configuration, and looked indestructable. Sumo has grown from a farmer with a good idea to a small company that can't keep up with demand. I would love to try a unit out here, but the exchange rate of the Australian dollar, makes this machine very expensive.

2014 travels & study

Going forward, I hope to travel to the USA, Italy and Uruguay from April 2014. Nuffield has encouraged me to look outside the square and I have already seen some opportunities to follow up.

I am not sure what I will find when I travel next, but I am keen to see how other growers around the world are direct drilling their crops, and how they are dealing with their problems. I must thank the rice industry and Nuffield for allowing me to look at further opportunities.

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