



Extension for improving rice yields & WUE

John Lacy, Mary-Anne Lattimore, Kieran O'Keefe, Andrew Schipp, Rachael Whitworth, John Smith, Alex Murray, & Felicity Steel

NSW DPI, various locations

in a nutshell

- Last season's yields were 14% above average, but yields for the last two years were 6% lower than average because of the severe cold damage in the 2005 harvest season
- Water productivity was 11% above average last season, but 7% lower over the last two years
- An economic evaluation of Ricecheck was conducted finding the benefit of the program from 1986–2002 was \$64 million at \$3.5 million per year, with a benefit:cost ratio of 18:1

The rice extension project has assisted rice growers to adopt the best techniques and technologies to improve yields, profitability and sustainability of the rice enterprise and the rice-based farming system.

The objectives of the rice extension program are to:

- improve yields and water productivity by 5%
- improve adoption of targets for microspore water depth by 10%, establishment by 20% and nitrogen uptake at panicle initiation by 15%
- assist the Environmental Champions Program meet its targets.

Average yields

Average yield over the first two seasons of the current project was 8.4 t/ha. However, there is a large contrast between these two years, with 6.8 t/ha in the 2005 harvest after devastating cold damage to 10.0 t/ha in the above-average temperature season of 2006, which had no cold damage. The yield in 2006 was close to the record yield of 10.2 t/ha

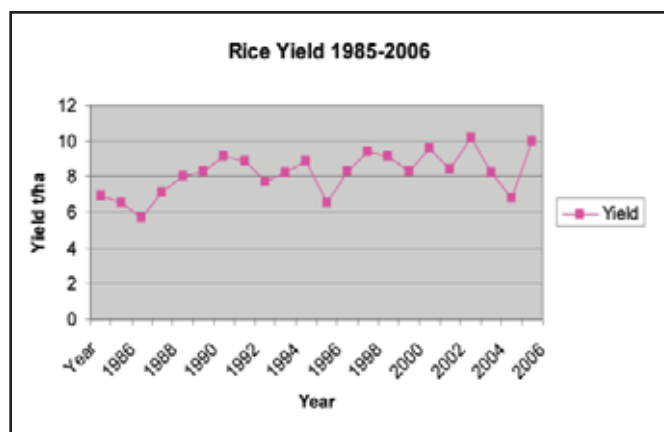


Figure 1: Average rice yields (t/ha) for the industry 1985 to 2006

in the 2003 harvest year. Average rice yield for 2000–04, the five years preceding the project was 8.94 t/ha, which is 6% higher than the average yield for the two years of the current project.

Water productivity

For the project period 1985–2006 water productivity increased by 60% up to 2000 but has plateaued since, and this can be attributed to seasons with cold damage reducing potential yield or drought conditions leading to dry soils before fill-up and low rainfall leading to extra water use.

Specifically affecting water productivity were the lower yields in the cold affected harvest years of 2000, 2002 and 2005. The water productivity in the 2006 harvest season was 0.8 t/ML, which is the general industry target.

The water productivity for the last two years was 7% lower than the average for the previous project seasons 2000–2004.

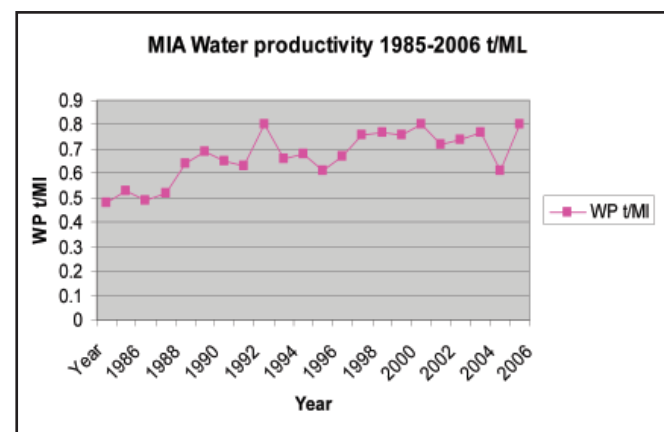


Figure 2: Water productivity t/ML in the MIA 1985–2006. (Sources: Murrumbidgee Irrigation and SunRice)



Ricecheck yield challenge

Yield potential varies between the rice growing valleys, with the Murrumbidgee Valley experiencing higher minimum temperatures than the Murray Valley, enabling a higher yield potential.

Farmers in each valley are challenged at the start of each season through the Ricecheck program facilitated at discussion groups and pre-season meetings, to achieve target yields which are set 10–15% above average industry yields but are achievable using current technology and adoption of the key checks.

Figure 3 shows that the yields of Amaroo and Langi in the 2005 harvest season were well below each valley target yield because of the severe cold damage at the microspore stage of pollen development. In the excellent 2006 harvest season, the yields of Amaroo and Langi, although good, were still below the target yields in most areas. However, the western Murray Valley did relatively better than other areas in 2006, either equalling or exceeding the target yield.

Focus on lifting the adoption of the poorest adopted Ricecheck checks

A major step to lifting yields is to improve the adoption of the poorest adopted checks, ie microspore water depth by 10%, establishment target populations by 20% and nitrogen uptake at panicle initiation by 15%. Figure 4 shows there has been significant progress in lifting the adoption of these checks compared to the three-year period prior to the project.

Good establishment temperatures in the 2005 sowing season greatly assisted the better plant numbers and evenness of establishment.

Extension activities

The rice extension program uses a wide range of activities and methods to help transfer the technologies for improved rice-growing practices. These activities directly and indirectly engage rice growers, as well as providing information and training to other industry groups who also advise rice growers.

1. Meetings

Commercial agronomists and pilots meeting

The inaugural combined networking meeting of retail and supplier agronomists and agricultural pilots was attended by 80 people. Held in late August, service industry people were updated on the latest technology and crop protection options available for rice growing. There was also an opportunity for retail agronomists and agricultural pilots to raise issues with each other, about improved communication, application methods for products and logistics for precision agriculture and nitrogen topdressing.

Pre-season meetings

Seven rice pre-season meetings were conducted and chaired by district agronomists. The combined attendance across the industry was 495 farmers compared to 471 in the 2004 season. The focus was on staggered early sowing as a risk management strategy to combat cold damage at microspore, split nitrogen fertiliser strategies, deep water for microspore cold protection and the varieties Reiziq and Quest. Reiziq is a new variety and whole grain millout concerns with Quest were addressed.

Ricecheck results were used at the meetings to show that the highest and most consistent yields, particularly in cold seasons, were achieved with split nitrogen application and when nitrogen uptake at panicle initiation was in the 90–150 kg N/ha range. Conversely, for the same group of data, many of the lowest yielding crops had nitrogen uptakes over 150 kg N/ha, indicating the increased risk of cold damage in high nitrogen status crops.

2. Field day

The rice field day held at Rice Research Australia Pty Ltd (RAPPL) in February 2006 was a great success with an attendance of 300. It was collaboratively organised by NSW DPI, SunRice, RGA and RAPPL. Concurrent research trial inspections were conducted in the morning and concurrent static display talks held in the afternoon. Some machinery displays were organised by RAPPL. A field day booklet '2006 Rice Field Day' was produced with a summary of research, extension and industry projects observed at the field day.

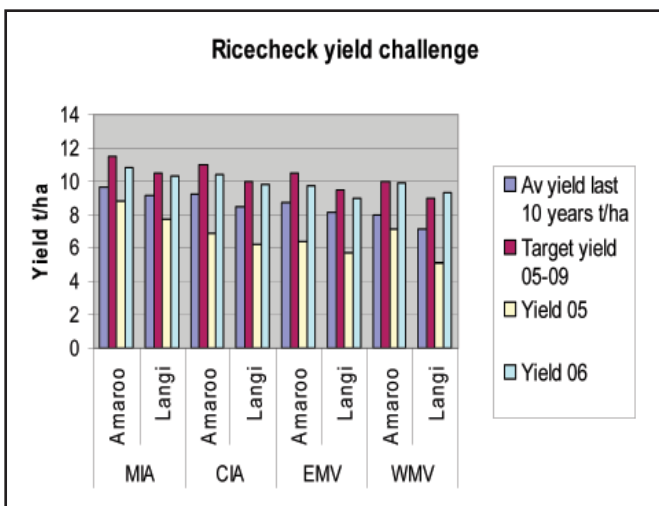


Figure 3: Rice yields for Amaroo and Langi in 2005 and 2006 harvest seasons compared to target yields

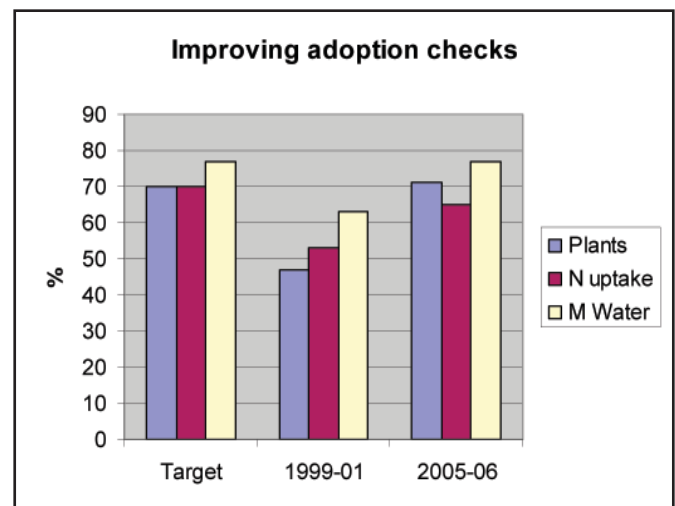


Figure 4: Adoption of three checks between 1999–01 and 2005–06



3. Rice discussion groups

District agronomist discussion groups remain an important communication activity for the rice extension project. Group numbers dropped off during the low irrigation allocation years because fewer farmers were growing rice and some groups had to be amalgamated. However, with improved allocations in 2005–06 compared with previous seasons, group numbers were closer to normal (Figure 5).

4. Publications

The *Ricecheck Recommendations* booklet was updated and reprinted and direct mailed to all growers. The layout was significantly improved to make it more readable for farmers. Sections on biosecurity, precision agriculture nutrient management and mid-season drainage were added.

Both the *Rice Crop Protection Guide* and *Rice Variety Guide* were reprinted in the new NSW DPI 'primefact' style by the publications section in NSW DPI head office. This was a massive change from the rice note style and feedback on the 'primefact' style was excellent. Both publications incorporated significant technical updates.

5. District agronomist surveys

District agronomists conducted farmer surveys on rice sowing methods coordinated by Andrew Schipp (Hay) and herbicide programs coordinated by John Smith (Barham). The surveys showed considerable differences in practices between districts. For instance dry broadcast sowing was 55% of sowings in the Griffith district, but was zero for the Barham district. Several herbicide programs were listed in the survey, with herbicide program one, ie Taipan® with molinate or Magister®, the most popular at Coleambally, while herbicide program 5, ie bensulfuron methyl (eg Londax®) with molinate or Magister®, the most popular in the Barham district. Farmers should contact their district agronomist if they wish to obtain a copy of the survey.

6. Projects

Aerial imagery

The use of aerial imaging to target sample for the NIR Tissue test has been heavily promoted by the rice extension team.

In the 2004–05 season, 29,000 ha or 66% of the total rice crop was imaged. In the 2005–06 season 46,500 ha or about half the area was imaged.

The Technical Officer for the project collated the data for 20–30 rice crops, organised by District Agronomists from the 2003–04 and 2004–05 seasons, for which aerial imagery had been conducted. In each field, measurements and Ricecheck records for soil type, soil nutrients and pH, paddock history, variety, pre and post sowing fertiliser, plant numbers, water depths, water salinity, nitrogen uptake and yield were taken at 6–8 sites in the crop. After harvest the measurements were related to yield, with the objective of identifying the factors causing rice growth and yield variability.

Figure 6 shows some of the results for one crop where three factors are compared with yield – soil type, landforming (undisturbed (normal), cut or fill) and Colwell phosphorus level. The results show these factors have no particular correlation with yield. The results are a good example showing that it is difficult in identifying all the factors and inter-relationships which cause yield variability.

Economic evaluation

An economic evaluation of Ricecheck was conducted by NSW DPI economists Rajinder Singh and John Brennan. They found the benefit in terms of increased rice production of Ricecheck from 1986 to 2002 was \$64 million, at \$3.5 million per year. The benefit cost ratio was 18 to 1. The project was published as a NSW DPI report, *An assessment of the economic, environmental and social impacts of the Ricecheck program* Economic research report No.28.

Precision agriculture

A precision agriculture (PA) workshop was held in June 2006. It highlighted many issues. Few farmers have accurate yield maps of rice and other crops. There is a lack of industry skills in writing prescriptions for application of variable rate products. There is a lack of pilot skills in applying variable rate products. Farmers lack understanding of precision agriculture. The issue which summarises the lack of progress with precision agriculture is the lack of benefit costs information justifying the change to and financial benefits of

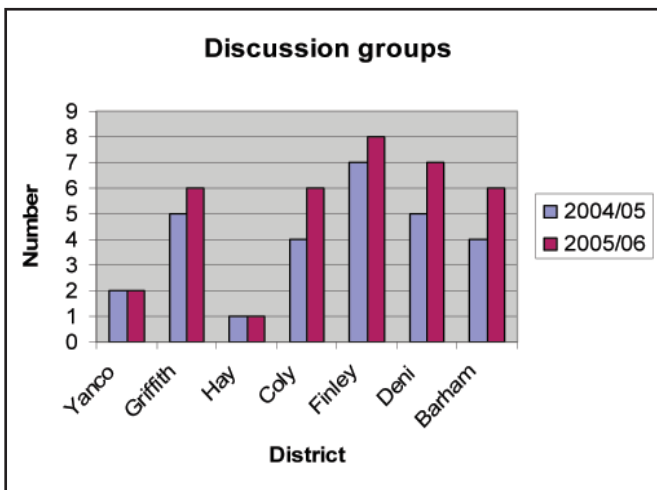


Figure 5: Rice discussion group numbers for the previous two years

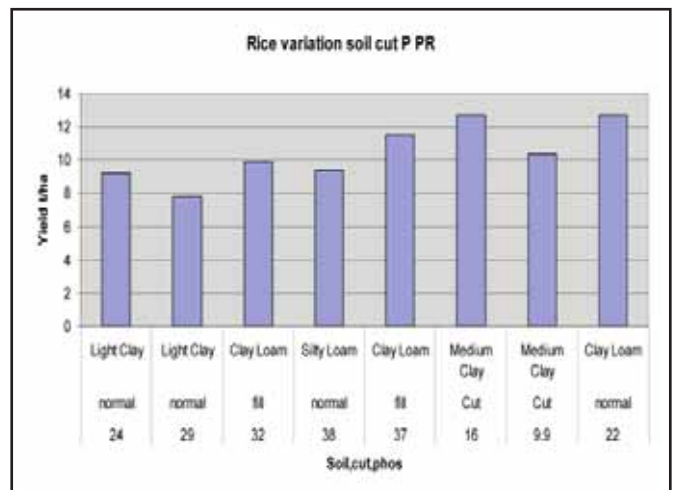


Figure 6: Yield at 8 sites in one crop, with underlying factors of soil type, landforming status and Colwell phosphorus level indicated.



adopting PA. A steering committee was formed which will address the issues raised at the workshop.

Farming systems

The extension team is becoming engaged in farming systems projects which relate to both rice and non-rice rotations on the same farm. One such project is the GRDC funded 'Lifting irrigated cropping profitability and water use efficiency'. NSW DPI district agronomists and irrigation officers met for a workshop to plan a survey on 'Farm layouts, enterprises and rotations', which was conducted by Scott Glyde and Tony Dunn, Charles Sturt University. The survey report shows labour savings is an important consideration in the development of new layouts. One comment on bed layouts was "when I see blokes row cropping driving around in a Mercedes then I'll look at it". The market reliability and stability for rice over other enterprises was a major factor for the dominance of rice on farms. It is expected this project will lead on to the evaluation of new layout designs.

7. Visiting scientists

A Brazilian researcher Dr Julio da Silva from EMBRAPA spent several months at Yanco evaluating Ricecheck. The major output was the publication, *The Ricecheck Case Study, Leeton, NSW*.

The report identifies the major constraint to Ricecheck being the crowding out by other programs run by other stakeholders. It is as if stakeholders are fighting each other for farmer attention, and farmers are feeling overwhelmed and confused. A suggestion from the report is to form collaborative service network.

Future work

In addition to the existing extension program, it is proposed the NSW DPI rice extension and research team will address a number of new initiatives in the 2006–07 season.

Profitability

- Show financial benefits of improved practices, eg use the Ricecheck database in conjunction with financial data to show the loss in income for each day sowing is delayed beyond the recommended window
- Develop a whole farm economic model for rice based farming systems. This will allow farmers to identify the most profitable rice rotations and watering strategies for their own farms

Learning tools

- Upgrade the PI slide rule to include all the main varieties and develop a water productivity slide
- Develop a new user friendly front end entry into the Ricecheck database

Training

- Develop a farmer or service industry training program for MANAGE RICE
- Conduct Ricecheck database training for DPI extension and research team members and rice research committee members
- Implement education and training activities (to be driven by the precision agriculture steering committee) for farmers, retail agronomists and commercial suppliers
- Conduct new training to ensure the new agronomists have the opportunity to effectively and efficiently learn about the industry, and can quickly become a valuable resource for rice growers

Service delivery

- Develop a new collaborative service network to position Ricecheck and other farmer packages to avoid duplication and assist growers in understanding and accessing each of the packages
- Improve DPI extension and research teamwork and partnerships and links to other research bodies, eg CSU, funding bodies, service providers to improve the efficiency of rice research and extension outputs and outcomes
- Improve resource centre/websites

Technology

- Explore the possibility of improving the draining recommendation package because many growers still find drainage decisions very difficult
- Assess research and extension opportunities/needs in 5 year R&D plan to identify opportunities for NSW DPI and delineate the opportunities for other research providers
- Develop a new precision agriculture check in Ricecheck 🌱

Acknowledgements

The contribution of all rice extension stakeholders to the outcomes in this report is greatly acknowledged. This includes government agencies such as RIRDC, CSIRO, CSU and other universities, the retail, consulting, and aerial industry agribusinesses, and rice industries organisations such as RGA and SunRice, and the irrigation companies.

RIRDC project DAN-236A

John Lacy
Industry Leader
Yanco Agricultural Institute
T: 02 6951 2738
E: john.lacy@dpi.nsw.gov.au