



Improving rice yields & water use efficiency

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in a rice hull

- The aim of the 3-year extension project was to improve rice yields and water use efficiency by 5%
- As a result of very cold temperatures at the pollen microspore stage in 2004–05 and drought effects in 2006–07, the average rice yield for the project period remained the same as the previous 5-year project period and water use efficiency (WUE) was 8% lower

Over the past three years the rice extension project effectively educated and assisted rice growers to adopt the best practices and technologies to improve yields, profitability and sustainability. However seasonal effects prevented better outcomes and the achievement of the project's numerical objectives.

The Rice R&D program of RIRDC invested in the rice extension program to ensure that the knowledge gained by research can be made available to rice growers to contribute to ongoing improvement and increased profitability and sustainability of rice growing practices.

The objectives of the rice extension program were to:

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

Unfortunately for growers and the project, two of the three seasons of the project were abnormal with yields and WUE for the 2004–05 season decreased by some of the lowest cold temperatures ever experienced in the industry. Water use efficiency of the small rice area in the 2006–07 season was reduced by high water use from the various effects of the drought.

The claim of partial success of the project can be substantiated on the basis of significant progress in lifting the adoption of the three poorest adopted Ricecheck checks and the targets were achieved.

This 3-year project followed on from a similar project that was carried out over a 5-year period, immediately preceding this project.

Average yields

Average rice yield for the five years 2000–04 preceding the project was 8.94 t/ha. The average yield for the three years of the project was 8.9 t/ha (Figure 1) so average yield remained the same. The average was affected by the devastating cold damage which reduced yields in the 2004–05 season to 6.8 t/ha. The 2005–06 and 2006–07 seasons yielded well at 10.0 t/ha and 9.9 t/ha, respectively.

Figure 2 shows the yields for the last 23 years highlighting the good yields in the past two seasons and the two low yields for the 1995–96 and 2004–05 seasons due to severe cold damage.

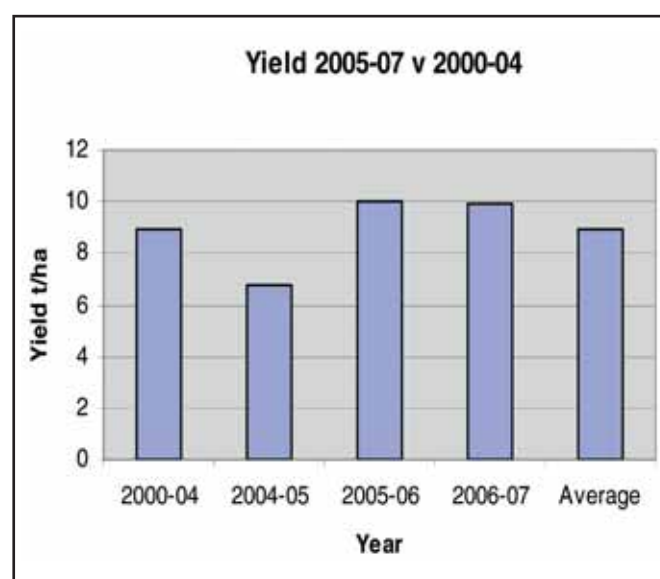


Figure 1: Yield for individual years and 2005–07 compared to the average for 2000–04



Water use efficiency

Great progress with increasing WUE (tonnes per megalitre) was made from 1985 to 2001 with WUE increasing by 60%.

Water use efficiency for the three years of the project dropped because of the very low yielding cold affected 2004–05 season and the drought affected high water use 2006–07 season. Water use efficiency was 0.61, 0.8 and 0.7 t/ML for the 2005, 2006 and 2007 harvest seasons, respectively.

The average WUE for the period of 0.7 t/ML was 8% lower than the average for the previous five years (Figure 3). Figure 4 shows WUE from 1985 to 2007.

Water use

Water use data for 27 years, courtesy of Murrumbidgee Irrigation, show slightly higher water use from 2002 onward as a result of the drought. The water use in 2005–07 was not as high as expected and only 2% higher than the water use for the previous five year period. Dry soils led to extra water use for fill-up of bays and below average rainfall and above average evaporation compounded the higher water use.

Lifting adoption of the poorest adopted checks

A major step to lifting yields is to improve the adoption of the poorest adopted *Ricecheck* checks, ie microspore water depth by 10%, establishment by 20% and nitrogen uptake

at panicle initiation by 15%. Figure 5 shows there has been significant progress in lifting the adoption of these checks within this project period compared to the 3-year period prior to the project. The smaller crop areas in 2004–05 and 2006–07 would have aided adoption as smaller crop areas are easier to manage. Posters showing adoption of these checks were printed for each district agronomist for use at discussion groups.

Assisting Environmental Champions

Through the extension program, assistance has been provided to the Environmental Champions Program (ECP) in several ways. District Agronomists attended an ECP update in April 2005 and liaised with the three regional coordinators and Coleambally District Agronomist Keiran O’Keeffe was on the ECP working group. An example of collaboration is that in order to achieve level 2 in the ECP, farmers need to fill in a *Ricecheck* crop data form which assists the NSW DPI *Ricecheck* program. At NSW DPI meetings, an ECP topic has often been included on the agenda. The ECP either had a static site or speaking role at Rice Field Days. In the last 12 months there has been close collaboration between ECP and NSW DPI in developing new WUE targets for the industry which have been included in the 2007 *Ricecheck* Recommendations.

Extension activities to improve adoption

Many education activities were held and aimed at improving understanding and knowledge, and adoption of new



Figure 2: Average rice yields t/ha 1985 to 2007

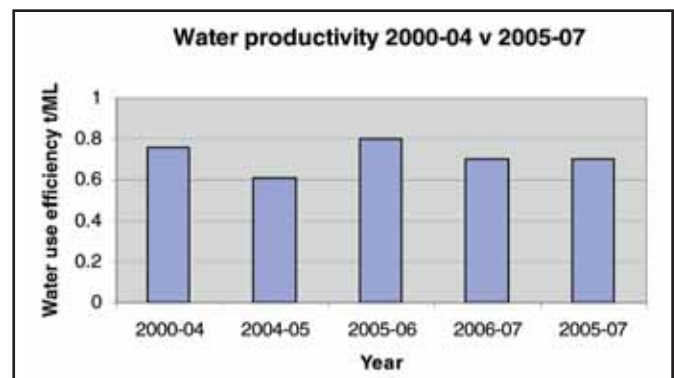


Figure 3: Water use efficiency t/ML in the MIA for individual years of the project, and for the two project periods 2000–04 (far left) and 2005–07 (far right)

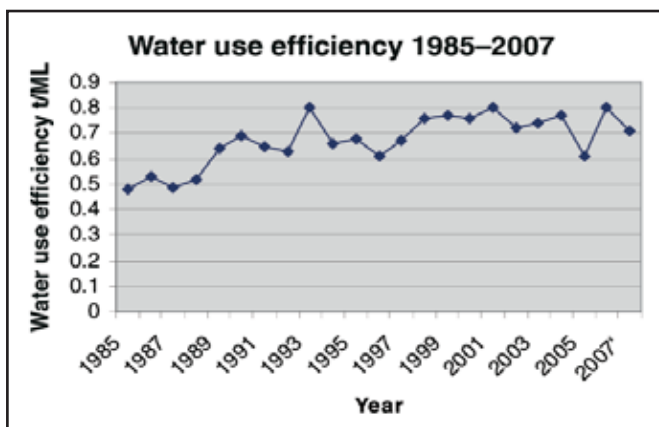


Figure 4: Water use efficiency for MIA rice growers 1985–2007
Sources: Murrumbidgee Irrigation and SunRice

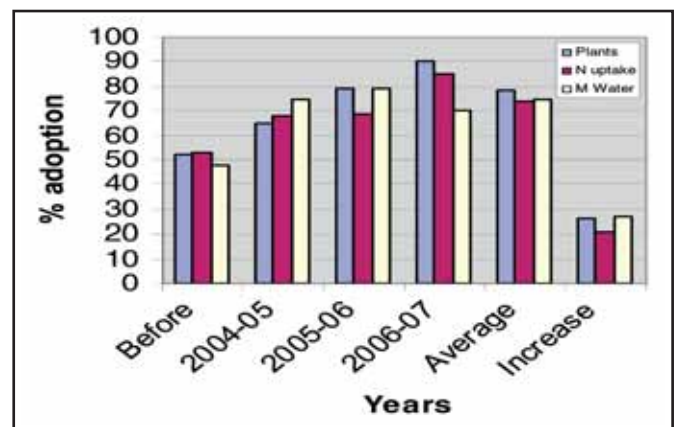


Figure 5: Adoption of the poorest adopted checks comparing 2005–07 adoption rate with that in 2002–04



technology and best practice to farmers and industry stakeholders. Farm visits, personal contact and media releases are not formally reported but underpin many of the main activities.

1. Ricecheck yield challenge

Since yield potential varies between valleys, challenges to farmers to increase yield should be based on potential yields relating to each valley. This helps farmers to engage and benchmark themselves against their valley yield targets. Posters for each valley displayed at discussion groups showed the past 10-year yield average for the valley and a target yield set 10–15% above the average (Figure 6).

The results for the variety Amaroo show that the CIA achieved the target yield in the 2006–07 season and WMV in the 2005–06 season. For the variety Langi the WMV achieved the target in the 2005–06 season with the MIA and CIA close to achieving the target.

2. Ricecheck records

Although the number of Ricecheck records has greatly dropped for the 2005–07 harvest seasons compared with the years 2001–04, much of this is related to the rice crop size. When the number of records is compared to the rice area, ie the relative return, the 2005 harvest has the best relative return of all the years. A total of 287 crops was entered into the database in 2004–05 and proportionately this is the highest number of crops entered in the last five years and is 23% higher than the 2000–01 season (830 crops). The 2005–06 relative return was surprisingly low with data for 313 crops entered into the database. Records were not requested for the 2007 harvest because the crop area was so small.

3. Publications

The key publications produced by the extension program were revised and updated throughout the project period.

Ricecheck Recommendations

The *Ricecheck Recommendations* publication was updated and the layout significantly improved to make it more readable for farmers each season. Some of the changes include:

- updated checks adopted and yield response figure
- a new section and figure showing differing yield potential between each rice growing valley
- an expanded diseases and pests section to include major overseas rice pests, eg golden apple snail, and diseases, eg rice blast; and comments on the National Rice Industry Biosecurity Plan
- updates on the split nitrogen fertiliser strategy section
- a new precision agriculture nutrient management and midseason dry down section (a draft check for precision agriculture was developed and added to the productivity checks in 2007)
- new water productivity (t/ML) benchmarks based on irrigation water use and rainfall were included (this changes previous benchmarks based only on irrigation water use).

Rice crop protection guide & rice variety guide

Both the *Rice crop protection guide* and *Rice variety guide* were updated each season. In 2006 both guides were reprinted in the new NSW DPI *primefact* style. This was a massive change and feedback on the primefact style was excellent. Both publications incorporated significant technical updates.

4. Discussion groups

District agronomist discussion groups remain an important communication activity. Group numbers dropped off during the low irrigation allocation years because there were no farmers growing rice in some groups and some groups had to be amalgamated. However when most farmers were able to grow rice in the 2005–06 season groups numbers were closer to normal (Figure 7).

5. Rice for Profit course

The Rice for Profit Profarm course was run in 2006 with good numbers of farmers and agribusiness agronomists attending who gave positive feedback. NSW DPI research and extension staff were used as presenters. The Rice for Profit course notes and some talks were revised. There were not enough numbers in 2005 and 2007 to run the course. The course convenors are now John Smith (DA Barham) and Kathryn Bechaz (Technical Officer Yanco).

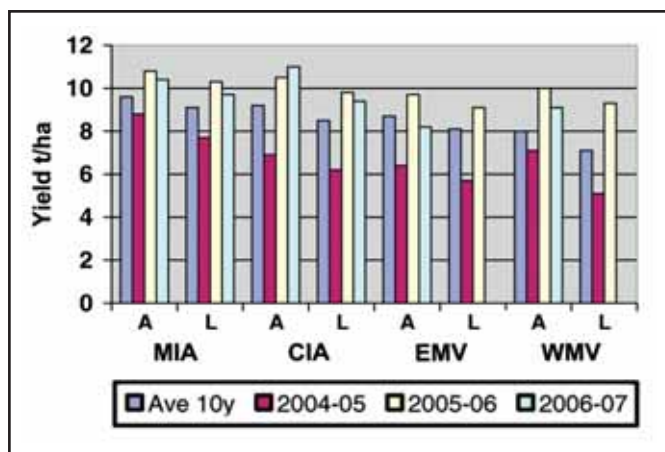


Figure 6: Yield of Amaroo (left) and Langi (right) for each of the three years compared to the average 10-year yield.

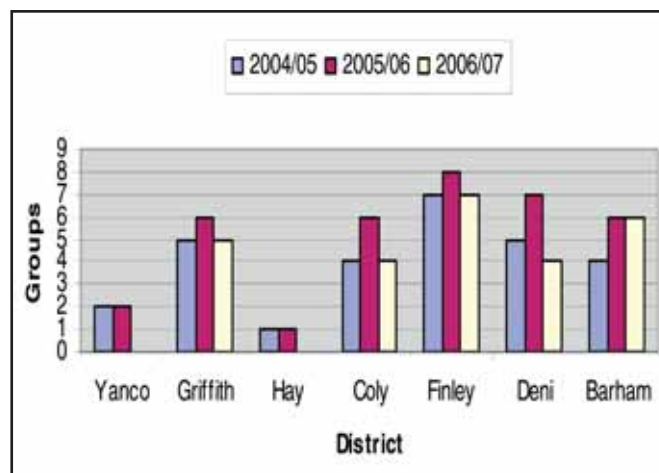


Figure 7: Number of discussion groups 2005-07



6. Meetings

Pre-season meetings

In each season seven rice pre-season meetings were conducted and chaired by district agronomists. Attendance was around 500 in 2004 and 2005, and down to 350 in 2006.

The topics in any one season focus on new research results and technology relevant to the coming season. An example of this is with the low water allocations and late announcements being a feature of the drought years a special topic on "Strategies for late sowing" was added to the program. Examples of other topics include "Staggered early sowing as a risk management strategy to combat cold at microspore", "Split nitrogen", "Importance of deep water".

Ricecheck results were used to show the highest and most consistent yields, particularly in cold seasons, were from split nitrogen application with nitrogen uptakes in the 90–150 kg N/ha range. Variety talks were always included and addressed farmer issues such as the comparative cold tolerance of Amaroo and Reiziq and the whole grain percentage of Quest compared with Amaroo and Reiziq.

Retail agronomist pilot meetings

The annual workshop held for agricultural pilots was conducted. A new initiative following feedback from the Rice Research Committee was to also hold a workshop for retail agronomists on the latest crop protection recommendations. In 2004 separate retail agronomist and pilot meetings were conducted. In 2005 the audiences were combined with an attendance of 80 people, and then 75 in 2006. In 2006, both crop protection and agronomic updates were presented. Feedback from attendees has been excellent.

Precision Agriculture workshop

A precision agriculture 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 adopting precision agriculture. A steering committee was formed to address the issues raised at the workshop. There is an opportunity to link this committee to the new spatial variability project being conducted by Geoff Beecher and Brian Dunn (pp 27–30).

7. Field days

Field days are important for the awareness of new technology and networking between farmers and rice industry stakeholders. In 2004–05 valley field days were held attracting 200 farmers. The 2006 rice field day held at Rice Research Australia Pty Ltd (RAPPL) 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 with concurrent static site talks held in the afternoon. Some machinery displays were organised by RAPPL. A field day booklet "2006 Rice Field Day" was produced with summary of research, extension and industry projects observed at the field day. In 2007, although there were only relatively few farmers growing rice, a morning field day attracted a surprising number of 120 farmers. An aerobic rice variety trial and frog trial attracted the most interest.

8. District Agronomist surveys

In the 2005–06 season, district agronomists conducted farmer surveys on rice sowing methods coordinated by Andrew Schipp (Hay DA) and herbicide programs coordinated by John Smith (Barham DA). The survey results were reported in last year's article and at the retail agronomist meeting in 2006.

9. Projects

The use of aerial imaging to target sampling for the NIR Tissue test has been heavily promoted and adoption has been excellent. In the 2004–05 season 29,000 ha or 66% of the total rice crop was imaged with 50% or 46,500 ha in the 2005–06 season and an estimated 5800 ha or 35% of the 2006–07 season crops imaged. 🌞

Acknowledgements

The NSW DPI research team; other government agencies ie RIRDC and CSIRO; CSU and other universities; agribusinesses; RGA; SunRice; and irrigation companies, all play a significant role in rice extension. The contribution of these stakeholders to the outcomes of the rice extension program is greatly acknowledged.

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Figure 8: The 2007 rice field day at RRAPL