Better extension programs improving rice yields

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IN A RICE HULL

- The rice extension program facilitates the transfer of the best techniques and new technologies to rice growers
- The benefits of the extension program over the last seven years are not immediately evident due to the impact of three years with cold damage and two years affected by drought
- Economic evaluation of Ricecheck has demonstrated a benefit of $18.50 to the rice industry for each dollar invested in the Ricecheck program, over and above normal research, breeding and extension activities

For seven years (1997–2004) the rice extension project has assisted rice growers to adopt the best techniques and technologies to improve yields, profitability, grain quality and sustainability of the rice enterprise and the entire rice-based farming system.

So what are the results?

What are the recommendations for future progress?

Results

The success of the rice extension program is measured by changes in productivity, grain quality, profitability and sustainability of the rice industry, over the life of the project.

Average yields

Average rice yields at the beginning of the project for the three years 1998–2000 and for the three years ending the project 2002–04 show no improvement, with the average yield for the entire period being 8.9 t/ha (Figure 1). The 2000, 2002 and 2004 harvest years were cold damage years, and 1998, 1999, 2001 and 2003 were warm years with no cold damage.

Yields in cold years before and during the project

A comparison of yields in cold years before and during the project shows that the average yield of the three cold years during the project was 30% higher than that for three cold years before the project (Figure 2).

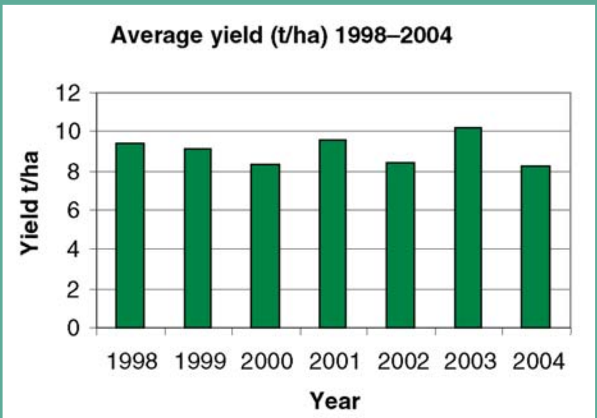

Figure 1 *Average rice yields 1998–2004*

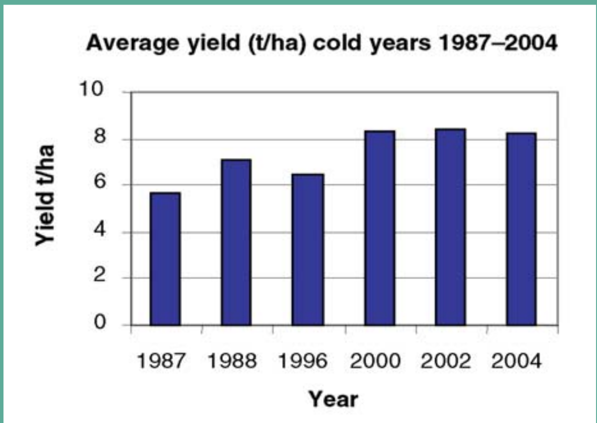

Figure 2 *Average rice yields of cold years 1987–2004*

Yields in warm years before and during the project

A comparison of the yields in warm years before and during the project show the average yield of the four warm years during the project was 12% higher than for the four warm years before the project (Figure 3).

Grain quality

Percentage wholegrain is the main indicator of grain quality. Annual data for % wholegrain from SunRice has been compared for the period 1997 to 2004. The % wholegrain for Amaroo has remained stable, being 60% for 1997–99 compared to 60.2% for 2002–04. In contrast, % wholegrain for the main long grain variety, Langi, has improved from 55.7% for 1997–99 to 57.9% for 2002–04.

Profitability

There is no whole farm financial data showing the impact of this extension program, or other programs, on the overall profitability of rice farms. However an economic evaluation of Ricecheck by NSW DPI Economists Rajinder Singh and John Brennan (in press) has demonstrated a benefit:cost ratio of 18.5, that is, each dollar invested in Ricecheck has produced $18.50 benefit to the rice industry over and above normal research , breeding and extension activities.

The average rice yield over the seven years of the project (including three cold years) was 8.9 t/ha compared to 8.2 t/ha for the previous seven years (only one cold year). The average rice area for the seven years of the project was 122,042 ha which produced extra yield of 0.7 t/ha. Assuming a rice value of $250/t this represents an extra $21.4 million to the industry from the collective efforts of the R&D team.

Sustainability

For the project period 1998 to 2004, there has been no increase in water productivity (Figure 4). This is related to lower yields in the cold affected 2000, 2002 and 2004 seasons, and drought-induced higher water use in 2003. Good rainfall in January 2002 and in 2004 helped to reduce rice water use. Sustainability as measured by water productivity in tonnes per megalitre (t/ML) increased by 60% in the MIA between 1985 and 1999.

Water productivity for the eastern Murray Valley was assessed for the 1998 to 2004 period. Figure 5 shows water productivity has decreased because of lower yields and drought-induced higher water use. The three lower yielding years from 2002 to 2004 averaged 8.3 t/ha compared to the previous three years' average of 9.2 t/ha. Average water use of 12.2 ML/ha for 2002 to 2004 was higher than the previous three years average of 11.3 ML/ha related to drought effects in the 2003 and 2004 seasons. The area of rice in the 2003 harvest year was very small so the weighting of statistics for 2003 is less than in other years.

Is there a brighter side to these results?

Yes there is. The unchanging yield results can be explained by the fact that over the project period, yields were affected by cold in three of the seven seasons. It is unfortunate these three years occurred from the year 2000 onwards, and then the 2004 and 2005 seasons coincided with low water allocations due to drought and small rice areas.

In the low allocation, drought-affected seasons of 2003–2005 many farmers grew only one rice crop, often with additional expenses of buying and borrowing water. This meant "all eggs were in the one basket". Following new analysis of minimum temperatures in the last week of January and first two weeks of February, during the young microspore stage of rice growth, it has been discovered that the chances of cold damage are one to three years in every ten. Unfortunately the one–three chance of cold damage occurred in both the 2004 and 2005 seasons.

In "normal" water allocation years most farmers grow two or more rice crops. This allows the use of risk management strategies to avoid cold damage. By staggering sowing within the recommended times, microspore development times are staggered, and in cold years chances are only one crop will be affected. The other key elements of the risk management strategy are deep 20–25cm water depth at the young microspore stage and following a split nitrogen fertiliser application strategy.

The 2005–06 season, at the time of writing, has the potential to be closer to normal which may allow farmers to be able to implement the risk management package.

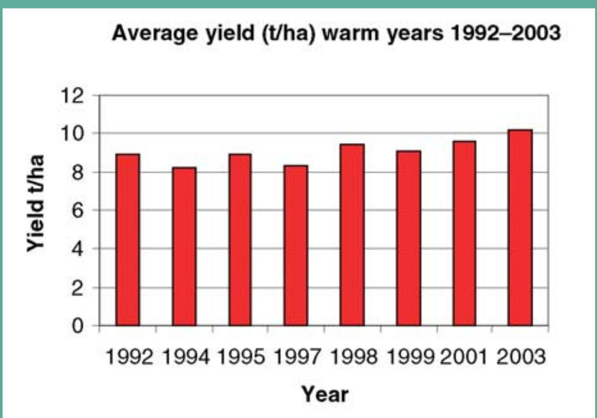

Figure 3 *Average rice yields of warm years 1992–2003*

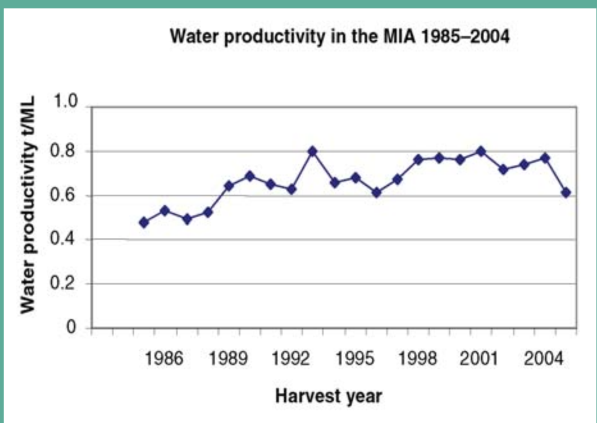

Figure 4 *Water productivity in the Murrumbidgee Irrigation Area, 1985–2005*
Source: Murrumbidgee Irrigation and SunRice.

Recommendations for future extension coordination and delivery

Besides the evaluation of results from this project is the need to evaluate service delivery and make recommendations for future improved delivery to farmers and industry. The recommendations are:

- To coordinate an annual meeting for retail agronomists on rice crop protection and new rice extension or research technology
- To develop closer links to the Rice R&D extension committee
- To maintain extension participation and links to agribusiness and retail agronomists with remote sensing
- To invite NSW DPI Irrigation Officers and rice farming system researchers from organisations such as CSIRO and CSU to NSW DPI research and extension agronomist meetings and projects
- To set up a Rice Resource Centre with a wide array of rice farming system extension material at Yanco Agricultural Institute
- To fund the NSW DPI extension team and Technical Officer to allow the provision of existing extension activities including the 40 discussion groups, pre-season meetings, field days, mass media outputs, newsletter articles, key publications, farm visits, surveys, short courses, demonstrations, trial work, postgraduate study, study tours and extension methodology training

Recommendations for Ricecheck

The Ricecheck database is an integral component of the extension program, and at the end of the project the following recommendations are made:

- Yield and water productivity targets should be developed and customised for each of the four valleys
- There is a need to improve the farmer adoption of the most poorly adopted checks, ie nitrogen uptake, plant numbers and water levels at microspore to improve yields
- Nitrogen management should focus on split nitrogen timing between pre-flood and panicle initiation
- There is still a need to identify and overcome known barriers to water depth management at the microspore stage, as it is such an important check in minimising the effects of cold damage.

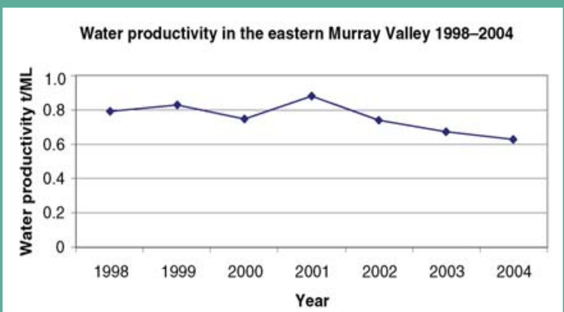

Figure 5 *Water productivity in the eastern Murray Valley, 1998–2004*
Source: Murray Irrigation Limited Environmental Report 2004

- There is a need to improve rice layouts with particular focus on improving the proportion of lasered paddocks used for rice
- Farmers need to be encouraged to improve the adoption of more of the nine yield checks
- The three irrigation companies need to be supported and encouraged to use the best EM (electromagnetic) and sodicity technology to enable the selection of rice land with the lowest water use
- The importance of the sowing date and panicle initiation date key checks need to be highlighted as an option for minimising the risk of cold damage and opportunity to increase rice yields
- A risk assessment on the benefits of sowing on time with low announced water allocations needs to be weighed up against the risk of running out of water and expensive water trading
- Better ways of communicating to growers the importance of harvesting at 20–22% grain moisture to enable improvement in grain quality need to be investigated
- Resistance management herbicide programs should encourage farmers and retail agronomists to alternate the thiobencarb (Saturn®) and benzofenap (Taipan®) herbicide program with other resistance programs where possible
- Farmer training in weed identification needs to remain a high priority particularly to prevent and control the spread of water plantain into the Murrumbidgee Valley
- The phosphorus check record should be rewritten to allow phosphorus check adoption to be evaluated
- More farmers in the Deniliquin, Barham, Griffith and Yanco districts need to be encouraged to complete and return Ricecheck records
- Restrictions on internet access to the Ricecheck database need to be overcome to allow agronomists and farmers to use the database

Recommendations for research

The lack of yield improvement in this project because of three cold seasons has highlighted the continuing importance and impact of cold damage on yields and the urgent requirement for cold tolerant varieties to complement the Ricecheck management practices for reducing cold damage.

Non chemical and new herbicide weed control options should be investigated as the industry is highly dependent on herbicide weed control and current herbicides and is threatened with future herbicide resistance to existing herbicides, eg Taipan®.

The factors causing soil variation and rice growth variability should be investigated and identified. Research is needed into technology and practices to overcome the variability.

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