A system of rice intensification (SRI)

- does it have potential to lift yields on the Riverine Plains?

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in a nutshell

- A rice production system called a system of rice intensification (SRI) was developed in Madagascar in the 1980s
- Recently, several prominent speakers have suggested that it may be applicable to the Australian rice industry
- None of the principles promoted for the apparent advantage of SRI are necessary for growing rice near its yield potential
- Some Australian growers are already achieving grain yields that are approaching 90% of the theoretical yield potential of rice grown in the Riverina

Is there a better way of producing rice?... and can significantly higher yields be produced? Supporters of the rice production regime called a system of rice intensification (SRI) would have us believe that the answers to these questions is 'yes'.

A keynote speaker at the 4th Temperate Rice Conference in Italy (June 2007) referred to and promoted SRI as an avenue to substantially increase grain yield of rice crops around the world.

At this year's annual conference of the RGA (June 2007), the keynote speaker Professor Julian Cribb, science journalist and Adjunct Professor of Science Communication at the University of Technology Sydney, also indicated that SRI could be a 'way forward' for Australian rice producers.

Internationally, SRI has been promoted by Professor Norman Uphoff of the Cornell International Institute for Food, Agriculture and Development, based at Cornell University, New York State, USA. Yield increases under SRI of 50–100% and even higher have been reported.

What is SRI?

The system of rice intensification was developed in Madagascar in the 1980s by the Rev. Father De Laulanie, a French Jesuit priest and agriculturalist who worked closely with local farmers.

Main features of SRI

The main features of SRI are:

- early transplanting (less than 15 days old) of single seedlings
- weed control – early and often
- intermittent irrigation to maintain moist but aerated soil during the vegetative stage of growth, ie from transplanting to just before panicle initiation – the irrigation system now referred to as alternate wetting and drying (AWD).

Other recommended practices

Other rice growing practices recommended in SRI are:

- transplanting rice seedlings on a square pattern at a 'wider' spacing than is used traditionally, eg 25 x 25 cm or 30 x 30 cm
- the application of compost, preferably to the preceding crop.

The only reported disadvantage with SRI is that the additional care required to transplant the seedlings (which are at the 2-leaf stage) and the need for earlier weed control require substantially higher inputs of manual labour. Weeds tend to be more of an issue where they have space to grow and under non-ponded water management.

In April 2002, I was fortunate to attend a workshop at IRRI (International Rice Research Institute) at Los Banos in the Philippines on *Water-wise rice production*. Three papers presented at the workshop were based on the Madagascar experience: a review by Professor Uphoff; a paper that surveyed farmer implementation of the recommended irrigation practices; and one that surveyed why farmer adoption of the system was low and disadoption was high.

Does SRI have advantages?

Substantial debate in the scientific literature and in more reader-friendly formats, eg *Rice Today* published by IRRI, has

occurred in recent years. Some of the relevant contributions from rice researchers around the world are summarised below.

Dobermann from University of Nebraska, USA reviewed cropping practices at known high-yield sites and concluded that 'techniques such as SRI are not necessary for growing rice near yield potential'. He further concluded that the 'benefits of SRI over conventional rice management are likely to be small on fertile rice soils with no constraints such as potential iron toxicity - provided that management follows known best practices'. And finally, 'approaches such as SRI may serve the important needs of resource-poor farmers in areas with poor soils but are likely to have little potential for improving rice production in intensive irrigated systems on more favourable soils, where high yields can be achieved through implementation of more cost-efficient management practices'.

Sheehy and colleagues at IRRI conducted experiments at three locations in China comparing yields in conventional and SRI management systems. They also 'used a theoretical model to predict maximum yields and compared these with reported yields for various locations, including China and Madagascar' (and Yanco). Their results 'imply that the SRI has no inherent advantage over the conventional system and that the original reports of extraordinary high yields are likely to be a consequence of error'. They reported that the predicted yields for Madagascar were high (up to 14.9 t/ha) and comparable to that of other high-yielding environments such as southern Australia and California.

McDonald and colleagues from the Department of Earth and Atmospheric Sciences, Cornell University, New York State, USA analysed the results from 40 comparisons of SRI with best management practices. Comparisons were sourced from 10 countries including Madagascar. This group ascertained that, excluding the Madagascar examples, the typical SRI outcome was negative. Twenty four of the 35 site-years demonstrated inferior yields from SRI – the average yield reduction was 11%. They concluded that the proponents of SRI based much of their case for SRI on experiments in a single country (Madagascar) with distinctive soils and outside Madagascar, to comparisons with farmer practices or national yield averages.

In Bangladesh, Latif and colleagues conducted a series of experiments and concluded that 'results of these studies suggest that several of the key management principles stated in SRI had in fact little effect on rice yields. Moreover, SRI did not increase rice yields when it was compared to existing best management practices. This and the increased labour demand and poor economic performance may make it an unattractive choice for rice farmers in Bangladesh'.

Has SRI a place in the Riverina?

Theoretical yield potential for the Riverine Plain is around 15 t/ha. Some of our rice growers already achieve commercial yields in excess of 13 t/ha. It is difficult to accept that adopting SRI principles would lead to even higher yields.

I consider that the main aspects of SRI that have contributed to the reported yield increases are the more effective weed control and the use of compost on soils that would be considered of very low natural fertility (either inherent or because they have grown rice for many decades or even centuries).

It will save some water because AWD is practiced up until near panicle initiation but not to the same extent as claimed for some of the experiences in other countries. Rice elsewhere is generally grown on lighter and much more free draining soils than those approved as suitable for rice production in the Riverina. Most of the 'savings' reported in SRI are due to reductions in seepage (down-slope) and drainage well below the root zone of the crop - not a reduction in evapotranspiration.

SRI may have a place in some rice growing areas in other countries but I do not consider that it has any potential to improve on current practices employed by most rice growers in the Murrumbidgee and Murray valleys.

Further reading

A Doberman (2004) A critical assessment of the system of rice intensification (SRI) Agricultural Systems ***79***:*261–281*

MA Latif, MR Islam, MY Ali and MA Saleque (2005) Validation of the system of rice intensification (SRI) in Bangladesh Field Crops Research ***93***: *281–292*

AJ McDonald, PR Hobbs and SJ Riha (2006) Does the system of rice intensification outperform conventional best management? A synopsis of the empirical record Field Crops Research ***96***:*31–36*

A Satyanarayana, TM Thiyagarajan and N Uphoff (2007) Opportunities for water saving with higher yield from the system of rice intensification Irrigation Science ***25***:*99–115*

JE Sheehy et al (2004) Fantastic yields in the system of rice intensification: fact or fallacy? Field Crops Research ***88***:*1–8*