



Irrigated wheat research - wrapping up the CSIRO- GRDC projects

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in a nutshell

- Wheat growers in the irrigation areas of southern NSW and northern Victoria have access to a new report bringing together all aspects of past and recent research results and knowledge in the management of irrigated wheat
- Now you can read at your leisure what you have been hearing from Maarten Stapper in workshops and field days over recent years

Maarten has been a valued contributor to the Farmers' Newsletter and his efforts to communicate the results of his research to the irrigators of the region are commendable. I take this opportunity to wish Maarten all the best in his new endeavours, post CSIRO. Ed.

Research into irrigated wheat over recent years has culminated in a set of guidelines that are the most comprehensive compiled from research trials undertaken in irrigation on the plains of south eastern Australia.

The GRDC-funded, Irrigated Cropping Forum supported *Irrigated Wheat Evaluation Project* for the irrigation areas in the GRDC Southern Region was conducted from 2001 to 2005. The project followed irrigated wheat research from 1983 to 1986 by Maarten Stapper and Tony Fischer.

A large range of breeding lines and varieties was evaluated in a core trial with sites at Griffith, Benerambah and Deniliquin. Additional experiments at Griffith involved sowing dates, sowing rates, nitrogen timing, growth regulators and fungicides. Progress reports have been presented on the GRDC website under *Research Updates – Irrigation, Southern Region and High Rainfall*; on the IREC website under *Research Updates*; and in IREC *Farmers' Newsletter* large area editions no.s 164, 166 and 169.

Crop management report

The results of three seasons' trials are compiled and discussed in the report *High Yielding Irrigated Wheat Crop Management* by Maarten Stapper, which will be available on the Irrigated Cropping Forum website <http://www.icf.org.au/pubs.html>, or a hard copy will be available from the IREC office.

The 30-page report highlights a range of factors that could contribute to building a crop structure (ie canopy management) necessary for achieving high grain yields with reduced lodging risk and with best use of solar energy (growth) with residual and fertiliser nitrogen, and available water. The important findings and conclusions of the project have been summarised in the guidelines that are listed as follows.

Choice of variety

- **Short season** varieties were most efficient with nitrogen and water
- **Flowering early** within the 3-week optimum period, around 1 October, can save one irrigation for similar yields
- **Stem strength and anchorage** of varieties is highly dependent on management

(Pre-)sowing management

- **Healthy soil condition** allows good root growth for plant anchorage, ie a healthy soil is well aerated, has good organic carbon content, no hard pans, has had minimum tillage and well managed traffic
- **Deep sowing** (6–7 cm) enhances strength of plant anchorage
- **Lower sowing rates for wider row spacings**, attaining a within-row plant distance of at least 2.5 cm, achieve best anchorage strength
- **Plant densities** of 60–80/m² minimise lodging losses while maintaining high yields



Post-sowing management

- **Limited early growth, restricted tillering and delayed canopy closure**, resulting in groundcover at Z30 (start of stem elongation) of less than 70%, enhances stem strength and achieves better balance between “source” size (leaves, stems) and “sink” numbers (spike, kernels); with a shoot density target of 600–800/m² at Z30
- **Nitrogen fertiliser application** to promote yield is most efficient when topdressing is between Z30 and Z32 (second node stage)
- **First spring irrigation** during early stem elongation is important, when required, if high yield potential has been set
- **Topdressing near flowering** with 30–40 kg N/ha may increase grain protein by 0.5–1.5%, and yield by 0.0–0.5 t/ha, if there has been an earlier topdressing to increase yield
- **Green leaf area at flowering** needs to be more than

3.5 green leaves per shoot to achieve greater than 8 t/ha yield,

- **Green leaf area duration** is maximised with timely irrigation after flowering to fill the “sink” to potential.

Crop monitoring document

There are no recipes to secure consistently high yields and a key message in striving for high yielding crops is that **you can't manage what you don't measure**.

Crop knowledge and monitoring are important to achieving profitable results.

A second document available on the ICF website is *Crop Monitoring and Zadoks Growth Stages for Wheat*, which explains paddock observations that are used with the guidelines in the project report. Crop observations are required to adjust timing and quantity of management to actual crop condition. This is a revised and greatly expanded edition of a handout from 21 years ago, *SIRAGCROP- Field Observations and Crop Standards for Wheat*, by Maarten Stapper and David Murray (IREC).



Figure 1: Maarten Stapper (centre) discusses wheat plant characteristics with growers



Figure 2: The trial results discussed at many field days and seminars are now available in a new report, *High Yielding Irrigated Wheat Crop Management* by Maarten Stapper.



Figure 3: The research indicates that lodging can be managed to a degree by later sowing dates. Here, the plots were sown on 4 April 2002 and by 30 October only the strong-stawed Marombi was standing.



Figure 4: The research concluded that stem strength and anchorage of the crop is highly dependent on management, more so than variety choice. This plot of a CIMMYT, Mexico, breeding line yielded 9 t/ha and had excellent short, strong stems.



Complementing other work

The guidelines presented in the *Irrigated Wheat Evaluation Project* report can be used with the key checks for best management practice in Wheatcheck, to determine with one's own experience, local guidelines for efficient use of resources and inputs in high yielding grain production, which of course will be dependent on the availability of water.

Comprehensive management guidelines for growing eight tonnes a hectare using many of the recommendations from this research have been described by John Lacy and Kirstie Giblin in the NSW DPI Primefact series. 🌾

Finale

I wish to thank all of you who have stimulated and supported me over the years in my directions of applied and on-farm research to benefit you, starting 24 years ago (!). Your comments and questions at workshops and field days were more profound than those from my colleagues because you

see the world from the inside. Sorry that I have not been able to deliver on some promises made. Keep going in these difficult times on the irrigation farm! Maarten.

Further information

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Further reading

Wheatcheck Recommendations (2003) NSW DPI, Vic DPI, GRDC & ICF.

Growing eight tonnes a hectare of irrigated wheat in southern NSW, Primefact 197 (2006) NSW DPI.

SIRAGCROP- Field Observations and Crop Standards for Wheat (1986) M Stapper and D Murray, CSIRO Plant Industry.