Permanent beds on rice farms - the final year

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in a rice hull

- The performance of wheat sown in the final cropping season of the 'beds in bays' experiment was hampered by seasonal conditions and availability of irrigation water, and conclusions about irrigation systems could not be drawn
- The over-riding conclusion of the work over the last three years is that adoption of terraced zero-graded bankless channel rice layouts (including raised beds) is likely, as the layout system increases cropping choice and flexibility, and significantly reduces labour requirements
- Adoption will be dependent on locations with:
  - existing land grades that allow creation of zero-graded layouts with appropriate terrace widths and steps to allow adequate drainage (landforming costs not being excessive)
  - access to large irrigation flows or on-farm storages in order to achieve satisfactory short duration 'water on/ water off' times for crops other than rice

The objective of this research was to assess the performance of rice, soybean, barley and wheat on lateral permanent raised beds or 'beds in bays' compared with conventional flat irrigation layouts. The experiment has been progressively reported upon in previous issues of the IREC Farmers' Newsletter (see Further reading).

After the 2005–06 rice crop, wheat performance was assessed on lateral permanent raised beds following rice-rice or soybean-rice crop sequences, using either furrow or subsurface drip irrigation.

Wheat (cvv Chara and Ventura) was sown into the burned rice stubble on 18 May 2006 using the Stubble King disc seeder at a seeding rate of 100 kg/ha with 175 kg/ha of DAP. Each treatment plot was split widthways to sow the two wheat varieties. The subsurface drip irrigated treatments were irrigated after sowing on 18 May. The furrow irrigated treatments were not irrigated, but germinated following a 25 mm rainfall event on 10 June 2006.

All treatments were topdressed with 125 kg N/ha as urea on 28 August and surface irrigated on 31 August. A further four irrigations were applied, the last being on 7 November. The 'in season' rainfall was 112 mm.

Wheat results 2006

Plant establishment

Plant establishment was excellent (130–150 plants/m^2) with no difference between irrigation layouts or varieties.

Dry matter production

There was no significant difference in dry matter production at anthesis (flowering) between irrigation layouts or cropping history (Figure 2). However there was a significant difference between varieties, with Chara producing significantly more dry matter than Ventura.

At physiological maturity there was no significant difference in total dry matter production between cropping history or irrigation layout (Figure 3). There was however a significant difference between varieties, Chara producing significantly more dry matter than Ventura.

Harvest grain yield

Yields of treatments with a soybean-rice cropping history were not significantly different to those with a rice-rice cropping history (Figure 4). The furrow irrigated treatments yielded significantly more grain than the drip irrigated treatments and Chara yielded significantly more grain than Ventura. There were no significant treatment interactions.

Water use & water productivity

The water use (irrigation and rainfall) of the furrow treatment (4.3 ML) was 0.5 ML higher than the drip irrigated treatments (3.8 ML) (Figure 5). The water productivity of different irrigation layouts was not significantly different. Due to its higher grain yield Chara had significantly higher water productivity than Ventura (Figure 6).

Figure 1: Ventura (left) and Chara wheat growing on raised beds following rice during the 2006 season at Coleambally Demonstration Farm

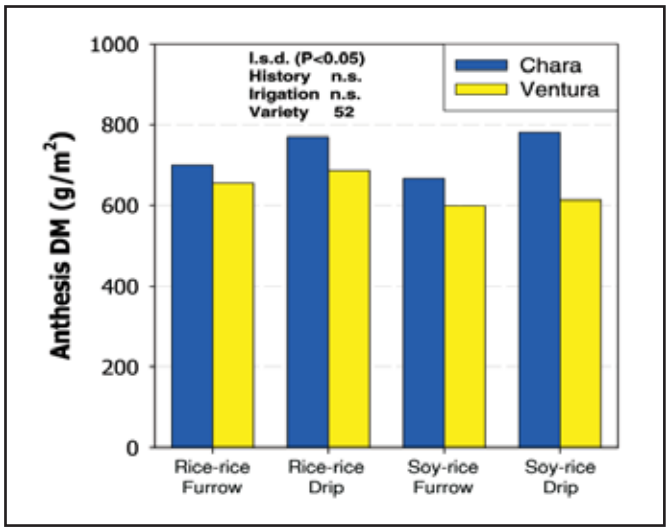

Figure 2: Effect of irrigation layout, crop history and variety on anthesis dry matter production

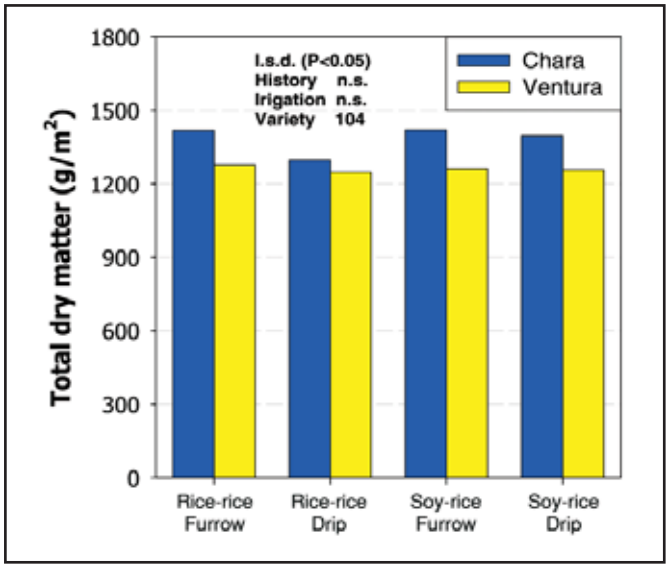

Figure 3: Effect of irrigation layout, crop history and variety on total dry matter production at physiological maturity

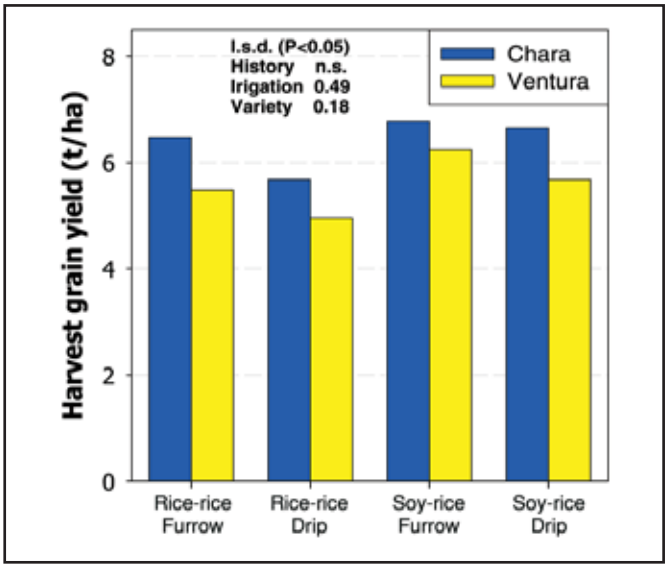

Figure 4: Effect of irrigation layout, crop history and variety on harvest grain yield

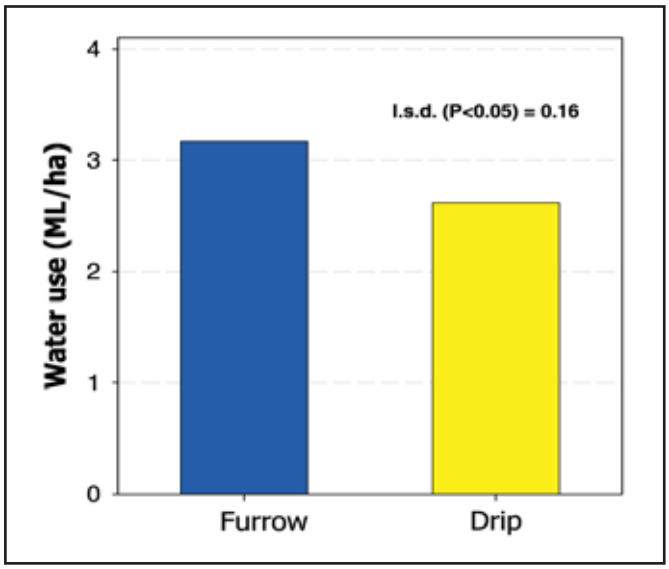

Figure 5: Effect of irrigation layout on wheat crop water use

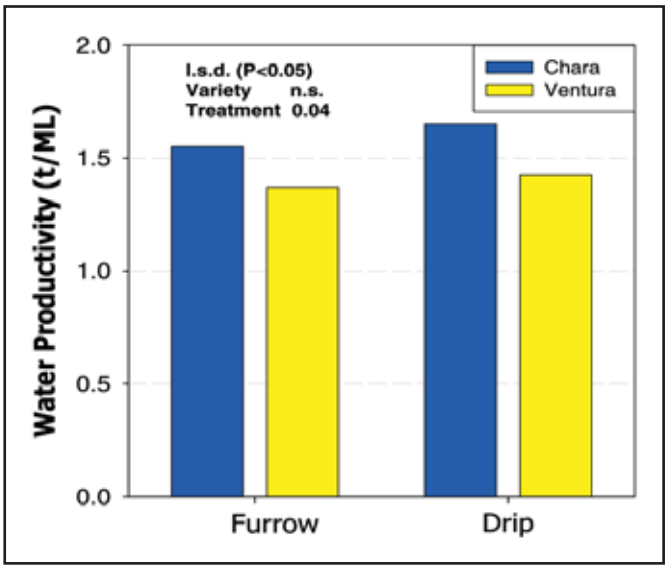

Figure 6: Effect of irrigation layout and cultivar on water productivity

Season summary

Winter cereal crop performance was limited due to delayed sowing in mid-May (the furrow irrigated treatment did not receive germinating rainfall until mid June), significantly later than the late April/early May optimum recommended to achieve high yields. Sowing time was constrained by growing wheat after rice (ie by a late harvest even with low rainfall during the autumn of the experiment and by low rainfall conditions generally). This was exacerbated by an inability to access irrigation water in late winter/early spring when soil moisture levels were depleted by lack of sufficient winter rainfall.

Terraced zero-graded bankless channel rice layouts (including raised beds) increased cropping choice and flexibility and significantly reduced labour requirements. So the on-going adoption of these layouts appears likely. The adoption of these layouts will be constrained to locations where existing land grades allow for creation of zero-graded layouts with appropriate terrace widths (landforming costs not being excessive) and steps to allow adequate drainage. These layouts will also require access to large irrigation flows in order to achieve satisfactory short duration 'water on/water off' times for crops other than rice. Adoption may require use of on-farm storages to allow access to adequate water volumes.

Acknowledgements

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Further reading

HG Beecher, JA Thompson, BW Dunn, RP Singh and SK Mathews (2007). Using raised beds on rice farms – innovative rice based cropping systems. RIRDC Publication number 07/115.

Geoff Beecher, Brian Dunn, Shayne Mathews, John Thompson, Rajinder Pal Singh, Liz Humphreys, Jagadish Timsina, Keiran O'Keeffe & Daniel Johnston (2007). Permanent lateral beds for sustainable cropping systems on rice farms. IREC Farmers' Newsletter, *Rice R&D edition, No. 174, Summer 2006–07, pp 4–8.*

Geoff Beecher, Brian Dunn, Shayne Mathews, John Thompson, Rajinder Pal Singh, Liz Humphreys, Jagadish Timsina, Keiran O'Keeffe & Daniel Johnston. Permanent lateral beds for sustainable cropping systems on rice farms (2006). IREC Farmers' Newsletter, *Rice R&D edition, No. 171, Summer 2006, pp 24–27.*

Shayne Mathews, Geoff Beecher, Brian Dunn, John Thompson, Liz Humphreys, and Daniel Johnston (2005). Permanent beds for sustainable cropping systems. IREC Farmers' Newsletter, *Rice R&D edition, No. 168, Summer 2005, pp 25–27.*