

# GROWER CASE STUDY

## “BELLEVUE” NARRABRI

### IRRIGATION CONVERSION: Siphon to small-pipe-through-the-bank

Supported by CRDC

CASE STUDY JULY 2024

#### BACKGROUND

- Darren, Leanne and Tom Eather, “Bellevue”, Narrabri NSW
- Converted irrigation Area: 630 Ha
- Farm irrigation area: 2,500 Ha
- Irrigation conversion: Siphon to small-pipe-through-the-bank
- Water Source: Namoi River and bores

#### MOTIVATION

To implement a more productive irrigation system and reduce labour and management requirements while meeting crop agronomic needs.

#### OVERVIEW OF SYSTEM

##### » Before

The siphon design had been the original layout from the initial development at “Bellevue”. The current siphon designs rely on casual labour at each watering which requires its own set of logistical challenges, management, planning, and communications. Labour costs in a normal year were in excess of \$300 per hectare. The field length is 600m and the layout has not been redesigned or altered during the redevelopment process, apart from the main channel supply area. The Eather’s are seeking to streamline their operations for higher labour productivity and disease management, without increasing exposure to erosion from moving large volumes of water.

##### » After

The Eather family has been researching alternative designs to simplify siphon irrigation as well as considering new layouts, following an initial visit to a well-developed bankless farm on the Murray Valley near Swan Hill. From here, Darren sought advice from pioneers, the Carolan family west of Wee Waa. The visit to ‘Waverley’ to see a large-scale small-pipe-through-the-bank (SPTtB) in operation and to hear Steve Carolan’s experience over eight years of development inspired Darren to continue his investigations into costing a design change to a similar layout. After the visit to Waverley and some reflection, Darren had enough confidence to take on the development ‘in house’ with his own staff and machinery.

***“I spoke with a consulting engineer about drafting a plan in a more formal process. I was happy to go down that path, but the wait times didn’t fit in with our schedule, so we thought we would have a crack ourselves.”***

The Eather’s then developed fields in 12 Ha bay increments using design measurements from Google Earth and existing survey maps. When the development was complete and use of the new fields commenced, the change in productivity was noticeable and management became much simpler.



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"When siphon irrigation is on, the vehicles are driving around in a cloud of dust on each water - priming siphons and checking tailwater. In the new system its one person – the farm is a lot less busy and more productive now under the new system," Darren commented.

The measured labour costs, including management oversight and on-costs were reduced by a whopping 90% after the development.

"We are very happy with the development overall. The change to SPTtB is equivalent in many ways to moving to the round-bale picker. We wondered why we hadn't done it sooner."

### KEY CONSIDERATIONS

The SPTtB bankless development is best characterised by its simplicity: no changes to pump capacities or field layouts and site planning and engineering were all carried out by the Eather's and their in-house personnel.

The field lengths were already optimal, and Darren believes that water use is basically unchanged, although he does see benefits in moving the water on and off the field in wet years and in-turn, improving fertiliser use efficiency and providing incremental yield differences from less waterlogging.

The Eather's did consider roll-over or bay bankless systems during their due diligence before deciding on and implementing SPTtB irrigation.

"While I'm sure it's a great system for those that have gone that way, in this slightly cooler climate east of Narrabri, flooding the whole field can lead to challenges with verticillium and we didn't have an appetite to undertake major civil earthworks as those projects are very capital intensive," Darren said.

***"Our field and system overall are already quite water efficient and moving water this way there is so little erosion and low-cost maintenance of bays and channels."***

The implementation of the SPTtB system has also created new opportunities to water winter crops. Darren estimates about one in every three cotton crops will have some surplus water to apply to wheat or the break crop which is normally too inconvenient or inefficient to mobilise siphons and staff. "Now that we have our irrigation streamlined in terms of staff and management, we have the ability to put one or two waters on winter crop, and during some dry years when cereal prices are high, the \$/ML returns can be right up there."

At Bellevue, the Eather's will continue to develop a target of around 600 hectares each year when time permits. Automation is not a priority at this stage and given the large gains in productivity already achieved, having a set of eyes and ears on the ground during irrigation still has a great value. "We are not ruling out automation and things may change as the new system expands, but for us, there is value in having someone on site who can ensure everything is running smoothly and troubleshoot any problems at the same time"

### BENEFITS

#### » Big gains in farm labour efficiency

The newly developed SPTtB bankless design revealed a labour saving of approximately \$330 Ha across a full season of eight water applications. This amounted to a 90% reduction in labour costs. The analysis of one fully developed 12 ha bay only requires one labour unit for one hour to start, finish and move to the next bay. The speed and efficiency of watering in smaller bays than the original siphon layout has avoided the need for casual staff and reduced traffic around the farm and simplified farm management.



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## ANALYSIS OF COSTINGS

The Eather's have valued their SPTtB development using market retail rates for infrastructure purchases and wet hire (inc. labour at market) for all machinery tasks performed by excavators and graders.

Figure 1 illustrates the cost area breakdown showing the largest cost line item being the 75mm siphons, forming the bay inlet followed by installing the 7m wide laser pad and reclaiming/installing the bay inlet. No alteration to pump stations or supply channels were necessary. The total development cost was calculated to be \$560/Ha.

"Bellevue", Narrabri - SPTtB development costings

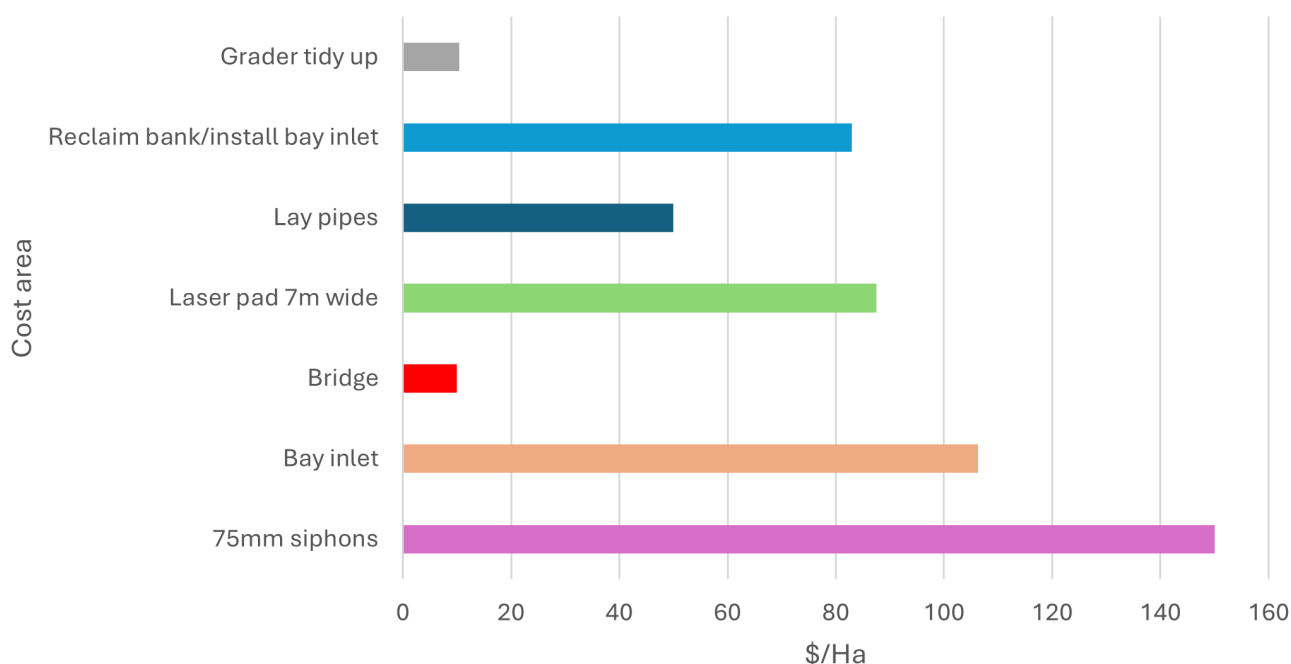


Figure 1 bankless costings at "Bellevue", Narrabri NSW



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## PROJECT ECONOMICS

There were benefits and costs associated with a system change from siphon/furrow irrigation to SPTtB bankless at “Bellevue”. The major benefit from the system change was the avoidance of labour, on-costs and management associated with logistics and communications during the irrigation season. Water savings were assumed to be nil in this scenario with immediate reference to the prior season as the comparison used. Crop yields were assumed to have risen by 1% owing to better crop water management during wet years when water can be applied in a timelier manner. Although some fertiliser use efficiency may occur now and in future, no benefits have been accrued in this analysis. The cost categories include all planning, equipment, and earthworks necessary to install the bankless system. There were no opportunity costs of foregone crops, with the works carried out during a planned crop fallow period.

A Discounted Cash Flow (DCF) analysis was used to measure the Net Present Value of the system change over 20 years to better account for periods of drought and low water availability. The crop rotation is irrigated cotton followed by wheat followed by fallow resulting in a one-in-two-year use of the bankless system in the fields in this analysis. A discount rate of 7% was used. The economic results of the analysis found a payback period of two years, although would most likely occur mid-way through the second cotton crop, or sooner if the following cereal crop were watered. The change to SPTtB bankless revealed a stellar Internal Rate of Return of 75%. The benefits and costs are illustrated in Figure 2.

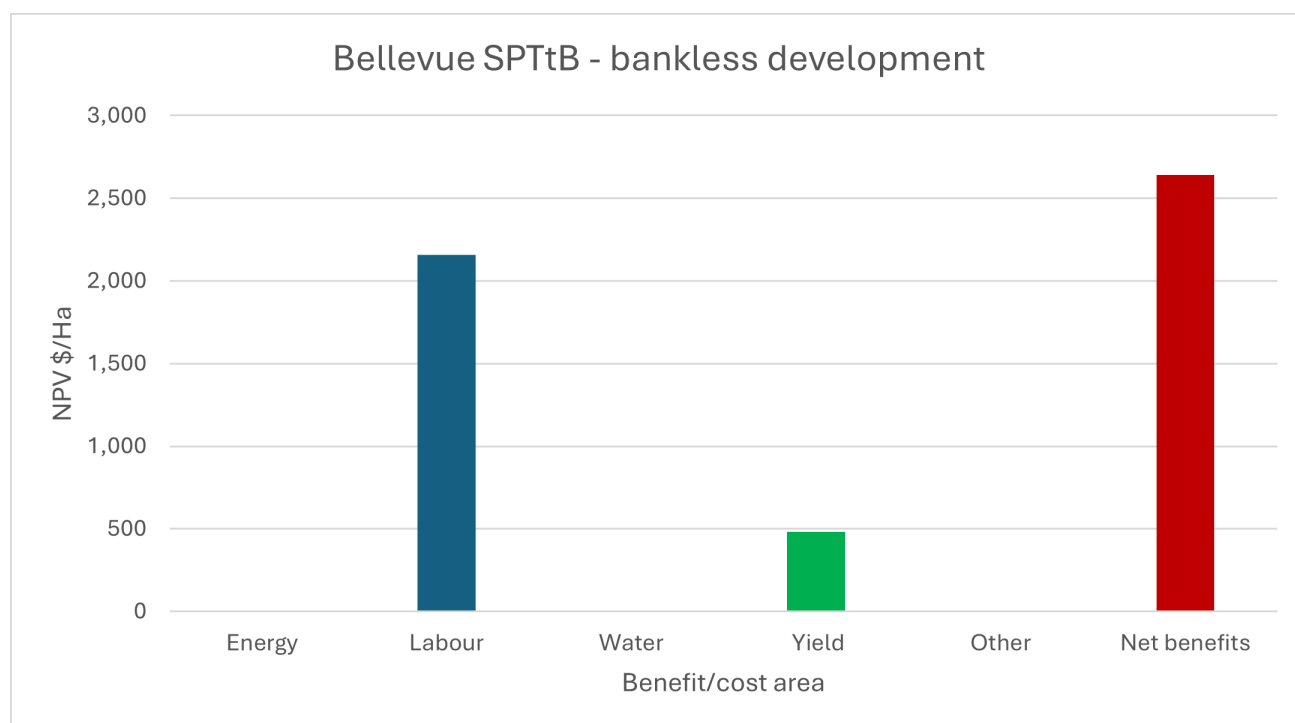


Figure 2 Present Value benefits and costs over 20 years on a bankless conversion at “Bellevue”, Narrabri



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## REFLECTIONS

After converting 630 hectares of siphons to SPTtB, the Eather's have a few key learnings and have fine-tuned installations of irregular fields and point rows but seem to have figured out an approach.

Larger fields are much easier quicker to develop, and smaller, irregular field layouts are slower.

When installing the poly pipe, extra care is taken to cover all the pipe, if not it tends to bend up and flow rates can vary across a given field. Darren has also learned not to skim on rock fill or ballast where water enters a section.

Also, where a side fall exists, engineer 200 m steps with 250mm drop which enables continued use of the head ditch.

The Eather's plan on developing a similar amount of land area this coming season.



**Images:** bankless conversion at "Bellevue", Narrabri



For further information:

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