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case study

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Bankless channels

The Cook family case study

“Turkey Lagoon” was first settled by the Cook family in 1886. Today it is a 1,788 ha mixed farming enterprise, located 10km east of Boggabilla and owned and operated by Graham (Cookie) and Kylie Cook.

Cookie's father first started the irrigation development in 1978. Their first irrigated crop was grown in 1980; sorghum and soybeans. They grew their first cotton crop in 1981. Today they irrigate 730 ha, growing cotton, maize, sorghum, wheat, barley and lucerne.

While their main irrigation system remains furrow, using siphons, they also have a centre pivot and lateral move and more recently developed two fields into bankless channels.



Why bankless channels?

In 2011, the Cooks experienced the biggest floods they can remember on Turkey Lagoon. The water went right over the top of the main supply, over the levee and took with it all the head ditches. There were siphons spread all across the farm. As a result of this flood, Cookie started looking around for different types of irrigation; one that didn't have all the banks and pipes. It was suggested that the Cooks go up to Bullamon Plains for a look.

It was this trip to Bullamon Plains that inspired the Cooks to make the change. They were able to look over the operation and were really impressed by the bankless system. They could see many benefits of the system over traditional siphons that they could achieve on their own farm.

“We had to make a few different changes that suited our system here. Where we originally wanted to put it in was in 100 ha in Field 5 as it's where we got a lot of flood damage. But we didn't have enough side fall to drop it from bay to bay, we would have had to move too much dirt, so it didn't fit in well in those fields.

“We then considered Fields 2 & 3, which also had some flood damage. Field 3 originally ran North South, so as a flood field it was lasered with a slope of around 1:1600 along the length of the field.

Best Practice



"By turning the paddock around we could use that slope as our side fall, but it also meant we were back to 1400m runs which we thought might be too long. However, I reckoned we could do it as long as we had the capacity to have high flow rates."

"The flow rate that we needed was equivalent to running a single 3" siphon every row, so that established the flow rate we required to get the water on and off quickly. It was designed using a flow rate of 100 ML/day which was to put the water through in eight hours. As it turned out with the head we can get in the main supply we can push it up to 140ML/day, if the main supply is completely full."

"With a higher head we are consistently getting them through in a five hour set. We have also reduced our soil deficit, where we used to run a 60mm deficit, we now run a 45 to 50mm deficit".

Benefits of the bankless channel system:

According to Cookie, the benefits are:

1. "Labour savings: not so much the labour in starting siphons, but the labour involved with putting siphons out, putting rotabucks in, working rotabucks and shifting siphons."

2. "Energy efficiency of the long runs with our tractor operations and spraying. It's at least 20 to 25 per cent more efficient without any doubt at all with our tractors being able to just lift up and turn around both ends, rather than having to back-back at a head ditch."

The Cooks cannot see any disadvantages in yield loss yet and water savings still need to be measured.

"We expect there are some water savings just by the amount of water flowing, irrigations are quicker and we wouldn't have the evaporation of the smaller siphon fields. Our siphon fields are half the length of the bankless and eight hours a set whereas on our 1400m bankless bays, we are getting them through in five hours, there has got to be some water saving there."

Challenges of the bankless channel system:

According to Cookie, the challenges are:

1. "Large water volumes we must have to get the water through."
2. "The evenness of your field, requiring a very good job on the levelling of the field. Laser levelling will have a big influence on the efficient watering of these fields."



Advice to others:

“Learn from others, go with what has worked and tweak it for your own farm”

1. The biggest thing is you must know your own block first, what will work for you in your situation taking into account soil type, slope, supply and tail return system.

“When I went out to Bullamon Plains, they had three or four designs and I had to work out what would fit in best with our system. Without going up there I wouldn’t have had the ideas to change the little things and everyone has to tweak the designs to suit their system and their farm.”

2. You must have enough side fall in your country to be able to get a minimum 15cm terrace (or step) between bays.

3. Make sure you have the capacity to get the high flow rates to get the water down each bay.

“People have asked me why can’t we do this with 60 ML/day and I’ve said you can, but you’d have to reduce your bay width, so would have to double your checks, and every check costs you around \$5000.”

4. Make sure you have a good tail return system to get your tail water away efficiently.

“Bigger is better when constructing your taildrains.”

Bankless channel system on Turkey Lagoon:

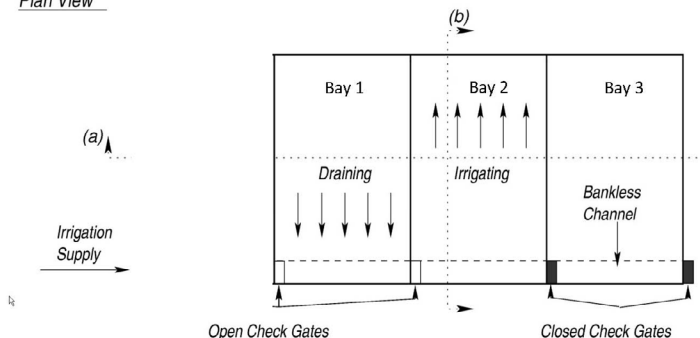
Two siphon fields (field 2 and field 3) have been converted to bankless channel. Works were conducted after the 2011 floods, with the first crop grown in Field 3 in 2012-13 and field 2 in 2013-14.

Field 3 consists of 3 terraced bays with a vertical separation of 150mm. Each bay is 1400m long and 165m wide, covering an area of 23 ha. Each bay has a very shallow positive (uphill) field slope of around +0.06% (1:1667). The bays have no cross slope and row crops are grown on beds. All bays are connected with a bankless channel, but each bay is irrigated individually.

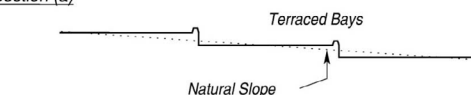
The irrigation process:

The check gates on both the bankless channel and taildrain are closed. The supply channel provides a flow of around 120 ML/day, filling the bankless channel in bay one. The irrigation water backs up behind the check gate structure causing the water to rise and spill into the adjacent bay. The water moves up the field. Once around 75% of rows are through, the tail drain gates are opened, this water flows into the second bay and wets up the tail drain, as the second check gate is closed the tailwater level rises and can back up into the second bay. The head ditch end check gates are then opened, one level at a time allowing both supply water from the channel and drainage water from the bay one to flow into bay two. This process is then repeated for each bay.

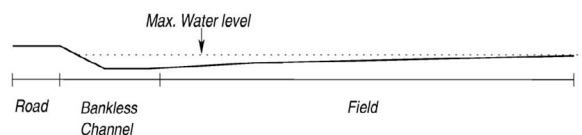
Plan View



Cross-Section (a)



Longitudinal Cross-Section (b)



Adapted from Grabham, M, 2012. Bankless channel irrigation systems, WATERpak, CRDC. www.crdc.com.au/publications.