Water reticulation on-farm in a challenging environment

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Abstract

Designing a water reticulation system is not easy. The example of 'South Bukalong' is one with a difficult terrain and high water requirements due to holistic grazing management. However, we have found an effective method for our situation.

Key words

Water reticulation, holistic grazing management, carrying capacity.

Introduction

'South Bukalong' is a 2,300 ha grazing property located 15 km northwest of Bombala, on the Monaro in southern NSW. It is a 6th generation family-owned property which, until recently, has centered its business on a cattle seedstock operation and a flock of 4,000 Merino ewes. The country is steep to undulating with a 230 m difference in elevation (640-870 m). 'South Bukalong' has access to rainfall records for over 180 years. Over this time the average and median rainfall has been 600 mm. Fortunately, water can also be sourced from the generally reliable Bombala River.

We are using an holistic grazing system (Savory 1988) where, in fast growing times (spring/autumn after good rain), stock moves are rapid (45 days) and, in slow growth (summer/winter or droughts), they are much longer (150+ days). If plants are not fully recovered by the time stock come back in the next cycle, stock movements are too fast, and pastures are probably overstocked. If you get it right, it is easy to plan ahead. How many of you would be able to graze your paddocks only TWICE a year in the next drought?

Reticulating stock water

After a series of dry seasons in 1965, my grandfather John made the first steps towards reticulating water across the property. He did this with the aim of reducing the dependence on unreliable farm dams and drought-proofing the property. My father Murray has added many extra lines to the main skeleton of this system over the last 30 years.

Initially, we merely had a trough in each paddock, but this changed in 2000 when we began to plan our grazing program with much longer rest periods. This new regime was to involve a small number of mobs with very large sizes, and we needed to ensure we could deliver enough water to any paddock at a sufficiently high flow rate to water all stock. With planned grazing, stock need water when they want it, and we have moved away from dams due to lack of run-off and better growth rates with cleaner water. Only 2 dams are full at present, and only because they receive extra runoff from a sealed road.

The other consideration was that to make this grazing plan work we needed smaller paddocks and a lot more of them. Having smaller dams in each paddock seemed like a recipe for disaster, as they tend to dry up quickly, and the capital cost of building them is prohibitive.

One of the first decisions we had to make was determining the long-term carrying capacity for our property. To do this we used a formula by Reg French from South Australia (French 1987). This formula suggests that we should be able to run 1 dse/ha for every 25 mm annual rainfall received over 250 mm. Therefore, using the above formula for 'South Bukalong' with 600 mm average rainfall, the long-term carrying capacity should be around 14 dse/ha.

With an holistic grazing system, it is easy to misjudge the overall carrying capacity because of the large mob sizes and the long rest periods. Due to the run of season failures and our attitude to grazing, we have opted to build in a safety margin by reducing the potential carrying capacity to 70% of the predicted rate. Using average rainfall for 'South Bukalong', this would be around 10 dse/ha. We currently run 8 dse/ha because we have only received 450 mm for the

past 12 months to mid May (driest decade in history). However, according to the 70% safety margin, we should be running only 5.7 dse/ha.

Water requirements

For our reticulation system we need to provide enough water for the entire property at the long-term average stocking rate. Assuming the full 14 dse/ha, this works out to be:

2,300 ha x 14 dse = 32,200 dse
32,200 dse x 3 L/dse/day = 100,000 L/day demand.

Our pump delivers 130,000 L/day over 1.8 km with 180 m of head to a turkey nest dam at 800 m elevation. This sounds simple, but needs a water professional to look at grades and flow rates, and is quite expensive.

With a mob of up to 6,000 sheep or 1,000 cattle in summer, the peak of water consumption requires 20,000 litres over 2 hours each day (40 mins at dawn, 40 mins at midday and 40 mins at dusk), and a high flow would be better, as sheep drink as a mob rather than individually. To achieve this, we need 3 litres per second gravity fed with at least 50 metres of head in Class 6.3 PN 63 mm (2½ inch) pipe, with minimal friction loss. This class of poly piping is adequate for these pressures. This exercise costs significant money (approx $5/m laid with joins, fittings and troughs), but when we weigh up the advantages of watering our sheep or cattle in this grazing system, the costs are small.

By using movable troughs we have been able to efficiently put stock water into every paddock on the property. However, a question in our minds is, "What trough length do we need to water 5,000 dse @ 3 L/sec"?

The water reticulation system should be an important success, especially when put in the context of the recent drought. Because of our grazing system, we believe we have more litter and have eliminated bare ground, seriously depleting runoff and, therefore, farm surface water supply. If we did not have our reticulated water, we could not have grazed all our paddocks. This would have had serious impacts on our ability to maintain our stocking rate and farm productivity.

Other water issues

Another aim is to increase our Readily Available Water (RAW) from 45 to 75 mm through increasing ground cover and infiltration, and by increasing soil carbon levels. Calculations show that increasing soil carbon by 1% can increase the water held in 1 square metre of soil by 18 litres. This is equivalent to 30-40 mm of rain, thus increasing RAW and decreasing runoff. We are also benchmarking our carbon levels this winter and are looking at selling them to people who are willing to be carbon-neutral.

Conclusion

We believe we can drought proof 'South Bukalong' before the next drought occurs - we just need five more years to have it all in the ground. As well as the benefits of the reticulated system outlined above, there is the added advantage of being able to "fill up" small (1ML) dry dams that are scattered throughout the paddocks.

References and further reading

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