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Rehydrating the landscape at Yanget, Geraldton, Western Australia

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Department of
**Primary Industries and
Regional Development**



Rehydrating the landscape at Yanget, Geraldton, Western Australia

Prepared by Jamie Bowyer, DPIRD, and Rod O'Bree, Yanget

Yanget, Geraldton, Western Australia

Rod and Bridie O'Bree

Farming goals

To re-create the natural beauty of the land by landscaping and controlling the water flow through the land, together with rebuilding the soil structure and resurrecting the plant life.

Regenerative agriculture practices

Rod and Bridie have used the natural sequence farming (NSF) approach with the aim of rehydrating the landscape based on using:

- earthworks to slow and spread the movement of water across the farm including re-engineering existing contour banks
- increased soil moisture with perennial pastures and native vegetation
- the holistic grazing approach
- natural plant evolution and increased biodiversity to rejuvenate soils and increase moisture absorption
- whole-of-farm pasture improvement.

Farm details



800 ha
25 km east of Geraldton



Long-term rainfall average is 486 mm. Average over last 30 years is 354 mm.



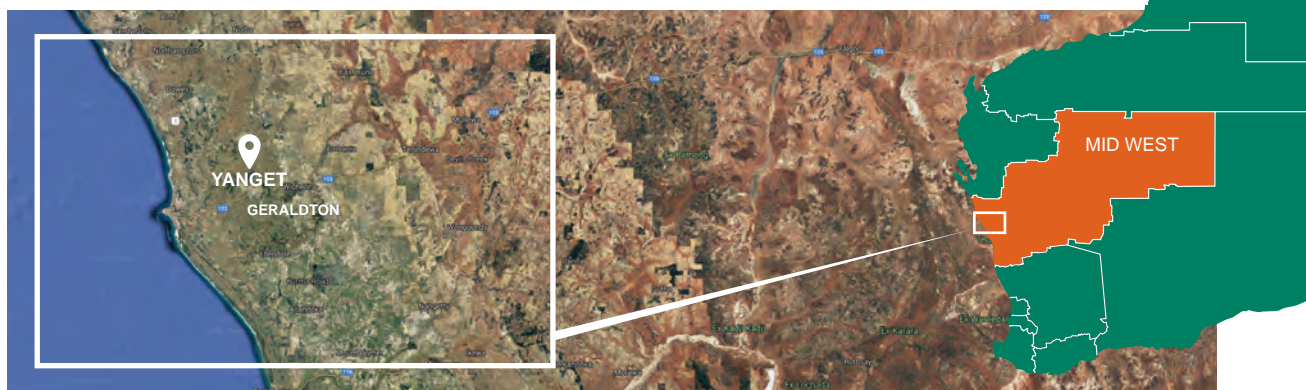
Red loam, gravel and sandplain soils on undulating and flat landscapes



150 head beef cattle herd,
40–60 head horse stud,
500–700 head lamb fattened annually



100% permanent pasture





Summer-active
perennial pasture
on sandplain soils

Rod and Bridie's story in brief

Rod and Bridie purchased 'Yanget' farm near Geraldton in Western Australia in January 2008 off the back of 2 of the worst years of drought in the Chapman Valley.

Yanget is an 800 ha property that straddles a breakaway between the gently undulating sandplain and the deeply incised upper catchment of the Chapman River.

In their first week on the farm, 25 mm of rain fell in a short period and by the next morning, all the water had run off and taken a lot of topsoil with it.

Erosion gullies were draining the landscape and the creekbeds were devoid of vegetation. Barely a blade of grass, green or brown, covered the soil on Yanget at the time.

Rod firmly believed that they could do better and set about learning and trialling how to sustainably manage the farm in a clearly changing climatic environment.

He had seen the work Peter Andrews was doing through the ABC's *Australian Story* and started experimenting at Yanget. Peter


Andrews visited the farm and passed on his philosophy and practical approach to managing the landscape.

The construction of earthworks to slow water down across the farm was ongoing from 2008. There were multiple failures in the early years until they were able to observe and better understand water movement across the landscape of their farm. They also re-engineered contour banks to hold water and to allow it to exit at strategic points.

The Department of Agriculture established perennial pasture trials on the farm in 2009 and Rod has also planted perennial pastures.

Some trees have been planted higher in the landscape, but most of the new vegetation is natural regeneration.

Rod also uses mechanical mulching to slash weeds, and he deposits manure at spill-out points on the contour banks so that water spreads nutrients down the landscape.



Gully erosion
and bare soil
typical of Yanget
in 2008

Motivation for change

Rod considered that he was pretty new to agriculture, despite being raised on a farm until he was 11 years old. He believed the NSF approach to farming made sense so he was keen to implement this approach on Yanget. He had also visited Peter Andrews' property 'Tarkyn Park' in NSW and liked what he saw from a sustainable land management perspective.

Rod has been around racehorses all his life and personal observations of the health of horses when grazing a mixed pasture sward compared to grain fed on limited species pastures made him think that there was a lot to learn about the interaction between animal health, pasture diversity and management, and general soil health.

Rod is also a food wholesaler and the observation of changes in human diet away from fresh produce to highly processed, long storage products motivated him to pursue the production of healthy, fresh food.

Condition of farm when purchased

Rod and Bridie purchased Yanget in 2008 after 2 years of drought. The creekbeds were devoid of vegetation and erosion gullies were draining the landscape.

'There was barely a blade of grass on the place. In February that year we had 25 mm of rainfall in a very short period of time. As a result of this fairly intense rain, water ran off the steep slopes below the breakaways and into the creeks. The water flowed through the creeks and then off the property at the creek crossing on the western boundary. The next day, the creeks were dry as if there had been no rain at all. The hard clay landscape in the valley would only grow thistles and radish, with very limited biodiversity overall. Every rain event caused further damage, with salinity visible in multiple gullies.'

Changes made

Soon after purchasing the farm, the O'Bree's engaged Peter Andrews to advise on implementing an NSF approach on Yanget, including:


- constructing earth banks within the creeklines aimed at slowing water movement down the landscape
- constructing near-level contour banks in the paddocks from the ponds formed behind the earth banks
- re-engineering existing contour banks to hold water and to allow it to exit at strategic points
- establishing Department of Agriculture perennial pasture trials in 2009
- establishing more perennial pastures on the slopes and flats, including onto heavy soils
- allowing weeds and invasive species to establish to increase the overall diversity of pastures
- using mechanical mulching to slash weeds
- depositing manure at spill-out points on the contour banks so that water spreads nutrients down the landscape.

Rehydration principles of natural sequence farming

- Construct earth banks within the creeklines at the places where there should be steps in the flow line.
- Re-create wetlands in the ponds that form behind those steps. This involves some planting of trees and other vegetation, but many wetlands species will naturally come back once the ponds are formed.
- Construct near-level contour banks, that will hold water high in the landscape, to allow water to run out of the creeklines along these contour banks.
- Construct spill-out points in the contour banks on the ridges so that water spreads out over the largest area below possible.
- Introduce perennials back onto cleared land:
 - ≈ woody perennials at the top of the landscape
 - ≈ water-tolerant perennials in the reformed floodplains low in the landscape
 - ≈ perennial grasses or legumes that will be compatible with cropping on the mid-slopes.
- Allow deep-rooted 'weeds' to grow and repair soils. The weeds can be mechanically mulched to help facilitate the natural succession to higher order plant communities.



Near-level contour bank designed to spread water across the landscape



Yanget sheep
grazing summer-
active perennials

Rod's observations of what has worked

- Grazing capacity has increased and the best animal production results were achieved in the last 2 years, despite limited rainfall.
- The diverse pasture and feed base seems to keep cattle healthy.
- Groundcover has increased.
- Earthworks associated with the NSF approach have slowed the movement of water through the property. Very little water now leaves the property. Water has left the farm in only 1 year out of the last 4 and that was after 185 mm in 2 weeks after a 10-month dry spell when only 18 mm of rain fell. Now, 25 mm of rain soaks into the broader landscape, compared to the 25 mm in February 2008 that flowed quickly off the property.
- Erosion has significantly reduced and gully-head erosion now doesn't occur.
- Drainage lines have naturally revegetated and are now stable.
- Native plants have naturally regenerated along creek and drainage lines.
- The perennial pasture species green panic, Bambatsi panic, signal grass, Consol love grass, siratro and lucerne have persisted well.
- Regrowth and recent plantings of trees and perennial pastures are surviving instead of dying as they did in early years.
- At least 2 new plant species are observed on the farm every year.
- Water storage at the site of the image on the cover page is extending each year.
- The correct placement of earthworks has resulted in waterholes having more water in them for longer, allowing more grass to grow in flow lines and helping to prevent salinity.

Rod's observations of what has worked (continued)

The 2 photos below of 'Three Creek Dam' show the differences in the retention of water and subsequent growth of native vegetation and stabilisation of waterways from 2009 (just after earthworks were completed) to 2017.

By luck, there have been 2 almost identical summer thunderstorms on Yanget that have demonstrated how dramatically water use has changed on the property in the first 4 years.

The first storm was just after the property was purchased and before any NSF works had started. This storm dropped 25 mm over several hours on 20 February 2009. As a result of the fairly intense rainfall, water ran off the steep slopes below the breakaways and into the creeks.

The water flowed through the creeks and then off the property at the creek crossing on the western boundary of the farm. Twenty-four hours after the rain fell, the creeks were dry again and all the surface water had left the property. In 2013, there was an almost identical February storm.

In this case there was also some water that ran off the steep slopes below the breakaways. This water filled the top contour banks and the first pond. Once the top pond was filled, it overflowed and filled the next pond. It took 3 weeks for the water in the creek to fill all the ponds and to reach the boundary. The creek continued flowing until late May when the next rain fell.

This before-and-after comparison demonstrates that the NSF implemented on Yanget has increased the time that the landscape has been hydrated from a summer rain event by 100 fold, that is, water in the creek for 1 day increased to water in the creek for 100 days.



Three Creek Dam in 2009



Three Creek Dam in 2017



What hasn't worked?

- European trees did not survive on the farm. They were not adapted to the climate and soils and none withstood the 47 °C days.
- Some of Peter Andrews' structures failed.
- Some early earthworks Rod constructed failed in places because of a lack of understanding on shape of the earthworks and their placement.
- Rod felt that perennial pastures failed on the heavy soils early in the Department of Agriculture's trials because of a lack of soil health.

What would you do differently?

- Implement the holistic grazing management system immediately.
- Complete most of the earthworks in the first year.
- Identify and introduce a wider variety and greater density of plants into the landscape from the beginning.

Next steps

To increase production on Yanget, Rod will be introducing a best practice grazing system based on:

- rotational grazing using holistic management method
- feed budgeting using fodder measurements with drones
- daily weighing of cattle using walk-over weighing in watering hubs
- contract growing-out of pastoral cattle as part of a supply chain.

Key lessons

- Develop an understanding of how to correctly build and place earthworks in waterways.
- Learn how water moves through the landscape.
- Learn about managing plants and stock.
- Better understand the roles of different plants.

Learning pathway and support used

- Peter Andrews philosophy and NSF approach, with some tips on earthworks from Peter.
- Self-learning including on-farm trialling and observing.
- Advice from a consultant who had seen the NSF approach working on other sites.

Yanget hydrogeology

Yanget occupies an upper landscape position in the Chapman Valley catchment. The southern boundary of the property is close to the catchment divide between the Chapman Valley and Greenough River catchments.

The farm is cleared and on flat, undulating and sloping land with well-defined incised drainage. The soils are shallow, residual soils overlying crystalline basement of the Northampton Complex. Small patches of crystalline basement rock outcrop throughout the general area.

Groundwater would not be present throughout most of the property and would only occur in discrete locations where favourable topography and regolith thickness allows small pockets of groundwater to accumulate and persist on the undulating bedrock topography. Salt storage in the profile would be negligible; studies have found that the highest salt storage in the Chapman Valley occurs in saprolite profiles directly under and protected by mesas, and the lowest salt stores occur in the sloping land.

General salinity risk considerations

Storage of excess water in parts of the landscape with high salt stores can raise saline watertables leading to evaporation, seeps and scalds that can also lead to erosion. DPIRD recommends that landholders investigate any likely salinity risk before they undertake works aimed at increasing recharge and rehydrating the landscape. This investigation needs to be done in the context of whether landholders are planning to introduce perennial plants across broad areas of their farm to use water stored in the soil from increased recharge.

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