Australian Government
Department of Agriculture, Fisheries and Forestry

Future Drought Fund

CHRRUP
Advancing rural communities

CASE STUDY
PREPARING FOR DROUGHT

HIDDENVALE

GAIL AND LES FIETZ FAMILY

JUNE 30, 2024

HIDDENVALE SUMMARY OF RESULTS

Activity	Situation 1984	Situation 2024	Future plan
Number of stock water points	5	19	24
Number of paddocks	1	8	12
Number of cattle sustainably supported	100	500	600

The project has played a crucial role by introducing techniques aimed at reversing developing erosion features in key drainage points and restoring function to bare, glazed, dehydrated areas. These issues are widespread throughout Australia, underscoring the high importance of this demonstration.

On Hiddenvale, the combination of hydration techniques and increased grazing rotation has resulted in spectacular results in only two years. The project has successfully achieved the following goals:

- ✓ Created a significant demonstration site for enhancing pasture cover and water function in the landscape.
- ✓ Restored the natural episodic wetland function of flats.
- ✓ Rehabilitated some of the most productive country by alleviating grazing pressure.
- ✓ Mitigated flood damage.

BACKGROUND

The Fietz Family purchased Hiddenvale, a 7,000ha cattle property in the desert uplands bioregion 40km East of Barcaldine, in 1984. Currently, the property supports a 500 head Droughtmaster cross breeder herd that is rotationally grazed across 8 paddocks. Dominant land types include Bloodwood and Box, supplemented by Ironbark and Gydgea. The recent drought caused significant dieback of shallow-rooted Ironbark and Gydgea trees, exacerbating erosion and leaving some areas completely bare.

Following nearly a decade of severe drought, Hiddenvale experienced 18 months of good rainfall at the start of the project. This rainfall triggered a significant vegetation response, including both pasture and woody vegetation. However, deep erosion gullies and widespread bare areas remain prevalent, with the property operating at approximately 66% of its carrying capacity.

Despite the property's gentle slope, large areas have become bare, showing varying degrees of erosion due to uncontrolled stormwater velocity. Flats that used to act as wetlands are now being drained too early or are not getting enough water from natural overland flow, which they used to rely on.

The project's activities were designed to showcase restoration potential while achieving cost-effective, optimal results. The aim is to reduce the damaging high velocity water flows, allow the system to take longer to drain, reduce flood damage, allow pasture and environmental re-establishment, and keep the catchment hydrated for longer.

HIDDENVALE

Hiddenvale provides an excellent demonstration site for targeting safe zones to address the accumulative effect of storm surge damage.

Interventions included strategically placing leaky timber windrows across flow lines on natural landscape steps to reduce water flow and create silt drop features. Additionally, small water blocks such as low-profile contour banks and water spreading channels were installed to counter damaging overland flow velocities on bare soils and erosion features, ensuring water is spread over a larger area. The project also focused on increasing water points and implementing paddock division to enhance paddock utilization and enable rotational grazing for improved land

Restoring natural function in what is often the most productive country best aids landholders to be more drought resilient.

recovery. New pasture grasses and legumes have been introduced into bare areas are thriving.

Left. Large areas of bare ground.

Right. Increasing gully erosion.

Solution. Dead trees pushed into contours to slow water flow have allowed pasture to establish in previously bare ground in only 1 year.

BASIC INFORMATION ABOUT HIDDENVALE

Property name	Hiddenvale; 6700ha
Nearest town	Barcaldine
Bioregion	Desert Uplands
Average rainfall (mean rainfall)	500mm
Land type/soils	Sandy loam
Livestock business	Breeding
How long have you owned the property?	40 years

PRACTICES – BEFORE AND AFTER

Grazing management system – (e.g. grazing periods, rotation time)	Time controlled grazing. Timing in each paddock varies according to grass availability. In 1984 – 1 paddock – no possibility for rotation. In 2024 – 8 paddocks Future plan for 12 paddocks
Stock Water improvement	In 1984 – 5 water points In 2021 – 19 water points In 2024 – 24 water points
Cattle numbers	In 1984 – 100 head of cattle Destocked early 2004 due to drought conditions. In 2024 - 500 head breeders. Future plan for 600 head breeders.
Pasture species grown	Significant areas of native grasses. Buffel grass is expanding due to increased rotation and new hydration measures. Have planted new legume and grass species through the project.
Land use by area - grazing, forest.	100% of country is used. In 2022 dead trees and suckers were pushed by a bulldozer. Timber was laid on the contour and successfully slowed water velocity and has significantly reversed erosion problems and increased ground cover.
Time of joining bulls	All year round – most cows calf naturally in November
Burning regime	No burning – previously owner used hot burns and caused erosion and destroyed pasture. The roots of spinifex were destroyed and was replaced with wire grass. Absence of burning has improved pasture quality.
Biodiversity	Plant and animal numbers are increasing rapidly. No problem with pigs, some problem with dogs

	and roos. The numbers are managed by shooting and trapping.
Plans for more infrastructure	Will lay poly pipe and connect it to 5000 and 10,00a stand to elevation and then trickle throughout property. Also a 10,000gal tanks.

TRANSITION TO DROUGHT PREPAREDNESS

Why did you take part in the project?	Wanted to learn about landscape hydration. We have large erosion gullies and bare land. We own machinery so this is a cost-effective way to improve production for us.
What are the "on-ground" objectives that you want to achieve as part of your project?	Slow water velocity to reduce erosion. Make better use of water that falls on the property – to allow more pasture growth. Increase cattle rotation.
What is required to consider the project a success?	Gaining knowledge through other peoples experience and through experts, and apply relevant ideas to our business
Will you continue to expand the project activities into the future?	Will use the experience from the project to expand in all problem erosion areas of the property. Will use lessons from other participants and our own trials to decide on what legumes to introduce. Will apply lessons learned on how to best establish a water system; undertake landscape hydration; increase the number of paddocks; seed eroded areas with legumes.
Do you envisage any impediments to implementation to increasing drought resilience - (risk analysis)	Lack of rain may cause us to sell animals. If it is too wet, can't use machines

CATTLE ROTATION

At the time of purchase, Hiddenvale consisted of a single large paddock. The owners have since divided the property into eight paddocks and implemented a rotational grazing system based on the number of cattle and the available pasture in each paddock. Cattle are moved before they start to lose condition, aiming to maximize pasture productivity and improve soil health. The project facilitated the division of the large paddock into two and the installation of a water distribution system to ensure more even grazing pressure across the paddocks.

EROSION REPAIR

Historic overgrazing on fragile soils has caused widespread sheet and gully erosion. The project has concentrated on landscape hydration, using techniques and practices to manage and enhance the water retention and distribution in a landscape. The owners have observed the following benefits:

1. Improved Soil Health
    - Reduced Erosion: Proper hydration has minimized soil erosion by stabilizing the soil structure and reducing runoff.

2. Increased Productivity
    - Optimized Plant Growth: Adequate water availability has allowed pastures to develop on bare land in only one year.
    - Extended Growing Seasons: Improved water retention allows for longer growing periods, even as conditions become drier.

3. Enhanced Biodiversity
    - Support for Diverse Plant Species: The well-hydrated landscape is supporting a wider variety of plant species, which in turn supports diverse native animal populations.
    - Habitat Creation: Increased water availability and the stick contours have created and enhanced habitats for wildlife.

4. Water Conservation
    - Improved Water Quality: By reducing runoff and erosion, water quality has improved as it slowly filters through the stick contours and diversion banks.

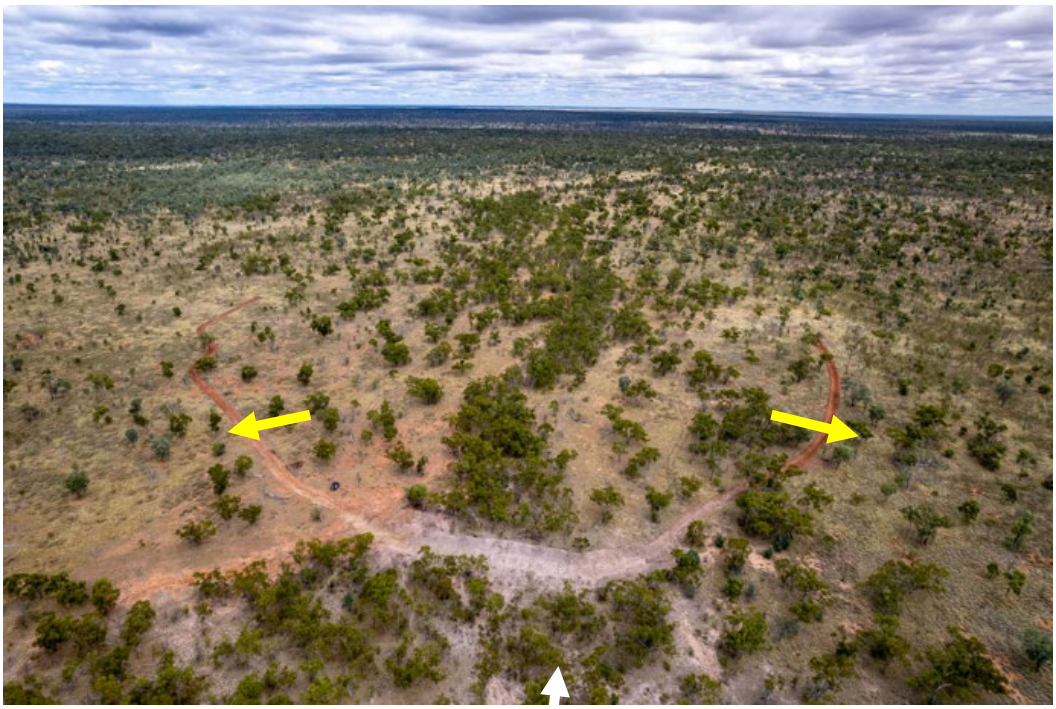
Hiddenvale is building Climate Resilience

Drought Resistance: Landscapes with good water retention are more resilient to drought conditions, maintaining productivity and ecosystem services during dry periods.

Temperature Regulation: Vegetated and hydrated landscapes help moderate the local temperatures, providing cooling effects during hot weather.

Implementing landscape hydration strategies is a key component of sustainable land management, providing multiple benefits for agriculture, ecosystems, and communities.

TECHNIQUES AND RESULTS OF LANDSCAPE HYDRATION



White arrow. Earthen bank across erosion gully to slow water velocity. Yellow arrows. Highlight the water spreading channels on the contour that irrigate the pasture and return natural function to the landscape.

Above. Building stick contours from trees killed in the drought slows water velocity, reduces erosion and allows infiltration and improves water quality.

Previously bare land now populated with improved pasture species. Left. Buffel grass, previously not thought to survive in this environment. Right. Secca stylo is growing to waist height. Legumes have high protein content and build muscle as well as providing nitrogen for the soils and stimulating nutrient cycling.

LINKAGE TO SOIL CARBON AND BIODIVERSITY CREDITS

Hiddenvale, one of five properties involved in the Future Drought Fund project, has adopted various drought-resilient strategies that align with the Clean Energy Regulator's 2021 soil carbon method for estimating soil organic carbon sequestration. These strategies include:

Altering Grazing Practices:

Adjusting the stocking rate, duration, or intensity of grazing to promote better soil health and carbon sequestration.

Land Remediation:

Modifying landscape or landform features to remediate and improve the land, thus enhancing its ability to sequester carbon.

Pasture Re-establishment:

Re-establishing or rejuvenating pastures through seeding efforts, contributing to improved soil organic carbon levels.

These activities fit well with the soil carbon and proposed nature repair market. However, the owners do not intend to register as a carbon project using the soil carbon methodology of the ERF. This partly due to the widespread local belief that the costs of registration and monitoring will outweigh the financial benefits.

BASELINE SAMPLING FOR SOIL HEALTH

The project only runs for two years but has embarked on a soils health monitoring program to provide a baseline to inform future management.

Soil health is critical to the productivity and resilience of arid and semi-arid regions. Soil health refers to the capacity of soil to function as a living ecosystem, supporting plant growth, storing water, and cycling nutrients. Improving soil health can increase pasture growth, reduce erosion, and enhance drought resilience. By monitoring soil health over time, land managers can assess the effectiveness of their management practices and make adjustments to optimize soil health and overall ecosystem function.

Soil was collected at depth 30 cm, 16.02.23 at three representative sites.

Sample 1.
Heavy Clay
Red clay soil with ant hills. Wattle, gum, sandalwood, desert oak, bloodwood. Kangaroo, white spear, and other native desert grasses.
Moderate water infiltration.
98% native plants. 50% ground cover

Sample 2.
Medium soil
Red clay loam – ironstone on surface.
Dead gydgea (due to dought) sandalwood, lancewood. Some wattle, galvanised burr, small grasses, some buffel under both dead and live trees.
Plan to push old trees into windrows and seed.
Moisture to 30cm. Poor infiltration.
90% native grass. 40% ground cover

Sample 3.
Light soil
Red sandy loam.
Dead Iron Bark (due to drought). Little regrowth. Some wattle, multiple native grass species. Some buffel. Less buffel under dead trees.
Roots to 30cm.
Moderate infiltration.
90% native grass. 90% ground cover

Importance of Total Organic Carbon

One of the major problems in continuous grazing systems is the depletion of Total Organic Carbon (TOC) in soils, that in turn runs down nutrient levels, particularly nitrogen (N). Understanding how much TOC is currently stored in the soils can be used as an indicator of soil health and will establish a basis for changed management practice.

Grazing has had a significant impact on soil health at Hiddenvale. Livestock grazing has degraded the natural pasture grasses and disrupt the natural ecosystem balance. Soil has compacted into hard capper surfaces leading to erosion and loss of soil organic matter. As a result, the soil is less productive.

The owners are reversing this process by increasing the amount of soil organic carbon - decaying plant matter, soil organisms and microbes through land management practices and through the introduction of legumes that fix Nitrogen.

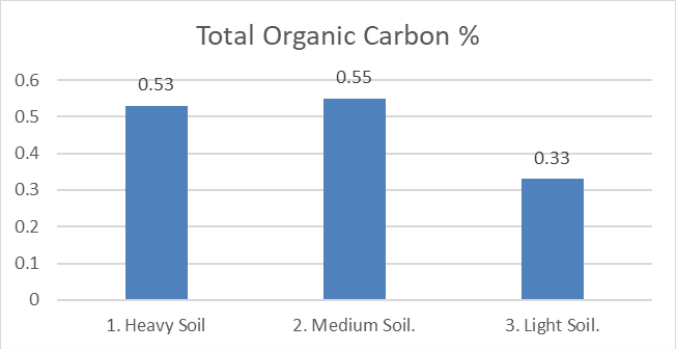
On Hiddenvale we have set a baseline by sampling soil to 30cm deep, collected from three representative land types. Laboratory LECO analysis was used to determine the % Total Organic Carbon (%TOC), the accepted measure of the organic carbon contained within the soil.

Soil Sample Results – Total Organic Carbon

Total Organic Carbon (TOC) is a vital measure of the carbon present in soil organic matter, and it is an essential indicator of soil fertility and health.

Typically, the TOC levels in arid rangelands of Australia are in the range of 0.1% to 2%. Arid rangelands generally have lower TOC levels than other ecosystems due to the limited availability of water and nutrients that restrict the growth and decomposition of organic matter. The strategy of landscape hydration has provided early results in the recovery of Hiddenvale.

The TOC content at Hiddenvale is low. The light soil has the lowest TOC content at 0.33%, while medium and heavy soils have TOC contents of 0.55% and 0.53%, respectively. Soil type appears to be the primary factor affecting TOC content, with heavier soils having higher TOC levels than light soils, despite the ground cover differences: 40-50% for heavier soils and 90% for light soils.

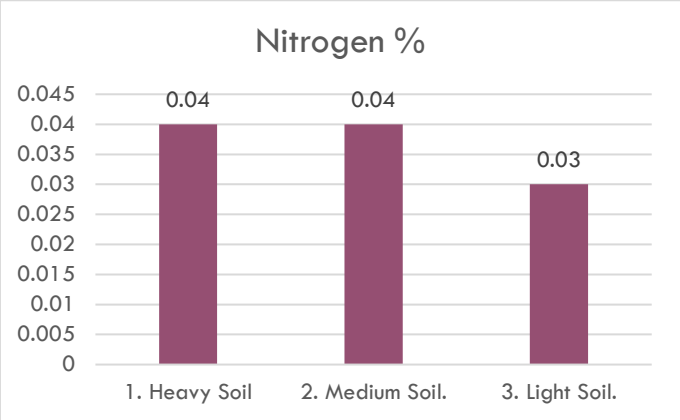


Importance of soil nitrogen and phosphorus

Nitrogen and phosphorus are essential nutrients for all living organisms. Phosphorus is bound to soil minerals, while nitrogen is converted by plants into protein. Plants use Nitrogen for leaf growth and good green colour, while Phosphorous helps form new roots, make seeds, fruit, and flowers.

Soil sample results - nitrogen and phosphorus

The results of soil N and P analysis on soils collected at Hiddenvale are depicted in the graphs below.



The soil Nitrogen (N) content at Hiddenvale is relatively low, with the light soil having the lowest N content of 0.03%, while the medium and heavy soils have TOC contents of 0.04%.

According to some studies, the total soil nitrogen content in arid rangelands can range from 0.01 to 0.5% by weight, with the highest levels typically found in areas with more favorable soil conditions and vegetation cover. However, it is important to note that the availability and mobility of nitrogen in rangelands can vary widely, depending on factors such as soil moisture, pH, temperature, and vegetation cover.

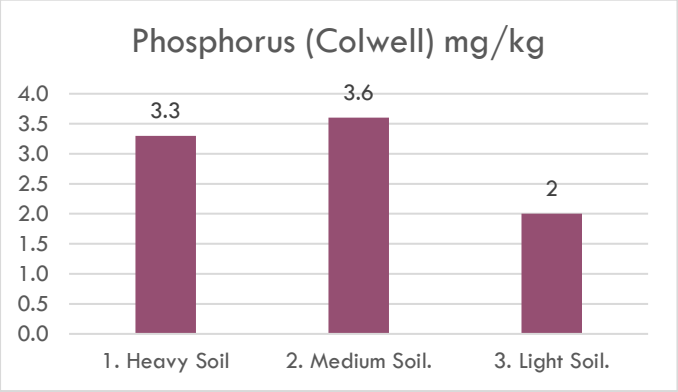
Improving soil nitrogen levels can be achieved through various management practices that focus on promoting nutrient cycling, enhancing soil organic matter, and supporting diverse plant communities. Some of the practices being used at Hiddenvale include:

•Legume incorporation: Introducing nitrogen-fixing legume species (e.g.,Desmanthes, Stylosanthes).

•Rotational grazing: Implementing rotational grazing or rest periods allows for better nutrient cycling and promotes plant growth. Paddock number has increased from 1 to 8.

•Soil conservation practices: Preventing soil erosion and maintaining soil structure through practices like maintaining ground cover promote N cycling.

•Diversifying plant species: Encouraging a diverse range of plant species in the rangeland can help improve soil health and nutrient cycling. 8 new plant species have been introduced by the project.



The test results show low levels of phosphorus (P). In Hiddenvale at levels expected in the Rangelands. Soils range from a high of 3.6 mg/kg in medium soil to a low of 2 mg/kg in light soil.

The average Colwell-extractable P level in arid rangeland soils of Australia is around 3.9 mg/kg, with a range of 0.5 to 12.2 mg/kg.

The reasons for low P levels include:

•P is often tightly bound to mineral particles or organic matter, making it less available for uptake by plants.

•low and unpredictable rainfall can limit the weathering of rock and mineral particles, which is an important source of phosphorus for many ecosystems.

•the removal of vegetation through grazing can further reduce the amount of phosphorus in the ecosystem, as plants are the primary source of phosphorus in many ecosystems.

The Hiddenvale management practices promote the conservation and accumulation of organic matter and the reduction of soil erosion can help to improve phosphorus availability and promote the health and productivity of pastures.

PASTURE NUTRITION, ROTATION GRAZING, SUPPLEMENTS

When selecting improved pasture species, consideration was given to the annual cycle of feed demand and supply as well as ensuring there is an appropriate mix of grasses and legumes. It is desirable to maintain at least 30% of the pasture composition as legume species, and 70% grasses.

When maintaining a productive pasture, it is necessary to consider the needs of the animal and the plant at the same time. Plants that have been grazed require a period of recovery before being grazed again.

Rotation grazing is a key management strategy for maintaining a productive and sustainable pasture system. It helps to ensure adequate nutrition for the cattle, improve soil quality and fertility, and reduce the risk of diseases and parasites:

•The more uniform grazing ensures that all areas of the pasture are utilized and not overgrazed. This helps to prevent underutilization of some areas of the pasture, which can lead to weed infestations and decreased productivity.

•Soil quality and fertility is improved by allowing for adequate rest periods for the plants. The resting period allows the plants to develop stronger root systems, which in turn improves soil structure and water infiltration. This improves soil moisture retention and nutrient availability, which can lead to improved forage growth and quality.

•The risk of diseases and parasites in the cattle is reduced. Moving the cattle to different areas of the pasture breaks the life cycle of parasites and helps to prevent the build-up of pathogens in the soil.

Cattle grazing in the desert uplands are generally limited by protein during the dry season and phosphorus (P) during the wet season. Research has indicated that providing phosphorus in the wet season when cattle are growing and putting on weight gives the most benefit.

High-protein supplements are provided to cattle during the dry season. Supplementing with phosphorus can help to improve weight gain and feed efficiency, increase reproductive performance, and reduce the risk of bone disorders such as rickets.

CONCLUSIONS

Hiddenvale provides compelling evidence of success in addressing erosion and improving production through carefully prioritized and planned rehydration works and rotational grazing. Significant improvements include increased ground cover, reduced erosion, and restored gullies.

The recovery of the landscape through rotational grazing is proving to be an effective long-term investment, while landscape hydration yields immediate benefits after rainfall events. Hiddenvale serves as an excellent demonstration site for addressing the cumulative effects of storm surge damage by targeting safe zones.

Remarkably, the restoration of landscape function was achieved in just one season, aided by two significant rainfall events. Deep erosion gullies were filled with soil due to the use of earthen and log blocks, and large areas of degraded land recovered through the installation of log barriers made from trees killed in the previous drought, carefully placed along the contour.

Pasture is being "irrigated" by combining earthen barriers to slow water in erosion gullies with water spreader banks, leading to a 70% increase in ground cover in previously bare areas. The introduction of various legumes has also proved beneficial, with species once thought unable to survive in arid regions now thriving.