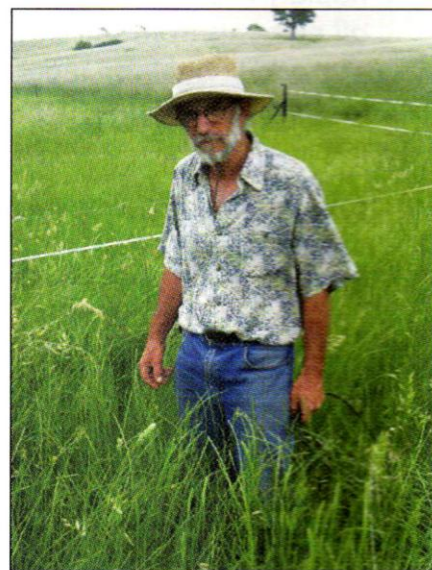


Lessons from the Lucky Country

Worm Juice Boosts Soil Fertility, Turns Farm Around



Bruce and Heidi Davison set up worm farms using an old car trailer deck, a bathtub, and a 3' x 10' box from steel framing and corrugated iron lined with plastic sheeting.



Bruce Davison stands in a pasture prior to grazing.

by John King

Australia is known as the “Lucky Country,” and you would certainly think that listening to Bruce and Heidi Davison. However, the story of this modest couple is not one of carefree serendipity but of diligence, thoughtfulness, and thrift. Their journey shows that fortune benefits those who can link ecology to productivity by building biological capital and saving cash.

The Davisons bought their southern New South Wales coastal rolling downs property in 1997. Its long sheep and beef history and short stint as a dairy run off had created an unforeseen problem; soil pH of 4.6 resulting from 60 years of superphosphate. Its long fertilizer history was the very point used to sell the 380-acre property.

In 2004 they started managing the farm, and as experienced organic farmers the first thing they did was stop using superphosphate and herbicides. Weeds exploded across the property, mainly African lovegrass and blackberry.

A local consultant calculated 2,000 lbs. per acre of 60 percent dolomite and 40 percent lime to get fertility back on track. The cost was US\$33,000 to the gate and with their property barely running 40 beef cows, their operating budget was zilch. It was then that the Davisons drew on their 18 years of experience growing organic flowers for the Sydney market.

WORM POWER

Bruce recalls how reading a primary school book (*Worms Downunder Down-under* by Allan Windust) changed their flower business. He began experimenting with vermicast and saw results overnight. Flowers were brighter, more upright, and developed a shelf life of 30 percent longer than before. Within weeks competition between florists drove up their flower price 20 percent and their fertilizer bill dropped by half.

How could they do something similar with a grass farm? Their problems stemmed from a damaged mineral cycle as evident by the long time pasture litter took to breakdown. Getting biol-

ogy working became a priority but how could they get proof worms could do the trick?

Bruce did an experiment comparing the consultant's lime mix and worm juice on 2¼-acre plots. The worm juice was applied at 2.25 gal. per acre in spring and autumn. In 12 months soil pH under lime hadn't changed and a faint layer remained on the soil surface. But pH under worm juice was 6.5 and legumes were starting to grow. That observation was all it took to scale up the idea.

This next bit sounds so crazy it's unbelievable. Bruce set up worm farms using an old car trailer deck, a bathtub, and a 3 x 10 ft. box from steel framing and corrugated iron lined with plastic sheeting. These slap-stick vessels generate enough quality fertilizer to lift the farm's fertility. Feeding worms cow dung and kitchen scraps keeps input costs at nil.

Fermenting worm juice produces fungi, and this is the secret to success. Initially Bruce applied 1.125 gal. per acre of fermented worm juice to seed the microbiology in the soil. He did this only once across the farm but discovered

more applications lowered soil pH, as fermented worm juice has a pH of 4. He now uses only non-fermented worm juice.

According to Bruce 62 acres of pasture needs just 11ft² of worm farm to supply juice to lift vigor. Initially he tried two applications (spring/autumn) of 2.25 gal. per acre of worm juice with 9 gal. per acre of water and watched soil pH move to 7 in 12 months. Now he applies 1.125 gal. per acre of worm juice with 10.125 gal. per acre of water annually and soil pH is steady at 6.5.

What did the worm farm save the Davisons financially? Soil tests show the amount of calcium improved by 456 lbs. per acre, and magnesium by 81 lbs. per acre over 12 months. Using local fine lime and fine dolomite prices as the market value for plant available calcium and magnesium (NZ Sept. 2010 prices), worm juice generated US\$130 per acre of minerals, or the equivalent of US\$49,820 across the whole property. That's a great return on any annual investment. The only purchase was a 110 gal. sprayer (US\$2,700) with boomless nozzles to form large droplets so as not to destroy the microbiology.

The first positive sign of applying the brew was lovegrass brix climbing from 1 to 5 within a month and then peaking at 7-10 inside 12 months. Lifting pasture energy levels means animals consume less grass to perform. Then legumes started re-establishing in areas with a pH of over 6. They grew up through the lovegrass without being sown, another cost saving.

Furthermore, in the last 18 months Bruce uses fish emulsion which doubles lovegrass brix to 15 and up to 20 with bamboo grass. The fish offal from a local processor is free and only costs freight to the gate. Some 1,100 lbs. of fish is topped up with water to seep for three months in a 500 gal. stainless steel milk vat that cost US\$400. Bruce estimates the cost of making and applying his pasture brew at US\$4 per acre.

Bruce checks when to spray worm juice by spraying a test plot first. If brix doesn't rise within an hour, it means applying the brew at another time of the month. The best time is after a full moon in spring or autumn when sap heads down the plant and open stomata drink in the brew. Ideally, spray very late evening (about 30 minutes after sunset) in heavy dew or fine drizzle and pasture 15 cm high (during the growing season). No problems about spray drift and needing dry conditions.

But drought-proofing a property takes more than worm juice. Set stocking is what encourages lovegrass. Cattle perform poorly during drought where African lovegrass dominates pastures. It matures quickly and loses quality as nutrients move into the roots. Changing to rotational grazing lowers costs and lifts farm performance by addressing these issues.

THRIVING DESPITE DROUGHT

During the 2009-10 summer drought an expert agronomist visited the Davison property to check their claim of maintaining stock numbers on lovegrass unlike the district norm. The combination of rotational grazing, worm juice, and lovegrass at 15 brix allows the Davisons' heifers to grow at 13.1 lbs. per day in drought conditions. The expert took photos of stock and pastures and was deeply impressed with the rotational grazing of lovegrass. At the height of drought the number of



African lovegrass after selective grazing on the Davisons' land.

livestock on the property was equivalent to 120 cows, 200 percent above what they started with in 2004.

Bruce observes lovegrass outperforms species like ryegrass, fescue, cocksfoot and clover throughout the dry season because they all require constant moisture. Lovegrass's tussock shape funnels any moisture down to the plant base and deep fibrous roots, which absorb it quickly. As a result it will grow up to 10 inches after a thunderstorm whereas most species barely grow ½ an inch in the same time. It also responds very quickly from a low grazing residual and therefore suits rotational grazing and high stock densities. Pasture renovation, spraying herbicide, and burning to remove lovegrass is what drives down profitability.

This is where another experiment signalled a new direction. Bruce mowed rank pasture and piled litter into a heap to decompose into the soil. In 12 months that spot was free of lovegrass with other species such as clovers, medics, phalaris, prairie grass, and paspalum establishing, no sowing as seeds were already there. To Bruce it seems low organic matter encourages bulky lovegrass to grow.

HOLISTIC MANAGEMENT

As a result of this observation and their exposure to holistic management they now lengthen recovery periods, increase stock density and lift post-grazing

residuals. They have noticed how their animals, soils, and plants respond to these changes despite always having to deal with summer drought; the very wet 2010-11 season being the exception.

Longer recovery times allow pasture to mature resulting in a better protein/carbohydrate balance and less animal health issues. They no longer drench or vaccinate and breed using genetics that suit this kind of system.

Increasing stock density crushes more pasture to the soil surface to feed soil microbes. Combined with worm juice, this practice helps lift soil fertility by keeping soil life active.

Post-grazing residual is around 2,700 lb. per acre even during drought. A high residual insulates soil and lengthens moisture retention. Greater solar surface area increases pasture growth rates. As a result, lovegrass is being replaced by other C3 and C4 species.

By observing ecosystem processes and then designing management to complement nature, the Davisons are building biological capital without the added stress of debt.

Worm farms have been an extremely cost-effective tool to strengthen the mineral cycle by establishing and feeding soil biology. An important part of this adventure is Bruce's monitoring to ensure soil conditions are right and altering application rates once soil pH reaches 7.

By changing grazing management to produce and crush more litter on the

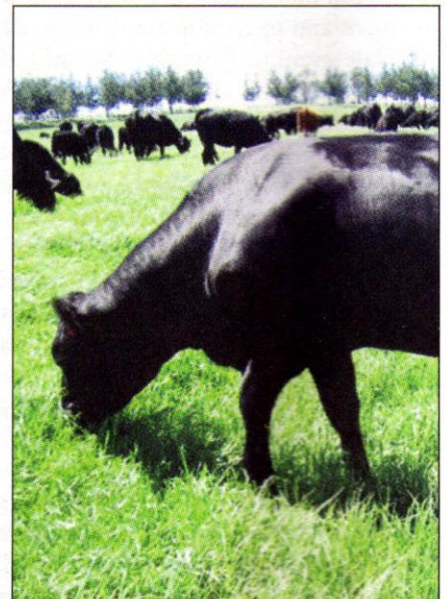
soil surface, the Davisons are ensuring a steady food source to energize organisms and maintain soil fertility. In practicing principles of holistic management they've used livestock to change soil surface conditions and cheaply initiate a shift in pasture ecology to lift the performance of the property.

As a result they are now part of a Department of Environment, Climate Change and Water pair-trialled site with their neighbor. This 20-year experiment started in 2008 and involves taking cross boundary soil samples every five years to monitor changes from different management practices. They also have regular field days on their property to educate farmers about their journey and show their achievements.

Once soluble mineral fertilizers and herbicides stripped bare the soil biology of this property, yet the reintroduction of soil life through worm juice signalled a turning point and a new direction. The worm farm generates the Davisons a small fortune and allows them to enjoy and share their slice of the lucky country.

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Bruce and Heidi Davison live near Candelero NSW and can be contacted at www.candelerosalers.com.



Cattle graze on verdant pastures in the "lucky country."