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## - Stories from the land -



### - INCREASING SOIL ORGANIC CARBON - THROUGH BIOLOGICAL FARMING

#### FARMER PROFILE

**NAME:** Stephen & Kerry Frost.

**LOCATION:** Stonemeal Farm, Narrikup, WA.

**AVERAGE ANNUAL RAINFALL:** 692 mm.

**ENTERPRISE:** 100 per cent livestock (wool & prime lamb production).

**PROPERTY SIZE:** 275 ha, including 40 ha of protected & managed remnant vegetation & 57 ha of blue gum plantation in second rotation.

**SOIL TYPE:** Sandy duplex.



#### NUTS & BOLTS

- Soil organic carbon (SOC) is the basis of soil fertility and therefore of sustainable agricultural production. Equally, healthy soils are needed for optimum SOC.
- SOC isn't a homogenous material, but a range of organic compounds at varying degrees of decomposition.
- Any agricultural practices which alter rates of carbon input to, or loss from the soil, will result in a change in the stock of SOC (*Baldock et. al., 2012*).
- Nutrient availability, soil structure, soil physical properties and biological soil health are all positively impacted by improving SOC.
- Soil carbon stocks are generally stable or in decline across Australia's agricultural landscape (*Clean Energy Regulator, 2015*).
- There are a range of pasture management practices that can increase SOC including: fertiliser management, grazing management, earthworm introduction, soil microbe enhancement, improved grass and legume species, sown pastures and perennial pastures.
- The actual amount of carbon that can be sequestered in a soil is dependent upon the farming system, soil type, climatic conditions and the initial soil carbon level of a site and is the direct result of the balance between carbon inputs and losses (*NSW DPI, 2008*).



## INTRODUCTION ●●●

Stephen and Kerry Frost farm at Narrikup, a small town located approximately half-way between Albany and Mt Barker in the Great Southern region of Western Australia.

The Frosts have spent many

years investigating and implementing a wide range of land management practices centred on maintaining and improving the health of their soils. These practices have allowed them to "*grow their own carbon*".

The Frosts hold the firm belief, that when actively engaging in conservation practices and striving to increase biodiversity in a whole-of-farm management system, not only does the productivity improve, but so too does the profit.

## THE IMPETUS for CHANGE ●●●

The Frosts have been farming at Narrikup, WA since 1979.

Initial clearing of the property occurred in the 1960s, with the Frosts' undertaking further clearing in the 1980s.

Red flags were raised within a couple of years of further clearing after distinct differences were observed between newly cleared and established lands, particularly:

- Stock health was better on the new land.
- Salinity was rapidly developing on the new land
- Pasture disease was prevalent on the old land. (red-legged earth mite, pasture scorch and powdery mildew).
- Clover growth was significant on new land, while the older land had decreasing clover in well-established pastures.

- Fecundity of ewes was lower on the older land.
- Wool from ewes aged six and a half years and older, was found to be going off (yellowing and excess greasiness) on the older land.

The conventional approach to tackling these issues required a growing reliance on chemicals, increasing input costs and the development of an increasingly complicated and stressful (personally and environmentally) farming system.

This was not the approach the Frosts determined would improve the health of their land, or suit their personal, family and environmental goals.

So, in the mid-1990s, the Frosts decided that "*a living soil was their number one priority, their greatest asset*" and they set about making changes to their management principles and practices, based around biological farming ideals.

## BIOLOGICAL FARMING: an APPROACH to IMPROVE SOIL HEALTH & GROW CARBON

Stephen feels today's conventional farm management forces farmers to deal reactively with issues facing them. "Whether it's stock health, soil issues, plant health and disease, with never enough time to be proactive and preventative in management. Biological farming has allowed us to be proactive, leading to a lot fewer issues in our farming program," Stephen said.

The Frosts initial focus was on applying mineral fertilisers to "*re-mineralise the soil*" for plant growth and optimal animal and human nutrition. This was done with the understanding that the difference between the newly cleared land and the established

land, was mineral related, with mineral deficiency symptoms being observed in their animals. Stephen appreciated that on the ancient landscapes of the South Coast, many minerals only occur naturally in very low concentrations (if present at all) and this is particularly so in the sandy soils of Stonemeal Farm.

Stephen began looking at the non-take-up of minerals by plants. Following their focus on re-mineralisation and further networking, investigation and research, the Frosts were introduced to soil microbes and began using them on their farm, making Stonemeal Farm the founding property of Australian Mineral Fertilisers and the *GrowSafe*® program.



The Frosts' focus is on high lambing percentages and utilising the full reproductive age of their ewes. The mob above lambed at nine and a half years old in 2015.

## STONEMEAL FARM PRODUCTION TODAY ●●●

Stonemeal Farm is highly profitable, producing prime lambs and wool with merino, moving to multi-purpose merino breeds.

The Frosts' focus is on high lambing percentages and utilising the full reproductive age of their ewes. In 2015 a mob of nine and a half years old ewes lambed and were marked in August at 141 per cent lambing (best lambing rate on Stonemeal for that season).

Ordinary white tag straight merinos were marked at 127 per cent lambing with the flock average for 2015 being 133 per cent lambing across all mobs at Stonemeal.

The Frosts' lamb selling percentage for 2014 was 126 per cent (with the family's annual lamb supply held back) indicating a high proportion of multiples. In mid-May 2015, when most mobs were lambing, Stonemeal Farm was carrying "three ewes per acre" (7.41 ewes/ha).

When accounting for the lactating ewes and the prominence of twinning, the dry sheep equivalent (DSE) at Stonemeal Farm at that time was between approximately 17 and 20 DSE (DPI, 1997), well above the long-term district average stocking rate for Mt Barker of between eight and 10 DSE/ha (Hyder et al, 2002 and MLA, 2008).

"Since using both mineral fertilisers and soil microbial inputs, we have found other farm inputs have reduced considerably," Stephen said.

"There is little to no requirement for broad-acre pesticides, no nitrogen inputs for fodder crops, less requirement for liming to maintain and improve production, no requirement for stock mineral supplements and reduced veterinary intervention. The farm is primarily self-sustaining in fodder production," he said.

The Frosts' "hardly ever cultivate" having moved to direct drilling of perennial grasses into established pasture without the use of herbicides. "It's more economical and also allows the pasture to be grazed a lot sooner," Stephen said.

When seeding, the Frosts' microbe treat selected pasture seed varieties and direct drill with 50 kg of mineral fertiliser down the boot. The farm consists of 35 paddocks to manage the seeding and direct drilling program with seven lambing mobs being run on groupings of paddocks (the biggest mob being 300 head). Rotational grazing was trialled but Stephen found it was only partly effective in their system.

The mobs are allocated a kikuyu pasture paddock for autumn grazing prior to breaking rains and the establishment of annual and perennial pastures on lambing and finishing paddocks.

When in the kikuyu pastures, ewes are supplementarily fed hay and haylage, produced on-site and fully analysed to ensure appropriate nutrients are being delivered to the pregnant ewes. No further supplementation is provided.

Stephen's passion is the environment, which is evident in a variety of approaches at Stonemeal Farm. The build-up of carbon in the farm's soils is just one of the benefits of adopting biological farming. Stephen and Kerry openly share their experiences. Their philosophy is to develop and establish a farming ecosystem full of biodiversity that creates, supports and enhances the environment.

"Maintaining and increasing biodiversity is central to every decision we make. Our farm is not just about sheep production, it's about natural vegetation, pasture species, tree plantings, water environments and much more. Underlying this holistic approach is treating the soil as a living organism with as much biodiversity below the ground as above it," Stephen said.

## BIG DAM Paddock: LOW PH, HIGH SODIUM with DENSE PASTURES ●●●

Of particular interest at Stonemeal Farm is the paddock known as Big Dam.

This paddock, which has numerous granitic dykes dissecting the landscape, was cleared in the 1980s.

Salinity was expressed shortly thereafter, evidenced by bare, salt scalded ground, salt tolerant grass dominated pastures (barley grass) and groundwater and surface water monitoring results.

After implementing biological management practices, the paddock now has no salt scald present or salt tolerant varieties dominating.

It currently produces dense clover and rye dominated

pastures with "exceptional grazing and fodder production".

During a fodder production phase, the Frosts will graze a sown paddock two to three times and then lock it up in August, generally yielding 25, 6ft rolls/ha.

In 2014 the Big Dam paddock was grazed through to mid-October and due to late rains, was opportunistically locked up and cut in mid-November yielding 16, 6ft rolls/ha.

Ongoing monitoring indicates that soil and water salt levels remain high. However, Stephen feels the effects are drastically reduced in the Big Dam paddock as a result of the applied biological farming principles.



After implementing biological management practices, the Big Dam paddock has no salt scald present or salt tolerant varieties dominating.



With the Department of Food and Agriculture WA (DAFWA) recommending soil pH (CaCl<sub>2</sub>) at or above 5.5 in the topsoil and 4.8 in the subsurface

(Gazey, Davies and Master, 2014), the pasture growth shown in the photographs at Big Dam show an impressive ability of the biological farming management

practices employed by the Frosts to maintain soil coverage and produce dense pastures with a very low pH<sub>Ca</sub> of 3.9 in the top soil as shown in figure 1.

SOIL HEALTH INDICATOR	TEST	BIG DAM Paddock (Feb 2012)
Acidity	pH (water)	4.8
	pH (CaCl <sub>2</sub> )	3.9
Salinity	Electrical conductivity	0.31 ms/cm
Organic component	Organic carbon	4.4%
	Total organic matter	7.4%
	Total nitrogen	0.29%
	Carbon: nitrogen ratio	15.2
Total exchangeable ions	Aluminium	2.0%
	Sodium	13.5%

Figure 1: Soil test results at Big Dam paddocks, Stonemeal Farm, Narrikup (samples taken as indicated).



## SOIL CARBON at STONEMEAL FARM ●●●

Total organic matter indicated in 2012 in the Big Dam paddock sampled topsoils was measured at 7.4 per cent with organic carbon at 4.4 per cent.

Show paddock, which also exhibits low pH soils, has an increasing total organic matter and organic carbon level, as illustrated in *figure 2*.

Total organic matter increased from 5.5 per cent to 8.4 per cent and organic carbon increased from 3.3 per cent to 5 per cent in the decade between 2002 and 2012.

Biological management principles and monitoring are ongoing at Stonemeal Farm. Stephen feels the microbial carbon and organic matter carbon of soils *"are a direct result of how you treat the soil and what you don't do to it"*.

With so much conflicting information, science and advice about soil health, Stephen encourages farmers to *"find someone who is successfully working on an area of interest to them and find out what they are up to."*

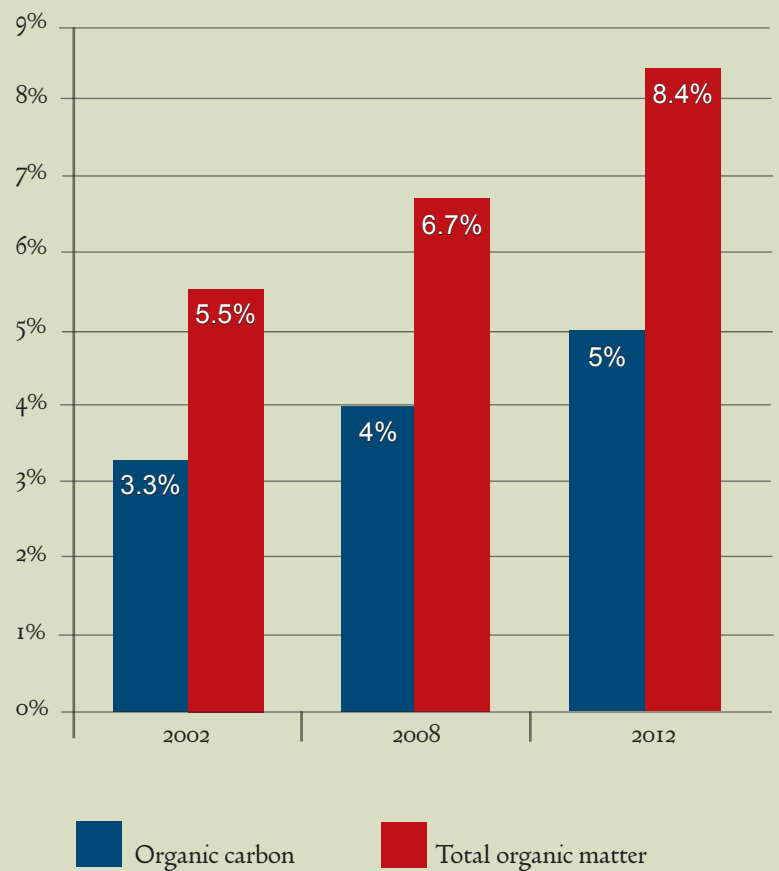


Figure 2: Organic carbon and total organic matter of soil samples from the Show paddock, Stonemeal Farm.

## CARBON FARMING & THE EMISSIONS REDUCTION FUND ●●●

Carbon farming minimises the production of greenhouse gases (emission reduction or avoidance) and/or captures and stores carbon in vegetation and soils (sequestration).

One of the key opportunities for farmers and other landholders is to increase soil organic carbon to improve health and help mitigate climate change.

A key market for carbon in Australia is through the Australian Government's Emissions Reduction Fund (ERF). Through the ERF (administered by the Clean Energy Regulator) landholders have the opportunity to develop offset projects that, if approved by the regulator, can generate Australian carbon credit units (ACCUs).

These can be sold to the Australian Government (the primary purchaser) through a Carbon Abatement Contract, or to other buyers (the secondary market).

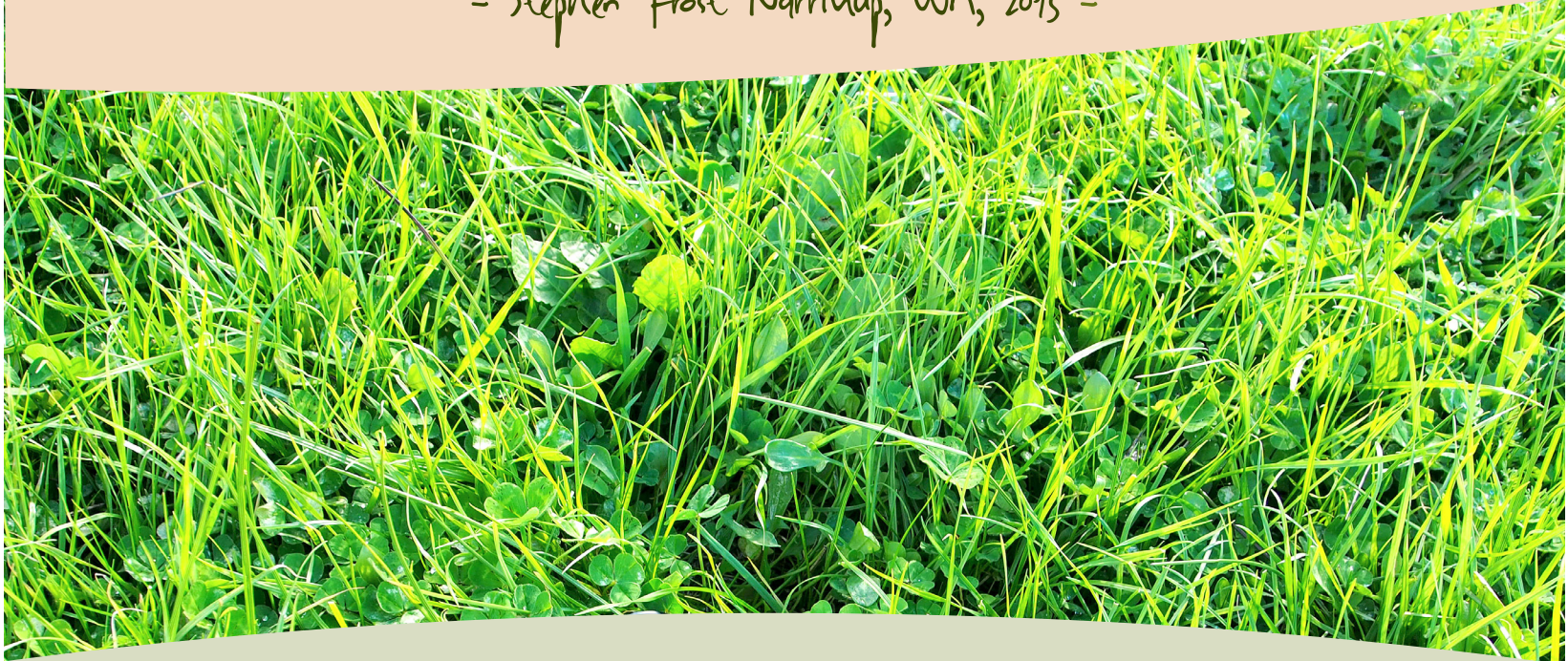
One ACCU is earned for each tonne of carbon dioxide equivalent (t CO<sub>2</sub>-e) stored or avoided by a project.

Through the ERF, a soil carbon offsets project stores carbon in soils on grazing land by introducing activities to increase inputs of carbon to the soil, reduce loss of carbon from the soil, or both (*Clean Energy Regulator, 2015*).

At least one of the management activities must be new and may include:

- Converting crop land to permanent pasture.
- Undertaking pasture cropping.
- Managing pasture by implementing or changing irrigation, applying organic or synthetic fertiliser to pastures or rejuvenating pastures by seeding.
- Managing grazing by changing stocking rates or altering the timing, duration and intensity of grazing (*Clean Energy Regulator, 2015*).

"Find someone who is successfully working on an area of interest to them and find out what they are up to."  
- Stephen Frost Narrilup, WA, 2015 -



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## FURTHER INFORMATION

For more information about this and other Climate Action Farming projects please visit: [www.climateactionfarming.com.au](http://www.climateactionfarming.com.au).

For information on agricultural trials in WA go to: [www.agtrialsites.com](http://www.agtrialsites.com). A series of short Climate Action Farming films can be viewed on the South Coast NRM You Tube channel.

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