The Green Challenger

Official Newsletter of the Willunga Hillsface Landcare Group

Willunga Hillsface Landcare Group

Winter 2011

Southern New England Landcare 'Fundamentals of Soil' workshop, Uralla, NSW, 14 May 2011

Carbon that counts

BY CHRISTINE JONES, PHD
FOUNDER, AMAZING CARBON www.amazingcarbon.com

Failing a cataclysmic collision with an asteroid or a volcanic explosion of earth-shattering proportions, the thin layer of weathered rock we call soil will have to feed 50% more people before this planet gets much older. The problem has not gone unnoticed. Learned men and women have gathered, books have been written and conferences convened. What has been discussed? How to build new topsoil? No. Everything but.

The collective knowledge of the human species on almost every subject from sub-atomic particles to distant galaxies is extraordinary, yet we know so little about soil. Is it too common, this world beneath our feet? This stuff of life that sustains us?

Failure to acknowledge/ observe/ measure/ learn how to rapidly build fertile topsoil may emerge as one of the greatest oversights of modern civilisation. Routine assessments of agricultural soils rarely extend beyond the top 10 to 15 centimetres and are generally limited to determining the status of a small number of elements, notably phosphorus (P) and nitrogen (N). Over-emphasis on these nutrients has masked the myriad of microbial interactions that would normally take place in soil; interactions that are necessary for carbon sequestration, precursor to the formation of fertile topsoil.

Fig. 1. ***Photo:*** *Christine Jones*

Property:
'Winona', operated by Colin and Nick Seis

Fig. 1. In this paired site comparison, parent material, slope, aspect, rainfall and farming enterprise are the same. Levels of soil carbon in both paddocks were originally the same.

LHS: 0-50cm soil profile from a paddock in which groundcover has been actively managed (cropped and grazed) to enhance photosynthetic capacity.

RHS: 0-50cm soil profile from a conventionally managed neighbouring paddock (10 metres through the fence) that has been set-stocked and has a long history of phosphate application.

NOTES:

i) The carbon levels in the **0-10cm increment** are very similar. This surface carbon results from the decomposition of organic matter (leaves, roots, manure, etc.), forming short-chain **unstable 'labile'** carbon.

ii) The carbon **below 30cm** in the **LHS** profile has been sequestered via the **liquid carbon pathway** and rapidly incorporated into the humic (**non-labile**) soil fraction. Long-chain, non-labile carbon is highly STABLE.

Land management and soil carbon

The **RHS** soil profile has formed under conventional grazing, intermittent cropping and standard practice fertiliser management. On the **LHS,** 50 centimetres of well-structured, fertile, carbon-rich topsoil have formed as a result of the activation of the 'sequestration pathway' through cropping and grazing management practices designed to maximise photosynthetic

Continued on Page 2

Carbon that counts *continued from Page 1*

capacity. Superphosphate has not been applied to the **LHS** paddock for over thirty years. In the last 10 years the **LHS** soil has sequestered 168.5 t/ha of CO_2. The sequestration rate in the last two years (2008-2010) has been 33 tonnes of CO_2 per hectare per year.

Due to increased levels of soil carbon and the accompanying increases in soil fertility, the **LHS** paddock now carries **twice** the number of livestock as the **RHS** paddock. Levels of both total and available plant nutrients, minerals and trace elements have dramatically improved in the **LHS** soil, due to solubilisation of the mineral fraction by microbes energised by increased levels of liquid carbon. In this positive feedback loop, sequestration enhances mineralisation which in turn enhances humification.

As a result, the rate of polymerisation has also increased, resulting in 78% of the newly sequestered carbon being non-labile. The stable, long-chain, high-molecular weight humic substances formed via the plant-microbe sequestration pathway cannot 'disappear in a drought'. Indeed, the humus now present in the **LHS** profile was formed against the backdrop of 13 years of below-average rainfall in eastern Australia. A major cause of soil dysfunction, as illustrated in the **RHS** soil profile in Fig.1, is the removal of perennial groundcover for cropping and/or a reduction in the photosynthetic capacity of groundcover due to set-stocking. In the post-war era, a range of chemical fertilizers have been applied to soils in an attempt to mask reduced soil function, but this approach has merely accelerated the process of soil carbon loss, particularly at depth.

The net effect of inappropriate management practices has been compromised landscape function, losses of biodiversity, markedly reduced mineral levels in plants and animals and an increase in the incidence of metabolic diseases. This will no longer do. Australia is not the only country in which subsoils - and hence landscape function - have deteriorated as a result of inappropriate land management and fertilizer practices. In New Zealand, a country blessed with vast tracts of inherently fertile topsoil, carbon losses are occurring at depth under heavily fertilized pastures, due to the inhibition of the sequestration pathway. To date, alternative management practices have been either dismissed or ignored by establishment science in that country. It is important to note that the rapid improvements to soil fertility and soil function recorded in the **LHS** soil profile in Fig.1 are dependent on the enhanced photosynthetic capacity that accompanies regenerative forms of cropping and grazing management.

Not just any carbon – and not just anywhere

The soil surface increment, 0-10cm, generally contains the highest levels of short-chain, labile carbon, indicative of rapid turnover. While this 'active' carbon is important for the health of the soil food-web, the surface increment is not where one would be looking to safely 'store' atmospheric CO_2. The deeper in the soil profile that carbon is sequestered, and the more humified the carbon, the better. Over the last 10 years, the amount of long-chain, non-labile soil carbon (i.e. the humic fraction) in the **LHS** profile has doubled in the 10-20cm increment, tripled in the 20-30cm increment and quadrupled in the 30-40cm increment. In future years, it is anticipated that the most rapid sequestration of stable soil carbon will take place in the 40-50cm increment, then later still, in the 50-60cm increment. That is, over time, fertile, carbon-rich topsoil will continue to build downwards into the subsoil.

Deeply sequestered carbon alleviates subsoil constraints, improves farm productivity, enhances hydrological function and improves mineral density in plants, animals and people.

The Kyoto Protocol, which relates only to carbon sequestered in the 0-30cm increment, completely overlooks this 'sequestration of significance' in the 30-60cm portion of the soil profile.

Building new topsoil

The formation of fertile topsoil can be breathtakingly rapid once the biological dots have been joined and the sequestration/ mineralisation/ humification pathway has been activated. The positive feedback loops render the liquid carbon pathway somewhat akin to perpetual motion. You can almost see new topsoil forming before your eyes.

The sun's energy, captured in photosynthesis and channelled from above-ground to below ground as liquid carbon, fuels the microbes that solubilise the mineral fraction. A portion of the newly released minerals enable rapid humification in deep layers of soil, while the remaining minerals are returned to plant leaves, facilitating an elevated rate of photosynthesis and increased levels of production of liquid carbon, which can in turn be channelled to soil, enabling the dissolution of even more minerals.

The levels of acid-extractable minerals in the **LHS** soil profile are higher than those on the **RHS** soil in the following proportions, calcium 277%, magnesium 138%, potassium 146%, sulphur 157%, phosphorus 151%, zinc 186%, iron 122%, copper 202%, boron 156%, molybdenum 151%, cobalt 179% and selenium 117%. Levels of inorganic plant nutrients have increased to a similar extent.

Where do the 'new' minerals come from?

A standard soil test provides very little information about the bulk soil and the minerals potentially available to plants. Most lab reports list 'plant-available' nutrients (that is, nutrients not requiring microbial intermediaries for plant access) and if requested, acid-extractable minerals (misleadingly quoted as 'totals'). With respect to phosphorus, for example, the 'plant-available' levels are usually estimated using an Olsen, Colwell, Bray 1, Bray 2, Mehlich 1, Mehlich 3 or Morgan P test. These tests provide information on the relatively small pools of inorganic soil P. Where a figure for Total P is provided, it refers only to the quantity of P that is acid-extractable, not the actual 'total' amount of P in the soil. Other techniques, such as x-ray fluorescence (XRF) are required to determine the composition of the insoluble, acid-resistant mineral fraction, which comprises 96-98% of the soil mass and contains far more minerals than are shown in a standard soil test. Indeed, the top one metre of soil contains thousands of tonnes of minerals per hectare.

Specific functional groups of soil microbes have access to this mineral fraction, while others are able to fix atmospheric N, provided they receive liquid carbon from plants. The newly accessed minerals, particularly iron and aluminium, plus the newly fixed N, enable rapid humification of labile carbon. However, the liquid carbon needed to drive the process will not be forthcoming if high analysis N and/or P fertilizers inhibit the formation of a plant-microbe bridge. The 'classic' models for soil carbon dynamics, based on data collected from set-stocked conventionally fertilized pastures and/or soil beneath annual crops, where the plant-microbe bridge is dysfunctional, fail to include nutrient acquisition from the bulk mineral fraction and hence cannot explain rapid topsoil formation at depth.

The puzzle is that establishment science clings to these out-dated models, inferring real-life data to be inconsequential. Measurements made outside of institutionalised science are branded 'anecdotal' and largely ignored.

Making the world a better place

When pastures (including those grown in association with crops) are managed to utilise nature's free gifts - sunlight, air and soil microbes - to rapidly form new, fertile, carbon-rich topsoil, the process is of immense benefit to farmers, rural communities and the nation. Property owner, Colin Seis, has no wish to revert to former management practices, as he can now carry twice the number of stock at a fraction of the cost. Nevertheless, if the land management were to change for some unforeseeable reason, the increased levels of humus (non-labile carbon) now present in his soil would remain for considerably longer than the average lifespan of carbon in trees.

In addition to reducing levels of atmospheric carbon dioxide, the activation of the soil sequestration pathway results in the release of plant nutrients from the theoretically insoluble mineral fraction, which comprises by far the largest proportion (96-98%) of the soil mass. This increased mineral availability improves the health of pastures, crops, livestock and the people consuming agricultural produce. Everyone benefits when food is more nourishing.

Mineral availabilities are determined more by the rate of carbon flow from plants than by the stock of carbon in the soil. The 'key' to mineral management is appropriate groundcover management. When the plant-soil sequestration pathway has been activated, it is possible to feed more people from less land.

Taking action on soil carbon

Those who persist in maintaining that soil carbon comes at a 'cost' and/or disappears during a drought and/or requires applications of expensive fertilizer and/or necessitates forgone production - had better 'please explain'. The on-farm reality is that when the sequestration pathway for non-labile carbon has been activated, the opposite is true. How much longer will the farming community have to endure the myths, misconceptions and misleading models put forward by the people currently employed to solve the problem of declining soil carbon, dwindling soil fertility and losses in soil function?

Will government show some initiative, seek the truth and act on it?

This article, extracted with permission, from: www.ofa.org.au/papers/JONES-Carbon-that-counts-20Mar11.pdf

PS–The photo on Page 1, Fig. 1, is clearer in the original document.

BRIAN

Here's the data

2000-2010: 168.5 tonnes CO_2 sequestered per hectare.

2008-2010: Sequestration rate 33 tonnes CO_2 per hectare per year.

Permanence: 78% of the newly sequestered carbon is in the non-labile (humic) fraction of the soil - rendering it highly stable.

Location: The 0-30cm increment and quadrupled in the 30- 40cm increment.

Minerals: The following increases in soil minerals have occurred - calcium 277%, magnesium 138%, potassium 146%, sulphur 157%, phosphorus 151%, zinc 186%, iron 122%, copper 202%, boron 156%, molybdenum 151%, cobalt 179% and selenium 117%.

Cash benefit: At a carbon price of $20 per tonne, and assuming payment for non-labile (permanent) carbon only, the value of 33t CO_2/ha/yr would be $660 x 78% = $515/ha/yr. A price on carbon would provide worthwhile incentive for progressive farmers to rebuild our precious agricultural soils.

Can we feed a "Big Australia" ?

by Michael Lardelli

The debate on Australia's future population size has taken a welcome leap forward in early 2010. Much attention is focused on the Treasury estimate of 36 million Australian residents by 2050. Most of the reasons given for why this is not a desirable outcome centred around quality-of-life issues and whether our natural environment can withstand the impact of so many Australians living relatively wealthy lifestyles requiring high levels of consumption. However, one question that is hardly ever raised is whether we can, in fact, feed 36 million people.

Historically, being a net exporter of food, we have rejected the idea that Australia might one day lack the ability to sustain its human residents. But what do the numbers say? And will our capacity to produce food in the future be the same as today? These are important questions for anyone with a stake in Australia's future – in other words all current and future parents.

So what do we currently eat? Let's divide up our diet into fruit and vegetables, grains and pulses, and meat. (Dairy products and fish will be mentioned later.) The most important part of these three categories is grains and pulses – not only because they form our staples (e.g. breakfast cereals, pasta, bread and rice etc.) but because, as you will see, a very large proportion go into making meat.

Fruit and vegetables

However, let's start with fruit and vegetables. This is a large and very diverse category so the simplest way to view production and consumption is in monetary terms. From the document "Signposts for Australian Agriculture" (and a shorter summary) produced by the National Land and Water Resources Audit of the federal government we learn that, "Australia became a net importer of fruit in 2006–07 and has been a net importer of vegetables since 2002–03."

They base this on "gross value of production" data from a report by ABARE, the Australian Bureau of Agricultural and Resource Economics (see page 7 of the "Signposts" report above):

It is also worthwhile noting the comment that, "Since 2000–01, the main constraint on the industry's productive capacity has been climate variability and the impact of two severe droughts in quick succession on production and farm profitability. Low water availability from natural rainfall and restricted irrigation water allocations have been key production limiting factors."

This suggests that climate change and finite resources (e.g. water) are already impacting on our food production. This is also indicated by another comment: "There have been rapid rises in input costs, particularly fertilizer and fuel."

So, in terms of Australia's fruit and vegetable production, we are not even supplying all of the needs of our current population. Supplies of fruit and veg. for a growing Australian population will be dependent upon the willingness and ability of other nations to sell us this food.

Now to the grain category

The "Australian Crop Report" of February 2010 compiled by ABARE gives historical and current information on Australian grain production, consumption and exports. Tables 5 and 6 from this document show the numbers for "Australian supply and disposal of wheat, oilseeds and pulses" (consumed by humans and animals) and "Australian supply and disposal of coarse grains" (predominantly consumed by animals) respectively for the financial years 2004-5 to 2009-10 (predicted).

For wheat, in an average year and under current conditions (fuel, fertilizer, climate), Australia can produce about 22 million tonnes (Mt) although drought can slash this by over half (see 2006-7 and 2007-8):

Note that in the drought years domestic use and exports for wheat were similar, i.e. we used half or more of what we produced. A bit over one third of our domestic use of wheat is for direct human consumption. The rest is used to feed animals and to provide seed for the next year's crop.

The statistics on grain can be complicated by the existence of stocks that are carried over from year to year and also the fact that Australia can import grain as well as export it. For example, in the drought year of 2006-7 Australia produced 0.57 Mt of canola (our main oilseed crop) but consumed 0.59 Mt and exported 0.23 Mt! However, in a good year we export about twice as much canola as we use. In 2008-9 we produced 1.9 Mt of canola.

For pulses, (e.g. lupins, field peas and chick peas) the bulk of our production (usually about 1-1.5 Mt) is consumed domestically. Coarse grains are the other major category of our grain production and include grains such as barley, oats, triticale, sorghum and maize. Our total coarse grain production, consumption and exports in Mt looks like this:

Less than one tenth of our domestic use of coarse grain is consumption directly by humans – the rest goes to feed animals and supply the grain for the next year's crop. For example, in 2008-9, 0.4 Mt of total coarse grain production was consumed directly by humans while 5.1 Mt went to Australian animals. When combined with domestic wheat consumption we can see that, on the whole, far more grain in Australia is consumed by animals than humans.

So let's look at meat. In the last few years our production and consumption of meat has varied by less than 10%. The most recent numbers (taken from

ABARE's "Australian Commodity Statistics 2009") are shown below.

Meat (Mt)	Red meat production	Red meat consumption (by humans)	Red meat exports	Pig meat consumption	Poultry meat consumption
2008	3.2	1.6 (1.1)	1.8	0.05	0.8

We can see that Australians consume about half the red meat we produce. (Per capita consumption figures from ABARE – not shown here – indicate that only about 70% of this consumption is by humans.) In Australia, most of our red meat production is from sheep and cattle fed by grazing. Less than 30% of our cattle are fed on grain before sale (i.e. "finished on grain") and, since "finishing" usually occurs for a lesser fraction of the life-span of cattle for sale, we can see that our red meat production is not largely dependent on grain. Most of the enormous volume of grain consumed by animals in Australia goes to pigs and chickens. Furthermore, the per capita consumption figures indicate that we eat more pig and poultry meat than red meat in Australia. While we do not import poultry meat, we do consume 95% of what we produce and so export only 5%. In contrast, our consumption of pig meat is 50% greater than our production. Since pig and poultry production is almost entirely dependent on grain, rising grain prices directly affect the larger part of our meat consumption.

So far in this analysis I have not addressed seafood or dairy products. Production from Australia's wild fisheries, (as in the rest of the world), is in decline and although there is some substitution for this loss by aquaculture, aquaculture itself is largely dependent on wild-caught fish for fishmeal (a major component of commercial fish food).

In 2007-8 Australia's wild fisheries and aquaculture production totalled 0.11 Mt. We exported 0.04 Mt of edible products but imported 0.20 Mt – nearly twice as much as we produced ourselves. During the past decade, Australian exports of dairy products have been in decline as both our domestic consumption of dairy products has been rising while water allocations for pasture irrigation have been cut due to droughts. In 2007-8 the average Australian consumed 104*l* of milk and 32 kg of milk products, e.g. including cheese (which lies somewhere between our kg per capita pig and poultry meat consumption rates). Although less than 10% of Australian cattle are dairy cattle, these tend to occupy our best irrigated pasture country, requiring large inputs of fertilizer, water and energy.

From the broad summary above we can draw the following conclusions. Under current economic, environmental, energy supply and climatic circumstances:

1. We are currently not self-sufficient for fruit and vegetables.
2. In a good year we could supply about 3x our current population with wheat but, in a drought year, less than 2x our current population.
3. We could supply 2x our current population with red meat in normal – not drought – years.
4. We could probably double our pig and poultry meat production if we consumed all our coarse grain production domestically (i.e. no exports) and significantly reduced our wheat exports. This is not possible under drought conditions.

A population of 36 million Australians is approximately a 64% increase over today's number. The rough analysis above shows that, in a drought year and under current conditions of resource supply, we would be nearing the limits of our ability to provide our own population with food and we are already beyond the limits of our ability to produce fruit and vegetables for ourselves. We would not be "food secure".

Future trends

Finally, let's take a quick look at future trends that might impact on our food production. As the driest continent spanning a tropical to temperate climatic zone Australia is very vulnerable to the effects of climate change. There are estimates that, for every 1°C rise in temperature over 30°C during crop flowering, grain production falls by ~10%. We now appear to be locked in for at least a worldwide average 2°C rise and, in that case, Australia can expect to experience an even greater change. Thus, we can expect a decline in grain production considerably greater than 20%. The droughts of 2006-7 and 2007-8 – that slashed grain production by about half - may be a preview of that. The drying of the Murray-Darling basin (that has been attributed to climate change) and the resultant collapse of fruit and vegetable production (that has already affected our self-sufficiency in this area) may be a warning of what is to come.

Another severe and under appreciated limit on agricultural production – especially for Australia with its ancient and nutrient-poor soils – is future fertilizer availability. One method for predicting future minerals production is Hubbert linearization (HL) analysis. HL analysis of phosphate rock production by Déry and Anderson shows that ~75% of the world's easily accessible phosphate may already have been mined! (P = production in Mt, Q = cumulative production in Mt):

This conclusion is supported by an analysis of annual and cumulative production curves by Ward. As a recent investigation in the scientific journal *Nature* noted: "…estimates [of phosphate reserves] all suffer from a lack of reliable data. Most of the world's phosphate-mining companies are integrated with fertilizer firms and the mines are either owned by the companies or are under state control… As a result, it is difficult to get accurate, independent information on phosphate reserves." The spectacular price rises for phosphate, nitrogen and potassium fertilizers in recent years (see >>

Can we feed a "Big Australia" ?

Continued from Page 5

page 97 of ABARE's "Australian Commodity Statistics 2009") do not bode well for fertilizer availability/affordability in coming decades.

Australia's broadacre agriculture is also highly dependent on oil and gas production – for powering farm machinery, producing pesticides and herbicides, generating nitrogenous fertilizer and for transport. A recently published analysis by those scientists who have been most successful in predicting recent oil production trends indicates that the world's maximum possible level of oil production (the "peak") was most likely reached in July 2008 and the long term trend of oil production will be down in future. By 2030 – which is only half way to 2050 – we can expect crude oil production to be, *at very best*, 7% lower than today and it will probably be far lower.

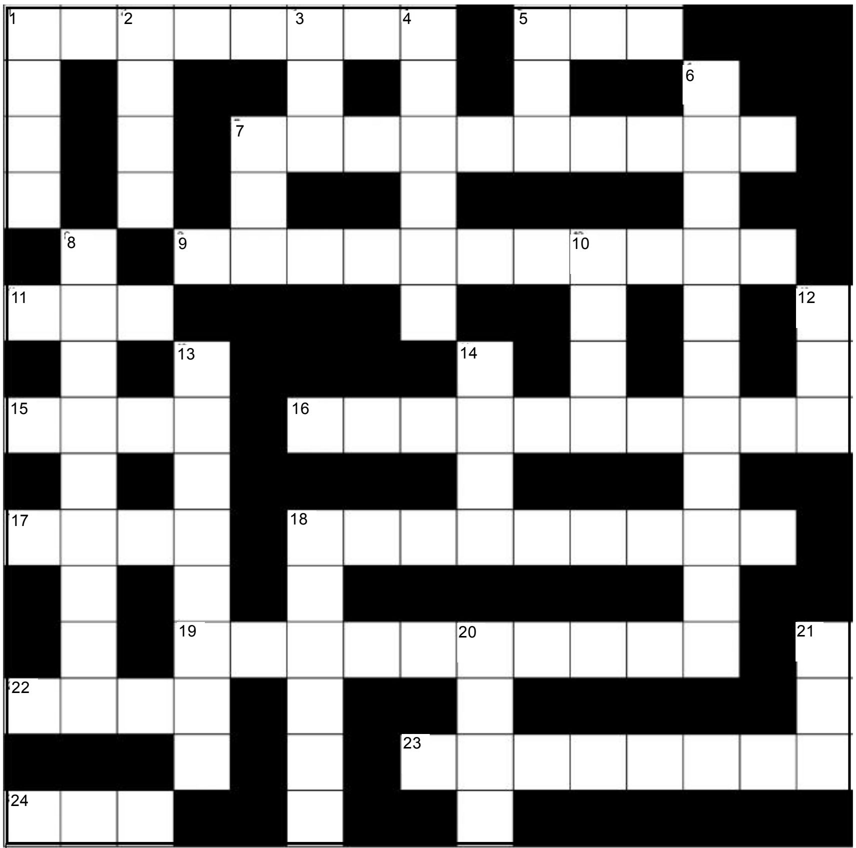
By 2050, when Australia's population is thought to be reaching 36 million, global oil production will be in its twilight. The green revolution – and the globalization of world agricultural markets that cheap oil has supported – may be at an end. If we cannot then produce sufficient food for ourselves, there will be no other nation to turn to for help. By 2050, if Australia is to survive as a nation, our agriculture will need to have adapted to climate change, instituted radical measures to recapture and recycle nutrients (e.g. using human and animal wastes as fertilizer) and have, somehow, compensated for the loss of cheap and plentiful fuel. We have not even begun to move in the direction of the more local, intensive but lower energy agriculture that will be necessary and we have less than four decades to accomplish it! In the face of these challenges it is highly unlikely that we will be able to support 36 million people. Indeed, even supporting our current population might prove a significant challenge.

In light of everything described above, we would be very well advised to restrict our population growth as much as possible, as soon as possible. Our ageing demographic profile – the "baby-boomer bulge" – represents an opportunity to do this in an organized and humane manner. We should not be desperately importing new mouths to feed in a vain attempt to either build more houses or support the baby boomer generation through their retirement. For the sake of our children's future we should, instead, do what is necessary to cope with the passing of the ageing bulge using our own people. This will be difficult, but an informed Australia can accept and meet this challenge. Moreover, our children will be left with a far more robust and food-secure nation. The alternative, "Big Australia" is not really an alternative at all.

(Thanks to DK, JW and others for comments and assistance with figures.)

Energy Bulletin (May 6, 2010) *is a programme of* Post Carbon Institute*, a non-profit organization dedicated to helping the world transition away from fossil fuels and build sustainable, resilient communities.* Go to the website to see the illustrations I had to leave out because of lack of space.

http://www.energybulletin.net/node/52706



CLUES

ACROSS

1 Good in salads
5 Feline
7 Groundcover herb
9 Brassica
11 Winning tennis serve
15 Wallpaper needs it
16 Stills the mind
17 Wise person
18 Herb - yellow flowers
19 Plant food
22 Leafy vegetable
23 Root vegetable
24 Becomes a flower

DOWN

1 Grape residue
2 Makes things grow
3 Pungent herb
4 Preys on insects
5 Vehicle
6 Chewing insect
7 Grow in pods
8 Cone flower
10 Vegetable
12 Makes skin look good
13 Herb with daisy flowers
14 Sweetens soil
18 Tapered vegetable
20 In the allium family
21 Small biting insect

WILLUNGA

Environment Centre INC

Supported by Adelaide & Mt. Lofty Ranges Natural Resources Management Board

18 High Street, Willunga. Phone: 8556 4188

10 am – 3 pm, Mon.– Fri., Sat. 9.30 am – 1.30 pm.

Advance notice:

Community, Sustainability & Environment Expo

to be held on

Saturday 8th & Sunday 9th October

in the

Willunga High School

Main Road, Willunga

(and various locations around the Willunga community) and is set to attract people from much further afield.

Hours: 10am to 4pm both days

We are still seeking expressions of interest from any parties willing to participate at this event, either as Guest Speakers on any of the above topics, or any topics related to this event, or as stallholders or volunteers on the day.

If you feel you could contribute to this event, or if you would like more information, please contact us via email:

expo_willungaenviro@westnet.com.au

or Ashleigh Pitman (Centre Manager) 0407 137261

or Janine Anninos (Project Officer) 0419 838631

This event is sponsored by

CITY OF ONKAPARINGA

Editorial

Our 'Open Day' showcasing the 'Regreen the Range Report from 2007 to 2010 that we held on 4th June was well received.

Exciting and colourful displays were arranged that walked visitors through 20 years of group activities and history, from the early beginnings to the present day. Displays that were particularly interesting to the community were the 'stitched' aerial photographs, visually showing the Hillsface area and the extent of Regreen the Range revegetation plantings.

There was also salvaged historical signage from the early **'Willunga Community Landcare Centre',** possibly the first community Environment centre in Australia, and ten very large picture signs illustrating aspects of the new office we are opening, the **'McLaren-Willunga Community Office for Sustainable Agriculture'.** Landowners also were interested in the noxious weed display loaned from the Willunga NRM Board, together with information pamphlets on related issues.

Tea, coffee and nibbles for anyone in need and free copies of the report were available. People wandered in from a busy 'farmers' market' to see what it was all about and very useful conversations took place that made the Group's effort very worthwhile.

Our President, John Campbell, has been working with the Onkaparinga Council for some time now, trying to secure commitment to our Community Office for Sustainable Agriculture. John has presented a detailed flow chart showing directions that the office could take which have been very well received. Talks are ongoing, but John is positive we will get a good outcome… eventually!

There should have been the latest Regreen the Range report in this issue from Wayne. However, although Wayne emailed it through to me, when I went to insert it… I couldn't find it! Wayne's away for a few days so I will put it into the next newsletter in Spring.

BRIAN.

Letters, emails or feedback of any kind on anything in this Newsletter would be most welcome. If you have something you would like to see published, please contact me.

BRIAN.

Crossword solution

ACROSS: 1 Marjoram; 5 Cat; 7 Pennyroyal; 9 Cauliflower; 11 Acre; 15 Size; 16 Mediation; 17 Sage; 18 Calendula; 19 Fertilizer; 22 Kale; 23 Beetroot; 24 Bud.

DOWN: 1 Marl; 2 Rain; 3 Rue; 4 Mantis; 5 Car; 6 Caterpillar; 8 Echinacea; 10 Quark; 12 Tan; 13 Feverfew; 14 Lime; 18 Carrot; 20 Leek; 21 Ant.

Willunga Hillsface Landcare Group

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Meeting dates vary, but are usually held on Mondays monthly at 4.30 p.m. in the Willunga Hub, cnr. St. Peters Terrace, Willunga.

All members are welcome to attend these meetings.

If you prefer to receive your copy in PDF format (via email) please let me know at this address: viza05@westnet.com.au.

Willunga Hillsface Landcare Group

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WILLUNGA HILLSFACE LANDCARE GROUP

Willunga Environment Centre
18 High Street Willunga

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Do you wish to continue receiving the Green Challenger? (Y/N)

Our thanks to Leon Bignell, MP, local Member for Mawson for printing this newsletter.