

ADDRESS BY

**MAJOR GENERAL THE HONOURABLE
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**TO THE FARM WRITERS' ASSOCIATION OF NEW SOUTH
WALES**

The critical role of soils in underpinning sustainable productivity

**THE GRACE HOTEL,
YORK ST, SYDNEY**

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Mr Paul Dellow, President

Members of the Executive Committee

Ladies and Gentlemen

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A pleasure to be here and thank you for inviting me.

As I will be speaking to you this afternoon on the critical role of soils in underpinning sustainable productivity, I thought it appropriate to open with a quote from the World Soil Charter. The charter, originally adopted by all member countries of the Food and Agriculture Organization of the United Nations (including Australia) in 1981, was updated last year and again endorsed by all FAO members. The first principle of the updated charter states that:

“Soils are a key enabling resource, central to the creation of a host of goods and services integral to ecosystems and human well-being. The maintenance or enhancement of global soil resources is essential if humanity’s overarching need for food, water, and energy security is to be met in accordance with the sovereign rights of each state over their natural resources. In particular, the projected increases in food, fibre, and fuel production required to achieve food and energy security will place increased pressure on the soil.”

While the language may be somewhat bureaucratic, the message is abundantly clear. The maintenance and enhancement of global soil resources is essential for the sustainable future of civilisation.

This important message is, I believe, gaining prominence and finally obtaining a foothold outside the spheres of traditional supporters – i.e. those who study soil (a surprising number – there are some 55 000 soil scientists worldwide), and those who manage it directly – farmers.

So while most Australians are likely to be oblivious of the World Soil Charter, most of you here today would be aware that 2015 has been declared the **International Year of Soils by the United Nations General Assembly**, and I hope that by the end of 2015 we can establish a simple message in the minds of the broader Australian public. That is –

- that soil underpins life as we know it
- that at home and abroad our soils are under threat from degradation, competing land uses and the demands of a booming world population

- that we have the knowledge and means to change the way soils are managed and in so doing to reverse degradation, boost productivity and build a sustainable future
- that now is the time for action.

I cannot overstate the importance of this message.

I will outline this afternoon what I see as some of the key challenges and opportunities for soil and landscape management and policy in Australia. But first, I will bring you up to date with how I came to be involved in these issues.

Advocate for Soil Health

In October 2012, at the National Farmers Federation Congress in Canberra, then Prime Minister Julia Gillard, announced my appointment as Australia's first ever Advocate for Soil Health. Prime Minister Gillard noted that the condition of our soils must be a national priority. She indicated that a key step in this direction was to be the appointment of a person with the authority and trust of the community to raise awareness of the importance of soil— an Advocate for Soil Health.

One of the roles of the Advocate for Soil Health involves the development of soil research priorities to complement existing efforts to develop a national soil research, development and extension strategy, to which we have already contributed through my expert advisory panel of soil and agricultural scientists.

The current Prime Minister, the Honourable Tony Abbott, extended my appointment, indicating that, as the Advocate, I would continue to raise public awareness of the critical role soil plays (integrated with good water and vegetation management) in underpinning sustainable productivity, delivering high quality ecosystem services and helping to meet global challenges, including food security and climate change.

Though appointed to this role by the Australian Government, I do not speak on behalf of the government.

Of relevance to the advocate role is my founding chairmanships of two not-for-profit organisations *Soils For Life* and *Future Directions International*, both of which are on the web and well worth a look.

You might well ask why a former soldier, vice regal office holder and research institute founder with no engineering, architectural, science, or farming experience is addressing you today?

Well, it is because I am a very, very worried global citizen, father and grandfather.

Why is this?

The globe is now subject to four great and difficult events. The ongoing impact of the financial crisis; unpredictable political, social and economic destabilization throughout the whole of the Middle East, much of Africa and elsewhere; a pending food and water crisis of huge dimension and behind all of that, the potential tsunami of climate variability.

But first some background to the big problem and my major interest; the food/water situation.

The impending global food/water crisis

Fundamentally the world has to almost double its sustainable food production by 2050 to meet a projected population increase from 7bn to perhaps 10bn, and it has to do this when the globe is losing around 1 percent of its arable land annually, where critical aquifer water supply for irrigated agriculture in China, India, Africa, and the Middle East is running out, and where most of the great rivers passing through populated areas of the undeveloped countries in particular, are heavily polluted.

We should also note that soils are becoming less fertile through run-down of nutrients and carbon, eroded through overgrazing and ground cover removal, and where wildfires are burning the equivalent of the continent of India every year and emitting large quantities of CO₂ in the process.

I note with great sadness that today some 27,000 children die daily from starvation whilst millions more are malnourished. The ramifications of malnourishment are, potentially, that many of these children will be impaired both mentally and physically such that they will be virtually unemployable. In India it is possible that 20% of poorly nourished children will suffer some sort of brain damage. This is an alarming statistic.

The social implications of a lack of food and water globally will also impact on world social stability and security, as indeed has already been demonstrated in

the food riots in Egypt that contributed to the overthrow of President Mubarek. Indeed the President of the World Bank stated last year that in five to ten years we will be fighting the water wars, and I think he is right.

This is perhaps the most urgent challenge facing humanity in the twenty first century. Countries that produce food will now have to produce significantly more of it. And this, in a world that will be experiencing the impacts of climate variability and increasing scarcity of natural resources such as water, soil and fossil fuels – all factors impacting on food production. Meeting this challenge will demand innovative solutions, including from Australia.

But to play our part, we have to overcome some land management issues of our own, including:

- an increasingly degraded landscape, particularly in the southern half of the continent where 60% of our arable land is degraded – some of it seriously, including through wind and water erosion, acidification, significant loss of soil organic carbon, structural decline and loss of nutrients;
- erosion and excision of one million kilometres of our streams and rivers - whilst the kidneys of any river system, our wetlands, have been too often drained for farming and urbanisation purposes;
- severe salinity, particularly in Western Australia;
- more urban growth and larger cities that are taking up good agricultural land and act as urban “hotspots” negatively influencing our climate, especially the small water cycle; and
- more erratic and unreliable rainfall, bigger floods, more extreme temperatures, longer droughts and consequently more wildfires.

These are indeed very serious and complex challenges. But what I am excited about is that in Australia we have the answers. We can reverse land degradation and equip ourselves to better deal with impending challenges. It is all in how we manage the landscape, but for which as yet we do not have a simple, clearly postulated aim or “light on the hill” to quote Ben Chifley.

Ladies and gentlemen I would suggest that such an aim might go something like this:

“To restore and maintain an Australian landscape that is fit for purpose”; that is fit for agriculture, for catchment, for mining, for cities, etc.

How do we go about achieving this aim? Let me suggest that healthy soil, with a focus on soil carbon, is the best place to start.

Healthy soil

The carbon content of soil is one of the key indicators of its health and is a master variable that controls numerous processes.

It is the carbon content of soil that largely governs its capacity to absorb, retain and supply moisture within the soil and to sustain active plant growth.

Soil carbon helps support a healthy balance of nutrients, minerals and soil microbial ecologies, improving soil fertility. Through this, healthy soils promote vigorous plant growth and plant animal resistance to disease and insect infestation.

Increased soil carbon levels therefore also have the means to reduce our reliance on costly fossil fuels and other farming inputs.

However, across the Australian dryland cropping and grazing sector, it would be unusual to find actively farmed soils with a carbon content of 1.5% or more. Indeed the State of the Environment Report of 2011 states that of 39 soil types across the country, only four have adequate carbon levels. Current rates of soil erosion by wind and water across much of Australia now greatly exceed rates of soil formation, by a factor of hundreds, and in some cases thousands.

To most effectively deliver its myriad of benefits soil carbon levels for quality agriculture should be around 3 to 5%. Soil carbon storage potential is of course determined by soil type, as well as the availability of water and other nutrients, and soil carbon levels are inherently low in much of arid inland Australia. Notwithstanding this, there is great potential to build soil carbon, and in doing so to build the resilience and boost the productivity of our agricultural soils.

Additionally, soil acidification affects about half of Australia’s agriculturally productive soils and costs the farming community tens of millions of dollars annually in lost production. Many standard agricultural practices accelerate soil

acidification, including removal of crops, use of legumes and application of non-organic fertilizers.

Sub-soil acidification in particular is emerging as a significant issue, and one which is costly and technically difficult to remediate. Acidification restricts options for land management and growing acid- sensitive crops and looms as a major constraint in Australia's capacity to increase carbon in agricultural soils.

How we manage our agricultural land, can either accelerate or moderate such degradation.

Water

Water, a major issue of concern in this State, is the next key issue: soil and water use efficiency are inextricably linked.

A primary outcome of a good level of organic carbon is its ability to absorb moisture. Broadly speaking, every gram of soil carbon can help hold up to 8 grams of water and of course vice versa. A well-structured soil, high in organic matter and soil carbon thus essentially acts as a sponge, improving infiltration and retention of rainfall. This retained moisture is then released slowly for plants and animals to maintain production over a much longer period.

The benefits of this are enormous, not only to maintain production but to maximize absorption in times of drought when rainfall is minimal, and in times of flood when significant rainfall can be retained in the soil profile and also drawn back into groundwater.

In future, securing a safe, reliable water supply for agriculture will become a strategic determinant for communities, regions and nations worldwide and remains fundamental for our farmers to sustain production. So we must be highly efficient in capturing and using the rainfall we get.

So what is the current situation in respect to rainfall?

For every 100 drops of rain that fall on our landscape, only ten go into rivers and streams, two end up in dams, two fall on our roads and roofs and are largely wasted as run – off. So what happens to the remaining 86 drops that fall on the land?

Some penetrates the soil with 6 going into groundwater and 30 are used by vegetation. But the remaining 50 drops, that is a staggering 50% of Australia's rainfall is unnecessarily lost to evaporation.

This is 25 times the quantity stored in all our dams every year. We must make use of rainfall where it falls and not let it be lost to excessive evaporation or flow rapidly away. And the means to achieve effective retention and efficient use of water lies substantially in healthy carbon- enriched soil. Infiltration rates can be vastly improved through ground cover retention, which slows the surface flow of water, and good soil structure, which not only improves infiltration but also water storage capacity. In light of predictions of increasingly erratic and lower rainfall, maximising soil water storage will be a vital means by which farmers can maintain productivity and profitability as they adapt to a changing climate.

Cropping farmers in particular are conscious of the importance of maximising soil water storage, and many improvements have already been made – largely through the adoption of stubble retention and reduced tillage in broadacre cropping. Some innovative techniques that farmers are using to hold water in the soil longer include construction of 'leaky' weirs to slow down water flow and the repairing of eroded water courses. The soil is then better able to support vegetation regeneration and pasture growth, streams are reconnected to their natural floodplains and wetlands rehydrated, so that maximum ground cover can be better sustained over prolonged dry periods for stock use and soil protection.

I am pleased to note that Australian farmers, with the support of the research community and through improvements in infrastructure have also made huge progress in building water use efficiency and productivity in irrigated agriculture.

Vegetation (bio-diversity)

Vegetation, the third critical component, adds organic matter essential to improving the structure of the soil, enhancing water retention and further supporting ongoing plant growth. It also provides a protective cover to control evaporation and soil loss through wind and water erosion while turning sunlight energy into the food and fibre we need.

Plant life diversity is important to support the ecosystem services that are fundamental to human survival. We need, therefore, to encourage mixtures, not monocultures and, where possible, perennials rather than annuals.

Perennial plants provide longevity of growth, ongoing protective cover and feed for stock, and they require fewer inputs. They are most resistant to pests and resilient to seasonal and climate changes. Again, many farmers are already moving in this direction, and I understand that research and development in perennial pastures is a focus within a number of our livestock industries. This should be supported, as a means of helping to build resilience and productivity in the extensive grazing industry.

Diversity of vegetative cover also supports diverse and essential microbial communities and healthy root ecologies, thus improving soil health and facilitating effective nutrient transfer. Nutrients are necessary for healthy soils and vegetation function and they are essential to healthy food.

Trees can lower the water table and draw down salinity from the soil surface. Trees also moderate temperature, limiting the effects of temperature extremes on surrounding groundcover. Vegetative cover can also re-establish the small water cycle to bring about a more even and regular distribution of precipitation. And importantly they can play a valuable role in cooling our cities.

EXAMPLE: the paddock, the house, the tree and the car park (Optional)

Ladies and gentlemen, the widespread adoption of regenerative landscape management or what might be termed a “fixing the paddock” approach, is a strategic imperative in restoring and maintaining an Australian landscape that is fit for purpose, including agriculture.

Therefore, if soil, water and biodiversity are integral to a healthy landscape, then perhaps they should be declared as national, natural, strategic assets and managed accordingly and in an integrated way.

Carers of the landscape

Another important factor relates to who is looking after most of our landscape.

It is our farmers and graziers who between them manage 60 per cent of it.

Thus for 130,000 farmers to play their part in achieving the policy goal of a landscape that is fit for purpose, two elements stand out:

- firstly, they need to be paid a fair price for their product, and

- secondly, they need to be adequately rewarded for their custodian role in caring for the soil on behalf of 23 million urban Australians.

As part of this recognition process, another factor arises, which is the urgent need to reconnect urban Australia to its rural roots. I take every opportunity to stress that urban Australians need to better understand the importance of rural and regional Australia, in terms of food production, the provision of clean air and water for all Australians, the value of the natural environment and the social contribution made by rural communities. We also need to build an appreciation of the achievements of our innovative agricultural sector, and the land management challenges being faced by our farmers every day. In this respect I commend the important role of organisations like the Farm Writers' Association of NSW – helping to strengthen links and understanding between the rural sector and the wider Australian community has never been more important.

Another simple and easily implemented solution to connect with our rural roots would be through the establishment of a cohesive and nationally applied school garden policy such that our young people can be taught about the science underlying food production and landscape processes, including by focusing on soil biology, photosynthesis, the water cycle and the fundamental role that green cover can play in reducing carbon emissions.

I am encouraged that Landcare Australia Limited, through its Junior Landcare program, has established more than 11,000 Junior Landcare schools and groups registered on the National Landcare Directory. Landcare Australia regularly distributes Junior Landcare grants for school gardens, creative gardening and other projects related to food and fibre production and looking after our land and water more generally.

A properly managed garden in every school in the country, could help overcome the acute shortages of agricultural scientists and extension officers and encourage more young people to take up farming; the average age of farmers now being 58.

Science policy and research coordination

A key factor in addressing our light on the hill is science policy and research.

Despite substantial investment in soil research, development and extension, lack of national coordination has resulted in inefficiencies, limited effectiveness and a less than maximum return on investment.

Knowledge, at both a State and Federal level, is scattered across a plethora of agencies and organisations, and is not readily or easily available to those working in agriculture and its related industries.

We need to undertake a stocktake to identify what knowledge we already have, who holds it, and what our shortfalls are, along with a national system of information/data collection, collation, analysis and dissemination.

An important task in the scientific context is the need to speed up research on the capacity of soils to sequester carbon and reduce emissions. There is increasing evidence that the soil can store large quantities of carbon from the atmosphere through regenerative farming practices that cool and rehydrate the landscapes. These practices can be both profitable and sustainable, but a good soil carbon measuring system, particularly for broad acre farming/grazing is needed.

Further, controlled intensive grazing practices offer the potential to limit emissions through wildfire reduction, particularly in Northern Australia, where we burn at least 30m hectares of un-grazed rangelands annually, which I am told emits twice our total CO₂ emissions from coal, motor vehicles, etc.

Where practicable, animals should eat the fuel and bio-digest it, rather than have it burn.

Policy coordination

Another key factor is in terms of policy.

Responsibility for all matters relating to the landscape lie across a range of federal and state departments and agencies, including agriculture, environment, regional development, mining, health, employment, indigenous, trade, security and education.

Delivery of a policy aimed at restoring and maintaining a landscape that is fit for purpose, would benefit from greater integration across all relevant departments and agencies. At the Commonwealth and State/Territory levels, perhaps the establishment of a Joint Parliamentary or Cabinet sub-committee with overarching responsibility for the well-being of the Australian landscape

with emphasis on agriculture, would potentially result in more effective policy development and implementation for the benefit of all Australians.

I hope to see broad government and industry support for the implementation of the National Soil Research, Development and Extension Strategy. Launched last year, the strategy aims to better coordinate the national soil RD&E effort, to reduce duplication, better target research to on-farm need and to help build the skills and capacity needed to meet future challenges.

The Soil RD&E Strategy includes a set of high level priorities for future soil research and development, which I contributed to by working with a panel of eminent soil scientists and consulting widely in the science community. The final set of priorities encompasses improvements to water and nutrient use efficiency, improved quality and availability of soil data and information, development of practical solutions to manage sub-soil constraints that limit production and building the understanding of soil biology within the farming system. Priorities will be evaluated and updated over time, and provide an excellent starting point for focusing investment and concentrating the research effort into areas of greatest need.

I was fortunate to address the opening session of the National Soil Science Conference in Melbourne late last year. It was apparent to me that we possess considerable, world-class capability in soil science but we have challenges in retaining these people and more generally encouraging students into science related streams.

Regulatory overburden and lack of cohesion

In managing the landscape it will be important to examine the unnecessarily complex and in part uncoordinated regulatory regime at local, regional, state and national levels to identify where simplification and rationalisation can occur, particularly in respect to stream, river, wetland and floodplain management. This is an important factor impacting on our “fit for purpose” aim.

Innovation

Australians are a nation of innovators coming up with novel solutions to unique problems. Australian farmers in particular, have a long history of innovation to overcome land management challenges. We need to identify and work with the farmers who are successfully adapting their management practices to improve resilience and productivity while also improving soil condition. Connecting

farmers with scientists to verify and build on on-farm success stories is essential, as is addressing barriers to the broader uptake of improved management practices.

Soils for Life

This leads me to the work we are doing through the not-for-profit organization *Soils for Life*, which I mentioned in my introduction. I am proud to be its founding Chairman. The objective of this organisation is to enhance Australia's natural environment through the provision of information and education on innovative leading performance in managing the landscape. And our goal is the widespread adoption of regenerative landscape management practices.

In 2012 we launched our report, *Innovations for Regenerative Landscape Management*. The report showcased 19 case studies of farming enterprises - across a range of regions and land-use types which were demonstrating strong environmental and production outcomes. The aim of these farmers has been to regenerate their landscapes, not just to improve profitability, but to build resilience to a changing climate and thus maintain ongoing productivity.

The common theme for each of our case studies was the recognition of the integrated nature of soil, water and vegetation and the need to manage them accordingly.

Many different techniques can be applied to regenerate the landscape as there is no single solution. The following principles, however, consistently emerge:-

- Enhance organic matter content
- Capture, use and conserve rain where it falls
- Manage holistically
- Care about the land as a resource
- Strive for maximum ground cover for the majority of the time
- Manage times of plenty for times of shortage

- Reduce reliance on off –farm inputs
- Observe, manage and respond, and
- Commit to education and constant learning.

Rotary Western Division Project

We were very fortunate in 2014 to develop a partnership with the Rotary Club of Sydney who, already supporting hay cartage to drought-affected areas, were looking for a more sustainable way of helping farmers in the drought-prone region of the NSW Western Division.

As you are all aware, Western NSW has long been prone to drought, but increasing climate extremes are seeing these occur more often and with greater ferocity.

Together with the Rotary Club of Sydney we saw a great opportunity to share with farmers how they could manage their properties to minimise the impact of drought on production and landscape health, drawing from the experience of successful innovative farmers who are already using regenerative practices.

We have identified some leading practice farmers in the Western Division, and in particular – Angus Whyte, who manages Wyndham Station 85km to the north, and Ashley McMurtrie from Gilgunnia Station near Cobar. We have documented their efforts and you can read these case studies on the **Soils For Life website**.

In the Western Division, what became clear through our case study process was:

- That increasing and maintaining groundcover, (preferably palatable perennial species) is priority for building resilience.
- To improve groundcover, pastures/forage needs time for rest and recovery from grazing, both by domestic and feral animals.
- Overall total grazing pressure needs to be controlled, and planned rotational grazing (also known as Holistic planned grazing) in conjunction with appropriate fencing (where required) facilitates this.
- It is rest time, not number of stock that is key to increasing groundcover.

The McMurtries and the Whytes have both demonstrated that property managers in the Western Division of NSW can achieve all-round greater resilience to drought for their landscapes and enterprises.

Conclusion

Ladies and gentlemen, today I have raised my concerns about an impending global food/water crisis.

I have identified a range of factors “to restore and maintain an Australian landscape that is fit for purpose”, including:

- designating soil, water and vegetation as national, natural strategic assets,
- rewarding farmers as primary carers of the agricultural landscape, refocussing science, reconnecting urban Australia with its rural roots,
- reducing regulatory overburden,
- recognising carbon sequestration potential through good land management practice, and
- bringing all involved government agencies together in a politically coordinated sense, perhaps through a senior cabinet sub-committee of relevant ministers.

From consideration of those factors would follow a plan of action on how best to bring all these components together in terms of policy development and implementation.

Suffice to say it is possible that impending global food and water crisis may be the most significant challenge humanity faces this century and it all devolves around how we look after our soil.

In dealing with this issue systematically, not only will we solve the problem, but there will be subsequent economic, social and environmental benefits for Australia, including the very real potential to export more food and perhaps even more importantly, export the knowledge that we acquire, to the many countries facing similar problems. The 2015 International Year of Soils

provides the ideal platform from which to renew our focus on these critical issues.

May I suggest in all seriousness that to “save the planet, we must save the soil”.

Thank you for your attention.

I would be happy to take questions.