Presentation to the Argyle Garden Club Goulburn. By Ray Shiel_

As we meet on this country today, we recognize the early custodians of this Land, the Gungungurra Nation to the north of Goulburn and the Nunawal Nation to the south and pay our respects to their elders past, present and emerging.

The SOILS pre 1788 were quite different to what we have today, and in what we grow our food and flowers in. From the diaries and journals of the early explorers and settlers we hear of soft spongy soils with a heavy cover of many species of plants and at times extensive areas of Wetlands and abundant wildlife.

All this was considered available to the new arrivals and were exploited to feed the growing colony as it expanded out from Sydney Cove.

Our soils in Australia are ancient-- but still a varied mix of sand, silt and clay--- most of our soils have been recycled over millions of years:

What were mountain ranges from volcanic and geological upheavals have eroded away into seabeds as sediments. These sea beds have then been pushed up and eroded again-- the cycling continues today.

Nutrients are leached and lost along the way, down through the soil profile into the ground water and out into the oceans from streams and rivers. But the land evolved over millions of years as did our native plants and animals, adapting to their Habitat.

Then the Europeans arrived…. Bringing their crop species and animals with them.

The Australian soils are very different to those of Britain and Europe. The British farming and gardening systems did not entirely suit Australian conditions when they brought them here in the late 1700's and into the century thereafter.

Crops did not yield well in the light soils of the Sydney Basin, new areas were sought-- the first wheat crop outside the Sydney basin was grown at " Inverary Park" just east of Goulburn by a Dr Reid on land granted to him by the Governor.

The cloven footed sheep and cattle compacted the soil as did horses. As new areas were discovered and opened up, numbers of livestock were moved over the landscape. Because they were herded out from night holding areas each day, the local areas were compacted and sweet nutritious plants were eaten out very quickly and not allowed to regenerate. The herdsman just moved their livestock to fresh pastures further out from the coast. The book by Eric Rolls "A million Wild Acres" gives an account of this happening in NSW as the land opened up to settlement in the early 1820's. And of course extensive Tree clearing (and this continues today), droughts and wild fires added to the landscape decline. The introduction of Rabbits and subsequent rabbit plagues added to the huge Losses of biodiversity that still continues today. We are now basically down to 5 major land species of food animals:- Cattle, sheep, goats, pigs and chickens.

And then came the period referred to as "Industrial Agriculture" following the 2nd World War. Bigger Machinery for faster clearing and ploughing large areas for bare fallow and increasing use of chemical

fertilizers that increased yields at the same time disrupting the natural nutrient cycles in our soils bringing disruption to the microbiological world of the "Soil Food Web". With the addition of large scale spray out of cropping areas using chemical pesticides and particularly the herbicide Glyphosate, the soil microbes have been grossly affected with a further major deterioration of soil fertility.

Just one example and there are many others: Wheat we eat today is 23--39% less nutritious than it was 100 years ago!!! *'Soil' p65 by Mathew Evans*

Plants have the ability to grow through the process of Photosynthesis --- with the energy from the sun, to produce their own food from the ingredients around them-- O, CO2, N, P, K, S, Ca, Mg, Cl, , (macro elements) Mn, Ni, Zn, Cu, Fe, B, Mo,(Micro elements) and I believe with more trace element amounts that are not essential to plant growth but actually play a roll in plant health and definitely in animal and Human Health and well being.

Plants have not done this alone-- They have made symbiotic connections with the Biome found in the soil --- the Soil Food Web. Take a teaspoon of fertile soil and there are millions of microorganisms present in it. These "livestock" under our feet are what really make things happen. (The same thing is applicable to the human gut) They vary in size from large animals down to microscopic ones that eat plant and animal material and turn that into material for food for each other-- often becoming victims themselves...its "a dog eat dog world" down there.

These are the many cycles that are part of nature. the composting cycle, carbon cycle, the nitrogen cycle, just to name 3 of the many natural cycles.

In gardening we refer to the process as composting where the microbes break down what was plant and animal material into the basic elements again, and make these elements once again available for plants to live on. They even feed the plants through a symbiotic connection--- all those those snails, slugs, grubs, slaters, earwigs, etc and of course worms (6,000 + species in the world and about 1,000 native to Australia). They all have a roll to play.

In the Rhysophere –the zone around the roots also contain bacteria, nematodes, spring tails and other microorganisms, that aid in this process.

Bacteria can produce polymyers that help to glue and hold the soil particles together giving healthy soils a crumb structure that we look for with all its benefits.

In the Rhysophere we also have fungi – the mycelium filaments of these produce glues that also help to hold soil particles into crumbs.

The fungal mycelium Hyphae-- (just 1/100 the diameter of a root hair) actually attach themselves to the root hair cells and supply nutrients into those cells in return for sugars that the plant produces from photosynthesis --with a message attached for the mycuem to further get needed elements for the plant. The mycelium then grows through the soil (the white threads we sometimes see when they are large enough and they can travel kilometers in vast networks) to return those elements back to the plant in return for further sugars.

Both bacteria and fungi thrive when there is plenty of Carbon available in the soil for them to utilize and support their health.

Our average Australian soils are becoming lower and lower in their Carbon content through our current agricultural practices with a loss of soil fertility. Our food grown on those soils are becoming less nutritionally dense. We are becoming more and more reliant on chemicals-- pesticides, herbicides and drugs for yields and good health for plants, animals and humans.

Fortunately there are some agricultural operators that are aware of what is happening and are using different ways to reverse the trends in our soils.

Regenerative farming practices without manufactured chemicals, maintaining soil vegetative cover, extensive growing of trees and under storey, Holistic management, Landscape hydration, mulching and particularly soil biological enhancement, better land and livestock management, adoption of tried and true systems such as Permaculture, Biodynamic techniques and there would be others.

I see this as a move away from Industrial Agriculture to a new Technical Agriculture---- Tec-Ag.

As gardeners and food producers we CAN turn this around in our own, sometimes small domains.

It all comes back to regenerating our soils…. Look after our soils, the plants will look after themselves and in turn animals and humans will be healthier as we face the extremes of Climate!!

About the author: Ray Shiel has experienced the steady decline of our soils and hence the drop in nutritional density of our food during his lifetime. After leaving a career in farming he was fortunate in gaining the knowledge through obtaining a diploma in Organic Agriculture, and Certificates in Farm Management, Horticulture, Catchment Land Management, Agricultural Nutrition (Nutri-tech), Permiculture Design (PDS), Soil Food Web, Biodynamics and has been involved in many Landcare workshops to gain an experience that he has put into practice in the urban vegetable garden environment and has run many workshops with the Goulburn Community Gardens and through U3A as a tutor as well as being part of a number of Landcare and environmental groups and advisory committees to Goulburn Mulwaree Council. Awarded the Goulburn Mulwaree Australia Day Citizen of the year in 2013.

Further reading and references:

*** *SOIL the incredible story of what keeps the earth, and us, healthy* by Mathew Evans
Published by Murdoch Books ISBN 978-1922351418

A great easy to read book to give an overriding appreciation of where we are at with our soils: *RLS*

*** *The Farm as an Ecosystem,* tapping natures reservoir-- Biology Geology, Diversity
by Jerry Brunetti Pub: Acres USA ISBN 978-1-60173-041-1

More technical book about the science of soil than the above but great information.

*** *Call of the Reed Warbler* by Charles Massy

Uni of Qld press ISBN: 978-07022-5341-6

"The evidence is overwhelming, for those who want to hear, that a key pathway to returning to health is eating healthier and more diverse foods off healthy regenerative landscapes, and also reconnecting to nature, along with becoming more physically active again." – Charles Massy.

A Company that is on the cutting edge of soil enhancement and has a website that has a lot of good information in S. A. is neutrog.com.au

This Company's research is superb and their products echo that. *RLS*

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