The role of technology in increasing agricultural productivity in Australia.

The Committee Secretary

House of Representative Standing Committee on Agriculture and Industry

Parliament House Canberra ACT 2601

Follow up submission to the Committee hearings from Nutri-Soil in Wodonga 28 January 2016

1. The productivity and viability of many technology intensive agricultural industries in Australia is declining rapidly due to the ongoing impact of these technologies on the structure and health of our finite soils.

This serious soil degradation is evidenced by the marked loss of carbon from soils and thus their physical structure under most current cropping and agricultural practices. These are continuing to;

1. Oxidize and/or erode from 5-10 tonnes of carbon per hectare per annum from our landscape.
2. Have variably impacted over 500 million hectares of Australia's cropping and over-grazed soils.
3. Have reduced soil carbon levels, often from over 6% (Strzelecki 1842-CSIRO 1983) to less than 1%.

2. This loss in soil carbon and structure has greatly impaired the ability of Australia's soils, bio-systems and agriculture to maintain its former hydrology, resilience and productivity. Over the next decades as climate changes systemically aridify much of Australia and extremes impact via floods, drought, wildfire and erosion; this loss of soil carbon and structure risks the viability of much of our agriculture and collapse of bio-systems.

Physically this degradation of soil carbon, structure and health has and will greatly;

1. Impede the infiltration, retention, availability and efficient use of our critical declining rainfall into and from our 'in soil reservoirs' intensifying flood peaks, erosion, drought stress and the collapse of agricultural and natural bio-systems, irrespective of the input of irrigation water in limited areas.

2. Impair the productivity of crops due to the inadequate supply of essential nutrients via the microbial processes naturally responsible for the solubilisation, availability, access, uptake and cycling of nutrients that depend on soil carbon; and can not replaced by fertilizer or precision technologies.

3. Restrict crop efficiencies and yields largely by limiting the longevity of green growth, both during plant growth and seasonally over which plants can optimally photosynthesize. Our genetic selection of crops has selected for the rapid growth and yield of plants under optimal conditions or inputs with few of our crop plants having the root/shoot ratios to sustain growth under limiting soil conditions.

4. Decrease the resilience particularly of these high tech, input dependent, agricultural systems to the increasing aridification, climate extremes and degradation of national soil capital values. While ever higher expensive inputs can keep plants alive, they reinforce such dependencies but not resilience.

Economically the degradation of soil carbon, structure and health values also impacts negatively by;

1. Inducing further degradation and loss of productivity in crops and pastures via soil acidification, salinity, water stress, frost, storm and hail vulnerability, toxicities, weeds and crop diseases.

2. Impeding Australia's capacity to sustain food production and exports to meet market demands thereby undermining incomes critical to sustain regional economies and national accounts.

3. Making Australia's natural and agricultural bio-systems and economy much more vulnerable to the now locked in increasing dangerous climate extremes.

4. Limiting Australia's capacity to meet its agreed COP21 net emissions, carbon draw down and soil carbon regeneration target of 0.4%/an or to generate carbon credits to offset our coal/gas exports.

5. Exposing Australia's major coal and gas exports to discounts by importers to cover their emissions liabilities under the COP21 targets; instead of Australia marketing them as greenhouse neutral fuels.

3.Fortunately, Australia can still avoid these serious adverse consequences and fully meet its emissions liabilities and those from our fossil fuel exports by adopting proven, practical agricultural innovations to regenerate the health of our soils, rehydrate landscapes and restore their natural resilience and productivity.

However to do this policies need to catalyse practical changes to many current farming practices so as to;

1. Reduce our excessive oxidation of carbon from our soils and bio-systems by;
    a. Limiting the area and extent of wildfires that risk increasing with climate extremes.
    b. Reducing our excessive cultivation of cropping lands.
    c. Ensuring the more effective limited use of fertilizers and bio-cides.
    d. Restricting the area and period land is fallowed without living green plants.
    e. Restricting serious overgrazing by stock and feral animals.

2. Maximize the proportion of biomass fixed by plants that is bio-converted microbially in soils into humus and glomalin to form the stable soil carbon critical to restore our soil structure and health.

4.Australia has unique advantages in being able to do this practically at the scale and urgency required. Australia's natural vegetation had adapted to its old leached soils and climate extremes through the evolution of microbial symbioses that optimized the soil-microbial root interface of its bio-systems and maximized the availability and cycling of essential limited water and nutrients supplies to sustain plant growth.

These soil microbial processes underpinned the high productivity, resilience and buffering capacity of the natural vegetation despite the limited soil water and nutrients and variable climate extremes. It is these microbial processes and ecologies that we have impaired via our current land management and have resulted in the degradation of much of our soil carbon, structure and thus the productivity and resilience of landscapes.

However by regenerating these natural microbial processes and ecologies we can regenerate these soil values; and thereby the sustained hydrology, productivity, resilience and bio-diversity of natural and agro-ecosystems. The bio-amendments being refined and used by Australia's innovative farm leaders form part of this focus to restore these natural microbial processes and ecologies, soil water and nutrient availabilities and through that the sustained productivity, health and nutritional integrity of the food from these regenerated landscapes.

5.Extensive evidence from leading case studies confirm the effectiveness of these innovative soil regeneration processes in restoring the health of Australia's degraded soils and landscape and in sustaining productivities.

For example while our current dominant oxidative soil management practices can at best bio-sequester up to 0.3 tC/ha/an as confirmed by the recent CSIRO SCARP project, leading innovative Australian farmers confirm that regenerative practices can bio-sequester up to 10tC/ha/an, over 30 times that under oxidative practices.

In addition plant and grain qualities as measured by their nutritional concentrations and range are consistently significantly higher when grown in the regenerated high carbon than degraded oxidative soils, ensuring their higher nutritional integrity and health outcomes can command premiums for Australia in global markets.

These innovative farming systems not only practically restore the structure, health, water holding capacity, resilience and productivity of our nation's soils and the viability of Australia's farmland but are doing this often with less than 30% of the conventional inputs and despite the increasing climate extremes and stresses.

Regionally these innovative regenerative practices will be critical for Australia's agriculture to protect and restore the natural capital value of its soils and landscape to underpin the longterm viability of its agriculture, food production, ecosystem health and services and its social wellbeing.

Strategically these innovative practices also provide Australia with the means to naturally bio-sequester over 2 billion tonnes of carbon per annum to more than offset our declared national emissions as well as offset all the unaccounted for emissions embodied in our fossil fuel exports and avoid them being seriously discounted.

Given Australia's unique natural and practical lead in regenerating and managing these microbial ecologies to restore the structure, health and productivity of soils and agro-ecosystems, Australia potentially has a major strategic competitive advantage to be a global leader in providing technology and services to extend such soil and landscapes outcomes to help regenerate over 5 billion ha of degraded soils and secure food needs.

Similarly in line with the Paris COP21 agreement, these innovations also provide Australia with major strategic competitive advantages in restoring soil carbon levels in local and global soils and in catalysing the global commercial trading of excess verified soil carbon credits to meet ecological, economic and social imperatives.

However to realize these global opportunities our policies must enable, rather than impede, these innovations.

6.Significant barriers currently exist to the successful extension and commercialization of these innovations. Despite being confirmed by the leading farmers and documented such as via the Soils for Life case studies systemic impediments still limit the wider adoption of such innovations, outcomes and benefits in Australia.

1. Information impediments currently mean that only some 1% of Australia's 130,000 farmers have access to adequate details of such innovations to make wise investments in their adoption.
2. Furthermore as these innovations involve optimizing the microbial ecology of the soil-root interface that varies with soils and past management practices, providing relevant support often requires more than just 'information' but tailored diagnostic, planning, mentoring and performance management support on a one to one basis, certainly for the initial lead demonstrator projects in each region.
3. Similarly as they differ in part from the dominant industry and academic information and practices, proposals to adopt such innovations are often rejected out of hand by 'gatekeepers' without the scientific or economic basis to assess the merit or potential of the proposals being presented.
4. Given that these innovations may lead to the lower uses of inputs and require transition periods, current industry suppliers and agencies may have a vested interests not to encourage such change, but to promote more of the current inputs.
5. In cases relevant regeneration strategies may also validly use natural pioneer plants and practices as tools to achieve desired outcomes even though current assumptions and regulations may deem them as weeds or contraventions to 'normal' practices. Such regulatory barriers can further impede action.

7.While not unique to these innovations, policy action is still needed to help overcome such barriers and ensure information is available to enable the innovations and their potential to be assessed on its merit. Given the unique aspects to successfully transition to these microbial ecology and regenerative approaches this policy support may ideally involve;

1. Providing catalytic resources to aid the wider proof of process demonstrations of how regenerating these innovative natural soil carbon and structural restoration processes can regenerate the productivity and resilience of degraded soils and agro-ecosystems in different sectors and regions.

2. Providing similar catalytic resources to document the evidence of these outcomes, their on farm and local economic benefits but particularly their strategic national interest benefits to Australia.

3. Providing catalytic resources to overcome information impediments so that most of Australia's farmers can become aware of these challenges, innovative solutions, potential outcomes and benefits beyond the 1% of innovative leaders and early adopters able to be reached under current resources.

4. Providing support for a small group of next early adopters to help them strategically diagnose, plan, resource and performance manage their tailored adoption of these innovations under mentored support so as to provide documented blueprints for their successful adoption in different situations.

5. Providing support to current industry and academic advisors and policy regulators to help them understand why and how these innovative regenerative approaches can be relevant and beneficial under specific conditions so that sound advice and assessments can be provided on their merits.

8.As the innovations seek to address the needs of a new reality and paradigm they should be judged on criteria relevant to the new imperatives Australia and the world must face in agriculture due to climate changes, demand pressures and resource limits, not the old paradigm that created the need for change. As outlined above these criteria have not been available which has impeded the previous objective assessment of the evidence for the need for and potential of these innovative regenerative approaches.

To overcome this an objective forum is needed where the need, case and evidence for these innovative soil regeneration strategies and how to achieve them via the practical restoration of soil natural microbial ecologies and processes can be demonstrated and critically analysed, relative to conventional approaches.

While the innovative leaders have confirmed the veracity and benefits from these processes and are applying them they do not have the capacity to catalyse the wider industry awareness and where relevant adoption of these innovative practices to enable Australia to maximize its strategic interest from them. Limited public support to enable the demonstration and extension of this potential will be needed for this.

The innovative Australian farmers and supporting NGO and agencies remain keen to support this wider public analysis and its extension and have submitted detailed proposals for consideration to effect this. Further information on these proposals or briefings can be provided as requested by the Committee.

Walter Jehne

Director

Healthy Soils Australia