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Dear Sir/Madam,

There is a paradigm shift occurring in agriculture which marks a transition from the approaches that were developed over the past eighty years of the green revolution; i.e. plant and animal breeding, fertilization and chemical control of problems such as weeds and diseases. The green revolution was a 20th century miracle that fed the burgeoning world population, however it is not certain that this paradigm will be sufficient to meet the food demands of the rising middle class population of this century.

The emerging paradigm is based on management and optimization of ecological performance, in order to increase production of food and fibre in a way that simultaneously maintains or improves the ecology of the production system. This paradigm puts soil management at the centre of the production system.

Soil Security

Soil is the most complex and little understood substance on the planet. Human existence relies completely on the thin layer of soil that produces our food and fibre, filters and recharges our fresh water systems, holds and supports terrestrial biodiversity and provides a range of essential ecosystem services. Soil security recognizes this fact and articulates the linkages between soil and the products and services it provides¹.

Without soil security, Australian agriculture will not be sustainable² and will be greatly reduced in its capacity to contribute to food security. This has been recognized in the

¹ Koch, A. McBratney, A. Lal, R. (2012) 'Global Soil Week: Put soil security on the global agenda', *Nature* 492, 186 DOI:10.1038/492186d

Koch, A et al (2013) 'Soil security: Solving the Global Soil Crisis', *Global Policy Journal*

² 2014, *The National Soil Research, Development and Extension Strategy, Securing Australia's Soil, For Profitable industries and healthy landscapes*, Canberra.

recently released National Soil Research Development and Extension Strategy. Unlocking knowledge about how soil functions and how these functions can be manipulated in order to underpin future agricultural enterprise will be critical to the emerging paradigm. Soil security is central to this 21st century paradigm shift.

Early examples on the continuum of this paradigm shift include:

- No-till cropping which reduces tillage and subsequently improves soil structure, resists erosion and increases soil water holding capacity. This approach has led to the reversal of wide scale soil erosion in Australian cropping systems over recent decades.
- High intensity short direction (HISD) grazing systems that focus on grazing limits which enable maintenance of vegetation levels and therefore maintain soil condition, rather than set stocking rates that can lead to overgrazing, de-vegetation, declining soil condition and erosion. Nowhere is the latter more evident than in the massive erosion events that have and continue to occur in Australia's rangeland systems.

Soil Security and International Competitiveness

Evidence is building that soil management is increasingly being recognized as a key part of a systems approach to farming – this is out of the realm of 'fringe agriculture', it is now working its way into mainstream industrial agriculture. An example of this engagement is the recent acquisition of the soil analysis business line of Solum by Climate Corp, under Monsanto's ownership. This acquisition occurred as part of Monsanto's development of the Integrated Farming Systems platform business³. The US Government has implemented a range of soil management and research programs aimed at driving increased resilience and productivity in agricultural systems.

Australian agriculture policy that ignores soil security and soil management as a critical approach to agriculture will be at the peril of the international competitiveness of the industry.

Conversely, agriculture that also secures our soil asset will reinforce the ideals of 'Brand Australia' – productive and healthy natural assets, producing natural and healthy food. We should not take this positioning for granted. Consumers are becoming increasingly sophisticated when it comes to the environmental values associated with food production – we should not expect middle class Asian consumers to be any different. Producing healthy food from healthy soil provides Australian agriculture with critical differentiation in increasingly competitive world markets.

The Impact of Soil Degradation

Failing to recognize and address existing problems of soil degradation will leave a large hole in the agricultural policy framework. Specific and well-recognised examples⁴ include:

- Wide-scale and worsening soil acidification. Soil acidity is already impacting farm gate returns in WA through lost production to the tune of \$400million per annum. This region produces half of Australia's wheat crop and 80 percent of its wheat exports⁵

³ Damon Kitney (24 February 2014) *Monsanto eyes local growth* The Australian

⁴ State of Environment 2011 Committee, 2011, Australia state of the environment 2011, independent report to the Australian Minister for Sustainability, Environment, Water, Population and Communities, Canberra, available at www.environment.gov.au/soe/index.html

- Wind and water soil erosion
- Declining soil carbon levels. Soil carbon is a general indicator of soil function and resilience – declining soil carbon generally means declining soil performance. Federal and State agricultural programs aimed at improving soil organic carbon (SOC) recognize this.

Australia is uniquely poised to take advantage of, and indeed drive this new soil management based paradigm shift in agriculture. It could be argued that failing to do so will lead to declining international competitiveness and profitability of Australian agriculture.

Australian Agriculture through the Soil Lens

A major omission in the Agricultural Competitiveness Issues Paper is lack of reference to the role of soil management and soil security in the ongoing competitiveness of Australian agriculture. If the subsequent White Paper seeks to address the issues raised in the Issues Paper without looking through the lens of soil security, then it will fail to harness this opportunity. Examples of how this lens could apply include:

- Improving soil condition leads to increased soil water holding capacity, which lengthens the time that water is available to plants for growth. Learning how to predict and manage soil moisture levels will help farmers to mitigate economic risk during dry spells. Evidence of this is emerging from projects such as the VIC DEPI project “Risk management through soil moisture monitoring”⁶
- Soil acidification is a problem that is already impacting farm profitability and productivity. Amelioration is well understood (i.e. the application of lime) but is expensive. This represents a major threat to future agricultural productivity.

Australian Leadership

The discoveries and innovations that are currently being made in soil management are akin to the types of discoveries in plant breeding and chemistry that led to the step changes of the green revolution during the last century. Australia needs to be on this new discovery and innovation curve in order to be at the head of the paradigm shift that is occurring.

Australia is well placed to lead in this discovery and innovation process, with direct benefits flowing to agriculture. We have great strengths in soil science, agricultural innovation and in general, comparatively infertile soils. Learning to get the best from our soil is important. The National Soil Research and Development Strategy that was released by Minister Joyce on 27 March provides the policy platform that links soil management to agricultural policy and future farm gate returns based on improving and maintaining the soil asset to underpin sustainable production.

Recommendations

There are four key recommendations for the White Paper that will address the issues outlined above.

⁵ Herbert, A, 2009, Opportunity costs of land degradation hazards in the South-West Agriculture Region, Resource management technical report 349, prepared by the Department of Agriculture and Food, Western Australia

⁶ Dale Boyd (2014) Soil Moisture monitoring for crop management, Soil Change Matters Papers and Abstracts Victorian Department of Environment and Primary Industries

1. Recognise the central role of soil security and soil management approaches in the future of Australian agriculture
2. Link the implementation of the National Soil Research Development and Extension Strategy to positive outcomes for Australian agriculture
3. Identify in the white paper the existential threats to Australian agriculture if existing soil degradation is ignored (i.e. soil erosion, soil acidification, declining soil carbon, de-vegetation and desertification)
4. Address degraded soil systems that are currently in the ‘too hard basket’, including heavily degraded rangeland soil. Eighty percent of Australia’s land mass is classified as rangeland. Unless rangeland soil is secure, Australia will simply not meet its aspirational goal of producing high value protein to Asian markets.

Sincerely,

Andrea Koch