**Key Priorities of Australian Soil Network**

**Implementing the National Soil RD&E Strategy**

**Preface**

Soils underpin food security in all nations. The often old and impoverished soils in Australia require specific focus and attention to ensure that they remain productive, both in terms of food production and ecosystem health. The release of the National Soil Research, Development & Extension Strategy provides a framework for coordinating such actions relating to soils.

The Australian Soil Network is responsible for implementing the National Soil RD&E Strategy. In 2015, members of the Network agreed on five key priorities that address research, innovation, data and information, extension and education, and policy. There are dependencies and linkages between each priority (e.g. Priority 3 supports the other four) but the order of presentation is not significant.

**The five priorities**

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| **SHORT DESCRIPTION OF THE PRIORITY** | **DESIRED OUTCOME** |
| **Priority 1 : Find solutions to soil-based constraints to agricultural productivity** | |
| * Improve our understanding of soil function, soil formation, erosion rates remediation and restoration processes so we can design ways to achieve sustainable soil management. * Develop rapid diagnostic systems for detection and response to soil-based constraints to root growth in crop, pasture and irrigation. * Improve the rhizosphere (the soil-plant-interface) to enhance plant productivity and soil function, including by improving soil structure, supporting breeding programs for plants with improved root systems, storing carbon and learning to manipulate microbial diversity. * Develop economically viable biological, chemical and/or physical methods to ameliorate unfavourable subsoil rooting conditions (e.g. compacted and dense soils, lack of macroporosity, acidified layers). | * Farmers are diagnosing when soil function is sub-optimal and is impacting yield and productivity. * Farmers have cost-effective options to ameliorate soil-based constraints (e.g. compaction) in locations where plant production is below the intrinsic potential. * The condition (health) and productivity of managed soils is improved using practical, well-verified, system-based strategies incorporating biological, chemical and physical process understanding. * Rates of soil loss are reduced as a result of improved soil condition, greater levels of plant cover, and appropriate land use. |
| **Priority 2: Improve nutrient and water-use efficiency to increase productivity and minimise negative impacts (including acidification, eutrophication, leaching and agricultural greenhouse gas emissions)** | |
| * Find new ways to improve nutrient-use efficiency, especially of nitrogen and phosphorus, in managed landscapes (e.g. improved fertiliser management that addresses the amount, form, placement, timing and potential for bio-enhancement). * Find new ways to optimize soil water-use in managed landscapes and improve the integrated management of water and nutrients in irrigation systems. * Determine current rates of soil acidification and identify feasible remedies. * Rebuild the stocks of organic carbon in Australian soils. * Develop efficient strategies for reducing soil greenhouse gas (GHG) emissions. | * Increased total factor productivity in crop, irrigated, pasture and livestock industries. * Reduction in agricultural nutrients entering the environment. * Greater ability of agricultural industries to adapt to variable and reduced rainfall and water availability. * Soil acidification is ameliorated, avoiding environmental impacts and widespread loss of agricultural productivity. * Increased carbon is stored in agricultural soils resulting in improved soil structure and plant productivity as well as significant carbon offsets. * Landholders are implementing efficient strategies for reducing emissions of GHG from agriculture. |
| **Priority 3:Develop better information systems for soil-related knowledge exchange** | |
| * Deliver easy-to-use spatial soil information at the scale of the farm and small catchment that enables farmers to benefit from precision, zone and mosaic management approaches. * Design practical and effective methods for monitoring soil function to underpin local management of water, nutrients, and carbon, and prevent degradation processes such as compaction, acidification, salinization, and erosion. * Apply new technologies for forecasting soil condition with an emphasis on functional attributes related to land management and plant productivity. * Support the development of Australia’s soil-data infrastructure (including computing, laboratory and archiving facilities) and provide web-based delivery of information services that unlock step changes in productivity through sustainable soil management. | * Effective knowledge exchange and improved soil management. * Reduced risks and uncertainties for farmers in deciding between alternative management strategies with the aim of achieving greater agricultural productivity. * Better matching of land use to land capability particularly in areas of new agricultural development. * An ability to monitor and forecast changes in soil condition under current and future systems of land management from local through to national scales. * The ‘Big Data’ revolution improves soil management and provides direct benefits to farmers and land managers. |
| **Priority 4: Capture, verify and communicate innovation in soil management** | |
| * Develop more effective ways to engage and exchange knowledge with farmers and land managers so that soil related R&D is applied and the potential benefits realised. * Capture the learnings from farmers and land managers as they test thousands of ideas every year in their day-to-day operations. * Test and verify the innovations using sound science to understand the likely effectiveness in different industries, locations and soil types. * Communicate innovations in soil management and work with farmers and land managers within a co-learning paradigm to maximise adoption of useful new technologies and practices. | * Reduced risk and uncertainty for land managers as to the likely effectiveness on their farm of practices designed to improve and maintain soil function. * New soil management ideas and innovations being evaluated, shared and applied more widely. * Increased public recognition of the fundamental linkage between the soil and agricultural productivity, and between soil and major environmental challenges (e.g. climate change). |
| **Priority 5: More effective soil and land use policy** | |
| * Support policy and planning with credible science to effectively identify and protect good quality agricultural land (e.g. better management of trade-offs with urban expansion, mining and energy developments, forestry and biodiversity). * Develop complementary policies in the national interest that address climate, agricultural and environmental objectives. * Support education policies and programs that lead to a better understanding of soils and the ecosystem services they provide in rural and urban communities. * Find policy solutions that address market failure in relation to the collection, management and provision of soil information. * Develop adaptive management frameworks that enable soils information and knowledge to be better utilised in land planning, policy implementation and industry growth. | * More efficient and equitable use of Australia’s soil and land resources. * Reduced conflict over land use and management and the impact of agriculture (e.g. on water quality). * Actions to prevent and reduce the risks of long term soil and land degradation. * Lessening of the urban-rural divide in Australia with citizens having a better understanding of agricultural production systems. * Creation of a sustainable business model for soil data collection and management that recognizes that soils are both a public and private good. |