

Agenda Meeting 8 of the Australian Soil Network¹

Location	Seminar rooms (G.A.603 and G.A.604), ground floor at ESP, Department of Science, Information Technology and Innovation, 41 Boggo Road, Dutton Park, Qld
Audio Call-In	To be advised
Date	Tuesday 15th November 2016
Attendees	
Georgina Kelly	New South Wales Department of Primary Industries (Chair)
Hamish Cresswell	CSIRO Agriculture and Food, Canberra
Neil McKenzie	CSIRO Agriculture and Food, Canberra
Jan Edwards	Grains Research and Development Corporation, Toowoomba
Jennifer Alexander	Executive Officer, Bendigo
Cameron Allan	Meat and Livestock Australia, North Sydney
Ian Anderson	University of Western Sydney, Richmond
Michele Barson	Department of Agriculture and Water Resources, Canberra
Louise Barton	University of Western Australia
Jim Cox	South Australian Research and Development Institute, Adelaide
Michael Crawford	Department of Economic Development, Jobs, Transport & Resources, Bendigo
Warwick Dougherty	New South Wales Department of Primary Industries, Camden
Felice Driver	Sugar Research Australia, Brisbane
Sharon Harvey	Wine Australia, Adelaide
Jason Hill (phone)	Department of Land Resource Management, Darwin
Karen Holmes	Department of Agriculture and Food Western Australia, Perth
Brenda Kranz (phone)	Horticulture Innovation Australia, Sydney
Paul Lawrence	Department of Science, Information Technology, Innovation and the Arts, Brisbane
Petra Marschner (phone)	University of Adelaide
Alex McBratney	The University of Sydney
Neal Menzies	University of Queensland, St Lucia
Cathy Phelps	Dairy Australia, Melbourne
Tony Weatherly	University of Melbourne
Allan Williams	Cotton Research and Development Corporation, Narrabri
Guest	General Jeffery, Advocate for Soil Health, Canberra
Apologies	Chris Grose (DPIPWE), RIRDC representative

¹ Formerly known as the Soil RD&E Implementation Committee

Agenda

Time	Item	
9.00	Welcome	
9.15	ITEM 8.1: Minutes of previous meeting	
9.25	ITEM 8.2: Establishing the Australian National Soil Facility	ASN-WG2
10.25	ITEM 8.3: Capability Audit	ASN-WG1
11.00	ITEM 8.4: Working Group updates on progress <ul style="list-style-type: none"> • National Committee on Soil and Terrain (ASN-SC1) • Soil RD&E Capability Audit (ASN-WG1) • Soil information infrastructure (ASN-WG2) • Register of field sites (ASN-WG4) • Plain English version of soil RD&E priorities (ASN-WG5) • Teaching curriculum (ASN-WG6) • Impact analysis and an evaluation plan (ASN-WG7) • Communication planning (ASN-WG8) 	Jason Hill (5 mins) See item 8.3 See item 8.2 Warwick Dougherty (5 mins) Michael Crawford (5 mins) Alex McBratney (5 mins) TBC TBC
11.30	ITEM 8.5: Member (jurisdiction) updates (to be taken as read). Up to 3-minute verbal update for emerging issues.	
12.00	Lunch	
12.50	ITEM 8.6: Parallel workshop sessions on prospectus development for Priorities 1 and 2 of the Soil RD&E Strategy	
2.45	ITEM 8.7: Financial report	Hamish Cresswell
3.00	ITEM 8.8: Other business <ul style="list-style-type: none"> • CRC update • Broad acre soil carbon measurement • 2017 meetings 	
3.30	Meeting close	

Australian Soil Network	Meeting Number: 8
	Location: Brisbane
	Date: 15 th November 2016
AGENDA Paper	ITEM 8.1
Minutes of last meeting and correspondence	
<p>Background</p> <p>The draft minutes of Meeting 7 of the Soil RD&E Implementation Committee are presented for review and endorsement (Attachment 1).</p>	
<p>Key issues</p> <p>None identified.</p>	
<p>Required action</p> <p>For review and endorsement.</p>	
<p>Resource implications</p> <p>None</p>	
<p>Preparation and consultation</p> <p>Soil RD&E Secretariat.</p>	
<p>Attachments</p> <p>Attachment One: Draft Minutes of Meeting 7 of the Soil RD&E Implementation Committee</p>	

Attachment 1: Draft Minutes of Meeting 7 of the Soil RD&E Implementation Committee²

Location: Teleconference

Date: 9:30 – 15:00, Thursday 25th August 2016

Attendees: Georgina Kelly, Neil McKenzie, Hamish Cresswell, Alex McBratney, Ian Anderson, Michael Crawford, Jason Hill, Paul Lawrence, Allan Williams, Cameron Allan, Michele Barson, Felice Driver, Cathy Phelps, Warwick Dougherty, Neal Menzies

Apologies: Jennifer Alexander, Jim Cox, Jan Edwards, Chris Grose, Sharon Harvey, Brenda Kranz, Karen Holmes, Michael Jeffery

Guests: Malcolm Buckby, Ravi Naidu, David Thompson (Item 7.7 only)

Agenda No.	Agenda Item	Discussion/comment	Decision/action	Who	Due date
7.1	Minutes of Meeting 6	Refer to Agenda Paper 7.1. The new members representing the Australian Council of Deans of Agriculture were noted and clarification was sought on university membership. Members were referred to Agenda Item 2.4 and related decisions.	The minutes of Meeting 6 were endorsed.	Moved Michael Crawford, seconded Paul Lawrence	
7.2	Working Group and Standing Committees - process	The Secretariat introduced the paper and noted that the Working Group system was central to the work of the ASN and that it was an important mechanism for in-kind contributions from members. The distinction between Working Groups and Standing Committees was defined and areas for improvement were noted. There was general support for the operating model and acknowledgement that governance had to be improved, particularly in	The proposed governance framework outlined in Agenda Paper 7.2 was endorsed noting that improvements to the management and performance of Working Groups is required.	Moved Michele Barson, seconded Michael Crawford	

² Formerly the Implementation Committee for the Soil Research, Development and Extension Strategy

		<p>relation to terms of reference, membership, work plans and resourcing. It was agreed that current number of Working Groups was too large (see Agenda Item 7.3).</p> <p>The relationship between the Australasian Soil and Plant Analysis Council and the ASN was discussed including a suggestion that it fitted the definition of a Standing Committee.</p>	<p>Approach ASPAC to discuss opportunities for closer engagement and the possibility of formal recognition within the ASN.</p>	<p>Secretariat</p>	<p>16th Sept 2016</p>
7.3	<p>Working Group and Standing Committees – description and status</p>	<p>The description and status of each entity was reviewed and recommendations were made on their future. One standing committee and seven working groups were confirmed (see below) and one was discontinued (WG3). Other possible activities identified in the agenda paper were deemed to be of lower priority at present and not in need of a working group.</p>	<p>All ASN Working Groups are to table reports at the next ASN meeting in November.</p>	<p>Secretariat and Working Group Chairs</p>	<p>21st Oct 2016</p>
		<p>Standing Committee 1: NCST</p> <p>The reduced external funding for the work of the NCST (via the Australian Collaborative Land Evaluation Program) was noted. Jason Hill (Chair of the NCST) welcomed more explicit guidance from the ASN in the future and he noted that the apologies from WA, SA and Tasmania which may have restricted the scope of feedback.</p>	<p>The current arrangements and scope of the NCST were supported.</p>		
		<p>Working Group 1: Soil RD&E Capability Audit</p> <p>Michele Barson outlined the recent activities of WG1. No changes were proposed and the importance of Soil Science Australia in assisting with</p>	<p>No change.</p>		

		the audit was highlighted.			
		<p>Working Group 2: Soil Information Infrastructure</p> <p>An update on membership and plans to present the draft investment prospectus were outlined. No changes proposed.</p>	No change.		
		<p>Working Group 3: Investor Forum</p> <p>WG3 was originally established to support coordination of investment in the Rural R&D for Profit process. It has been ineffective and no plans are in place for RDCs to liaise in the next phase of Rural R&D for Profit. Other aspects of investment into activities across the ASN will be pursued through other mechanisms including the prospectus.</p>	WG3 is to be discontinued.	Secretariat	25 th Aug 2016
		<p>Working Group 4: Register of Field Sites</p> <p>Warwick Dougherty outlined the work of WG4 and confirmed it will complete its planned activities on time.</p>	No change.		
		<p>Working Group 5: Plain English of the Soil RD&E Priorities</p> <p>Michael Crawford confirmed that the document has been drafted and it now requires review by communication professionals. The final document will be published online in 12 weeks and there will be an associated print run of ~250 copies. Approval for expenditure will be sought from the Committee prior engaging the communication professionals.</p>	Request for expenditure to be submitted to the ASN for approval.	Secretariat	30 th Sept 2016

		<p>Working Group 6: Teaching Curriculum for soil science</p> <p>Members affirmed the importance of WG6 and encouraged new representatives from the ACDA to engage. More information is needed on the status and proposed work plan.</p>	Request confirmation of status and proposed activities for WG6 from Dr Damian Field (University of Sydney)	Secretariat	30 th Sept 2016
		<p>Working Group 7: Impact analysis and evaluation plan</p> <p>It was agreed that WG7 is responsible in essence for developing the Monitoring, Evaluation, Reporting and Improvement plan for the ASN. More information is needed on the status and proposed work plan.</p>	Request confirmation of status and proposed activities for WG7.	Secretariat	30 th Sept 2016
		<p>Working Group 8: Communication Planning</p> <p>The task of WG8 is to develop a communication plan and related work program for the ASN. Terms of reference need to be developed along with nomination of members. A request was made for volunteers but none were forthcoming.</p>	Detailed proposal for WG8 to be presented at ASN Meeting 8 in November.	Secretariat and Paul Lawrence	21 st Oct 2016
7.4	Prospectus development	A verbal update on the development of the ASN prospectus was provided by Neil McKenzie. The priority is to produce the first stage of the prospectus which relates to ASN Priority 3 on soil information. WG2 is responsible for this activity.	Draft TOR and work plan was requested for the next meeting in November.	WG2	Nov 2016
7.5	Next annual forum	Options for the next annual forum were considered including co-convening sessions with other major soil RD&E events. The forthcoming International Nitrogen Conference was considered along with the SSA/NZSSS Conference in Queenstown, New	<p>No decision taken.</p> <p>A short brief was requested to propose options to be discussed out-of-session or at our next</p>	Secretariat	24 th Nov 2016

		Zealand.	meeting.		
7.6	Member and Working Group Updates	Members provided verbal updates that complemented the tabled reports.			
7.7	Soil CRC discussion	Malcolm Buckby, Ravi Naidu and David Thompson joined the meeting and provided an outline of the bid for the CRC on High Performing Soils led by the University of Newcastle. The Chair thanked the presenters and encouraged further consultation with the ASN as the bid process develops.	A letter of appreciation is to be sent Malcolm Buckby, Ravi Naidu and David Thompson for their contribution to the meeting.	Secretariat	14 th Sept 2016
7.8	Committee discussion on CRCs and update on the Sydney meeting	As an outcome of Meeting 6, a meeting was convened by Ian Anderson in Sydney on the 23 rd of August. It reviewed developments surrounding the current and possible future soil-related CRC bids.	Minutes of the meeting are to be circulated to members of the ASN.	Ian Anderson	2 nd Sept 2016
7.9	Financial report	Budget update tabled, motion of acceptance agreed (Felice Driver/Jason Hill).			
7.10	Other business	Allan Williams queried whether a structural problem existed within the ASN in relation to the distribution of meeting papers. He noted there was insufficient time to respond to meeting papers prior to this meeting. The Secretariat indicated that there was a heavy work load in the lead up to this particular meeting and that no structural problem existed beyond that.	The agenda is to be distributed no later than two weeks prior to each meeting. Agenda papers are to be distributed no later than one week prior to each meeting.	Secretariat and all members	Ongoing
		Correspondence from Prof Rob Fitzpatrick was noted. It requested recognition of the work undertaken by the Centre for Australian Forensic Soil Science within the ASN. The importance of forensic work to several industries was noted (e.g. diffuse contamination of the GBR lagoon). It was also noted	A letter outlining the response of the meeting is sent to Prof Fitzpatrick along with a query on possible future activities.	Secretariat	20 Sept 2016

		that the University of Adelaide (host institution for the CAFSS) is already a member of the ASN and the significance of their capability has already been recognized.			
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Australian Soil Network	Meeting Number: 8
	Location: Brisbane
	Date: 15 th Nov 2016
AGENDA Paper	ITEM 8.2
Establishing the Australian National Soil Information Facility	
<p>Background</p> <p>Understanding and managing soil change across Australia has been recognised as a high priority by the Australian Government (e.g. in its Science and Research Priority on Soil and Water). It is central to the Soil RD&E Strategy (e.g. Priority Three) and important to a wide range of industries, governments and communities.</p> <p>A recurring issue has been provision of the enabling infrastructure for collecting, curating and analysing soil information. A comprehensive plan to address this issue (ASAP) was prepared by National Committee on Soil and Terrain (NCST) and tabled at Meeting 1. Due partly to the scale of the institutional and resourcing issues involved, the ASN has been unable to proceed despite the general support for the program (refer to Agenda Papers 1.6, 3.8, 6.7 and related minutes).</p> <p>A staged approach to implementation was eventually agreed at Meeting 6 and it was proposed to focus on the data infrastructure aspects. Working Group 2 on Soil Information Infrastructure was established and its purpose was to:</p> <ol style="list-style-type: none"> 1. Expand the scope of the current ASAP Stream 4 proposal to ensure that private sector components are fully integrated. 2. Prepare the revised project proposal along with a budget identifying current expenditure and options for new expenditure. 3. Develop a viable investment model with low overheads and transaction costs. <p>The Working Group has now been established with the following members: Dan Brough (Queensland Department of Science, Information Technology and Innovation), Peter Wilson (CSIRO), Sandy Carruthers (South Australia), Chris Souness (Birchip Cropping Group), Mark Pawsey (Site-Specific Technologies (SST)), Ross Searle (CSIRO) and Brendan Malone (University of Sydney).</p> <p>A draft proposal for establishing the Australian National Soil Information Facility has been prepared by the ASN Secretariat with input from the Working Group (Attachment 1). The proposed Facility will provide information for decision makers in the public and private sector and improve the effectiveness of agricultural and environmental research in Australia. It also has the potential to act as an Accredited Release Authority for a National Interest Dataset on soils within the draft reforms on data availability and use that have been recently proposed by the Productivity Commission.</p>	

Key issues

- The draft proposal for establishing the Australian National Soil Information Facility provides a preliminary outline of the Facility's functions along with options for hosting and funding.
- A decision is required on whether the broad function of the Facility is supported. If the proposal is supported, then the next stage is for the Australian Soil Network to establish a formal consortium and work plan that aims to establish an operational Australian National Soil Information Facility by the 1st of July 2018.

Required action

- For decision.

Resource implications

- Funding from the ASN of \$35K is required to develop the full proposal by September 2017 to ensure the start date in 2018. The funds are to be used to support two national meetings of Working Group 2 with stakeholders along with separate consultations with those responsible for running similar existing facilities (e.g. IMOS, ALA, BOM, GA).
- The cost of running the core facility will be about \$6M per annum. Several agencies already invest in soil information systems and this funding base needs to be broadened. The initial proposal is for cost-sharing arrangement to be shared between the Australian Government (\$1.7M), Rural Research and Development Corporations (\$1.6M), CSIRO (\$1.3M), State and territory governments (\$1.4M).

Preparation and consultation

- ASN Secretariat and ASN-WG2

Attachment

- Attachment One: Establishing the Australian National Soil Information Facility

Establishing the Australian National Soil Information Facility

Draft Prepared by the Australian Soil Network Secretariat and Working Group Two (Soil Information Infrastructure), November 2016

Purpose

This paper proposes the establishment of an Australian National Soil Information Facility. The Facility's infrastructure will provide access to the observations and data streams necessary for understanding and managing soils across the continent. It will also provide information services to operational agencies and industries in a way that improves agricultural productivity and performance. Australia's soil information must be enhanced to fully realise the potential benefits of new and emerging digital agriculture technologies. Improved soil information will provide direct benefits to farmers and agricultural industries because it enables:

- precision agriculture and zone farming
- improved production forecasting
- better fertiliser decision making
- improved irrigation scheduling
- targeted amelioration of soil-based constraints
- effective management of soil carbon, and
- increased land literacy.

Improved soil information also generates direct benefits to a much wider range of beneficiaries through its use in:

- research and development
- natural resource management, particularly of water, contaminants and coasts
- land-use planning and environmental impact assessment
- evidence-based policy on agriculture, environment and trade.

The initial focus will be on enabling infrastructure for spatially explicit estimation of soil-nutrient budgets, soil-carbon stocks, the soil-water balance, soil-microbial function and soil acidification. The resulting data streams will provide a platform for application developers involved in the digital agriculture revolution. The Australian National Soil Information Facility will ensure that existing data holdings are accessible and fully utilised and it will provide the tools and incentives to guarantee that new data collection by public and private organizations is far more strategic and cost-effective than current practice.

In summary, the proposed Facility will provide information for decision makers in the public and private sector and improve the effectiveness of agricultural and environmental research in Australia. It has the potential to act as an Accredited Release Authority for a National Interest Dataset on soils within the draft reforms on data availability and use proposed by the [Productivity Commission](#).

Context and opportunity

Understanding and managing soil change across Australia has been recognised as a high priority by the Australian Government (e.g. in its [Science and Research Priority on Soil and Water](#)). It is central to the [Soil RD&E Strategy](#) (e.g. Priority Three – see Appendix One) and important to a wide range of industries, governments and communities. A recurring issue has been provision of the enabling

infrastructure for collecting, curating and analysing soil information. The need for new arrangements to achieve more open access to information has been recognised in a range of reviews and reports (e.g. Campbell 2008, NCST 2013, McKenzie 2014, ITPS 2015, Keogh and Henry 2016). However, the often-proposed option of establishing a new national agency has not received sufficient support partly because of the cost and difficulty of finding a suitable business model.

The digital revolution has created exciting new possibilities for collecting, managing and analysing data on natural resources. In Australia, several domains have made great strides in developing new and integrated national observing systems and forecasting capabilities *without* having to establish new agencies (e.g. Integrated Marine Observing System ([IMOS](#)), Atlas of Living Australia ([ALA](#))). Common to each of these activities is some form of national facility – hosted by an existing institution – that provides the necessary infrastructure for information management and computing. These facilities are notable for their clear strategic outlook, effective collaborative arrangements, and technical excellence.

The proposed Australian National Soil Information Facility directly addresses Priority Three of the Soil RD&E Strategy. It also responds to the recommendations made by Keogh and Henry (2016) in their analysis of global developments in digital agriculture and the steps that Australia needs to take to ensure benefits are quickly realised (e.g. Recommendations 3, 5, 7 and 9). The Facility will fill a critical gap in Australia's overall system for monitoring and managing its natural resources, and in particular, its agricultural landscapes.

This paper provides a preliminary outline of the Facility's functions along with options for hosting and funding. If the broad function of the Facility is supported, then the next stage is for the Australian Soil Network to establish a formal consortium and work plan that aims to establish an operational Australian National Soil Information Facility by the 1st of July 2018.

The proposal outlined here is based partly on Stream Four in the larger Australian Soil Assessment Program developed by the [NCST \(2013\)](#). However, it also draws heavily from successful facilities established under NCRIS (primarily IMOS and ALA) and also on approaches used by successful operational agencies (e.g. Bureau of Meteorology, Geoscience Australia).

Core functions of the Australian National Soil Information Facility

The Australian National Soil Information Facility will provide data streams that enable:

- an understanding of how soils vary across the landscape at scales useful to digital agriculture (i.e. maps of soil properties and functional soil types including regular updates to the [Soil and Landscape Grid of Australia](#))
- observational systems for detecting and interpreting soil-change with time (e.g. via monitoring sites, long-term experiments, time-series remote sensing)
- forecasting of the likely state of soils under specified systems of land management and climates (e.g. through the use of simulation models).

Provision of soil information infrastructure

Standards

Online geospatial information systems (e.g. Google Maps) have been a catalyst for innovation with many new businesses being built on the primary geospatial data services. Ironically, this diversity has only been possible through the development of, and adherence to, rigorous technical standards.

Online soil information systems require much stronger discipline in the collection and management of soil data than soil scientists and their institutions have shown to date. This is particularly

challenging because methods of soil measurement, mapping and monitoring are currently in transition and agreement is only now being reached on preferred methods (e.g. for proximal sensing and digital soil mapping). In many ways, the desired soil data services outlined here are conceptually simple – estimates are needed of key soil properties (e.g. water content, carbon, pH, N, P, K) at points in geographic space (including depth) and through time. However, the undertaking is complex because current data holdings have been collected according to different standards and they are held in diverse information systems.

As a consequence, an initial task for establishing the Australian National Soil Information Facility is to agree on standards for soil data collection, exchange and interoperability between national and local data systems. This needs to build on recent initiatives to implement [ANZSoilML](#) compliant web services and ensure standardised data flows from different sources.

Data services and application development

The Australian National Soil Information Facility will provide data services that are analogous to those provided by other domains (e.g. weather, climate and water data services provided by the Bureau of Meteorology). Data services will be delivered online and some will be of value to users in their primary form (e.g. soil water content). Others will be used by third-parties to supply value-added services that may be free (e.g. as provided by [SoilMapp](#)) or on a subscription basis. As recognised by Keogh and Henry (2016), a range of new business opportunities will develop around these data services (e.g. various forms of carbon trading, farm advisory services, financial products).

Research archives

The Australian National Soil Information Facility will incorporate the [CSIRO National Soil Archive](#) and other state and territory archives that are willing to participate. These archives have proven invaluable in recent years for projects including:

- Application of new measurement technologies such as MIR and NIR³ on specimens to produce improved national maps (e.g. aspects of the Soil and Landscape Grid of Australia)
- Calibration of new measurement methods using existing specimens and their accompanying data (e.g. new methods for soil carbon measurement)
- Re-analysis of specimens to enable high-precision measurement of soil change (e.g. reanalysis of the National Soil Fertility Program sites from the 1960s and 1970s).
- Rapid assessments of soil properties on existing specimens reducing and sometimes obviating the need for new sampling (e.g. mapping boron concentrations across Southern Australia in the late 1980s to support plant breeding and improved variety selection)
- Analysis of baseline variables in specimens collected prior to agricultural development (e.g. contaminants and potentially, molecular biology).

Good progress is being made in integrating physical archives and their associated soil information systems. This has resulted in the development of a demonstration portal for an Australian National Virtual Soil Archive (supported by the Australian Government Department of Agriculture and Water Resources).

Structure of the National Soil Information Facility

Most reviews of the soil-knowledge system in Australia touch on the difficulties of finding a robust business model for supporting soil information systems (e.g. Taylor 1970; Beckett and Bie 1978; Collaborative Soil Conservation Study 1978a,b; McKenzie 1991, 2014; Campbell 2006; Wood and Auricht 2011). The most significant issues relate to the following.

³ Mid-Infrared and Near-Infrared spectroscopy

- All levels of government need reliable information on soil resources, but no single level of government or department has responsibility for collecting this information on behalf of other public sector agencies.
- Public and private interests in soil are large and overlapping, but mechanisms for co-investment by public and private agencies have not been developed.
- Market failure in relation to the supply and demand of soil information is a significant and widespread problem. In the simplest case, beneficiaries of soil information do not pay for its collection and this reduces the pool of investment for new survey, monitoring and experimental programs.
- Partly as a result of the above, most soil-information gathering activities are currently funded through short-term government programs, private companies, individuals or in response to specific regulatory requirements (e.g. environmental impact statements). These have not produced the enduring, accessible and broadly applicable information systems that are needed to meet the requirements of nearly all stakeholders.

The success of pioneering information facilities such as IMOS and ALA show that most of these problems can be solved through effective formal collaborations between existing institutions. This avoids many of the problems associated with establishing a new national institution (see Morton and Tinney's (2012) analysis of institutional options for a national environment information system).

An important prerequisite for success is the availability of a willing and supportive organization that is able to host the Australian National Soil Information Facility. The Australian Soil Network will need to establish the mechanism for selecting and commissioning the host organization. It will also need to specify the federated design and governance structure in detail along with an efficient and equitable model for joint funding. The draft reforms on data availability and use proposed by the [Productivity Commission](#) provide good solutions to several of these institutional issues, particularly those relating to the National Data Custodian, Accredited Release Authorities and the declaration of National Interest Datasets.

Federated design and governance

The major existing soil information systems in Australia are currently managed by state and territory agencies, CSIRO, a few fertiliser companies and several universities. An important task in developing the federated design of the system is to rationalise the current arrangements to ensure economies of scale while retaining regional and local relevance. The Australian Soil Network is the logical group to undertake this task because it is consistent with the intent of the [National Primary Industries Research Development and Extension Framework](#). The Facility will require a standard management structure with an advisory board and facility leader. The governance structures of IMOS and ALA provide useful models.

Relationship to other national facilities

The Australian National Soil Information Facility needs to be closely integrated with existing national facilities and operational agencies in related fields. The former include IMOS, ALA, the Terrestrial Ecosystems Research Network ([TERN](#)) and the Australian National Data Service ([ANDS](#)); and the latter include Geoscience Australia, the Bureau of Meteorology and the Australian Bureau of Statistics.

Staff and resources

NCST (2013) and the experience gained through other national facilities indicate that the following complement of staff is required as a minimum. Some of the individual FTEs could be spread across several people (e.g. the archivists and positions in state and territory agencies).

- 2 FTE facility leadership
- 1 FTE soil scientist
- 2 FTE integration and interoperability
- 1 FTE programming and software engineering
- 2 FTE database manager
- 1 FTE GIS and spatial analyst
- 1 FTE open data manager
- 2 FTE application development and support
- 4 FTE soil archivists
- 4 FTE in state and territory agencies with matching skills
- 1 FTE industry support and engagement

The physical resources include the soil archives noted earlier and access to computing in the form of robust production systems and high-performance computing including the National Computing Infrastructure ([NCI](#)).

Funding

Based on the complement of staff outlined above and a salary to operating ratio of approximately 60:40, it is estimated that the cost of running the core facility will be about \$6M per annum. Several agencies already invest in soil information systems (e.g. state and territory governments, CSIRO, Australian Government Department of Agriculture and Water Resources). This funding base needs to be broadened and an initial annual cost-sharing arrangement could involve the following.

- Australian Government (contributions from Departments of Agriculture and Water Resources, Environment, and Education) (1.7M)
- Rural Research and Development Corporations (1.6M)
- CSIRO (1.3M)
- State and territory governments (1.4M).

Further details on funding and membership of the consortium will need to be developed by the Australian Soil Network if a decision is taken to establish the Australian National Soil Information Facility. An initial commitment of at least 10 years is essential.

Initial priorities for mapping and monitoring of soil change

The mapping and monitoring of soil change by the Australian National Soil Information Facility needs to be based on agreed specifications that address the required accuracy and precision for different systems of land use and locations. A suggested initial focus is on the following components noting that the Facility is intended to serve both public and private sector interests.

Soil nutrients

Nutrient imbalances are widespread throughout the more intensively managed landscapes of Australia. Intensification of agriculture in many districts is causing significant environmental impact, particularly due to the large increase in fertiliser use and ruminant animals. In other districts, nutrient mining and decline is occurring due to insufficient replacement of nutrients removed through harvest or other loss pathways.

Existing land resource surveys, the Soil and Landscape Grid of Australia, and several large data compilations by individual projects (e.g. Better Fertiliser Decision project, National Land and Water Resources Audit) provide a starting point for developing better data streams relating to nutrients. However, a major opportunity is to integrate these sources with the large quantities of soil test data

collected by farmers, agribusinesses and the fertiliser industry (most of which is currently inaccessible).

Acidification

Soil acidification is a widespread and serious problem that has the potential to cause irreversible damage to soils particularly across southern Australia, in select tropical landscapes, and in areas where product removal and leaching are contributing factors.

Data sources are similar to those for soil nutrients. However, improvements are needed to ensure estimates are up-to-date and to enable more accurate estimation of the Net Acid Addition Rates of different farming systems. Again, integrating public and private data sources and maximising data accessibility are essential.

Carbon

Understanding trends in soil carbon stocks is essential for achieving sustainable soil management. It is increasingly required for accreditation and monitoring for a range of purposes including market access, official statistical reporting (e.g. Sustainable Development Goal 15.3), carbon trading and other emerging international schemes (e.g. the [4-per-1000](#) initiative).

Data services on soil carbon need to include a regular update of the Soil and Landscape Grid of Australia and mechanisms for integrating local farm measurements with broader scale measurements across the landscape.

Soil-water balance

Real-time measurement and estimation of the soil-water balance are the current focus of several major national projects. Advances in proximal sensing (e.g. Cosmos probes, sensor networks) and time-series remote sensing have improved the spatial and temporal resolution of data streams. The use of the resulting information is widespread and includes drought and flood forecasting, pasture management, crop-yield forecasting, fertiliser decisions and agricultural management more generally.

Soil microbial populations

Major advances in molecular biology and activities such as the [BASE](#) project are providing completely new insights and potentially the basis for new interventions relevant to carbon and nutrient management in agricultural systems. The soil biological component of the ALA and activities such as the BASE project are both a source and user of new soil data services. A major opportunity for the Australian National Soil Information Facility is to ensure data services and the supporting computing infrastructure are closely aligned with existing systems for biodiversity. This will generate economies of scale and accelerate the rate of discovery and innovation in the management of soil biology across the Australian landscape.

References

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Appendix One: Priority Three of the Soil RD&E Strategy

Develop better information systems for soil-related knowledge exchange

Key activities

- 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.

Desired outcomes:

- 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.

Australian Soil Network	Meeting Number: 8
	Location: Brisbane
	Date: 15 th Nov 2016
AGENDA Paper	ITEM 8.3
Update of the 2011 Stocktake on Soil RD&E	
<p>Background</p> <p>Meeting 6 of the Australian Soil Network confirmed that Working Group 1 (Soil RD&E Capability Audit) would undertake a second audit of soil RD&E capability across Australia and ensure results are consistent with the original stocktake undertaken in 2011. This second audit will have a sharper focus and concentrate on numbers of specialists (FTEs) and overall levels of investment. The results will resolve differences across the various fields of RD&E and outline key demographic features that may affect the effectiveness of soil RD&E over the next decade.</p> <p>No resources were approved at Meeting 6 although the cost of recent capability audits for other RD&E Strategies were considered to be too expensive. As a consequence, members of the Working Group have been investigating how to undertake a cut-down version of the original stocktake.</p> <p>The original stocktake was based on three surveys (of organisations, consultants and members of Soil Science Australia). With the assistance of the Department of Agriculture and Water Resources, the 32 responses to the survey of organisations have been located. This is fortunate because this survey produced the most useful information.</p> <p>It is proposed that the most cost-effective way of updating the 2011 stocktake is to start with a re-survey of these 32 organizations using a simplified questionnaire (e.g. no questions on individual projects which caused problems last time). This will allow an estimate the total investment into soil RD&E and provide guidance on changes in staff numbers in these larger institutions. A draft of the simplified questionnaire is presented in Attachment Two.</p> <p>A re-run the survey of Soil Science Australia members is also proposed. However, while the response rate from members was good, it may have been insufficient to allow definitive conclusions to be drawn on changes over the last five years.</p> <p>The patchy response from the consultants in the original stocktake provides a poor baseline for comparison so a re-run of this survey is not likely to be useful.</p>	

Key issues

- The proposed survey of soil RD&E organisations will not provide a complete view of trends in capability and the proposed questionnaire will collect less data than the first survey.
- Every effort will be made to ensure the initial respondents to the survey of organisations are also the respondents for the update. However, there is a risk that the second survey will highlight flaws in the original survey (e.g. variations in methods used for estimating investments into soil RD&E)
- Trends in the private sector will not be captured by the survey of organisations and only partially by the survey of Soil Science Australia members.

Required action

- Members are asked to review and approve the proposed questionnaire of organisations to allow the Working Group to start the survey immediately.

Resource implications

- The time and cost of completing the survey of organisations will vary with the size and complexity of individual organizations.
- Time allocations and budgets to cover the costs of analysis and publication are yet to be confirmed.

Preparation and consultation

- ASN Secretariat and ASN-WG1

Attachment

- Attachment Two: Draft questionnaire for organisations

Australian Soil Network

Capability Audit of Soil RD&E, 2016

Introduction

The last national stocktake of soil research, development and extension (RD&E) was completed in 2011 and the results were critical to the formulation of the National Soil RD&E Strategy and to the current work of the Australian Soil Network which is responsible for implementation of this strategy. An update to the original stocktake is underway and it's focussing on several key indicators relevant to the strategy:

- Total investment in soil RD&E
- Composition and age structure of the workforce involved in soil RD&E
- The balance of investment into research, development and extension.

The results of the stocktake will be used to guide investment priorities and training needs. As a key stakeholder in soils RD&E and respondent to the previous stocktake, we are seeking your assistance in completing the attached questionnaire. The questionnaire is being sent to the 32 organisations that responded to the original survey. A separate survey of members of Soil Science Australia will complement the survey of organisations.

Please return your response to the Network's Executive Officer, Ms Jennifer Alexander, by XX/XX/2017.

Survey for Soil RD&E Organisations

Definitions and advice for respondents

In the context of the National Framework for Primary Industries Research, Development and Extension ([NPIRDE 2009](#)), organisations are asked to consider the significance of the role they perform for each of the six RDE fields (see below) in which they invest. The three types of role are as follows.

- **National leadership** role where there is a major priority for the relevant government/organisation and the government/organisation endeavours to give a high priority to funding research, including infrastructure, for that sector.
- **Support** role where they undertake some research, but the major activity is provided by another government jurisdiction or party.
- **Link** role where they undertake little or no research but access information and resources from other jurisdictions or parties to meet industry needs through D&E.

The following definitions are used here to ensure consistency with the initial stocktake.

- **Pure basic research** (PR) is experimental and theoretical work undertaken to acquire new knowledge without looking for long term benefits other than the advancement of knowledge.
- **Strategic basic research** (SR) is experimental and theoretical work undertaken to acquire new knowledge directed into specified broad areas in the expectation of practical discoveries. It provides the broad base of knowledge necessary for the solution of recognised practical problems.
- **Applied research** (AR) is original work undertaken primarily to acquire new knowledge with a specific application in view. It is undertaken either to determine possible uses for the findings of basic research or to determine new ways of achieving some specific and predetermined objectives.
- **Development** (D) is that adaptive development which is conducted regionally.
- **Extension** (E) is the local extension required to improve the uptake of innovation by industry.

The stocktake questionnaire is structured around the Australian Bureau of Statistics' Australian and New Zealand Standard Research Classification (2008) which is used to report on relevant activities undertaken by government, private not-for-profit organisations, and the business sector in Australia.

The Soil Group of the ANZSRC has six fields. These are:

1. Soil carbon sequestration
2. Land capability and soil degradation
3. Soil biology
4. Soil chemistry
5. Soil physics
6. Soil sciences not elsewhere classified.

The questionnaire subdivides Field 2 to give greater opportunity to report on 'Soil and land inventory and monitoring'. The 'Agricultural Land Management' Field has also been introduced from the Agriculture and Land Management Group of the ANZSRC classification.

Some examples of RD&E topics within these fields are as follows.

- **Soil carbon sequestration:** MIR analysis, organic carbon and NO_x flux modelling, areal estimation of carbon quantities
- **Land capability and soil degradation:** Erosion, modelling, sediment transport, sediment measurements, soil conservation, conservation measures and structures, productive potential of soil
- **Soil and land inventory and monitoring:** Soil and landform mapping, classification, spectral analysis, terrain analysis, geostatistics, GIS and spatial analysis, soil monitoring
- **Soil biology:** Biodiversity (function and structure), measurement and interpretation, bio/ecoinformatics, bioremediation, microbial metagenomics, biology of gas efflux phenomena, nutrient cycling, suppressive soil/plant disease resistance & susceptibility, inoculant technology, biofertilisers
- **Soil chemistry:** Acidity, alkalinity, colloids, conditioners, enzymes, fertility, organic matter, salinity
- **Soil physics:** Air, compaction, density, energy balance, mechanics, physical properties, porosity, strength, soil water
- **Other soil sciences:** Soil sciences not elsewhere classified
- **Agricultural land management:** Diagnosis and management of sodicity, soil amendments such as bentonite, crop responses to tillage systems etc. (soil research only, not agronomic or other research).

Questions

Section 1: Overview of responding organisation

Respondent ID (office use)	
Name of your organisation	
Name of work group if reporting for a section of that organisation	
Name of respondent	
Telephone number	
Email address	
Organisation type	
Primary function of your organisation (see Note 1)	
Response covers twelve month period (see Note 2)	From To

NOTE 1: Your organisation's main involvement in soil RD&E may be as a funder, provider, communicator or educator or 'other'.

- **Funder** of RD&E with a primary role in commissioning and funding RD&E to be undertaken by others e.g. Grains Research & Development Corporation
- **Provider** of RD&E or RD&E services including analytical services whether funded internally, externally or commercially, e.g. CSIRO, some state governments, state government chemical laboratories
- **Extension/Communicator** of RD&E conducted by others, acting as a conduit between the investor/provider and an audience e.g. Kondinin Group or consultant involved in extension of RD findings
- **Teacher** and provider of tertiary education (may also include some RD&E)
- **Other** e.g. private company financing and conducting its own commercial research?

NOTE 2: Most organisations will use the 2016-17 financial year as a reporting period. Tertiary education organisations may wish to use the 2016 calendar year.

Section 2: Involvement in ANZSRC Fields

Q1: Outline your organisation's role (national leadership, support or link role)

ANZSRC Field	National Research	Regional R&D	Local Extension
Soil carbon sequestration			
Land capability and soil degradation			
Soil biology			
Soil chemistry			
Soil physics			
Soil sciences not elsewhere classified.			

Q2: Briefly describe any changes or trends evident over the last 5-10 years in your organisation's RD&E level of activity or role in these ANZSRC fields (e.g. there may have been an overall increase or decrease of activity, shifts from one ANZSRC Field to another, or your organisation may have shifted from a national leadership role to a support or a link role).

Response:

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Q3: What changes, if any, do you expect in your organisation’s level of activity or role in these fields over the next five years?

Response:

Section 3: Funding

Q4: Please estimate the funds allocated to soil RD&E

ANZSRC Field	Funds provided by your organisation to others for soil RD&E (\$K) (A)	Funds received by your organisation from others for soil RD&E (\$K) (B)	Your organisation’s internal budget for soil RD&E (\$K) (C)	Your organisation’s total budget for soil RD&E (A+B+C)	How has your organisation’s investment in soil RD&E changed during the last five years?	How do you expect your organisation’s investment in soil RD&E will change during the next five years?
Soil carbon sequestration						
Land capability & soil degradation						
Soil biology						
Soil chemistry						
Soil physics						
Soil sciences not elsewhere classified						
TOTAL						

Section 4: Human Resources

Q5: Estimate the human resources in Full-Time Equivalents (FTEs) allocated to soil RD&E

ANZSRC Field	No. of professional soil researchers (FTE*) in your organisation	Number of soil technical support staff (FTE) in your organisation	Number of extension staff (FTE) in your organisation	Number of teaching staff (FTE) in your organisation	Number of postgraduate students (FTE) in your organisation	Total FTE involved in soil RD&E
Soil carbon sequestration						
Land capability & soil degradation						
Soil biology						
Soil chemistry						
Soil physics						
Soil sciences not elsewhere classified						
TOTAL						

***Note:** If a staff member works in a particular area for half a year, or half time, show this person as 0.5. Please show professional research staff, technical support staff, extension staff, teaching staff and post graduate students separately, but do not include administrative staff or undergraduate students.

Q6: Please briefly describe any changes or trends evident over the last 5-10 years in the number and composition of your organisation's staff who are involved in soil RD&E. What changes have occurred to the structure of soil RD&E groups/departments? This might include overall increases or decreases in staff or student numbers or shifts in priorities. Some soil RD&E groups/departments may have merged or separated from other groups/departments such as agriculture, environment or geology. Please give reasons where possible.

Response:

Q7: Over the next five years, what changes, if any, do you expect in the number and composition of soil RD&E staff? What changes do you expect in the structure of soil RD&E groups/departments? Please give reasons where possible.

Response:

Q8: Please briefly describe any changes or trends evident over the last 5-10 years in your organisation's i) FTEs involved in soil RD&E, ii) capacity to undertake soil R&D, iii) capacity to undertake soil E, or iv) capacity to provide teaching or training in soil RD&E.

Response:

Section 5: Physical infrastructure

Q9: Please list any major facilities connected to soil RD&E and estimate their value

Major facilities operated by your organisation which are primarily concerned with or important for soil RD&E. These might include laboratories, research stations and major items of equipment.	Please provide approximate value where possible (\$'M)
Insert additional rows if required	

Q10: Please describe any changes or trends evident over the last 5-10 years in your organisation's physical infrastructure for soil RD&E. This might include opening or closing of laboratories, acquiring or decommissioning major items of equipment.

Response:

Q11: Please identify any significant acquisitions or disposals of assets anticipated over the next five years.

Response:

Section 6: Concluding comments

Thank you for your assistance in providing this information. Are there any further comments you would like to offer regarding your organisation's involvement in soil RD&E or the priorities for, or the conduct of soil research, development and extension in Australia generally?

Response:

Australian Soil Network	Meeting Number: 8
	Location: Brisbane
	Date: 15 th November 2016
AGENDA Paper	ITEM 8.4
Working Groups and Standing Committees - updates	
<p>Background</p> <p>The Australian Soil Network has multiple current Working Groups and one Standing Committee (the National Committee on Soil and Terrain (NCST)). Working groups and standing committees are the primary mechanisms for progressing actions to implement the National Soil RD&E Strategy.</p>	
<p>Proposal</p> <p>Members are requested to provide written and verbal updates as agreed at Meeting 6. The listed contacts below are in most cases the chairs or leaders of the standing committee or working groups.</p> <p>Australian Soil Network – Standing Committee 1 (ASN–SC1) Name: National Committee on Soil and Terrain (Contact: Jason Hill)</p> <p>Australian Soil Network – Working Group 1 (ASN–WG1) Name: Soil RD&E Capability Audit (Contact: Michele Barson)</p> <p>Australian Soil Network – Working Group 2 (ASN–WG2) Name: Soil information infrastructure (Contact: Neil McKenzie)</p> <p>Australian Soil Network – Working Group 3 (ASN–WG3) Name: Investor Forum (Terminated at Meeting 6)</p> <p>Australian Soil Network – Working Group 4 (ASN–WG4) Name: Register of field sites (Contact: Warwick Dougherty)</p> <p>Australian Soil Network – Working Group 5 (ASN–WG5) Name: Plain English version of the soil RD&E priorities (Contact: Michael Crawford)</p> <p>Australian Soil Network – Working Group 6 (ASN–WG6) Name: Teaching curriculum for soil science (Contact: Damien Field)</p> <p>Australian Soil Network – Working Group 7 (ASN–WG7) Name: Impact analysis and an evaluation plan (Contact: Cameron Allan)</p>	

Required action

Members are requested to provide feedback and practical assistance in response to the updates from the Standing Committee and Working Groups.

Resource implications

None

Preparation and consultation

Australian Soil Network Secretariat.

Attachments

None

Australian Soil Network	Meeting Number: 8
	Location: Brisbane
	Date: 15 th November 2016
AGENDA Paper	ITEM 8.5
Member updates	
Background	
<p>It was agreed at Meeting 1 that members of the Implementation Committee would provide written updates that highlight key developments, challenges and emerging issues for their organization. A brief 3–5 minute verbal summary of these would be provided at the meeting.</p>	
Key issues	
<p>The intent is to provide all members with a clearer understanding of soil RD&E matters across all jurisdictions and organizations. With time, members should develop a more collegiate and integrated understanding of soil management across Australia.</p>	
Required action	
<p>Members are requested to provide a brief 3-5 minute verbal summary at the meeting.</p>	
Resource implications	
<p>Minor. Members will normally draw on existing review and reporting materials from their organization.</p>	
Preparation and consultation	
<p>Soil RD&E Secretariat with input from members of the Soil RD&E Implementation Committee.</p>	
Attachments	
<p>Attachment 2: Member Updates</p>	

Attachment 2: Member and Working Group Updates

Tasmanian Jurisdictional Update

The Department of Primary Industries Parks Water and Environment (DPIPWE) is the lead agency for soils and terrain assessment on private land in Tasmania. A number of other organisations provide a significant role in research, extension and education. These include the University of Tasmania and the Tasmanian Institute of Agriculture, Forestry Tasmania, the three Tasmanian natural resource management regions and a number of agricultural consultants. The DPIPWE role is primarily to provide information to government to support and guide policy development on agricultural matters.

Continuation of Tasmanian Government Water for Profit Program (DPIPWE/TIA/UTAS)

Continuing wet weather has severely impacted on the field component of this project with some areas still remaining to wet to access. Over the past few months work has focussed instead on improving the rule sets for the various crops being evaluated to ensure better quality and more reliable enterprise suitability outputs from the project. To this end DPIPWE staff member Mat Webb has been working closely with top Tasmanian wine producer Andrew Pirie to refine the climate rules for the production of sparkling wine grapes. Discussions are also underway with Private Forests Tasmania and CSIRO to develop crop rules for *E. nitens*, *E. globulus* and *P radiata* and a formal arrangement to progress this work is also under discussion.

A requirement for Water For Profit program is to produce maps of soils vulnerable to various forms of degradation. Digital Soil Mapping techniques have been utilised to develop draft vulnerability hazard layers for erosion by wind and water and salinity. Work is underway to produce a similar product for soil sodicity.

The enterprise suitability maps previously generated through DSM techniques have been incorporated into predictions for climate change (as reported previously) to generate crop suitability maps under a range of climate scenarios. A report on this work is available through http://www.dpac.tas.gov.au/_data/assets/pdf_file/0009/266184/Incorporating_Climate_Futures_Tasmania_into_Enterprise_Suitability_Mapping_Technical_Report.pdf.

DPIPWE continue to collaborate with Sense-T in the development of apps to support pasture growth prediction and real-time high resolution temperature mapping. Coding is virtually complete and the next step is to integrate the system onto the Sense-T platform. Anticipated that the data will also supplement existing Sense-T apps for viticulture and irrigation.

Tests are currently underway to determine reliability of producing state-wide evapotranspiration surfaces that can be used by farmers to assist with irrigation scheduling, potentially giving rise to significant improvements in irrigation efficiency and reduced costs.

Collaboration continues with the University of Sydney on quantifying soil spatial security with a draft methodology currently being tested with Tasmanian digital soil datasets. Results will be presented at Global Soil Security Workshop, Paris, Dec 2017.

Application has been made to the Beef RD&E trust to create support for resubmission of the ARC linkage application with Sydney University for modelling soil moisture and temperature at various depths. Opportunities to expand this project to provide information to support fire agencies in fire modelling are also being explored.

CSIRO

AgCatalyst – Creating opportunities for agriculture and food.

All members are very welcome to attend this event (free of charge) on the 5th to the 6th of December 2016 at the Australian Technology Park, Sydney. Examine the latest in digital technologies, data science and next generation genomics. Delve into biologicals, materials science and new bio products. Discuss the latest developments in food science, precision agriculture and robotics. More than 300 representatives from business, peak industry bodies, producer groups, research funders and providers, and policy-makers are expected at the event to explore opportunities to shape the future of agriculture and food. <https://events.csiro.au/Events/2016/July/14/AgCatalyst>

Grains industry

The CSIRO-led project 'Measuring and managing soil water in Australian agriculture' (GRDC project CSP00170) has been recently completed. The project has added more than 255 soil characterisations across the western, southern and northern GRDC regions to the publicly available APSoil database. The project delivered 70+ soil water workshops to more than 680 growers and advisors as well as various other industry presentations. Data can be accessed at: <https://www.apsim.info/Products/APSoil.aspx>

Soil and Landscape Grid of Australia

The Soil and Landscape Grid of Australia continues to be widely used. At mid-year, it has had well in excess of 10,000 data downloads, 22,000 site visits (200 per week), 300,000 map views (>4000/week), and has been viewed by people from 122 countries. The most viewed attributes are terrain indices, clay content, sand content, bulk density, and available water capacity. See www.csiro.au/soil-and-landscape-grid

Queenstown, NZ Pacific Soil Partnership meeting

Building on shared involvement in *GlobalSoilMap* and with the establishment of the Pacific Soil Partnership, soil scientists from the Pacific Community, New Zealand and Australia are developing new approaches to soil information and its application to food production, land management and climate resilience. There are new opportunities to connect and enhance these activities. To progress this there will be a planning workshop on "Identifying and progressing opportunities in soil information research and management across the Pacific" on 12th December in Queenstown, coinciding with the joint conference of the New Zealand Society of Soil Science and Soil Science Australia (which has the theme 'Soil, a Balancing Act Down-under').

Agricultural development

CSIRO has completed a useful study into the role of remote-sensing and spatial information systems in agricultural development and poverty alleviation (including components on soil and land resources). The work was supported by the Bill & Melinda Gates Foundation and draws significantly on Australian experience. The work presents another facet of the worldwide digital revolution in agriculture and it is an output of the [STARS Landscaping Study](#).

The Australian Centre for International Agricultural Research (ACIAR) is a significant investor in soil science research for development, with a number of projects being led by CSIRO. A few current examples are "A virtual irrigation academy to improve water productivity in Malawi and Tanzania", "Land resource evaluation for productive and resilient landscapes in the Central Dry Zone of Myanmar", "Soil management in the Pacific to achieve improved crop yields and resilience to climate change", "Watershed evaluation for sustainable use of sloping agricultural land in the southern Philippines", "Cropping system intensification in the salt-affected coastal zones of Bangladesh and West Bengal, India", and "Developing multi-scale climate change adaptation strategies for farming communities in Cambodia, Lao PDR, Bangladesh and India". Hamish Cresswell can facilitate connections with these projects and project teams if this is of interest to your agency.

ITPS engagement with IPCC

At the 44th Session of the IPCC (Bangkok, Thailand, 17 to 20 October 2016), the IPCC accepted by consensus the accreditation of the Intergovernmental Technical Panel on Soils (ITPS) as an observer organization to the IPCC. The IPCC is to organize a Global Symposium on Soil Organic Carbon (with WMO and UNCCD) to be held in Rome on 21-23 March 2017. The ITPS will coordinate some of the main inputs to the symposium and these will constitute part of the official scientific evidence to include information on soils and soil organic carbon into the next Assessment Report of the IPCC (AR6) in 2021. CSIRO provides the Australian representation on the ITPS.

Global Soil Partnership and INSII

The International Network of Soil Information Institutions (INSII) is meeting in Rome at the end of November and the agenda includes planning the development of a new global map of soil carbon stocks. This is to be used for monitoring in support of sustainable development goals and climate mitigation. CSIRO contributes and represents Australia in this international network.

Australian Soil Network	Meeting Number: 8
	Location: Brisbane
	Date: 15 th November 2016
AGENDA Paper	ITEM 8.6
Draft prospectus for Priorities One and Two of the Soil RD&E Strategy	
<p>Background</p> <p>Meeting 6 (refer to Agenda Paper 6.5 and related minutes) agreed to develop a prospectus for each of the five national Soil RD&E priorities. The intention is to:</p> <ul style="list-style-type: none"> • help organise investment across the five key priorities • clearly articulate the benefits of each priority • outline the scope of works, resourcing and mechanisms for delivery. <p>There was in-principle support from the Committee for development of the prospectus but not on the commitment of strategy funds for this purpose. Instead, a draft for Priority 3 (see Agenda Paper 8.2) was requested with the expectation that it could act as a template for the other priorities. To ensure progress on the other four priorities, parallel workshop sessions at Meeting 8 will prepare plans for Priority 1 and 2 (see Attachment Three).</p>	
<p>Key issues</p> <ul style="list-style-type: none"> • A process for developing each prospectus needs to be agreed including the establishment of a Working Group (as per Priority 3). • The option of engaging a consultant to do most of the work should be considered. • If a consultant is engaged then the new Working Group would need to undertake a range of tasks including specifying terms of reference, managing the procurement process and providing oversight. 	
<p>Required action</p> <p>Members are requested to:</p> <ul style="list-style-type: none"> • review the national soil RD&E priorities prior to the meeting • contribute to the workshop sessions for Priorities 1 and 2 by focussing on refinement of the value proposition, identifying key outputs or deliverables, specify the delivery pathway • Identify the most appropriate format and structure for the prospectus documents (c.f. draft for Priority 3) • achieve agreement on who is responsible for developing the prospectus for both priorities. 	
<p>Resource implications</p> <p>None requested at this stage.</p>	
<p>Preparation and consultation</p>	

Soil RD&E Secretariat

Attachments

ATTACHMENT THREE: Priorities 1 and 2 of the Soil RD&E Strategy

ATTACHMENT THREE: Priorities 1 and 2 of the Soil RD&E Strategy

DESCRIPTION OF THE PRIORITY	DESIRED OUTCOME
Priority 1: Find solutions to soil-based constraints to agricultural productivity	
<ul style="list-style-type: none"> • 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). 	<ul style="list-style-type: none"> • 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)	
<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • 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.

Australian Soil Network	Meeting Number: 8
	Location: Brisbane
	Date: 15 th November 2016
AGENDA Paper	ITEM 8.7

Budget update

Funding for the strategy operating budget has been sought from members of the implementation committee. Table 1 provides a summary of the initial cash contributions. The following tables provide a rolling update to the budget position. Table 2 is the report on expenditure for 2014/15. A summary of cash contributions received for 2015/16 is provided in Table 3. Expenditure for 2015/16 is shown in Table 4. Expenditure to date for the 2016/17 year is shown in Table 5.

Table 1: Cash contributions for 2014-15 paid by member agencies

Organisation	Cash contribution
Department of Agriculture	15,000
NT DLRM	5,000
DAFWA	15,000
GRDC	35,000
Dairy Australia	15,000
MLA	10,000
GWRDC	10,000
SRA	15,000
CRDC	15,000
CSIRO	20,000
UNE	9,092
Rollover from strategy development budget	\$35,616
Total funds available*	\$239,708

* Includes forward payment of \$40 000 from CSIRO (\$20 000 p.a. for years 2 and 3).

** The initial rollover amount received by CSIRO from DoA was \$224,708; the DoA 2014/15 contribution of \$15,000 was paid later to CSIRO as a separate transaction.

Table 2: Report on expenditure (as at 30/06/2015)

Item	Expenditure (\$)
Domestic travel fares and expenses	2,179
General operating (meeting catering and room hire)	1,231
Subtotal	3,410
Remaining funds balance	\$236,298

Table 3: Cash contributions received for 2015-16 by member agencies (NB: CSIRO contributions of 20,000 for 2015-16 were prepaid in 2014-15).

Organisation	Cash contribution (\$)
GRDC	35,000
Dairy Australia	15,000
MLA	10,000
SRA	15,000
CRDC	15,000
RIRDC	15,000
DAWR	15,000
Northern Territory DLRM	5,000
Wine Australia	10,000
Tas DPIPWE	3,000
SARDI	2,500
Carry forward from 2014-15	236,298
Total funds available	\$376,798

Table 4: Report on expenditure (2015-2016 year, 30/6/2016)

Item	Expenditure (\$)
Domestic travel fares and expenses (exec officer, strategy leadership)	2,649
Operating (meeting catering, document preparation, comm's)	1,457
Executive Officer salary (0.4FTE, 12 months from 23 Feb 2016)	60,000
Annual forum (venue, accommodation, catering)	8,447
Annual forum consultant costs	24,346
Website development	1,927
Subtotal	98,826
Remaining funds balance	\$277,972

Table 5: Report on expenditure (2016-2017 year, to 31/10/2016)

Item	Expenditure (\$)
Executive Officer salary (0.4FTE, 6 months)	30,000
Outlook Conference sponsorship	8,182
Travel and meeting costs	948
Subtotal	39,130
Remaining funds balance	\$238,842

Key issues

- There is significant funding available to progress Australian Soil Network activities.
- Member contributions for 2016/17 financial year will be sought as part of our annual process.
- Requests for expenditure on Australian Soil Network activities should be brought forward to our meetings as normal business.

Required action

- Note the current expenditure and funds balance.

Resource implications

- As shown above

Preparation and consultation

- Secretariat and members.

Attachments

- None