

Soil CRC Commonwealth Milestones 24/11/2020 (V2)

Guide for Soil CRC Participants, Project Teams and Students

Compliance Milestones (MPA clauses 1.1, 4.1, 12 and 13)

No.	Milestone	Due Date
C1	Provision of Company Constitution and executed Participants Agreement	Within 90 days of the Commencement Date
C2	Submission of Quarterly Report	Each Quarter in accordance with Guidelines
C3	Submission of Annual Report	Each Financial Year in accordance with Guidelines

Performance Milestones (MPA clause 1.1 and 4.1(d))

Research Program No. 1 Investing in High Performance Soils			
Output 1 - A support portfolio to assist development of market based instruments		Start Date	End Date
A portfolio of documents, tools, mechanisms and arrangements to assist governments, financial institutions and value chain participants, develop and implement approaches to capture and distribute financial returns from good soil stewardship.			
1.1.1	Complete review of market mechanisms for rewarding soil stewardship. Identify most feasible options.	01/07/2017	30/06/2018
1.1.2	Complete assessment of consumer demand for soil stewardship.	01/07/2017	01/07/2019
1.1.3	Develop and evaluate market mechanisms for rewarding soil stewardship.	01/03/2018	01/03/2022
1.1.4	Evaluate the potential of certification for supporting soil stewardship.	01/07/2021	30/12/2025
1.1.5	Revise existing, or develop new, market mechanisms for rewarding soil stewardship. Include assessment of risks associated with any proposed practice change and potential returns from increased and more reliable production.	01/07/2022	30/06/2024
1.1.6	Publish a comprehensive analysis of market mechanisms that capture and distribute financial returns from soil stewardship.	01/06/2024	30/12/2026
Output 2 - A support portfolio for assessing potential acceptance and use of approaches to soil stewardship		Start Date	End Date
A portfolio of documents, tools, mechanisms and arrangements to assist agri-ecosystem participants assess new soil products, tools and knowledge in relation to their likely acceptance and use.			
1.2.1	Publish a framework to guide assessments within CRC HPS of the adoptability of practices and technologies by farmers to improve soil performance.	01/07/2017	30/12/2018

1.2.2	"Go live"/publish on the web a decision support tool for farmer organisations, policy-makers (and managers), researchers and businesses to assess the social acceptability of practices and technologies aimed at improving soil performance.	01/07/2017	01/03/2018
1.2.3	Complete workshops with farmer groups and CRC HPS researchers to assess adoptability by farmers of practices and technologies proposed to improve soil performance.	01/01/2018	31/12/2024
1.2.4	Publish findings of baseline and follow-up surveys in six farming regions identifying actual and intended adoption of practices and technologies to improve soil performance, influences on adoption and strategies to increase adoption.	01/01/2018	31/12/2026
1.2.5	Synthesise and provide support for learning, innovation, and risk management for soil stewardship in agri-ecosystems.	01/07/2024	30/12/2026
1.2.6	Synthesise and make available information and decision support tools and approaches related to supporting learning, innovation and soil stewardship in agri-ecosystems.	01/07/2025	30/12/2026
Output 4 - Models for partnering and collaborating for soil stewardship. New partnership models and supporting resources, focused on soil management and stewardship, to facilitate innovation, entrepreneurialism and practice change in the agri-ecosystem.		Start Date	End Date
1.4.1	Establish innovation partnership agreements with CRC HPS partner farmer groups and/or SMEs (one per state in Phase 1 and Phase 2).	01/07/2017	01/01/2022
1.4.2	Complete innovation strategic plans with CRC HPS partner farmer groups and/or SMEs (one per state).	01/01/2018	31/12/2021
1.4.3	Synthesise and provide information in a range of formats on processes, including risk assessment, for facilitating soil-centred innovation in the agri-ecosystem, for next and end users.	01/07/2021	30/06/2024
1.4.4	Create or use existing learning systems and approaches/ communities of practice/ stakeholder forums, to enable and support social learning related to soil stewardship.	01/07/2022	30/12/2025
1.4.5	Co-create improved model(s) for acceleration of research translation and practice change among next and end users.	01/07/2022	30/12/2026
Research Program No. 2 Soil Performance Metrics			
Output 1 - Key indicators of high performance soils. Identification of data and thresholds defining a high performance soil and determination of key indicators of high performance soils, including soil biological health, across key soil types.		Start Date	End Date
2.1.1	Establish steering committee of farmers, scientists and industry representatives.	01/07/2017	30/12/2017
2.1.2	Review information on soil health nationally and internationally to identify and develop indicators of soil	01/01/2018	30/06/2019

	health and function for economically important high performance soils.		
2.1.3	Identify target values for key indicators of soil biological health for economically important high performance soils.	01/01/2018	30/12/2024
2.1.4	Explore relationships and interdependencies between key indicators for high performing soils.	01/01/2018	30/12/2025
2.1.5	Explore and develop novel methods for assessing soil chemical, physical and biological function or activity, for guiding management practice.	01/01/2018	30/12/2025
2.1.6	Develop a field based tool kit and procedures for rapid determination of soil health and function for the high performance soils	01/01/2020	30/12/2026
2.1.7	Develop guidelines and targets for key indicators, deliver information to industry, and develop a framework for their utilisation.	01/01/2020	30/03/2027
Output 2 - Sensor networks for on-demand assessment of key soil indicators Development of 'use appropriate' sensors to provide actionable information on soil water, nutrients and biological function. This may include the novel re-configuration of existing sensors or the creation of new sensors to fill any identified technology gaps		Start Date	End Date
2.2.1	Establish steering committee of farmers, scientists and industry representatives.	01/07/2017	30/12/2017
2.2.2	Review and scope of both existing and workbench (prototype) proximal and remote sensors technologies for key soil performance indicators.	01/01/2018	30/12/2018
2.2.3	Development and field evaluation of novel prototype proximal sensors, or novel combinations of existing proximal sensors for assessing soil health and function.	01/01/2018	30/12/2024
2.2.4	Develop and evaluate novel, in paddock, rapid, low cost approaches to estimate soil chemical properties (lab on a chip) or functions.	01/01/2018	30/12/2024
2.2.5	Develop and calibrate mobile mapping sensors to spatial indicators of high performance soils.	01/01/2019	30/12/2025
2.2.6	Explore novel surrogate sensor technologies for mapping key soil indicators.	01/01/2020	30/12/2022
2.2.7	Identify appropriate approaches for commercialisation of developed technology and management of IP	1/07/2020	30/03/2027
Output 3 - Intelligent analytics of big data Development of capability to analyse raw soil data and assess the interactions within it and provide the results to farmers and agronomists. The analytics will be driven by intelligent and machine learning algorithms to process a continuous multi-source data stream.		Start Date	End Date
2.3.1	Establish a project steering committee comprising, growers, scientist, agri-business, and other stakeholders.	01/07/2017	30/12/2017
2.3.2	Run a workshop to engage key researchers, stakeholders to identify limitations and options for server based storage, analysis and retrieval of soil sensory data.	01/10/2017	30/06/2018
2.3.3	Develop capacity, procedures and common protocols for communication, storage and access of data for all Soil CRC projects.	01/01/2018	30/12/2022

2.3.4	Explore and develop new approaches for server based analysis of sensed data (including machine learning).	01/01/2018	30/12/2025
2.3.5	Report on soil quality, function, targets of high performing soils based on analytics of server based HPS project data, and 3rd party soil data.	01/01/2022	30/03/2027
2.3.6	Development of user interface software to allow access and visualisation of soil metric data and performance.	01/01/2022	30/03/2027
Output 4 - Mobile platforms to deliver sensor data for day-to-day soil management decisions.		Start Date	End Date
Development of user-friendly and informative mobile user interfaces in consultation with farmers.			
2.4.1	Establish steering committee of farmers, scientists and industry representatives.	01/07/2017	30/06/2018
2.4.2	Collaborate with industry and farmer groups to co-develop appropriate types of information output and human interface technologies.	01/01/2018	30/12/2022
2.4.3	Enable and configure existing soil-crop models and analytical codes for operation on servers.	01/01/2018	30/12/2025
2.4.4	Development and testing of machine learning approaches for model parameterisation from sensor data.	01/01/2018	30/12/2025
2.4.5	Development of grower focused mobile tools for improved soil management using server based analytics of sensor data.	01/01/2018	30/12/2025
2.4.6	Obtain farmer and agronomist feedback on data presentation format and interface design for management tools delivered via mobile platforms.	01/01/2020	30/09/2026
Research Program No. 3			
New Products for Soil Fertility and Function			
Output 1 - New, targeted and high performance fertiliser products		Start Date	End Date
Identification of the most cost-effective ways of recovering and concentrating nutrients from solid and liquid organic wastes to create new fertiliser products that have an immediate and growing market in Australia.			
3.1.1	Establish a steering group comprising waste industry, growers and researchers	01/07/2017	30/11/2017
3.1.2	Complete a review of prioritising solid and liquid waste based on nutrient contents, and technologies on nano-fertilisers	01/07/2017	31/05/2018
3.1.3	Synthesise innovative fertiliser products (e.g. nano-fertilisers)	01/06/2018	31/05/2020
3.1.4	Test and validate nutrient release characteristics of innovative fertiliser products.	01/01/2021	31/12/2022
3.1.5	Evaluate the optimised innovative fertiliser products under different agro-ecological conditions	01/06/2023	31/12/2024
3.1.6	Demonstrate the use of innovative fertiliser products and techniques to optimise agri-chemical usage in farmers' field.	01/01/2025	30/12/2026
Output 2 - New, targeted and low residual pesticide delivery systems		Start Date	End Date
Development of pesticide delivery mechanisms that are more			

targeted and less wasteful, to reduce negative impacts of pesticides on cropping systems and the broader environment.			
3.2.1	Complete a review on technologies of nano-porous materials for pesticide delivery	01/07/2017	31/05/2018
3.2.2	Conceptualise new pathways to encapsulate pesticides	01/07/2017	31/05/2018
3.2.3	Modify nano-porous materials for encapsulated pesticide delivery	01/06/2018	31/05/2020
3.2.4	Assess encapsulation of pesticides by nano-porous materials and the kinetics of their release into soil.	01/06/2020	31/05/2023
Output 3 - Novel materials to address surface and subsurface soil constraints Development of soil amendments to address constraints such as soil acidity, soil sodicity and poor soil structure without physically disturbing the soil. Novel mechanisms will also be developed for placing amendments at depth		Start Date	End Date
3.3.1	Complete a review on technologies for advanced organic-based materials for ameliorating subsurface acidity and sodicity constraints	01/07/2017	31/05/2018
3.3.2	Conceptualise new pathways to deliver soil ameliorating materials in subsoils covering the root zone	01/07/2017	31/05/2018
3.3.3	Synthesise novel materials for ameliorating subsurface acidity and sodicity constraints	01/06/2018	31/05/2020
3.3.4	Assess dissolution kinetics and long-term effectiveness of novel materials for ameliorating subsurface constraints.	01/06/2020	31/05/2022
3.3.5	Assess the effectiveness of subsurface delivery of novel soil amendments	01/06/2022	31/05/2024
3.3.6	Evaluate and demonstrate application of innovative novel materials for ameliorating subsurface soil constraints in the field	01/06/2024	30/12/2026
Output 4 - Effective delivery mechanisms for moisture retention products and beneficial microorganisms Development of delivery systems for moisture retention and microbial carrier products, and seed coatings that increase the effectiveness of desirable, beneficial microorganisms in the soil, which help fix nitrogen, protect against root diseases, act as symbionts with plants		Start Date	End Date
3.4.1	Complete reviews on moisture retention and microbial carrier technologies, physiological processes, their utilization to enhance soil health	01/07/2017	31/05/2018
3.4.2	Synthesise novel moisture retention and microbial carrier products, and identify the technologies for their field application	01/06/2018	31/05/2019
3.4.3	Assess the moisture retention and release characteristics	01/06/2019	31/05/2020
3.4.4	Assess the activity and persistence of microbes in the carrier products	01/06/2020	31/05/2021
3.4.5	Test field evaluation and demonstrate application of innovative moisture retention and microbial carrier products	01/06/2021	31/05/2023
Research Program No. 4 Integrated Soil Management Solutions			
Output 1 - Novel plant and systems based solutions to improve soils Develop rhizosphere management technologies and improve our		Start Date	End Date

understanding of farming approaches to develop high performance soils. This includes regenerative farming approaches, intercropping, cover cropping, crop rotations and incorporation of livestock into systems to improve the rhizosphere. This will enable farmers to address difficult and multiple soil constraints while maintaining profitable production.			
4.1.1	Conceptual framework developed for Programs 4.1-4.3 and Program 4 steering committee established	01/07/2017	30/06/2018
4.1.2	Test methods for indicators of high performance soils (including biological, chemical and physical methods) evaluated and validated for the assessment of novel plant and system based re-engineering	01/07/2017	30/06/2020
4.1.3	Soil rhizosphere improvement technologies developed and assessed at glasshouse and small field plot scale.	01/07/2018	01/07/2021
4.1.4	Five medium/long term field sites (minimum four years) across three regions will deliver data evaluating novel plant and farming system-based soil improvement methods.	01/07/2018	01/03/2027
4.1.5	Data are delivered into Output 4.3 to populate and validate new intelligent decision support tools.	01/07/2020	31/12/2026
4.1.6	Assessment of underlying ecosystem processes and functions that account for changes to soil resilience, function and soil carbon stocks.	01/07/2021	30/06/2026
Output 2 - Novel physico-chemical based solutions to improve soils Develop novel physico-chemical methods for addressing complex and multiple soil constraints. This includes strategic placement of new and existing amendments, novel tillage approaches and reducing crop losses due to plant-back toxicity from herbicides. This output will provide an understanding of the impact and benefit of combination and additive approaches.		Start Date	End Date
4.2.1	Glasshouse/ mechanistic studies addressing multiple soil chemical and physical constraints deliver data used to inform field studies.	01/07/2017	30/06/2022
4.2.2	Loss of productivity due to plant-back issues from herbicides in farming systems is quantified and trace back methods (metabolomics) and better management tools developed for 5 principal herbicides used.	01/07/2018	30/06/2023
4.2.3	Six field sites are established, monitored and deliver data for evaluating and addressing multiple soil and sub-soil constraints across a minimum of 4 seasons.	01/07/2020	30/06/2025
4.2.4	Data are delivered into Output 4.3 to populate and validate new intelligent decision support tools.	01/07/2020	31/03/2027
4.2.5	Field trials deliver data on the role of addressing soil constraints on crop water use efficiency, and the importance of improved soil physico-chemical properties under a more variable climate.	01/01/2022	30/06/2026
Output 3 - Soil improvement decision support tools: Development of soil improvement decision support tools based on Soil CRC research outputs and other supporting data. The Output will assist farmers and agronomists in identifying the most cost-effective approaches within their constrained systems to develop high performance soils.		Start Date	End Date

4.3.1	Build on and value add to existing tools by better representing P status and multiple soil physico-chemical constraints to production within and alongside existing models.	01/07/2017	31/12/2021
4.3.2	Diagnosis frameworks, including hybrid biophysical models, for multiple soil constraints based on data that farmers and agronomists have ready access to (or can efficiently collect), and populated by data generated from within the Soil CRC and other sources.	01/07/2018	30/06/2024
4.3.3	Using field sites established in Outputs 1 and 2, deliver a total of nine farm walks (workshops) which highlight and present the most successful soil improvement methods.	01/07/2021	30/06/2025
4.3.4	Universal decision-support tools based on advanced computational and analytical frameworks that guide decisions and actions to create high performance soils and consider economic outcomes.	01/01/2020	31/03/2027
4.3.5	Evaluation and delivery of strategies to ensure that soils are more resilient to climate variability, especially drought.	01/07/2023	31/03/2027

CRC - Education and Training Milestones

	Education Milestones	Start Date	End Date
E1	Training Courses and Workshops provided in various locations across the nation for: farmers, farmer groups, extension officers and consultants, agronomists and soil scientists.	01/07/2017	31/03/2027
E2	Production of online information sheets and course materials for on-farm implementation of new practices and of integrated technologies.	01/07/2017	31/03/2027
E3	Commencement of 46 PhD candidates.	01/07/2017	31/06/2023
E4	Completion of 40 PhD graduates.	01/07/2021	31/03/2027

MPA = Major Partners Agreement