Sustainable Land Management and Climate Change (SLMACC) projects funded for 2016/17

Theme 1: Impact of climate change & adaption			
Title	**Applicant Group**	**Project Summary**	**Funding Awarded**
Effects of climate change on irrigation supply and demand	National Institute of Water and Atmospheric Research (NIWA)	Warmer temperatures and shifts in precipitation patterns projected for this century will likely exacerbate drought conditions in many agricultural regions across New Zealand. This will increase the demand for irrigation while altering freshwater quantity supply and timing of availability. In order to inform irrigation adaptation strategies this research will take an ensemble of regionally downscaled projections of six global climate models and four Representative Concentration Pathways to assess implications for irrigation supply and demand up to 2100 in agricultural regions. The significance of the impacts will be assessed with a suite of performance indicators relative to present-day land use and nominal abstraction guidelines. Analysis of the time of emergence of the climate change signal from natural background variability will highlight when significant effects may happen. This information would be invaluable in assessing the potential for increased irrigation to offset climate change effects, and when any interventions may be needed.	**$150,000**
Microbial function and adaptation in response to climate change driven drought and the resulting effects on plant production and nutrient cycling	Landcare Research New Zealand Ltd	Climate change predictions show that many regions of New Zealand will experience increasing frequency of drought conditions in the next 20 to 50 years. The soil processes that underpin the ecosystem services derived from our soils (including production of food and fibre, carbon sequestration and nutrient retention), are largely carried out by soil microbes, yet we have little idea how the microbial community will adapt to increased frequency and duration of drought. We propose to undertake a critical assessment of findings published in the literature, identify knowledge gaps, and forecast the consequences for ecosystem services using quantitative techniques such as meta-analysis. We will also investigate potential mitigation options in order to advise the primary sector on strategies to maintain agricultural production under drought conditions.	**$150,000**
Adapting to climate change: Information for the New Zealand food system	New Zealand Food Safety Science and Research Centre	This project will review anticipated changes in the NZ food system, as a result of climate change predictions over a period of the next 50-100 years. To date there has been no assessment of New Zealand?s food system and the many links and processes in the food value chain that might be impacted, from greater cooling needs and energy requirements, quicker food spoilage, to food safety issues. The project team comprises of partners of the New Zealand Food Safety Science and Research Centre partners along with NIWA, and will assess issues such as cold storage, food spoilage, food safety, changing food disease profiles and harvest times with a focus on the impact of increased temperature and moisture change. The objective is to make qualitative evidence based predictions of likely effects on the food system, in order that industry can prepare and adapt so that economic performance is maintained.	**$150,291**
Mind the Gaps: Synthesis and Systematic Review of Climate Change Adaptation in New Zealand's Primary Industries	Landcare Research New Zealand Limited	Climate change predictions show that many regions of New Zealand will experience increasing frequency of drought conditions in the next 20 to 50 years. The soil processes that underpin the ecosystem services derived from our soils (including production of food and fibre, carbon sequestration and nutrient retention), are largely carried out by soil microbes, yet we have little idea how the microbial community will adapt to increased frequency and duration of drought. We propose to undertake a critical assessment of findings published in the literature, identify knowledge gaps, and forecast the consequences for ecosystem services using quantitative techniques such as meta-analysis. We will also investigate potential mitigation options in order to advise the primary sector on strategies to maintain agricultural production under drought conditions.	**$278,350**
Theme 1 Total			**$ 728,641**

Theme 2: Mitigation of agricultural and forestry GHG emissions			
Title	**Applicant Group**	**Project Summary**	**Funding Awarded**
Impact of irrigation on soil carbon	Landcare Research New Zealand Ltd	New Zealand wishes to increase the quality of its natural resource base, while sustaining growth to meet its 40% exports to GDP growth target. Increased irrigation of pastures is a critical part of primary sector growth and it is imperative we fully understand the impact of this land-use intensification on soil carbon and nitrogen stocks. We previously demonstrated surprisingly large losses of soil carbon and nitrogen in irrigated pastures at 34 paired sites (Mudge et al. 2016), questioning the sustainability of irrigation. We estimate these carbon losses could potentially represent up to $260 million in carbon credits, not including potential for enhanced N2O emissions, nitrate leaching, and reductions in soil quality. In this previous study, insufficient numbers of samples meant we were unable to determine whether carbon and nitrogen losses were dependent on irrigation duration, region, and soil type. Here, we will substantially extend data coverage by sampling more paired sites to resolve these questions.	**$300,000**
Analysing soil carbon measurements in hill country from three slope positions and three aspects under contrasting fertiliser and grazing management: Ballantrae field trial (1975-2014)	AgResearch Ltd	This proposal is directed at the policy question "Does hill country slope position and aspect affect soil carbon (C) stocks" In response, we will analyse C measurements from soils sampled in 2014 at three slope positions and three aspects under contrasting fertiliser and stocking rates at NZ's second longest pastoral field trial and the only remaining in hill country monitored since 1975. Once analysed, these unique data present an opportunity to determine how hill country soil C inputs, losses and stocks are affected by slope position and aspect under contrasting fertiliser and stocking rate. In year 1, the results will be reported to MPI and a manuscript submitted for publication. In year 2, the results will be further analysed using the Rothamsted soil C model, an approach compatible with NZ's agricultural methane and nitrous oxide emissions inventories, to explore land management options to conserve hill country soil C and offset emissions.	**$234,692**
Understanding how universally hill country pastures are gaining soil carbon	Landcare Research New Zealand Ltd	Previous studies indicate the rate of soil carbon accumulation in hill country is highly variable, and processes affecting stock changes differ for contrasting topographic units. Resampling of 23 National Soil Database (NSD) sites at mid-slope positions provided strong evidence of soil carbon increase for these specific sampling sites since the 1980s. However, there is little data available for other topographic units, e.g. swales, summits, gullies. We propose to establish a soil-monitoring framework for NZ hill country, leveraging the wealth of environmental data-layers now available. This will guide the selection of new NSD sites for resampling in places previously under-sampled to reduce uncertainty in estimates of changes in soil carbon stock at different slope positions and for different soil orders. In addition, the framework will provide a statistically robust method for monitoring ongoing soil carbon changes for New Zealand hill country, and for National Carbon Accounting and ETS systems.	**$400,000**
Review of agricultural greenhouse gas mitigation research in New Zealand	AgResearch Limited	Agriculture is the largest contributor to the national greenhouse gas (GHG) inventory of New Zealand (NZ) with enteric methane (CH4) and soil nitrous oxide (N2O) emissions accounting for 94% of agricultural emissions. Therefore, mitigation of these two agricultural GHGs would be an effective way to reduce the national carbon footprint. A large body of agricultural GHG mitigation research has been funded through SLMACC and other GHG funding bodies. The objective of this project is to critically evaluate agricultural enteric CH4 and N2O mitigation research programmes to date, to identify key messages, areas of focus, outcomes and value to date and gaps in knowledge, which will help inform future research directions.	**$216,400**
Review of all agriculture mitigation related climate change research in New Zealand	Motu: Economic and Public Policy Research Trust	This project will review, summarize, discuss and evaluate all research conducted in New Zealand related to direct and indirect climate change mitigation on the agricultural sector. Carefully consideration will be given to analyse and summarise all outputs, outcomes and impacts to date of the research conducted by public and private research centres, universities and other agencies. The review will also consider all climate change mitigation related agricultural policies implemented in New Zealand and how these compare to policies implemented in other countries such as the USA, Canada and Australia.	**$100,000**

Small carbon forestry options for landowners	New Zealand Forest Research Institute ltd	This project seeks to improve landowners' understanding of the opportunities to establish small-scale carbon forests on farms. It will provide information that will enable the evaluation of timber returns, carbon returns and other ecosystem services, as a component of the whole farm system. It will also lower investment risk by advising on appropriate combinations of species, management and site. By removing one of the key barriers to afforestation (lack of trusted information), the likelihood of new forest establishment will be increased.	**$230,104**
A review of climate change research in New Zealand focusing on forests	New Zealand Forest Research Institute ltd	Forestry plays a key role in addressing and responding to climate change. A review and analysis of research undertaken in New Zealand and internationally over the last ten years is critical for recognising advances in knowledge, impacts on forestry practice, as well as outstanding needs from a policy and sector perspective. This research review will pick up and address key messages arising from a local context and reflect on the international setting to identify research, the outcomes and gaps in knowledge significant for understanding climate change impacts on plantation and indigenous forestry in NZ. It will use a systematic approach to the selection of relevant research and identification of key messages and areas of focus to inform sector and policy areas of knowledge need and future opportunities for NZ forestry research leadership in addressing knowledge gaps. It aims to deliver a systemic approach to assessing value for money and addresses forestry research contributions in relation to other sectors.	**$250,423**
Theme 2 Total			**$ 1,731,619**

Theme 3: Cross-cutting issues including economic and social impact			
Title	**Applicant Group**	**Project Summary**	**Funding Awarded**
Review of the SLMACC Technology Transfer projects (providing an overarching evaluation approach for the review of technology transfer activities in all SLMACC projects)	AgResearch Ltd	This work will take an overarching evaluation approach to show the benefits achieved from the SLMACC projects funded to date. The particular focus will be on evaluating the outcomes and effectiveness of the Technology Transfer projects to demonstrate the extent to which these have increased awareness and knowledge of climate change within the sector(s) they were intended for. In doing so, we will take an Agricultural Innovation Systems perspective, which will enable a wider systems understanding of how SLMACC projects across adaptation, mitigation and forestry, as well as technology transfer, have and could contribute to climate change mitigation and adaptation in New Zealand.	**$250,226**
Applied Adaptation Pathways: Supporting Robust Regional Decision-Making: An Application in Hawkes Bay	Landcare Research New Zealand Limited	Climate change is expected to adversely affect primary industries, compounding existing vulnerabilities, creating new ones and confounding decision-making. Although our understanding of potential impacts has improved, the capacity for identifying, evaluating and comparing adaptation options remains limited by poor integration of social and economic studies with biophysical impact assessments and an emphasis on individuals' adaptive strategies. Working with land managers and other primary sector stakeholders, we will develop an integrated vulnerability assessment for Hawkes Bay, combining regional climate change modelling with an impact assessment and an evaluation of scenarios for future change. This will provide an applied adaptation pathway capable of supporting robust decision-making at multiple scales and across diverse sectors. The findings of the project, including the conceptual and methodological frameworks, will provide a template for further application in diverse sectors and regions and support the effective integration of climate change issues into policy and planning processes.	**$400,000**
Theme 3 Total			**$ 650,226**