Title	**Predicting appropriate GHG mitigation strategies based on modelling variables that contribute to ruminant environmental impact (RUMEN PREDICT)**
Project Timeframe	Sept 2017 – Sep 2020
Countries Involved	New Zealand (AgResearch) UK (Aberyswyth University) Finland (Natural Resources Institute) France (INRA) Sweden (Swedish University of Agricultural Sciences) Germany (Leibniz Institute for Farm Animal Biology) Ireland (Teagasc, Ireland Breeding Federation, University College Dublin) Netherlands (Wageningen University)
Aims	The New Zealand contribution to the RumenPredict project was to: • Analyse, and integrate into the project database, existing sheep rumen metagenome and metatranscriptome datasets; • Generate new sequence datasets from rumen contents and buccal samples of pasture-fed sheep with associated methane yield measurements via a Community Science Program project at the US Department of Energy Joint Genome Institute.
Research Highlights	• New Zealand sheep metagenome and metatranscriptome sequences datasets from high/low methane yield rams was integrated into the RumenPredict database. • New sheep metagenome and metatranscriptome datasets were generated from pasture-grazed sheep via a Community Science Program project at the Joint Genome Institute. • Investigated the potential of rumen microbial genes to act as biomarkers to predict methane yield in ruminants. Unfortunately, the targeted biomarker genes amplified from pasture-grazed sheep rumen or buccal samples did not correlate strongly with methane yield, meaning this approach was not feasible. • The RumenPredict activities complemented the PGgRc and NZAGRC methane mitigation programmes by providing new rumen microbiome datasets and their bioinformatic analyses. • New Zealand RumenPredict work has contributed significant new rumen metagenome and metatranscriptome datasets with associated methane emission measurements via respiration chamber experiments, which has helped build up a useful database for methane mitigation research worldwide. • Collaborations have been formed with international experts in rumen nutrition, animal breeding and rumen microbiome analysis

	(Ireland, Northern Ireland, Finland, France, Sweden, and the Netherlands).
Future Work	• The RumenPredict datasets will be analysed to identify the network properties (i.e. degree, centrality and hubness) of strongly correlated genes to enable hypothesis generation towards determining the mechanistic roles of those genes in ruminant methane emissions. • The data will be used to link rumen microbiome information to host genetics and phenotype and to guide feed-based mitigation strategies. • New data analysis tools will also be used to further mine the project database to provide a platform for predicting how ruminant genetics, feed additives and microbiomes may affect emission phenotypes and develop genetic/diet/prediction technologies for implementation to improve ruminant digestive efficiency whilst decreasing their environmental impacts.