FACCE-JPI is the **Joint Programming Initiative on "Agriculture, Food security and Climate change"**. It brings together 21 European and associated countries to coordinate their research capacities to address the vital challenge of ensuring sufficient production of food, as well as feed, fibres and bio-fuels, in the context of demographic growth and a changing climate.

The Multi-partner Call on Agricultural Greenhouse Gas Research, initiated by FACCE-JPI with the American National Institute of Food and Agriculture of the USDA, New Zealand's Ministry for Primary Industries and Agriculture and Agri-Food, Canada aims to bring together excellent research consortia to enhance international collaboration in the face of the global issue of climate change mitigation.

In the frame of this call, the following project has been recommended for funding:

Basic Data

Title	**Identifying ways to reduce agricultural GHG emissions: A multinational modeling approach to optimize C and N cycles between livestock and cropping systems**
Acronym	**IdenWays**
Theme	Study of mitigation options at the field, animal and manure management scales with quantification of their technical potential for a range of agricultural systems and regions
Topic	Greenhouse gas emissions in the agriculture sector arising from agricultural soils including crops and grasslands, domestic livestock and waste management systems
Duration	01.01.2014 – 31.12.2016
Total cost (in €)	447 000€
Requested funding (in €)	343 000€

Coordinator

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Partners

Organisation Name	**Environmental Health, Science and Technology Branch, Agriculture and Agri-food Canada**
Country	Canada

Organisation Name	**Karlsruhe Institute of Technology, Institute of Meteorology and Climate Research - Atmospheric Environmental Research**
Country	Germany

Organisation Name	**University Court of the University of Aberdeen**
Country	UK

Organisation Name	**Landcare Research New Zealand Limited**
Country	New Zealand

Organisation Name	**Melbourne School of Land and Environment, The University of Melbourne**
Country	Australia

Summary

One of the biggest dilemmas for contemporary agriculture is rooted in nutrient management. A large amount of synthetic fertilizer is produced to support production of food and forage, while a large amount of nutrients contained in livestock manure is discarded as waste. The nutrient losses due to both fertilizer application and manure disposal have severely polluted the environment at local to global scales. People have long been being aware of the problem. However, the efforts to improve the nutrient-use efficiency of the agricultural sector have been hampered by a lack of validated tools to track nutrient cycling across animal-plant-soil systems. A number of process-based, biogeochemical models have been developed that provide capabilities to quantify cycles of carbon (C), nitrogen (N) and other nutrients in agro-ecosystems. However only recently do models characterize nutrient cycling in both livestock and cropping systems at the farm scale. This proposed study will adopt and test a group of these models and apply them to a representative group of farms to explore to what degree the environmental impacts of farming can be minimized by maximizing nutrient recycling at the farm scale.

Six farms will be selected from the collaborative partner countries – the U.S., Canada, the U.K., Germany, New Zealand and Australia. The criteria for selection include (1) representativeness in farm nutrient management for the country, (2) accessibility of local climate/soil/management and crop yield data for driving and evaluating model runs, and (3) availability of measured greenhouse gas (GHG) emission data and, where available, nitrate leaching and NH3 volatilization for model validation.

The six partner groups participating in the project have been working in collaboration during the past 10-20 years with a focus on model development. A soil chemistry-cored model, Denitrification-Decomposition or DNDC, has been adopted and developed into new versions by the partner groups. By integrating these models onto a unified platform and characterizing differences in process descriptions, we will develop a tool to serve GHG mitigation across livestock and cropping systems at the farm or regional scale in a way that has already been done for climate models (model ensemble). All of these models represent a large collection of scientific knowledge and experience about structure, function and behaviour of agro-ecosystems. This proposed study will characterize the approaches employed by a range of models and thus contribute to the development of more comprehensive ecosystem theory.

The project will complete four tasks: (1) Evaluating the DNDC family models and possibly unifying some approaches by establishing a common database to supply input information and benchmark cases for model validation; the six farms will provide a foundation for benchmark tests; (2) Testing and modifying these models against observations in the six farms; conduct model comparisons to identify the strengths and weaknesses of the models; collectively improve the models through validation, sensitivity, and comparison tests; (3) Evaluating best management practices for GHG mitigation at the farm scale by running the model array with alternative management scenarios for the six farms; and (4) Disseminating the model array for broader use through the GRA and GRAMP networks.