



Ministry for Primary Industries
Manatū Ahu Matua



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OFFICE OF OUTREACH AND PARTNERSHIPS
GRANTS AND CO-FINANCING MANAGEMENT UNIT

**REGIONAL FUND FOR AGRICULTURAL TECHNOLOGY (FONTAGRO) –
MINISTRY FOR PRIMARY INDUSTRIES (MPI) OF NEW ZEALAND**

**CONTRIBUTION TO THE PROGRAM
“LIVESTOCK AND CLIMATE CHANGE: APPLIED RESEARCH AND
KNOWLEDGE”
(FTG/RG-X1202)**

ANNUAL REPORT 2015

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Acronyms

CATIE	<i>Centro Agronómico Tropical de Investigación y Enseñanza</i>
CIAT	International Center for Tropical Agriculture
CORPOICA	<i>Corporación Colombiana de Investigación Agropecuaria</i>
CURLA	<i>Centro Universitario Regional del Litoral Atlántico</i>
DICTA	<i>Dirección de Ciencia y Tecnología Agropecuaria de Honduras</i>
FONTAGRO	Regional Fund for Agricultural Technology
GCM	Grants and Co-Financing Management Unit
GHG	Greenhouse Gas
GRA	Global Research Alliance
IDIAP	<i>Instituto de Investigación Agropecuaria de Panamá</i>
IICA	Inter-American Institute for Cooperation on Agriculture
INIAF	<i>Instituto Nacional de Innovación Agropecuaria y Forestal de Bolivia</i>
INIAP	<i>Instituto Nacional de Investigaciones Agropecuarias de Ecuador</i>
INIFAP	<i>Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias de México</i>
INTA-COSTA RICA	<i>Instituto Nacional de Innovación y Transferencia en Tecnología Agropecuaria de Costa Rica</i>
INTA-NICARAGUA	<i>Instituto Nicaragüense de Tecnología Agropecuaria</i>
IPTA	<i>Instituto Paraguayo de Tecnología Agraria</i>
LAC	Latin America and the Caribbean
LEARN	Livestock Emissions Abatement Research Network
LIFE-SIM	Livestock Feeding Strategies-Simulation Models
NAMA	Nationally Appropriate Mitigation Actions
ORP	Office of Outreach and Partnerships
TAS	Technical Administrative Secretariat at FONTAGRO
TC	Technical Cooperation
UNALM	<i>Universidad Nacional Agraria La Molina</i>

EXECUTIVE SUMMARY

The purpose of this report is to inform the Ministry for Primary Industries (formerly the Ministry of Agriculture and Forestry) of New Zealand about the progress of projects financed under the Program “Livestock and Climate Change: Applied Research and knowledge Dissemination” during 2015.

With resources from the Ministry for Primary Industries (MPI) and the Regional Fund for Agricultural Technology (FONTAGRO), three technical cooperation projects are being financed and are in execution. Their goal is to increase capacity on the measurement of GHG emissions from livestock systems under traditional and improved management. The projects facilitate the design of mitigation strategies and the formulation of policies to promote sustainable animal production systems in Central America and the Andean Region, and expanding knowledge sharing, special network expansions and capacity building on these topics.

The project in Central America, led by CATIE, includes institutions from Panama, Costa Rica, Nicaragua, and Honduras. The main objective is to develop methodologies for the estimation of GHG emissions from livestock production systems and their economic impacts. The project expanded strategic alliances with public institutions in Honduras (Universidad Autónoma de Honduras, Dirección de Ciencia y Tecnología Agropecuaria, DICTA), Panama (Universidad de Panamá), and Nicaragua (Federación de Asociaciones Ganaderas de Nicaragua, FAGANIC), among others. During 2015, the project initiated its activities related to (a) the design and identification of a methodology for the GHG emissions analysis; (b) collection and analysis of primary data from the field (farms), and (c) capacity building /training.

The project in the Andean Region, led by IICA Peru, seeks to increase participating entities capacity to measure GHG emissions from dairy systems. The project will also generate information that allows farmers to improve animal management. As of December 31, 2015, the project conducted bio economic characterization of pilot sites, a workshop on GHG mitigation, and it updated the Livestock Feeding Strategies-Simulation Models software (LIFE-SIM) which includes a model for dairy, beef and goat production.

The project that finances networking and capacity building activities is being implemented by FONTAGRO’s Technical and Administrative Secretariat (TAS). The objective is to create a network of LAC institutions on livestock and climate change aimed at exchanging information, standardizing

methodologies, providing mutual technical support, building capacities and promoting collaboration. To that effect, in 2015 the TAS has organized a training course in Osorno (Chile) on methodologies for the measuring of GHG. Twelve entities participated and received training on techniques for measuring enteric methane and nitrous oxide from agricultural and livestock systems. During 2016, another workshop is scheduled in Costa Rica to provide training on methodologies for dairy and livestock production systems adapted to climate change. In addition and due to the outreach activities performed by the TAS, most of the Central American and Andean Region countries joined the Global Research Alliance (GRA).

I. INTRODUCTION

- 1.1 This report presents the status and results from the execution of the Technical Cooperation (TC) projects during the 2015 calendar year. Article 11 of the Trust Fund Agreement signed on June 9, 2014 requires the presentation of an annual report by the Bank by April 30st of each year.
- 1.2 The Regional Fund for Agricultural Technology (FONTAGRO) is an alliance of countries for financing research and innovation in the agricultural sector in Latin America and the Caribbean (LAC). Since its launch in 1997, FONTAGRO has become a recognized mechanism characterized by its transparency, sustainability and governance by the member countries.
- 1.3 The Medium Term Plan 2010-2015 of FONTAGRO sets out three priorities: (i) link farmers to markets, (ii) support climate change adaptation, (iii) promote the productive and sustainable use of natural resources. This Plan was updated and approved at the last FONTAGRO Board of Directors meeting in July of 2015.
- 1.4 The document is organized as follows: Section II reviews the Program's activities and demonstrates the results achieved during the year 2015; and Section III draws preliminary conclusions for the Program.

II. Program Activities and Results

A. Purpose and Description of the Program

- 2.1 The Program aims at strengthening the institutional capacity to measure GHG emissions from livestock under traditional and improved systems. This is to facilitate the design of mitigation strategies and the formulation of policies to promote sustainable livestock systems in Central America and the Andean Region. The Program also promotes networking and capacity building.

- 2.2 Livestock and dairy production are very important activities for the livelihood of small farmers in LAC. Demand for meat, milk and dairy products has been increasing in the last decades as a consequence of urbanization, rising incomes and population growth. These activities are particularly important in Central America and the Andean region and are critical for food security. However, livestock and dairy production systems are also major utilizers of natural grasslands and pastures, and thus important contributors to greenhouse gas (GHG) emissions, thus to climate change. It has been found that GHG emissions (especially methane) from livestock can be reduced with better feeding and management practices, which could also result in higher productivity and better incomes for smallholders.
- 2.3 The present initiative was designed by FONTAGRO and its partners within the Medium Term Plan 2010-2015, which aims to improve family agriculture, and adapt to and mitigate climate change through targeted applied research. Furthermore, promoting applied agricultural research and collaborating with other platforms such as the Global Research Alliance in Latin America and the Caribbean is part of FONTAGRO's mission.

B. Financial Information

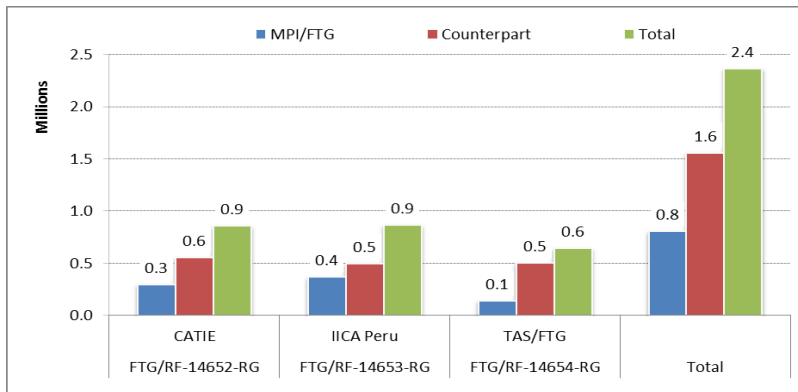
- 2.4 To date, the Bank has received from the Ministry for Primary Industries (MPI) of New Zealand resources totaling US\$471,076, which represents the value of NZ\$600,000 as specified in the Agreement. The total amount available for the program is US\$810,000 which includes FONTAGRO's own resources. These resources have been assigned to the projects as follows:
- i. US\$300,000 technical cooperation with CATIE (Central America);
 - ii. US\$370,000 technical cooperation with IICA-Peru (Andean Region);
 - iii. US\$140,000 technical cooperation executed by FONTAGRO/STA.

C. Program Overview

1. Approvals and Disbursements

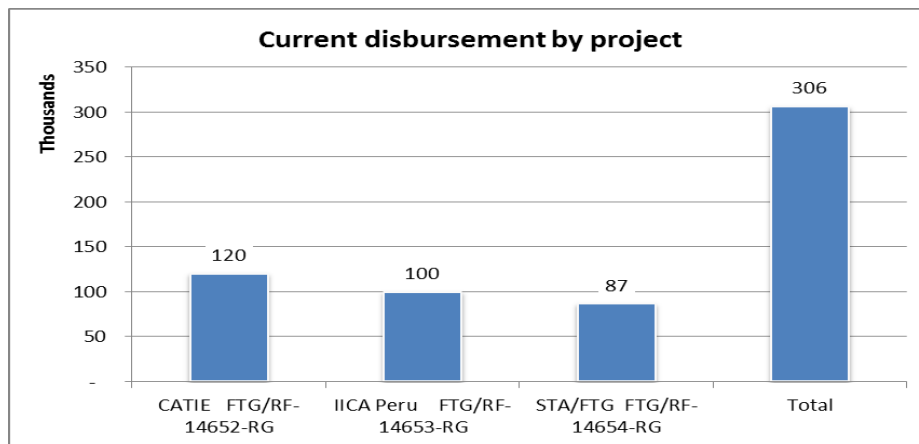
2.5 Since 2014, the three projects listed in the previous paragraph were approved by the Bank and registered in its financial system. As shown in Graph 1 below, the resources from MPI and FONTAGRO together with the in-kind counterpart resources add up to US\$2.4 million.

Graph 1. Funding sources / project



2.6 The current total disbursement of the three projects combined is 38% (Graph 2). At the project level, advances in disbursements is as follows: (i) the project with CATIE has disbursed US\$120,000 (40% of project amount), and currently is preparing a new advance of fund request for US\$98,000; (ii) the project with IICA-Peru has utilized US\$99,535 (27% of its budget), and the project executed by TAS has disbursed 62% of its funds.

Graph 2. Current disbursement by project



III. Current Program Execution Status and Results

A. Silvopastoral systems in Central America: CATIE (FTG/RF-14652-RG)

1. Objective

3.1 The main objective is to develop methodologies for the estimation of GHG emissions and the economic impact of different production systems in Central America. To that effect, the project contemplates a set of activities described below.

2. Project Activities

3.2 The project contemplates the implementation of activities that will define and apply CH₄, CO₂ and N₂O measurement methods to silvopastoral systems in Central America, increase systems' productivity while reducing emissions, and disseminate the knowledge obtained. These activities and their expected outputs and results are presented in table 1 and advances in execution are being described in the subsequent paragraphs.

Table 1

Component	Activities	Expected results
1. Systematization of methodologies to quantify GHG emissions in livestock farms	This activity involves a literature review, a compilation of tools and methods developed globally, and a workshop with experts to analyze pros and cons of various CH ₄ , CO ₂ and N ₂ O measurement methods.	Identification of limitations for the estimation of GHG emissions and selection of measurement tools and methods for the project. These accomplishments are to be generated within the first year of project execution
2. Quantification of GHG emissions under various levels of livestock systems' intensification	At least 30 farms that participated in a previously approved FONTAGRO project will be monitored in the various countries. Only in the case of Honduras a new site will be established. Monthly collection of data is to be made, and includes: land use, pastures, livestock production and productivity, labor, inputs and outputs. GHG (CH ₄ , CO ₂ and N ₂ O) emissions will be estimated with methods and tools selected in the previous activity. Two trials will be established in Costa Rica to determine the factors that affect emissions. One will be done with dairy cows and the other with fattening cattle.	Identification of good practices that contribute to reduce GHG emissions in Central American farms. These accomplishments are to be generated within two years as of project approval date

	Even the literature review made it before, the methodology utilized in the Southern Cone (product of the FONTAGRO-New Zealand project FTG/RF-1028-RG) will be used and technical assistance will be sought through LEARN (Livestock Emission Abatement Research Network).	
3. Evaluation of economic performance of livestock production systems and their relation with GHG emissions	A cost-benefit analysis will be performed of the various production systems and their expected GHG emissions. CO2 equivalents per Kg of milk and beef will be determined for the various levels of production intensification. A trade-off analysis will be conducted considering ecological intensification to reduce GHG emissions and income per unit of product or area.	Farming systems with higher income and lower emission levels. These accomplishments are to be generated by year 3 as of project approval date
4. Strengthening technical capacities, and communication strategies to influence policy formulation for the promotion of low emission and high productivity livestock systems	A series of activities are planned, including workshops, roundtables with decision makers, scientific and technical publications, policy briefs, networking with regional and national initiatives, and strengthening exchange of information through the Web, among others.	Greater awareness and livestock production systems with lower GHG emissions
5. Preparation of a Phase II to increase the knowledge on livestock, silvopastoral systems and climate change	Livestock research and development is a long-term endeavor. Results of the present project will be analyzed in a workshop towards the end of third year. Positive progress and gaps will be assessed and they will serve as the basis for the preparation of a Phase II aimed at scaling up results obtained in this project.	Scaling up use of research results and addressing knowledge gaps for the improvement of livestock systems with lower GHG emissions in Central America

3. Advances to date

- 3.3 The executing agency (CATIE) received its first advance of funds in the amount of US\$120,000 on April 2015.
- 3.4 Within the context of “**Systematizing methodologies and tools to quantify GHG emissions in livestock farms**” (component 1), CATIE and other participating entities such as INTA Nicaragua, INTA Costa Rica, DICTA Honduras, and IDIAP Panama; defined the variables to analyze the cattle production efficiency and its measurements of GHG at the farm level. The results obtained will contribute to the creation of a GHG inventory in livestock farms [Methane (CH₄), Nitrous oxide (N₂O) and Carbon dioxide (CO₂)].

- 3.5 In addition, twelve different measurement tools for GHG emissions from IPCC, FAO, INTA Costa Rica and FONTAGRO were compared, in order to identify the most appropriate tool for the Central American region. These different GHG emissions measurement tools were evaluated, taking into consideration their best suitability for the region's characteristics: geographical location, animal type, pastures, feeding strategies, among others. As a result of this comparative analysis, the project team concluded that the FONTAGRO tool was the best suited for the region's characteristics and current technological infrastructure capacity.
- 3.6 In order to generate comparative data, the team applied the FONTAGRO and IPCC tools to selected farm conditions: small, medium and large farms. The application of the IPCC tool resulted in higher CO₂ emissions readings (over 15% to 20%) compared to the FONTAGRO tool. These preliminary findings highlighted the appropriateness of the FONTAGRO tool for the region's conditions. The team therefore concluded to apply the FONTAGRO model to the remaining pilot sites.
- 3.7 With the identification and selection of the GHG emissions tool, activities related to the **quantification of GHG emissions** (component 2), have been initiated in experimental and farm sites. In this context, surveys were conducted directly to livestock farmers in Honduras (100 farmers), Nicaragua (300 farmers), Costa Rica (18 farmers), and Panama (80 farmers). This data contributed to the definition of a base line for this research in each country.
- 3.8 Simultaneously, and in order to generate comparative data on GHG emissions from the experimental sites the IPCC tool was applied. These experimental sites were located at CATIE and the Ministry of Agriculture of Costa Rica (located in Guapiles). The trials at these sites were conducted under different pasture management conditions and seasons (dry and rainy) and measured methane and nitrous oxide emissions. As a result, the new local emissions factors were generated. This information will also be used to generate the GHG emissions data at the national level.
- 3.9 In the context of the **development of mechanism for strengthening technical capacities, communications strategies and results dissemination that allow policy incidence and the promotion of the competitive livestock production system with low GHG emission** (component 4), some activities were carried out.

3.10 To promote low emission and high productivity livestock systems, the program supported by NZ was presented in Nicaragua at a workshop on sustainable livestock, where several local institutions participated, such as the Nicaraguan Agricultural Technology Institute, the National Livestock Commission (CONAGAN), the Nicaraguan Federal Association of Ranchers (FAGANIC), the Ministry of Agriculture and Forestry (MAGFOR), and the Dairy Multisectoral Cooperative (NICACENTRO). The primary results of the project were shared with 25 agricultural professionals. This event enabled the project to initiate the policy discussion around sustainable / adapted livestock production systems.

B. Dairy systems in the Andean Region: IICA-Peru (FTG/RF-14653-RG)

1. Objectives

3.11 The general objective of this project is to improve the positioning in the IPCC of the countries from the Andean Region on the estimates of GHG emissions (methane and nitrous oxide) originated by agricultural activities, especially from dairy production. In order to achieve this goal, the project seeks to build institutional capacity for measuring the mentioned GHG, and improve the dairy systems in the Andean Region without affecting the natural environment.

2. Project Activities

3.12 The project with IICA contemplates the financing of activities that will define and apply methane and nitrous oxide measurement methods to dairy production systems in the Andean Region. These activities and their expected outputs and results are presented in table 2 and advances in execution described in the subsequent paragraphs.

Table 2

Component	Activities	Expected results
1. Bio-physical and socio-economic characterization of livestock production systems in pilot sites.	This activity analyzes information to characterize project sites and traditional and improved livestock systems. The data to be analyzed includes: Soils maps, climate data, pastures, human and livestock population, production systems, inputs, outputs, prices, etc.	Pilot project sites identified.
2. Measurement of enteric methane and nitrous oxide on traditional and improved dairy production systems in pilot project sites.	Treatments including addition of bovine urine or nitrogen fertilizer and inhibitors of nitrogen mineralization will be performed. The sulfur hexafluoride (SF6) technique will be used to measure enteric methane, according to the methodology proposed by Johnson et al (1995) and Grainger et al (2007). For the measurement of nitrous oxide (N2O) in the soil, an experiment using closed chambers will be established in each pilot site on pastures of various qualities. The design of chambers and the sampling methodologies will follow the protocols established by Rochette and Erick-Hamel (2008).	Training will be provided to at least two professionals per participating institution.
3. Evaluation of feeding strategies and their effects on enteric methane and nitrous oxide emissions.	Experiments comparing diets of low and high digestibility will be established in each pilot site.. For the experiments, a cross-over design will be utilized with “n” animals x 2 treatments x 2 periods. Pastures and supplements will be analyzed and their digestibility determined, and the emission will be measured in each animal during a seven-day period, using the methodology utilized in the FONTAGRO-New Zealand project in the Southern Cone (FTG/RF-1028-RG).	Capacity established in at least four institutions of the Andes for the measurement of GHG emissions.
4. Development of scenarios to mitigate enteric methane and nitrous oxide emissions under various dairy production systems.	The LIFE-SIM (Livestock Feeding Strategies Simulation Models, Leon-Velarde et al, 2006) models will be utilized to measure the enteric methane and nitrous oxide emissions under various dairy production systems. These models integrate livestock production responses with bio- economic analysis and methane emissions. The model will be calibrated with results of the previous activity (3). This activity will be coordinated by Dr. Leon-Velarde who will provide technical assistance for the analysis and synthesis of the information for the various pilot sites.	Capacity established in at least four institutions of the Andes for the modeling of scenarios to mitigate GHG emissions. Development of strategies to increase livestock productivity and reduce GHG emissions.
5. Strengthening research capacity on measurement of GHG emissions and contribution to policy formulation for the promotion of sustainable dairy systems	A virtual platform will be created to exchange information on livestock and GHG emissions among researchers, extensionists, students and decision makers. Information will be exchanged with other projects supported by FONTAGRO and New Zealand in Central America and the Southern Cone. Linkages will be established with decision makers from the Ministries of Agriculture and the Environment, the academia and civil society to discuss policy issues to promote more sustainable livestock systems. Policy briefs will be	Development of strategies to increase livestock productivity and reduce GHG emissions. Contributions to policy dialogue. Increased number of members of GRA.

	prepared and roundtables will be organized for these purposes. Andean countries which at present are not members of the GRA will be encouraged to become members.	
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3. Advances to date

- 3.13 The project involves Bolivia, Colombia, Ecuador and Peru. The project's first disbursement for US\$99,535 was done in May 2015. During 2015, the project introduced some modifications to its annual work plan and thus in the schedule of activities.
- 3.14 Within the context of **“Bio-physical and socio-economic characterization of livestock production systems in pilot sites”** (component 1), in 2015 a bio-physical and socio-economic characterization of the pilot sites was conducted by gathering information from existing databases / publications, as well as input from experts in the region. This activity was carried out in Ecuador (Carchi, Chimborazo and Bolivar), Bolivia (La Paz) and Perú (Puno, Taraco, Manazo and Cabanillas).
- 3.15 For the development of the **“Measurement of enteric methane and nitrous oxide on traditional and improved dairy production systems in pilot project sites”** (component 2), training workshop was conducted in November 2015 on **“GHG Mitigation: using simulation models for assessing feed strategies”**. The content of the workshop focused on more sustainable dairy production systems and their capacity to mitigate GHG. It also included hands-on training on better feeding strategies. Annex III provides more information on the workshop.

C. Networking and Capacity Building: FONTAGRO/STA (FTG/RF-14654-RG)

1. Objective

- 3.16 Create a network on livestock and climate change to exchange information, standardize methodologies, provide mutual technical support and promote collaboration.

2. Project Activities

- 3.17 This project is executed by FONTAGRO/TAS, and contemplates the financing of networking and capacity building activities for the Latin

America and the Caribbean region. These activities and their expected outputs and results are presented in table 3 and advances in execution described in the subsequent paragraphs.

Table 3

Component	Activities	Expected results
1. Coordination Committee and network meetings.	Main purpose will be to coordinate, review progress and plan initiatives. A plenary meeting of members will be organized every 18 months to share research results, and coordinate activities, to achieve efficiencies; they may be linked to other meetings and workshops.	<p>Activities coordinated among institutions of Latin America and the Caribbean for pastures and livestock production and the measurement of GHG emissions.</p> <p>Mutual support in the region obtained for the conduction of initiatives on livestock and climate change.</p>
2. Web-page.	A web page will be created in addition to the web page established by Universidad Nacional Agraria La Molina (UNALM), an effort will be made to link web pages of all member institutions to share information and knowledge on livestock and climate change.	Information exchanged among institutions in Latin America and the Caribbean and LEARN for pastures and livestock production and the measurement of GHG emissions.
<p>2.Capacity Building.</p> <p><i>*Complementary funding will be sought out from LEARN and the MPI, especially for training on measurement of GHG emissions, exchange visits to New Zealand and Post Graduate training. This complementary funding is estimated in NZ\$200,000 and will not be administer by FONTAGRO.</i></p>	<p>The main objective is to build research capacity on measurement of GHG emissions and on livestock systems research and modeling. The main activities are:</p> <p>Workshops: Two workshops will be conducted before starting project implementation: (i) Livestock Production Systems Research and Modeling. It will be organized by CATIE-UNALM and FONTAGRO and coordinated by Dr. Carlos Leon-Velarde. Participants will include leaders of the member institutions of the two consortia, resource persons and at least two persons per institution. In addition to technical aspects, issues of coordination and implementation will be discussed. (ii) Techniques to measure GHG emissions. It will be organized by CATIE-LEARN-New Zealand-FONTAGRO and it would involve three modules: CH₄, N₂O and Gas Chromatography analysis. Instructors will include members of the consortia, New Zealand and INIA-Uruguay. Participants will include at least two members of each institution participating in the consortia. Towards the end of years 2 and 3 workshops will be</p>	<p>Workshops: Capacity established in at least eight institutions of Latin America and the Caribbean for the measurement of GHG emissions and the modeling of costs and benefits.</p> <p>Exchanges: Capacity strengthened in at least eight institutions of Latin America and the Caribbean for pastures and livestock production and the measurement of GHG emissions.</p> <p>Post graduate training: Capacity strengthened in at least eight institutions of Latin America and the</p>

	<p>organized by CATIE and UNALM to review and synthesize results.</p> <p>Exchanges: During the three years at least two professionals per institution will receive short-term training on pastures, livestock production systems, and measurement of GHG emissions.</p> <p>Post graduate training: Funding will be sought under the Livestock Emissions Abatement Research Network (LEARN) initiative and others to offer scholarships for post graduate training to candidates from the various institutions participating in the consortia.</p>	<p>Caribbean for pastures and livestock production and the measurement of GHG emissions.</p> <p>Post graduate training: The project will offer opportunities for the conduction of MSc Thesis for at least 8 candidates.</p>
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3. Advances to date

- 3.18 The TC executed by the TAS/FONTAGRO, which is also co funded by the MPI, allowed training activities in Chile, and a second workshop will be held next month in Costa Rica.
- 3.19 In the context of the capacity building (component 3), in 2015 a training activity was organized in Osorno, by the INIA Chile. It included a two-day workshop on livestock systems research, which was followed by a two-week training on methodologies for GHG measurements. Participants had theoretical and hands-on experience in techniques for measuring enteric methane and nitrous oxide from agricultural systems as well as they had the opportunity to familiarize with livestock systems research methods. Instructors included INIA-Chile staff that had participated in the first project supported by the cooperation between New Zealand and FONTAGRO that started in 2011, as well as CATIE staff, and a consultant. Twenty participants from 10 LAC countries participated. More detailed information on this workshop is included in Annex II.
- 3.20 Currently, FONTAGRO is co-coordinating a new workshop with CATIE in Costa Rica on “Research methodologies on dairy and livestock production systems adapted to climate change”. The workshop includes the training of 20 researchers from Latin America and the Caribbean, and hands-on activities in farms. The workshop will be held from April 25th to May 6th, 2016.

IV. Concluding Remarks

- 4.1 During 2015, the projects in Central America and the Andean Region have started its activities according to its annual work plans, and initial results are becoming observable.
- 4.2 The Central American region has advanced in adjusting the software tools for measuring the GHG in both, experimental and farm sites. Preliminary results show that the current tools used by IPCC generate higher emissions data for the Central American region. The application of the measurement tool developed / adjusted in this project contributes to the generation of better data on GHG emissions from the livestock production systems. This in turn will lead to the adoption of the most appropriate livestock productions systems in Central America.
- 4.3 The Andean Region initiated the compilation process of secondary information for the production areas under consideration, with focus on bio physical and economic data. The pilot sites have been identified. A group of scientists were trained in the methodologies on how to design improved feeding strategies that lead to a reduction in GHG emissions.
- 4.4 The training conducted in Osorno (Chile) helped to improve the coordination among technical leaders and institutions and their ability to measure GHG from different livestock production systems. This activity has set up the basis for the formation of a regional network. In addition, the activities conducted so far contributed to an increased knowledge in the region on adaptation and mitigation measures for livestock and dairy production systems.

ANNEX I. Project Summary Table: Active

As of December 31st 2015
TC Active Projects for Project Number RG-X1202

Approval Number	Project Name	Approval Date	Sector	Approved Amount	Disbursed Amount	% of Disbursement	Committed Amount	Available Balance
FTG/RF-14652-RG	Silvopastoral systems in Central America	June-09-2014	-1	300,000	120,000	40%	180,000	180,000
FTG/RF-14653-RG	Dairy systems in the Andean Region	June-09-2014	-1	368,000	99,535	27%	268,465	268,465
FTG/RF-14654-RG	Networking and Capacity Building	June-09-2014	-1	139,318	11,542	8%	127,776	127,776
Total				807,318	231,077	29%	576,241	576,241

ANNEX II. TRAINING REPORT

**“MEASUREMENT OF GREENHOUSE GAS EMISSIONS IN LIVESTOCK SYSTEMS: BUILDING
CAPACITY IN LATIN AMERICA AND THE CARIBBEAN”**



Ministry for Primary Industries
Manatū Ahu Matua



MEASUREMENT OF GREENHOUSE GAS EMISSIONS IN LIVESTOCK SYSTEMS: BUILDING CAPACITY IN LATIN AMERICA AND THE CARIBBEAN

Final Report
9th of April 2015

MEASUREMENT OF GREENHOUSE GAS EMISSIONS IN LIVESTOCK SYSTEMS: BUILDING CAPACITY IN LATIN AMERICA AND THE CARIBBEAN

1. Introduction

For the past few years, New Zealand and Latin American institutions have been collaborating to build capacity on measurement of GHG emissions in livestock under diverse farming systems. The collaboration has been done through agreements between the Regional Fund for Agricultural Technology (FONTAGRO) and the Ministry of Primary Industries (MPI) of New Zealand.

A first project under the leadership of INIA-Uruguay was started in 2011. This project has been instrumental in the adaptation of measurement techniques for enteric methane and nitrous oxide emissions in five countries (Uruguay, Argentina, Chile, Colombia and the Dominican Republic). Two other projects have been developed to work in eight countries (Bolivia, Colombia, Ecuador, Peru, Panama, Costa Rica, Nicaragua and Honduras). Other organizations (CATIE and IICA) are also involved in facilitating regional cooperation and providing technical back up. Given the limited knowledge on techniques to measure GHG emissions from livestock in many countries in Latin America, a Workshop on Livestock Systems Research and on-the-job training on Measurement of Greenhouse Gases was carried out by INIA Remehue in Osorno, Chile.

Training funds provided by MPI were used to cover the travel of 15 scientists to participate in the workshop which was followed by two weeks on-the-job training at the experimental station of INIA in Remehue in Osorno (Chile). Additionally, FONTAGRO funded the participation of other three attendees, including representatives from Paraguay and México.

2. Objective

Provide in-depth knowledge and skills regarding the application of techniques for measuring enteric methane and nitrous oxide from agricultural systems as well as familiarize participants with livestock systems research.

3. Content and methodology of the activities

3.1 Date

Workshop on Livestock Systems Research: 8th and 9th of January 2015

GHG determination and hands-on training course: 12th to the 23rd of January 2015

3.2 Venue
 INIA Remehue, Osorno

3.3 Language
 Spanish

3.4 Participants

Country	N° of participants	Name of participant	Institution
Bolivia	1	Rubén Dueñas	INIAF
Colombia	2	Sandra Loaiza	CIAT
		Wilson Barragán	CORPOICA
Costa Rica	5	Roberto Soto	INTA-MAG
		Francisco Arguedas	INTA-MAG
		Andreas Jenet	CATIE
		Diego Tobar	CATIE
Ecuador	1	Cristobal Villanueva	CATIE
		Francisco Clavijo	INIAP
Honduras	1	Mauricio Vargas	DICTA
Mexico	1	Jorge Bonilla	INIFAP
Nicaragua	1	Michael Vilchez	INTA
Panama	2	Adolfo Santos	IDIAP
		Domiciano Herrera	IDIAP
Paraguay	2	María Gorostiaga	IPTA
		Daniel Idoyaga	IPTA
Peru	1	Javier Arias	UNA LA MOLINA

Other participants (attending only the Workshop on Livestock Systems Research)

Peru	Instructor	Carlos Velarde	IICA
Paraguay	National Director	Daniel Ydoyaga	IPTA

USA	Executive Secretary	Hugo Li Pun	FONTAGRO
-----	------------------------	-------------	----------

3.5 Activity Topics

3.5.1 Workshop on Livestock Systems Research

Concepts and methodology for livestock systems research. Diagnosis and characterization of livestock systems. Key data and indicators. Design of improved systems. Ex-ante analysis. Field validation.

3.5.2 GHG determination hands-on training course

3.5.2.1 Nitrous Oxide

Theoretical aspects: Cycles and losses of nitrogen in soil, technical bases for measuring soil GHG. Practical aspects: preparation of plots and static chamber, measurement with manual chamber, application of fertilizers and inhibitors to soils, syringes preparation and minor devices, gas sampling in manual chambers and associated measurements, automated sampling systems, analysis by gas chromatography (GC), spreadsheets and emissions calculations of manual and automated systems, N₂O/NH₃ interactions. Implementation of best practices and safety. Final evaluation.

3.5.2.2 Enteric methane

Theoretical aspects: Technical Basis of SF₆ methodology and permeation tubes, and use of laboratory methodologies. Practical aspects: practical work equipment building SF₆ technique, assembly line, sampling and halter union, work with collars, analysis by gas chromatography (GC), laboratory methodologies, templates and SF₆ emissions calculation. Implementation of best practices, safety and animal ethics. Final evaluation.

3.6 Activities

Both the initial workshop and the hands-on training course were organized with both theoretical and practical sections (see detailed programme in Annex 1).

Livestock systems research. In the initial workshop, the sections were organized to provide the basic understanding of the main factors affecting

livestock production and the potential interactions that should be considered when socio-economic and environmentally evaluating livestock production systems. The practical section allowed the practice with examples of models that can be used for this purpose. For more details on the topics covered in this workshop, please see Dropbox link - presentations/Livestock systems.

GHG determination hands-on training course. The first section provided the necessary knowledge on biophysical processes affecting N₂O and CH₄ emissions from soils and animals, respectively. For more details on the topics covered in this section of the course please see Dropbox link - presentations/N2O/CH4/NH3. In the practical section, both a prototype of a static chamber for the determination of N₂O emissions from soils, and a canister for the determination of CH₄ emissions from bovines were built by the participants following the instructions of the teaching team. Photographs at different stages of this work can be found in the Dropbox link - photo sets. In the case of countries with more than one participant, only one prototype of each was built, due to financial constraints. CATIE was considered another country and so, they built their own set of prototypes.

Additional activities. To contribute to the exchange of research techniques and topics among participating countries, three additional activities were considered over the course period. These included i) a practical workshop on meat quality on grazed-based systems; ii) a visit to the Remehue Research farm, including visits to the dairy, beef and potato production units; and iii) a visit to the laboratories of INIA Remehue, including the areas of biotechnology and molecular biology (both for potato production and soil analysis), meat quality and animal feed analysis. Photographs of these activities can be found in the Dropbox link-phot sets/visit to labs/visit to Remehue Research Station.

At the end of these activities, a short evaluation was carried out and a certificate per technique was given to all attendees.

3.7 Instructors and presenters

Dr. Julio Kalazich (INIA-Chile work on agriculture and climate change)

Dr. Hugo Li Pun (FONTAGRO projects on livestock and climate change)

Dr. Carlos Leon Velarde (Systems research, Perú)

Dr. Andreas Jenet (Central American experiences)

Dr. Marta Alfaro, Dr. Erika Vistoso, Mr. Luis Ramírez (N₂O determination)

Dr. Camila Muñoz, Dr. Emilio Ungerfeld (CH₄ determination)

Dr. Francisco Salazar, Mr. Josué Lagos (NH₃ determinations)

Miss Sara Hube (Automated system for N₂O determination; N₂O and SF₆/CH₄ determination by gas chromatography).

3.8 Materials distributed to participants

As part of the course, all attendees received:

- **1 Workshop workbook**, containing basic information for their successful stay in Chile during the duration of the course, as well as technical information including the GRA Good Practices Guidelines for both N₂O determinations using static chambers and CH₄ determination using the SF₆ technique, and the list of basic materials required for these purposes. A copy of this document can be found in the Dropbox link-Workbook.
- **1 GALA proceeding**, book of proceedings of the 1st Latin-American Conference on GHG emission from livestock production systems
- **1 pen drive**, with all presentations used during the course
- **1 notepad**, for additional notes
- **1 pen**
- **1 set of touristic information for the Lake district of southern Chile**
- **1 backpack**

4. Dissemination of the activities

This included the coverage in the local newspaper and other media (Annex 2a) and information provided to the New Zealand Ministry of Primary Industries, as requested (Annex 2b).

Annex 1. Detailed program of activities carried out.

Day 1	Time	Day 2	Day 3	Day 4	Day 5
Wednesday 7th		Thursday 8th	Friday 9th	Saturday 10th	Sunday 11th
	8:30	Hotel-INIA Remehue	Hotel-INIA Remehue	Free	Free
	09:00-10:30	Registration Welcome notes. Julio Kalazich, INIA's Director	Animal production systems, examples. Carlos Velarde		
	10:30-11:00	Coffee break	Coffee break		
	11:00-13:00	New FONTAGRO grants. Hugo Li-Pun (FONTAGRO)	National Inventories improvement, the example of dairy farms in Costa Rica. CATIE, Andreas Jenet		
	13:00-14:00	Lunch	Lunch		
Arrival	14:00-16:00	FONTAGRO projects on livestock production and GHG emissions. 1) M. Alfaro, 2) CATIE, Andreas Jenet	GHG emissions in Latin American countries. M. Alfaro (Chile)		
	16:00-16:30	Coffee break	Meat quality workshop		
	16:30-17:30	Animal Production Systems, basic concepts. Carlos Velarde			
		Free	Free		

Day 6	Day 7	Day 8	Day 9	Day 10	Day 11
Monday 12th	Tuesday 13th	Wednesday 14th	Thursday 15th	Friday 16th	Saturday 17th
Hotel-INIA Remehue	Hotel-INIA Remehue	Hotel-INIA Remehue	Hotel-INIA Remehue	Hotel-INIA Remehue	Free
N cycling and losses in grazing systems	Hands-on work: static chambers construction	Hands-on work: vials, vaccum, sampling system	Hands-on work: treatments application	Flux estimation	
Coffee break	Coffee break	Coffee break	Coffee break	Coffee break	
Technical basis for N2O determination in soils	Hands-on work: static chambers construction	Hands-on work: plot lay out, chambers instalation	Hands-on work: N2O sampling	Flux estimation. N2O sampling	
Lunch	Lunch	Lunch	Lunch	Lunch	
Visit to Remehue Experimental Research Centre	Hands-on work: static chambers construction	Hands-on work: automated chambers	Hands-on work: gas cromatography analysis	FAQ	
	Coffee break	Coffee break	Coffee break	Coffee break	
	Hands-on work: static chambers construction	Gas cromatography determinations	Best practices and safety considerations-FAQ	Final discussion. Evaluation	
Free	Free	Free	Free	Traditional Chilean barbecue	

Day 12	Day 13	Day 14	Day 15	Day 16	Day 17	Day 18
Sunday 18th	Monday 19th	Tuesday 20th	Wednesday 21st	Thursday 22nd	Friday 23rd	Saturday 24th
Free	Hotel-INIA Remehue	Hotel-INIA Remehue	Hotel-INIA Remehue	Hotel-INIA Remehue	Hotel-INIA Remehue	Departure
	Introduction. Technical basis for the use of the SF6 technique	Hands-on work: Canister preparation	Hands-on work: work with animals	Flux estimation	Methodologies for NH3 determination	
	Coffee break	Coffee break	Coffee break	Coffee break	Coffee break	
	Tubes and required equipment	Hands-on work: Equipment check out	Hands-on work: work with animals	Best practices and safety considerations	Field practice of NH3 determination	
	Lunch	Lunch	Lunch	Lunch	Lunch	
	Hands-on work: tubes preparation	Procedures for the SF6 technique	Hands-on work: Canister sampling, GC analysis	Energy metabolism in the rumen and CH4 production	Visit to laboratories, INIA Remehue	
	Hands-on work: Sampling line construction	Coffee break	Coffee break	Coffee break	Coffee break	
		Hands-on work: Sampling materials preparation	Hands-on work: GC analysis	Final discussion. Evaluation	Closing remarks and certificates	
	Free	Free	Free	Free	Free	

Annex 2a. Appearance in local newspaper and other media coverage about the workshop

Published in FONTAGRO's website

www.fontagro.org/category/noticias/noticias-de-prensa

FONTAGRO y Nueva Zelanda apoyan la capacitación para medición de gases de efecto invernadero en sistemas ganaderos en Chile

Enviado por fontagro el Lun, 02/02/2015 - 19:01.

in Noticias de Prensa



Prácticas de medición de gases en ganado. Chile

El taller en "Investigación en Sistemas Ganaderos y Medición de Emisiones de Gases de Efecto Invernadero" se llevó a cabo en Osorno y fue organizado por el Instituto de Investigaciones Agropecuarias de Chile.



Published in INIA's
website



Instituto de
Investigaciones
Agropecuarias
Ministerio de
Agricultura, Chile

Inicio Nosotros ▾ Investigación ▾



🕒 08 ene 2015 📁 Noticias

💬 0

INIA Remehue es cumbre de científicos de Latinoamérica y el Caribe

Expertos de 10 países se reúnen en Osorno para conocer experiencia local de investigación en sistemas ganaderos y a su vez capacitarse en medición de gases de efecto invernadero.

Osorno 07 de enero de 2015. Con la presencia del director nacional del Instituto de Investigaciones Agropecuarias (INIA), Julio Kalazich y el secretario ejecutivo del Fondo Regional de Tecnología Agropecuaria (Fontagro) Hugo Li Pun, se realizó la primera jornada de un encuentro que sostendrán hasta el 23 de enero, 18 científicos de 10 países de Latinoamérica en torno a la medición de las emisiones de gases de efecto invernadero en sistemas ganaderos.

El director nacional de INIA, junto con destacar el liderazgo de la institución del Ministerio de Agricultura en la materia, precisó que "en nuestra región, América Latina, los niveles de emisión de gases alcanzarían alrededor del 4.2% del total mundial, y la actividad agropecuaria contribuye alrededor del 21% de ese porcentaje y dentro del sector agropecuario la actividad ganadera, es responsable del 88% de estas emisiones. El cambio climático es una preocupación de todos los gobiernos; para Chile es un tema prioritario, nos propusimos como país bajar el 20% de las emisiones al año 2020, por lo tanto para INIA es parte de su plan estratégico, llevamos más de una década trabajando en esta temática. INIA es responsable de entregarla información anual del inventario de gases de efecto invernadero del sector agropecuario de Chile, que forma parte del reporte oficial que entrega el país".

Festival. Pág. 26
Bandas locales alistan sus 15 minutos sobre el escenario



Panoramas. Pág. 27
Dictarán clases de yoga, masajes y tarot a orillas del río en Tril Tril



Rodeo. Pág. 48
Exposición trae a la ciudad a 63 de los mejores caballos chilenos



EL AUSTRIAL

01_15_pag_01-1440.jpg

Joven de 17 años beber alcohol

Deceso. La menor apareció muerta bajo unos arbustos de la orilla del río Rahue, a un costado del puente Chaurakawin.



SITIO PILAUCO: HALLAN TROZO D
La pieza es un nuevo indicio de la temprana pre



Científicos de diez países estudian cómo medir gases de efecto invernadero

UPHON \$ 24.404,82 DOLAR COMPRAJOS: \$ 679
LITR 5.43,398 DOLAR VENDEDOR: \$ 602 SANTIAGO

Actualidad



LOS INVESTIGADORES APRENDEN LAS TÉCNICAS DE MUESTRA EN TERRENO PARA LUEGO LLEVARLAS Y REPLICARLAS EN SUS PAÍSES DE ORIGEN.

Científicos de 10 países estudian en Osorno técnicas para medir los gases de efecto invernadero

AGRO. Los investigadores de América Latina se reúnen en Inia Remehue para conocer la experiencia local en sistemas ganaderos y de producción agrícola.

Paola Rojas Méndez
periodista@osornoinformal.cl

Espertos de América Latina permanecen reunidos en el Instituto de Investigaciones Agropecuarias Inia Remehue hasta el 23 de enero, para estudiar la tecnología adoptada y desarrollada por esta institución en relación a la medición de gases de efecto invernadero en ganadería y producción agrícola.

Marta Alfaro, investigadora del área de medioambiente y ganadería del Inia explicó que los participantes de esta reunión son jóvenes investigadores de universidades o centros como el Inia, provenientes de 10 países de Latinoamérica.

"Ellos recién están participando en la cuantificación de cuál es la contribución de su país en emisión de gases al cambio climático, específicamente desde su agricultura y ganadería", detalló.

Durante su estadía, los 18 investigadores aprendieron de la experiencia chilena a través de los métodos desarrollados por el Inia Remehue sobre cómo medir la emisión de gases desde los rastos producidos por el uso de fertilizantes, como asimismo la que se genera a partir de la ganadería con el pastoreo y otras prácticas del agro.

Chile

es pionero en el uso de metodologías de investigación de gases de efecto invernadero.

METODOLOGÍA

El Inia Remehue lleva 6 años trabajando en esta área de investigación, los métodos usados para el análisis son los más innovadores a nivel mundial y no son conocidos en el cono sur, exceptuando nuestro país. "El hecho de que aquí en Chile concorramos y tengamos montados estos protocolos de investigación, nos permite poder enseñar a los países que están participando. Somos pioneros en montar esta tecnología y saber de Inia quien más desarrolla esta área en nuestro región", indicó Marta Alfaro.

Este método consiste en medir a partir de una cámara, que es una pequeña caja de vidrio puesta en el suelo, cuando se utilizan los gases que son el dióxido de carbono, CO2 y metano, siendo el último el más dañino al calentamiento global, resalta veces mayor que el del CO2, y que se genera en pequeñas cantidades a partir de la agricultura y uso de fertilizantes. En Chile la generación de gases emanados desde la agricultura, representan solo un 18% de la contaminación relacionada al calentamiento global, cuyas mayores fuentes emisoras provienen del sector industrial, donde la provincia de Osorno se encuentra dentro del promedio de las emisiones.

Además, científicos investigadores del Centro Agronómico Tropical de Investigación y Enseñanza CATIE de Costa Rica, se encuentran participando de esta reunión para aprender sobre la experiencia chilena en este ámbito, como líder de la región.

"Queremos distribuir este conocimiento y experiencia al resto de Latinoamérica, trabajando muy cerca con países que aún no tienen la este tipo de mediciones. Chile se benefició a partir de contactos internacionales especialmente con Nueva Zelanda desde donde adaptaron esta metodología al contexto chileno".

Marta González, es una joven ingeniera agrónoma paraguaya, que llegó a través de la experiencia del Inia, "mi objetivo es poder llevar tecnologías para el medio ambiente. Chile está avanzando en esta materia" comentó.

Pues dijo que en su país no cuentan con avances tecnológicos en este ámbito, por lo que quiere llevar conocimiento a los campos y a la familia, os

Lanzan proyecto turístico adecuado a discapacitados

TURISMO. Programa Corfo mejora accesibilidad en este tipo de pasajeros.



LA REUNIÓN CONGREGÓ A 40 PROFESIONALES QUE APOYARÁN LA INICIATIVA.

En la ciudad de Puyehue, con el apoyo de Corfo en la cual participaron 40 representantes del sector privado, fue promovida una nueva iniciativa de oferta turística diseñada a pasajeros con movilidad reducida y discapacitados, para aumentar la captación de oportunidades de negocio de las empresas del sector, basado en la articulación de productos turísticos, la preparación de servicios de calidad, además de la creación de redes de negocios y colaboración entre micro y pequeñas empresas de la región de Los Lagos.

El director regional de Corfo, Adolfo Alfaro, señaló que "necesitamos compromisos como navegantes de gobierno, de poder nuestros esfuerzos en generar oportunidades de acceso y servicios adecuados para este segmento. El Turismo es una actividad crucial a nivel regional, por tanto no podemos dejar de atender a este segmento", dijo.

Pero las acciones concretas a realizar, se cuentan generen redes asociadas de cooperación público-privada, que permitan desarrollar circuitos y rutas turísticas para los pasajeros con movilidad reducida y discapacitados, en los mercados turísticos nacionales e internacionales, proporcionar herramientas, conocimientos y buenas prácticas para la atención de personas con discapacidad, tanto en las beneficiarias asociadas, como en las medianas y pequeñas empresas de turismo de la región.

NECESITA contratar para el período escolar 2015

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- PROFESORA Jefe DE EDUCACIÓN BÁSICA
- EDUCADORA INTERVENCIÓN CON ESPECIALIDAD EN TELL

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Fono Información: 79625979

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Annex 2b. Information requested by MPI-New Zealand

2015-01-23 1:26 GMT-03:00 Vicki Payne <Vicki.Payne@mpi.govt.nz>:

Dear Maria,

I am writing the news post for our website. Thank you for all the information; it's very helpful.

Could you please tell me what equipment is being used and what workshop is being run in the photo where participants are using the equipment? It is a great photo to have on our website.

Many thanks

Vicki Payne | Policy Analyst
International | Policy
Ministry for Primary Industries | Pastoral House 25 The Terrace | PO Box 2526 |
Wellington | New Zealand
Telephone: 64-4-8940554 | Web: www.mpi.govt.nz

From: Marta Alfaro V. [mailto:malfaro@inia.cl]
Sent: Thursday, 22 January 2015 11:01 a.m.
To: Andrea Pickering
Cc: Deborah Knox; Vicki Payne
Subject: Re: GHG workshop

Hi Andrea

yes, they have been great (feeling a bit tired now I think!)

Please find attached the program, list of attendees, group photos with chambers and canisters, plus a general group one, and a copy of the appearance of this activity in our Regional newspaper.

Cheers,

Marta

Marta Alfaro V.
Ingeniero Agrónomo, Ph.D.
INIA Remehue
www.medioambienteyganaderia.cl

Ruta 5 norte, km 8, Osorno, Chile
(56 64) 2334800 - 2334823
www.inia.cl

2015-01-21 17:23 GMT-03:00 Andrea Pickering <Andrea.Pickering@mpi.govt.nz>:
Great, thank you so much Marta. They look great.

Could you possibly send me the final program and list of attendees as we would like to write a short news post on this. We will send to you for review before posting.

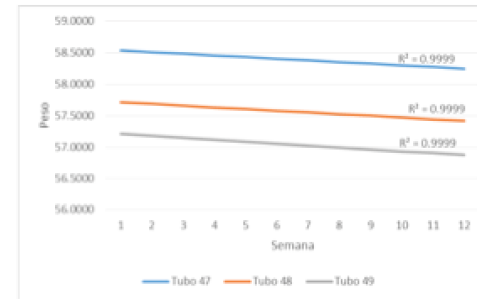
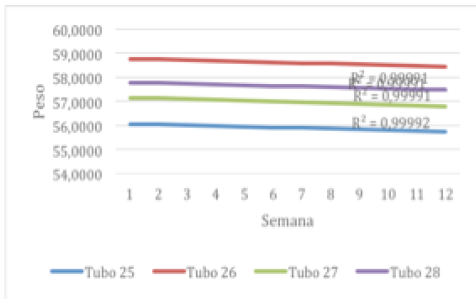
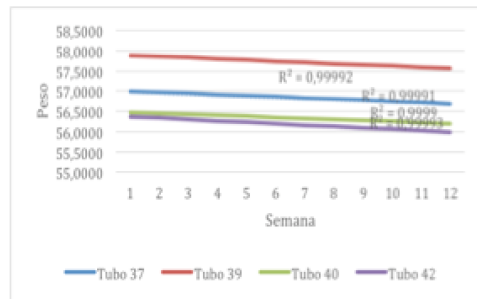
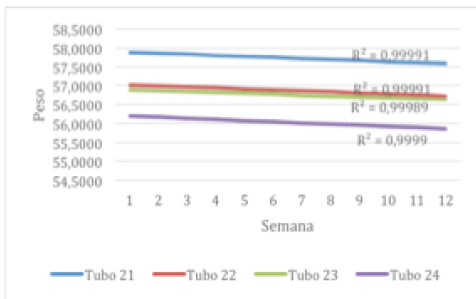
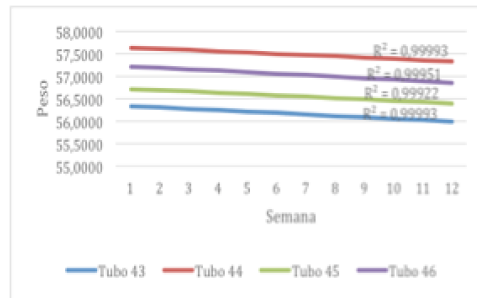
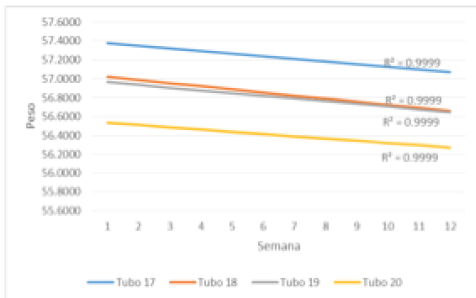
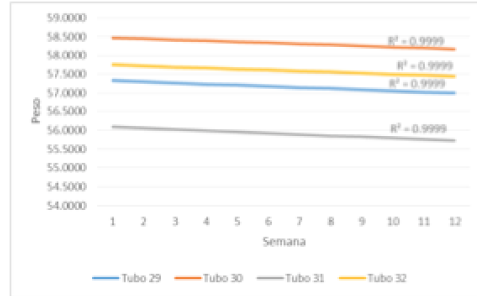
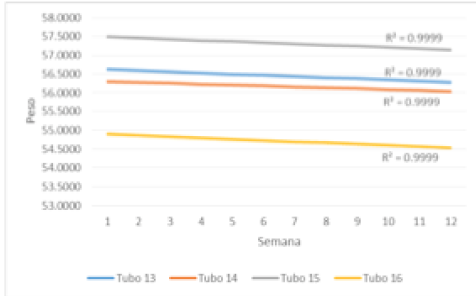
Thanks!

Kind Regards

Andrea

ANNEX III. ACTIVITIES IN THE CENTRAL AMERICA REGION

Measures of SF6 gas released from the permeation tubes during 12 weeks. Statistically, SF6 emissions were similar and hence it was not necessary to separate the tubes by emission rate.



CATIE, COSTA RICA (FTG/RF-14652-RG): Silvopastoral Systems In Central America. Measures of GHG at a farm in Guapiles (Costa Rica). Photo Roberto Soto.

Imágenes de día de campo para la toma de muestras de oxido nitroso en las cámara estáticas en la finca Diamantes, Guapiles, Costa Rica



Establecimiento de cámara estática para toma de muestra de oxido nitroso



Cerrado de la cámara



Cámara establecida para la toma de muestra

Sampling of nitrous oxide, Finca Dimantes, Guapiles. Photos: Roberto Soto.

Imágenes de día de campo para la toma de muestras de oxido nitroso en las cámara estáticas en la finca Diamantes, Guapiles, Costa Rica



Toma de muestra de muestra para análisis de oxido nitroso, la muestras se toman por espacio de 40 minutos a los tiempo (t:0, T:20 y T:40)

Incorporating permeation tubes in cows. CATIE. Photo: Andres Vega.

Incorporación de los tubos de permeación de SF6 al ganado lechero. Finca comercial CATIE.



Introducción del tubo de PVC al rumen para la introducción del tubo de permeación



Incorporación del tubo de permeación al animal

Sampling of methane in cows by using collar. Photo: Andres Vega

Establecimiento de la jaquima y collar a los animales. Finca comercial CATIE.



Postura de la Jaquima



Postura del collar de PVC

ANNEX IV. ACTIVITIES IN THE ANDEAN REGION

**“IMPROVED LIVESTOCK PRODUCTION SYSTEMS WITH SPECIAL REFERENCE IN DAIRY
PRODUCTION IN THE ANDEAN REGION”**

Manual “Mitigating GHG: use of simulation models to assess feeding strategies”



“Mejoramiento de los sistemas de producción animal con énfasis en la producción de leche en la Región Andina dentro del contexto de cambio climático”.

“Mitigación de gases de invernadero; uso de modelos de simulación para la evaluación de estrategias de alimentación”

**Curso -Taller Internacional
16 al 20 noviembre del 2015
Lima , Perú**

CD cover of the LIFESIM software for Dairy, Beef, y Goat management

El CD contiene tres modelos de simulación; manual e información relativa al curso-taller.

Para instalar cada modelo ubíquelo en el directorio específico y ejecute el setup.exe del modelo instalar. Los modelos son:

- Beef v. 15.1
- Goat v. 15.1
- Dairy v. 15.1

Los modelos **Dairy** y **Goat** estiman producción de leche en condiciones de pastoreo y estabulación. Los modelos **Beef** y **Goat** estiman ganancia de peso en condiciones de pastoreo y estabulación. Adicionalmente el CD incluye procedimientos para analizar experimentos diseñados con base en superficie de respuesta (Excel Sheet)

Agradecimientos

Varios donantes de la cooperación internacional han contribuido al desarrollo y validación de los modelos de análisis y simulación que se presentan en este CD: SLP/ILRI, The Ecoregional Fund, STC-CGIAR (Perú), INIA-Spain and CIDA-Canada. El CIP esta agradecido por el apoyo continuo de ellos, lo que permitió desarrollar los modelos, así como de poder compartir su uso con los técnicos de las diferentes instituciones, nacionales e internacionales, en el análisis de estrategias de alimentación en la producción animal. De esta manera, los modelos han sido actualizados mediante un proceso de retroalimentación (comentarios y sugerencias) de los participantes a los diferentes talleres-cursos realizados en Latino America, Asia y Africa

El programa de Intesificación de sistema de cultivos y medio ambiente del CIP esta agradecido con los miembros del equipo de investigación y apoyo técnico en la elaboración de los modelos de ganado de leche, carne entre otros.

International Potato Center
<http://www.cipotato.org>
 Intensificación de Sistema de Cultivos y Medio Ambiente: <http://inrm.cip.cgiar.org>
 Av. La Molina 1895, Apartado 1558
 Lima 12, Perú

Versiónes y actualizaciones de los modelos pueden ser encontrados en el enlace:
<http://inrm.cip.cgiar.org/home/downmod.htm>

Para información adicional escriba a:
 R.Quiroz@cgiar.org
 cleonvelarde@gmail.com

IMPORTANTE:
 Para el correcto funcionamiento de los modelos, Ud debe estar seguro que su PC esta utilizando el punto (.) para separar decimales. En caso contrario realice el cambio en el panel de control de Windows en la sección de cambios regionales.

Requerimientos mínimos para instalación:
 Pentium PC, 16 MB RAM
 Monitor SVGA, 256 colores
 1024 x 768 resolución de pantalla
 Windows: 95, 98, Millennium, 2000, XP7, 7

LIFE-SIM

Livestock Feeding Strategies Simulation Models

Colaboración institucional del:

• INTERNACIONAL •

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Edición Especial

Version V 15.1


 Beef


 Goat


 Dairy

Instituto Interamericano de Cooperación para la Agricultura, IICA
Universidad Nacional Agraria La Molina, UNALM

Curso-Taller Internacional
Mitigación de gases de invernadero; uso de modelos de simulación para la evaluación de estrategias de alimentación
Noviembre 16-20, 2015
Lima, Perú




La reducción de gases de invernadero contribuirá a minimizar el efecto del cambio climático. En ello, el uso de adecuadas estrategias de alimentación permitirá reducir metano enterico y producir leche, carne en forma bio-económica.

Ministry for Primary Industries
Manatú Aho Matua





ANNEX V. Unaudited Financial Statement as of December 31, 2015

Regional Fund for Agricultural Technology

December 31, 2015

(Expressed in United States dollars)

Statement of Assets

Cash	107,226
Investments	98,582,441
Accrued interest on investments	268,953
Total Assets	98,958,620

	<u>Prior Years Accumulated</u>	<u>Current Year</u>	<u>Total</u>
<i>Administrator accountability</i>			
Funds contributed	82,869,156	-	82,869,156
Allocation of inflation income (loss)	14,293,526	-	14,293,526
Intangible Capital	<u>97,162,682</u>	<u>-</u>	<u>97,162,682</u>
Grant contributions received	471,076	-	471,076
Income from investments	16,818,560	338,740	17,157,300
Income (expenses) from cash accounts	453,146	(1,393)	451,753
Technical cooperation expense	(13,668,528)	(1,869,968)	(15,538,496)
Direct and indirect expenses	(5,066,873)	(490,174)	(5,557,047)
Contribution released from restrictions	533,414	-	533,414
	<u>(459,205)</u>	<u>(2,022,795)</u>	<u>(2,482,000)</u>
Total Accountability	<u>96,703,477</u>	<u>(2,022,795)</u>	94,680,682
Interfund accounts payable (receivable)			61,804
Undisbursed Grants			4,202,291
Other Liabilities			13,843
Total Liabilities and Accountability			<u>98,958,620</u>