Pampa is recognized as the most important forage source to livestock production in South America. The impacts of Pampa grazing management on net global warming potential are still unknown. The study was performed to quantify the global warming potential (GWP) of four forage allowance in a native grassland: 4, 8, 12 and 16% (kg dry matter 100 kg animal live weight^{-1} day^{-1}). Experimental site was located in UFRGS Experimental Station in Rio Grande do Sul State, Brazil. Native grassland has been managed with four forage allowance for 30 years. Experimental design was randomized blocks, with two replicates. Soil methane (CH_4) and nitrous oxide (N_2O) emissions were measuring with static chamber method during two years. Soil samples to evaluate organic carbon concentration and stocks were collected in stratified layers up to 100 cm deep in four trenches per replicate. Soil carbon sequestration was calculated taken 4% forage allowance as reference. GWP was calculated for each forage allowance treatment as the sum of emitted CO_2 equivalents from three factors: carbon sequestration, CH_4 emission from soil and enteric fermentation, and N_2O emission from soil and bovine excreta (urine and dung). Soil carbon stock in 0-100 cm in the 8% forage allowance (135.7 Mg C ha^{-1}) was 20 Mg C ha^{-1} higher than in 4%, but did not differing from the 12% (124.2 Mg C ha^{-1}) and 16% (122,2 Mg C ha^{-1}). Cumulative N_2O (0.19 kg N ha^{-1}) and CH_4 (1.53 kg C ha^{-1}) emissions were low, with no difference among forage allowance on 2-year average. The 8% forage allowance showed the lowest GWP (-442 kg CO_2eq ha^{-1} yr^{-1}) and the lowest GHG intensity (-3.5 kg CO_2eq kg animal live weight^{-1}). GWP were predominantly determined by CH_4 production from enteric fermentation and carbon sequestration rates. Results suggests that 8% forage allowance may promote an increase in soil carbon stock in native Pampa grassland compared to 4% forage allowance. Forage allowance of 8% associated animal production and low GHG emissions, featuring environmental benefits for livestock production on native grassland in Pampa biome.

Keywords: Grassland, Carbon, Nitrous oxide, Methane, Livestock
Financial support: Capes, CNPq

(3212 - 2904) Greenhouse gases fluxes as affected by water potential in soils under sclerophyllous vegetation of Central Chile

Juan-Pablo Fuentes-Espoz[1]; Horacio Bown[1]; Amanda Martínez[1]; Daniela Celedón[1]; María-Andrea Díaz[1]; Jorge Pérez-Quezada[2]
University of Chile, Faculty of Forestry Sciences and Nature Conservation[1]; University of Chile, Faculty of Agronomy[2]

In natural systems, most of the greenhouse gases (GHG) are sequestered or emitted by soils. The fate of CO_2, CH_4, and N_2O is mostly biologically mediated, hence soil properties affecting microbiota play a key role. Soil water content (swc) affect aerobic and anaerobic microorganisms, inducing shifts in the fluxes of GHG. Most studies of soil GHG fluxes use swc as an explanatory variable. However, microorganisms can have different responses to similar swc, particularly when comparing different soils. Consequently, the use of soil water potential (P_T) could be a good surrogate variable. We determined the effects of P_T on GHG fluxes in soils under 4 sclerophyllous plant species of Chile. Soil samples (0-10 cm depth) were obtained under *Quillaja saponaria* (QUI), *Lithraea caustica* (LIT), *Colliguaja odorifera* (COY), and *Acacia caven* (ESP), all growing in the same landscape area. Soil samples (50 g) were brought to swc equivalent to saturated (P_T= 0 MPa), near saturated (P_T ~0.005 MPa) and field capacity (P_T =0.01 MPa), and then incubated at 23°C in 1L jars for 3 days (n=5 per plant species and P_T). GHG fluxes were measured using a Cavity Ring Down Spectrometer (G2308, Picarro Inc., USA). CO_2 fluxes were affected by P_T ($p<0.001$) and plant species ($p<0.05$). Higher P_T (Y_T *= 0 and 0.005)* caused a decrease in CO_2 fluxes of about 50% as compared to the lower P_T (0.45-0.78 and 1.95 umol m^2 sec^{-1}, respectively). ESP had 3.5 times lower fluxes as compared to QUI (0.45 and 1.56 umol m^2 sec^{-1}, respectively). Such difference might be caused by soil organic carbon availability. In contrast, P_T and plant species did not affect CH_4 fluxes, which were very variable, particularly for P_T=0.01 (-0.0227 to 0.6361 nmol m^2 sec^{-1}), showing either emission or sequestration patterns. Mean values of CH_4 fluxes were positive, suggesting that saturated and near saturated conditions, and even lower P_T, create conditions for methanogenesis. N_2O fluxes were affected by Pt ($p<0.001$) but not plant species. N_2O emissions were greater with near saturated and saturated conditions (176.65 and 93.58 nmol m^2 sec^{-1}, respectively) as compared to the lower P_T (2.81nmol m^2 sec^{-1}). Our findings suggest that, under saturated and near saturated conditions, methanogenesis and denitrification start shortly after water saturation. Emissions of CH_4 and N_2O at lower P_T, suggest that production of these GHG in sclerophyllous soils can occur despite aerobic conditions.

Keywords: Methane, Nitrous oxide; Soil Water Potential; Soil Respiration
Financial support: Chilean National Scientific and Technology Fund, Fondecyt regular # 1150877.

(9745 - 1947) Impact of *Eucalyptus* Harvest Residues Management on Soil Carbon Storage and Greenhouse Gas Emission (GHG) in sandy soil in southern Brazil

Jackson Freitas Brilhante de São José[1]; Cimélio Bayer[1]; Andressa Classer Bender[1]; Juscilaine Gomes Martins[1]; Deborah Pinheiro Dick[2]; Elias Frank de Araújo[3]; Renato de Aragão Ribeiro Rodrigues[4]; Eduardo Carniel[1]; Daniela Ulian da Silva[1]
Department of Soil Science and Graduate Program on Soil Science, Faculty of Agronomy, Federal University of Rio Grande do Sul; Porto Alegre, RS; Brazil[1]; Department of Physical-Chemistry, Institute of Chemistry, Federal University of Rio Grande do Sul; Porto Alegre, RS; Brazil[2]; Technology and Forestry Development, CMPC Celulose Riograndense, Guaíba, RS; Brazil[3]; Researcher Climate Change, EMBRAPA Soils, Brazilian Agriculture Research Corporation, Rio de Janeiro/RJ; Brazil[4]

In the last years, Brazilian companies in the forestry sector have discussed the use of waste left by the forest harvest residues for energy generation as an alternative to the use of fossil fuels. These residues are basically composed of leaves, branches, bark and parts of wood, and are usually left in the field, thus maintaining soil organic matter contents and forest productivity. In Brazil, studies on the impact of harvest residues (HR) on GHG emissions (N_2O, CH_4 and CO_2) and soil organic matter are scarce. We investigated the GHG emissions in an eucalyptus plantation in function of five alternative strategies for management of HR: (i) SRCS- all forest residues from the previous rotation were removed; (ii) CRC- bark, leaves and litter layer from the previous rotation were maintained on the soil; (iii) CRG- branches, leaves and litter layer from the previous rotation were left in the soil; (iv) CR- presence of all harvest residues (leaves, branches, bark, + litter); and (v) SRSS- all forest residues were removed and litter from the new plantations were also removed. These treatments were installed in plots of 900 m^2, using a randomized block design with four replications. The experiment was conducted in the forest Park of the company CMPC, located in the county of Barra do Ribeiro/RS, Brazil in sandy entisol. In each plot, one trenche was opened up to 100 cm

depth, and soil samples were collected in two sides of the trenche and soil carbon was analyzed by dry combustion (Shimadzu TOC-VCSH analyzer). Annual campaign of GHG colletion was performed by method of closed chamber where air samples were collected each three weeks, and analyzed in regarding the contents of N_2O and CH_4 contents by gas chromatography. The maintenance of HR of eucalyptus CR led to an increment of 8 Mg ha^{-1} of soil C storage in 0-100 cm mineral soil compared to SRSS. Soil N_2O fluxes were very low under all HR management.The highest accumulated emissions of N_2O were obtained in CR, with 0.45 kg ha^{-1}. There was a predominance of CH_4 influx in practically all treatments. Similarly to N_2O, CR also showed higher cumulative annual emissions influx of CH_4 reaching 5.7 kg ha^{-1}. All HR managements presented negative GWP values, showing the potential of forest plantations as drainage for GHG. Our results indicated that the maintenance of eucalyptus HR is an environmentally interesting strategy with the greatest potential to mitigate GHG emissions, as it promotes greater soil carbon retention.
Keywords: Eucalyptus; Harvest residues management; Greenhouse Gas Emission ; Soil carbon;
Financial support:

(2648 - 1067) Influence of irrigation on photosynthetic carbon inputs under ryegrass-white clover pasture in New Zealand

C.R. Medina[1]; S. R. McNally[2]; T. Clough[1]; M.H. Beare[2]; J. E. Hunt[3]; C.S. Tregurtha[2]
Department of Soil and Physical Sciences, Faculty of Agriculture and Life Sciences. Lincoln University, Lincoln 7647, New Zealand.[1]; Sustainable Production Portfolio, New Zealand Institute for Plant and Food Research Limited, Private Bag 4704, Christchurch 8140, New Zealand[2]; Landcare Research, P.O. Box 69040, Lincoln 7640, New Zealand[3]

Carbon (C) stocks under grazed pasture in New Zealand represent ~50% of the national soil C inventory. The use of irrigation is increasing to improve dry matter production (DMP). However, it is not clear whether irrigated pastures act as a sink or a source of atmospheric CO_2. Our objective was to study the effects of irrigation on the allocation of photosynthetic-C in a plant-soil system under a perennial ryegrass (*Lolium perenne L.*) and white clover (*Trifolium repens L.)* pasture. The experiment consisted of two treatments (dryland [37-80 % of field capacity] and irrigated [69-92% of field capacity] pasture) applied to pots (15 cm dia x 25 cm deep) with soil (0-15cm, sieved <6 mm) from a non-irrigated site. Well established ryegrass-clover pasture was continuously pulse labelled with $^{13}CO_2$ (10 atom %) over three months. A further set of pots were maintained at natural abundance CO_2. After labelling, the allocation of fixed-C to plant-soil compartments was determined by harvesting 8 pots/treatment. The soil organic C derived from the newly fixed-C at the end of the labelling phase was calculated using a two-pool mixing model. During the labelling period, DMP was greater under irrigated (65 ± 1 kg ha^{-1} d^{-1}) than dryland conditions (55 ± 1 kg ha^{-1} d^{-1}). Total annual DMP was also higher for irrigated (17400 ± 370 kg ha^{-1}) than dryland pasture (14700 ± 380 kg ha^{-1}). The total DMP of the dryland system was higher than would typically be expected under field conditions. After labelling, approximately 76% of the added ^{13}C was recovered in the herbage, 8% in above-ground residue, 7% in roots, 5% in the bulk soil and 1% in the rhizosphere soil. The allocation of ^{13}C into these respective compartments was similar between the irrigated and dryland systems. The C input to bulk soil was 1479 ± 144 kg ha^{-1} and 1433 ± 85 kg ha^{-1} (0–15 cm) and 750 ± 131 kg ha^{-1} and 557 ± 72 kg ha^{-1} (15–25 cm) for irrigated and dryland systems, respectively. There was no significant effect of the irrigation treatments. These results show that despite greater aboveground production there was not an increase of C inputs to the soil under irrigated pasture. However, the effects of more extreme differences in soil moisture on pasture production and belowground C allocation under irrigated and dryland conditions are not know and require further study. On-going work is also investigating the longer term stability of new pasture-fixed soil C under both irrigated and dryland conditions.
Keywords: ^{13}C, irrigation, pasture-soil systems, soil C inputs, soil organic C
Financial support: The New Zealand Fund for Global Partnerships in Livestock Emissions Research (GPLER), Plant and Food Research and Lincoln University

(7570 - 977) Legume cover crops favour soil organo-mineral formation through microbial products

Murilo Veloso[1]; Denis Angers[2]; Martin Chantigny[2]; Janaína Costa[3]; Deborah Dick[1]; Cimélio Bayer[1]
UFRGS[1]; AAFC Canada[2]; UFGRS[3]

The implementation of no-till coupled with legume cover crops results in high carbon sequestration rates in subtropical soils of Southern Brazil. We hypothesized that this effect is due to the accumulation of organo-mineral associations enriched in microbial products induced triggered by the absence of tillage and the high-quality of legume biomass. We sampled soil in a 30-yrs old field experiment and used density and particle size fractionation in combination with carbohydrate and *n*-alkane analyses to compare the effect of conventional tillage (CT) vs. NT, combined or not with legume cover cropping, and combined or not with mineral N fertilization. In general, the amount of microbe-derived carbohydrates (galactose, manose, fucose and rhamnose) exceeded plant-derived carbohydrates (arabinose and xylose), especially in clay fraction of 20-30 and 75-100 cm layers (microbe-derived-to-plant-derived carbohydrate ratio of 1.9 and 2.2, respectively). Due to the large abundance of LF-C in the 0-5 cm soil layer, leading an overwhelming contribution of plant-derived carbohydrates, the relative contribution of microbial residues was lower than from microbial-derived, but still dominant. In 20-30 and 75-100 cm, the contribution of microbial over plant-derived carbohydrates in the clay fraction was 19 and 7%, respectively, greater with than without legume cover-crops. These findings were in good agreement with the assessment of *n*-alkanes biomarkers: Short *n*-alkanes chains (15-25) instead of long chains (25-35) were favoured by legumes under NT in clay fraction of superficial and deeper soil layers, indicating predominance of microbial residues. The nitrogen fertilization favoured the increase only in LF-C but not in clay-C due to increase of maize input. This result suggests that the high lability of legume residues might be the main driver to C accumulation in organomineral association. This study confirmed our hypothesis that carbon accumulating in organomineral associations is dominated by microbial-derived carbohydrates, and that legume cover crops under NT further favour the dominance of microbial over plant-derived residues, and consequently the SOC accumulation.
Keywords: Organic matter; no-tillage; *n*-alkanes; soil carbohydrates; soil carbon accumulation
Financial support: UFRGS, AAFC Canada, CNPq, CAPES

(4572 - 1450) Liming increases carbon sequestration in tropical cropping systems

Murilo de Souza[1]; Danilo Silva Almeida[1]; Kassiano Felipe Rocha[1]; Gustavo Prestes Gomes[1]; Ciro Antonio Rosolem[1]
School of Agricultural Sciences, Sao Paulo State University[1]

Lime application for soil-acidity amelioration has been considered a