posters

PO40

DISAGGREGATED N2O EMISSIONS FROM IRISH AGRICULTURE

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Agriculture accounts for 31% of total Irish greenhouse gas (GHG) emissions with around 40% of these emissions associated with nitrous oxide (N2O) from soils. Dairy farming in Ireland is set to expand in response to the abolition of EU milk quotas and this expansion occurs within the national policy target to reduce GHG emissions by 20% by 2020. Soil N2O emissions relate mainly to fertiliser, manures/slurry and excreta deposited on soils by grazing animals. These sources are spatially and temporally highly variable making measurements for inventory purposes difficult and resource demanding. The Agricultural GHG Research Initiative for Ireland (AGRI-I) has approached the refinement of these emission factors through the disaggregation of individual N2O sources, namely fertiliser types, dung/urine with and without fertiliser, and slurry taking rate and application timing into account. A range of potential mitigation measures such as urease and nitrification inhibitors, slurry spreading method and timing and dietary manipulations are being evaluated on direct and indirect emissions. This research to date has highlighted the importance of including indirect emissions, due to the pollutant swapping potential of abatement measures which can reduce direct emissions by increasing indirect emissions. These data will be summarised and integrated using a new farm system model to enable the testing of scenarios such as agricultural expansion, optimising production targets and reducing GHG emissions. This paper presents the Irish approach to refining GHG emission inventories and evaluating potential mitigation strategies within productive grazed grasslands.

PO41

MONTE CARLO UNCERTAINTY ANALYSES OF A BLS INVERSE-DISPERSION TECHNIQUE FOR MEASURING GAS EMISSIONS FROM LIVESTOCK OPERATIONS

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The backward Lagrangian stochastic (bLS) inverse-dispersion technique has been used to measure fugitive gas emissions from livestock operations. The accuracy of the bLS technique, as indicated by the percentages of gas recovery in various tracer-release experiments, has generally been within ± 10% of actual emissions with appropriate sensor placement and data filtering. However, standard deviation of the emission calculations can be as high as 32%. This uncertainty is due to the combined uncertainties in the field measurements, model assumptions, and so on. The objective of this study is to investigate the uncertainty of the bLS technique by performing multiple Monte Carlo simulations using the bLS model. While typical analytical error-propagation techniques utilize first-order approximation, the complexity of the bLS dispersion model requires a more robust analysis. A Monte Carlo method is a more appropriate method for the task. It numerically produces output distributions propagated by input uncertainties. It is simple, but requires high computing resources. Three 15-min datasets from a previous waste lagoon study were used to assess the uncertainty of the emission rates calculated by a bLS model (WindTrax). Randomly generated input values for concentration and wind statistics were selected assuming uniform probability distributions based on instrument's specifications. Up to 100,000 bLS model iterations were performed to generate accuracy distributions. The resulting distributions showed smaller dispersion of bLS accuracy than typically found in field validation studies, with standard deviations less than 12%. This suggests that factors other than sensor uncertainties, such as model idealization of terrains, contributed to the overall uncertainties of the bLS technique in field settings. More experiments are currently underway isolating different sources uncertainties (in terms of sensors, degree of uncertainties of each sensors, and so on). These results will be presented at the meeting.

PO42

METHANE EMISSION IN TROPICAL CONDITIONS

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In the world, India and Brazil lead the ranking of enteric methane emissions. In this context, research activities in some countries have been developed in New Zealand, NZD $ 16 million was invested in research into greenhouse gases and the goal is to reduce by 20% the GHG emissions come from agricultural activities. Australia have already been tested vaccines for reduction of methane and are being implemented mitigation strategies

based on pasture management techniques as well as the inclusion of ingredients in diets. Brazil, as featured in the global agricultural context, must also meet this trend and provide answers up to the technological and economic advances that has achieved in recent years. Research efforts relating to diagnostic and enteric methane mitigation strategies are still scarce because there are few laboratories with direct calorimetric system. The first study was conducted in laboratory animals calorimetric of the Federal University of Minas Gerais, the oldest among the four existing in Brazil. In Nuclear Energy Center and Paulista State University also have been generated enteric methane emission data respirometry chambers. In order to advance in enteric methane assessment methodologies in tropical conditions, has been deployed at Embrapa Dairy Cattle Experimental Complex Multi-User of Bioefficacy and Sustainability of Livestock contemplates that one respirometry laboratory, equipped with four respirometry chambers 'No-Industrial Pollution Systems Ltd, UK 'in vivo reference method for measurement of enteric methane. The first studies are being conducted with dairy heifers (half-sister) of three genetic groups (Holstein, Gyr and F1 Holstein-Gyr). The animals will be evaluated over five years, in phases of growth, first and second lactation. A meta-analysis with the data generated in tropical conditions and such information is of utmost importance to prepare the national inventory of greenhouse gases by livestock activities as well as public policy guide will be held.

PO43

ESTIMATES OF THE POTENTIAL OF GREENFEED ERRORS USING A MODELING APPROACH WITH VARIED VISITATION PATTERNS

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GreenFeed (GF) quantitatively measures methane (CH4) for periods of 3-6 min over days while the animals are eating, and then multiple visits are averaged to estimate daily CH4 emissions. The purpose of this study is to mathematically predict uncertainty associated with spot measurement of CH4 due to varied visitation patterns. Two experiments were completed with ad-libitum fed crossbred beef heifers (n = 29, DMI=8.34 kg/d) and lactating dairy cows (n=23 , DMI= 20.7±2.4 kg/d) each measured over 7 days. Herd-averaged diurnal CH4 pattern for beef heifers and dairy cows was determined by averaging all measurements that occurred within 1 hour incremental periods over the day. The random coefficient of variation (CV) of CH4 spot measurements was calculated. Varied visitation rates to GF were assumed to create the maximum error including once per day and six times per day spaced every four hours with increasing numbers of samples over days. The systematic percent error was determined as |modeled-measured|/measured and the 95% CI of the random error as 1.96*CV/N. The CH4 diurnal pattern was more variable in beef heifers than in dairy cows, where beef heifers varied by 2.3 fold over the day, and dairy cows by 1.3-fold. The CV of GF in both groups was 14%. Systematically sampling at one time per day resulted in a maximum error of 14.6% in dairy cows and 41% in beef heifers. However, sampling six times over the diurnal pattern reduced the maximum sampling error to 2% in dairy cows and 3% in beef heifers. Increasing numbers of samples reduced the 95% CI of the random error from 15.8% (N=3) to 6.1% (N=20). There was minimal improvement with more frequent sampling. Overall, GF required 15-30 samples gathered over 7 to 14 days for optimal accuracy, with low numbers of spot samples having a large potential for error.

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SAMPLING FREQUENCY AND MEASUREMENT PERIOD FOR SHORT-TERMS SPOT MEASUREMENTS OF METHANE EMISSIONS FROM CATTLE USING GREENFEED EMISSIONS MONITORING SYSTEM

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GreenFeed Emissions Monitoring (GEM) system measures methane (CH4) emission from the animal's exhaled air due to eructation and respiration. GEM records CH4 emission during 3-6 min visits several times per day, and the measurements are repeated day after day. The objective of this study was to define a sampling and data analysis protocol for optimal prediction of CH4 using short-term CH4 measurement. Twenty-eight crossbred beef heifers averaging 344.4±30.6 kg body weight and 326±23d of age were housed in a dry-lot pen for 59 days at the Lacombe Research Center, AB, Canada and were fed ad libitum twice daily a 90% barley silage and 10 % rolled barley grain total mixed ration (as fed basis). Heifers had free access to a GEM system to measure their CH4 emission, and their feed intake data was measured by eight automated feeding stations (Growsafe Systems Inc., Airdrie, AB, Canada). A total of 3242 spot CH4 measurements were collected using the GEM system. These Then GEM spot measurements were averaged using 1, 3, 7, and 14d averaging periods, and were analyzed for variability, repeatability, and correlation with

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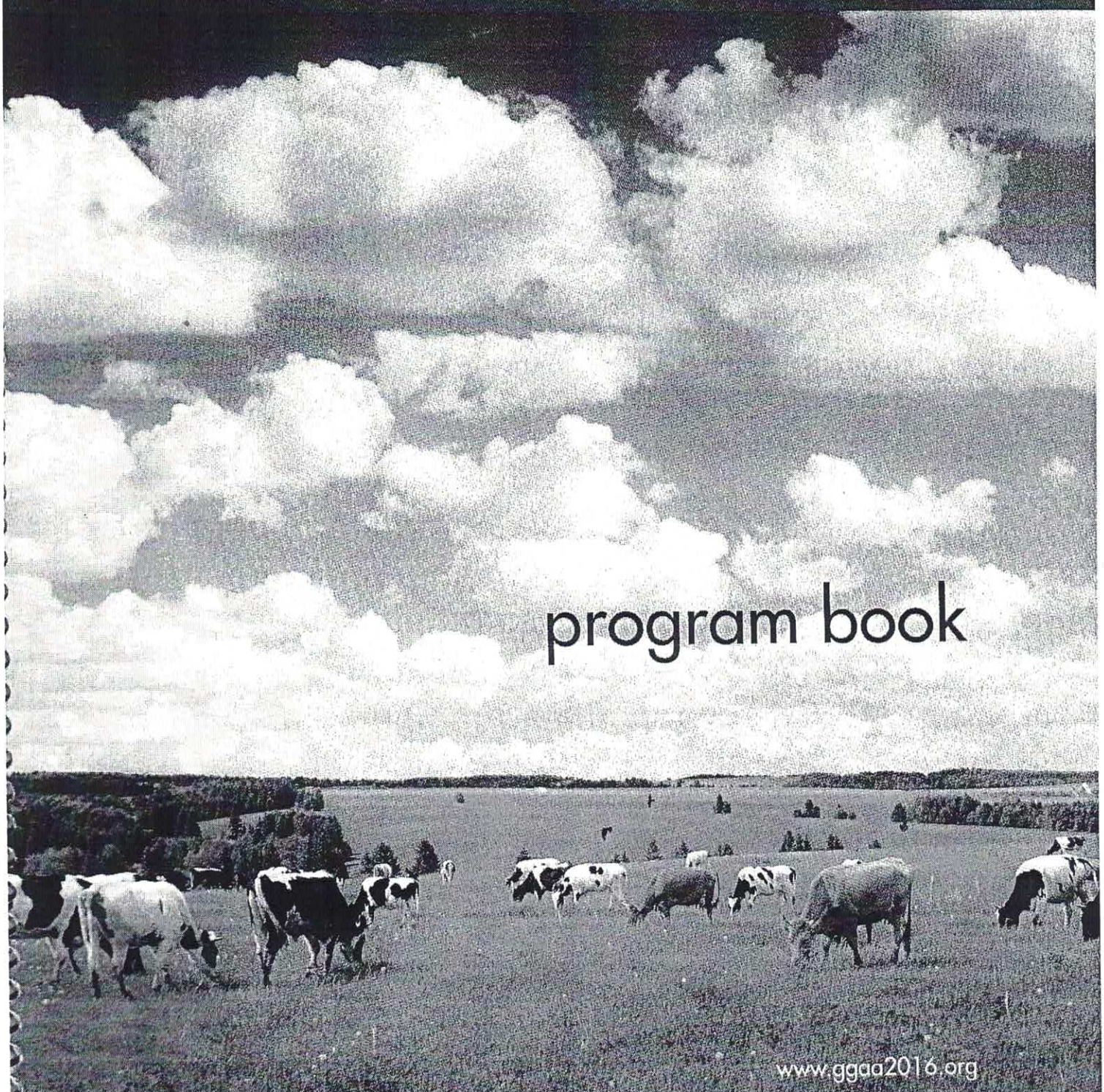

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