Alberta Agriculture, Food and Rural Development
Greenhouse Gas Technical Team
Research Capacity, March 2005

The AAFRD Climate Change/ Greenhouse Gas Technical Team is a cross departmental team focused on assisting Alberta producers in responding to GHG policy changes and mitigation/ adaptation strategies. In addition, many of the team members are involved with various GHG and climate change related activities, which are described below:

I. Atta Atia, **Manure Management Specialist**, Technical Services Division

Atta is currently involved with these GHG related projects and activities:

1. Co-authored the AAFRD Manure Management and Greenhouse Gases information bulletin #11. This fact sheet can be accessed from AAFRD's Internet homepage Ropin' the Web at www.agric.gov.ab.ca.

2. Reviewed the manure management section of the AAFRD GHG management practices workbooks. This material is currently being update will be available on AAFRD's Internet homepage Ropin' the Web at www.agric.gov.ab.ca.

3. Member of the Pork Technical Working Group (PTWG). The PTWG is developing a quantification protocol with the best available science on GHG emission reductions from manure storages, manure application, and feeding strategies for hog operations. Atta's work is specifically dealing with methane calculations from manure storages. He also helped to write the methane emission section of the PTWG's science discussion paper.

4. Coordinated the manure management part of the AAFRD GHG Science Strategic Roadmap for Research.

II. Dr. Vern Baron, Research Scientist, Lacombe Research Centre, Agriculture and Agri-Food Canada (AAFC).

His research focus is on the extension of grazing seasons, sustainable pasture management, and improving the growth efficiency of forage crops and pasture. His publications on GHGs include:

1. Basarab, J.A., Okine, E.K., Baron, V., Marx, T., Ramsey, P., Ziegler, K. and Lyle, K. 2005. Methane emissions from enteric fermentation of Alberta beef cattle population: A model methodology for Canada. Can. J. Anim. Sci. (accepted).

2. Okine, E.K., Basarab, J.A., Baron, V.S. and Goonewardene, L.A. 2003. Effect of residual feed intake in growing cattle on methane and manure production. Can. J. Anim. Sci. (*submitted*).

3. Okine, E.K., Basarab, J.A., Baron, V. and Price, M.A. 2002. Methane and manure production in cattle with different net feed intakes. Can. J. Anim. Sci. abstr.

4. Okine, E.K., Basarab, J.A., Baron, V., and Price, M.A. 2001. Net feed efficiency in young growing cattle: III. Relationship to methane and manure production. In "Abstracts of Presentations and Posters". AIC2001, University of Guelph, Guelph, Ontario N1G 2W1, July 8-11, 2001, CSAS 01-21.

III. John Basarb, **Beef Research Scientist** at the Western Forage Beef Group.

His group is involved with research that is focusing on feeding efficiency in beef cattle, which is indirectly related to methane and manure production in beef cattle. No direct methane emissions research in beef cattle is planned at this time. However, if dollars are available, this could change. John is also a member of the Beef Technical Working Group (BTWG). The BTWG is developing a quantification protocol with the best available science on GHG emission reductions for beef operations, with the focus on ration balancing, feed additives, and selecting for feed efficiency. Projects under the Beef Key Initiatives take priority (>80% of his time). His GHG related publications include:

1. Nkrumah, J.D., Okine, E.K., Mathison, G.W., Schmid, K., Li, C., Basarab, J.A., Price, M.A., Wang, Z. and Moore, S.S. 2004. Relationships of feedlot feed efficiency, performance and feeding behavior with digestion, energy partitioning, methane production and metabolic rate in beef cattle. J. Anim. Sci. (submitted).

2. Basarab, J.A., Okine, E.K., Baron, V., Marx, T., Ramsey, P., Ziegler, K. and Lyle, K. 2005. Methane emissions from enteric fermentation of Alberta beef cattle population: A model methodology for Canada. Can. J. Anim. Sci. (accepted).

3. Fuller. L., Chetner, S., Sauve, J., Basarab, J., Banks, T., Chakraborty, S., Corbett, R., Khan, M., Neilson, D. and Zhang, M. 2003. Development of a farm-level greenhouse gas assessment: Identification of knowledge gaps and development of a science plan. AARI Project Number 2001J204.

4. Basarab, J.A., Okine, E.K., Corbett, R., and Lyle, K. 2003. Methane emissions from enteric fermentation in Alberta's livestock. Western Forage/Beef Group, Lacombe Research Centre, 6000 C & E Trail, Lacombe, AB, T4L 1W1

5. Okine, E.K. and J.A. Basarab. 2003. Livestock feed efficiency as it relates to nutrient balancing: Improved nutrient utilization reduces nutrient loss in manure. June 2003 Manure Conference, Lethbridge, Alberta, Canada.

6. Okine, E.K., Basarab, J.A., Baron, V.S. and Goonewardene, L.A. 2003. Effect of residual feed intake in growing cattle on methane and manure production. Can. J. Anim. Sci. (*submitted*).

7. Okine, E.K., Basarab, J.A., Baron, V. and Price, M.A. 2002. Methane and manure production in cattle with different net feed intakes. Can. J. Anim. Sci. abstr.

8. Okine, E.K., Basarab, J.A., Baron, V., and Price, M.A. 2001. Net feed efficiency in young growing cattle: III. Relationship to methane and manure production. In "Abstracts of Presentations and Posters". AIC2001, University of Guelph, Guelph, Ontario N1G 2W1, July 8-11, 2001, CSAS 01-21.

9. Okine, E.K. and Basarab, J.A. 1999. Strategies for reducing methane emissions from ruminants. Alberta Agriculture, Food and Rural Development, Western Forage/Beef Group, Lacombe Research Centre, 6000 C & E Trail, Lacombe, AB, T4L 1W1.

10. Basarab, J.A., Okine, E.K. and Engstrom, D. 1999. Greenhouse gas emissions from livestock in Alberta: Past, Present and Future. Alberta Agriculture, Food and Rural Development, Western Forage/Beef Group, Lacombe Research Centre, 6000 C & E Trail, Lacombe, AB, T4L 1W1.

IV. Tony Brierley, Soil Land Resource Info Specialist, with the Western Land Resource Group Research Branch at AAFC.

Tony currently has these two main activities related to GHG and climate change:

1. The National Carbon and Greenhouse Gas emission Accounting and Verification System (NCGAVS) for agriculture will be an improved system for comprehensive estimation of GHG emissions and removals for agriculture in Canada. NCGAVS will estimate carbon (C) change on and nitrous oxide (N_2O) emissions from agricultural land in Canada. The accounting methodology involves processing relational databases of land and of land use and management to derive areas of land-use change (LUC) or land management change (MC) for which C change is required. An estimator is used to derive the C change factor for various LUC or MC. The C change factor is then multiplied by the area of LUC or MC and summed across landscapes to produce an estimate of C change at regional, provincial, and national scales. N_2O emissions are calculated on a landscape basis with MC and subsequently scaled up to national levels of reporting. The methodology is to be systematic and transparent, accompanied with complete documentation and associated estimates of uncertainty.

2. The Land Use and Land Use Change and Forestry Monitoring Accounting Reporting System working group:

Tony is also a member of the Land Use and Land Use Change and Forestry (LULUCF) monitoring, accounting and reporting system working group. The purpose of this working group is to ensure the coordination of Agriculture and Agri-Food Canada (AAFC), Natural Resources Canada, and specifically Canadian Forestry Service and Environment Canada activities, in addressing the requirements of the United Framework Convention of Climate Change and the Kyoto Protocol. In addition, Tony is a member of the Canadian Forestry Service and AAFC working group to monitor and model the effect of land use change on C change associated with the change in forest cover in the Meadow Lake, SK pilot area.

V. Victor Brunnette, Woodlot Program Manager, Ag-Entrepreneurship Division.

Victor recently became manager of the woodlot program and has been involved with the writing and editing of the agroforestry GHG book. (or else a chapter of a larger workbook to include other productions, pork, beef, forage etc.) produced by Noel McNaughton from Raven Eye Consulting and published in May 2002. The original booklet on Agroforestry involved Toso Bozic of AAFRD.

VI. Rachid El Hafid, **Research Scientist**, Ag-Entrepreneurship Division.

Rachid is currently involved with the following GHG related work:

1. Assessing the value of carbon credit to Alberta Agriculture industry.

2. Assess the market opportunity, competitive dynamics, and Alberta competitive advantages/disadvantages in this emerging international GHG market.

3. Develop recommendations on market access strategies for Alberta producers.

4. Publish a quarterly update on climate change market activities.

5. Build a business case for agriculture producers considering access to the emerging international GHG market.

6. Establish a user-friendly carbon credit-trading manual.

7. Establish a roadmap to access and participate in the carbon credit market.

VII. Tom Goddard, **Soil Conservation Specialist**, Conservation and Development Branch.

Tom has participated in these following various GHG and climate change related publications and projects:

1. Peter Dzikowski, then Tom Goddard were members of the Sinks Table (carbon sinks in agriculture and forestry) of Canada's National Climate Change Process. An options paper was delivered in 1999 to the government of Canada by the Table.
http://www.nccp.ca/NCCP/national_process/issues/sinks_e.html#membership

2. Participated in steering committee of Natural Resources Canada poster for the prairie region "Winds of Change" and acknowledged on the poster. (Goddard, and AAFRD).

3. AESA Soil Quality Monitoring Program developed the initiative to create a daily climate database for all of Alberta back to 1961. The Drought program

subsequently continued the development of the data back to 1900. This has been used to create awareness of climate, climate change and to do modeling.

4. Invited member of Landscape Scale Cropping Systems Network sponsored by BIOCAP/NSERC, chaired by Dr. Dan Pennock, University of Saskatchewan (TG)

5. Implemented GHG components (carbon sequestration, nitrous oxide emissions) into the Crop Diagnostic Field School from 2003 onwards.

6. Sauve, Jilene. 2000. "A preliminary assessment of carbon dioxide and nitrous oxide emissions from agricultural soils in Alberta."

7. AAFRD staff were members of the Prairie Carbon Soil Project sponsored by GEMCO in the late 1990's.

8. Development of Scientifically Defensible Estimates of N_2O Emissions from Agricultural Ecosystems in Canada (CCAF, 00-03), Grant, Juma, Goddard, Kryzanowski, Zhang Solberg, Pattey.

9. Assessing the Nitrous Oxide Tradeoffs to Carbon Sequestering Management Practices (CCAF, 00-01) Lemke, Desjardins, Keng, Kharabata, Smith, Goddard, Ellert, Monreal, Drury, Rochette, Pattey.

10. Carbon sequestration and greenhouse gas flux in selected Alberta catenas containing wetlands (IWWR 02-07) Goddard, Kryzanowski, Brierley. Project in association with sister projects at the University of Saskatchewan and University of Manitoba.

11. Emissions of N_2O from Cereal-Pea and Cereal-Lentil rotations in western Canada (NRCan 01-02). Lemke, Goddard, Selles.

12. Sauvé, J.L., Goddard, T.W. and Cannon, K.R. 2000. Assessing greenhouse gas emissions from agriculture soils in Alberta. . 4th International Conference on Integrating GIS and Environmental Modeling (GIS/EM4): Problems, Prospects and Research Needs. Banff, Alberta, Canada, Septemer 2-8, 2000.

13. Lemke, R.L., McConkey, B.G., Izaurralde, R.C., Goddard, T.W., Selles, F., Campbell, C.A., Boehm, M., and Lindwall, C.W. 2001. Reduced tillage: Can it help conserve soils and reduce greenhouse gas emissions from western Canadian agriculture? p.p. 302-306 (session 3: Resources and Environment). In Wei et al.

(eds.) Promoting Global Innovation of Agricultural Science & Technology and Sustainable Agricultural Development, proceedings of the International Conference on Agricultural Science and Technology. Nov. 7-9, Beijing, China.

14. Lemke, R., Goddard, T., Hahn, D., Burton, D., Ellert, B., Farrell, F., Monreal, M. and Noot, D. 2002. Results of an inter-laboratory comparison of nitrous oxide analysis in western Canada. Commun. Soil Sci and Plant Analysis 33 (15-18): 2705-2713.

15. Lemke, R.L., Goddard, T.W., Selles, F. and Zentner, R. 2002. Nitrous oxide emissions from pulse-wheat rotations on the Canadian prairies. *In* G.Clayton, H. Muendel and B. Sim (eds) Proc. Fourth Canadian Pulse Research Workshop, Edmonton, December 8-10, pp. 95-98.

16. Izaurralde, R.C., Lemke, R.L., Goddard, T.W., McConkey, B. and Zhang, Z. 2004. Nitrous oxide emissions from agricultural toposequences in Alberta and Saskatchewan. Soil Sci. Soc. Am. J. 68:1285-1294.

17. Lemke, R.L., Karahabata, S. Goddard, T.W., and Desjardins, R.L. 2001. Assessing the Nitrous Oxide trade-off of managing soils to sequester carbon on two western Canadian sites. *In* American Society of Agronomy Abstracts. 92nd Annual Meeting, Charlotte, North Carolina. Oct. 21-25. (in press).

18. Lemke, R.L., McConkey, B.G., Izaurralde, R.C., Goddard, T.W., Selles, F., Campbell, C.A., Boehm, M., and Lindwall, C.W. Reduced tillage: Can it help conserve soils and reduce greenhouse gas emissions from western Canadian agriculture? Seminar presented to the Vocational and Technology University of Inner Mongolia, Nov. 12, 2001 Hohhut, China.

19. Lemke, R.L., McConkey, B.G., Izaurralde, R.C., Goddard, T.W., Selles, F., Campbell, C.A., Boehm, M., and Lindwall, C.W. Reduced tillage: Can it help conserve soils and reduce greenhouse gas emissions from western Canadian agriculture? Seminar presented to the China Agricultural University, Nov. 14, 2001 Beijing, China.

VIII. Karen Haugen-Kozyra, Environmental/Land Use Policy Member, Policy Secretariat

Karen is the chair of both the Beef and Pork Technical Working Groups. She is also involved with policy analysis and development regarding GHGs and

climate change in agriculture. Karen is also a member of the Manure Processing Technical Working Group, which is developing quantification protocols with the best available science in the areas of manure biodigesters, composting, and manure handling. Karen also sits on the National Offset Quantification Team (NOQT) working on developing quantification protocols to support the Canadian Offset System.

IX. Richard Heikkila, Senior Economic Analyst, Economics and Competitiveness Division

Richard is currently working on the economics of these three following GHG related projects:

1. An assessment of spring fertilizer placement versus fall placement, including greenhouse gas emissions, economic benefits and costs, and farm management factors.

2. An assessment of alternative renewable energy projects / technologies, including energy dynamics, greenhouse gas emissions, economic benefits and costs, and farm management factors.

3. An assessment of reduced summer fallow, including, greenhouse gas emissions, economic benefits and costs, and farm management factors.

The outcome of his work is to (a) have producer oriented fact sheets released (b) have an increased amount of producer understanding of the advantages and disadvantages of renewable energy schemes and (c) have an increased producer adoption of renewable energy sources.

X. Len Kryzanowski, **Crop Nutrient Research Agronomist**, Crop Diversification Division.

In terms of GHG related projects, Len has only worked on these projects:

1. Development of Scientifically Defensible Estimates of N_2O Emissions from Agricultural Ecosystems in Canada (CCAF, 00-03), Grant, Juma, Goddard, Kryzanowski, Zhang Solberg, Pattey.

2. Carbon sequestration and greenhouse gas flux in selected Alberta catenas containing wetlands (IWWR 02-07) Goddard, Kryzanowski, Brierley. Project in

association with sister projects at the University of Saskatchewan and University of Manitoba.

XI. Mimi Lee, New Venture Economist, Ag-Entrepreneurship Division.

The purpose of her GHG and climate change related work is to increase industry knowledge of carbon credit trading and its risk management by contracts and market place. She is planning these following GHG related activities in 2005:

1. Conduct a focus group study to identify specific client needs for information (market, contract, economics) to make informed decisions on carbon credit trading (to be completed in May 2005).

2. Research and compile a Carbon Credit Trading Manual (to be completed in June 2005).

XII. Kristian Stephens, Climate Change Agrologist, Conservation and Development Branch

Kristian is involved with the writing and production of the various GHG management (hog, cropping systems, cow/calf, feedlot, agroforestry, and alternative energy) booklets. Also Kristian is a member of both the Beef and Pork Technical Working Groups and makes public presentations on GHGs and climate change policy.

XIII. Kendall Tupker, Climate Change Specialist, Conservation and Development Branch

Kendall is also involved with the writing and production of the various GHG management booklets (hog, cropping systems, cow/calf, feedlot, agroforestry, and alternative energy). Kendall is also a member of the Manure Processing Working Group and makes public presentations on GHGs and climate change policy. Kendall also sits on the Alberta Adaptations to Climate Change Team (ACCAT) and the AESA GHG Task Team.