



The Gene Scene



Fall 2011 Volume 2

Information letter of the Canadian Farm Animal Genetic Resources Foundation

#14282 County Road #2, R.R. #4, Brighton, Ontario K0K 1H0

In the past nine months our Foundation provided the initial impetus and inspiration for the establishment of a Task Force, which has discussed and exchanged information on the challenges and opportunities facing the animal agriculture sector. The initial call to action from this group is a “Summit For Animal Agriculture” titled “Feeding A Hungry World” to be held in Ottawa October 17th and 18th, 2001.

Presentations and panel discussions will focus on five pillars:

- Animal Welfare
- Environmental Sustainability
- Food Safety
- Economic Viability
- Human Well Being

These pillars underpin the ongoing ‘Social Contract’ of the animal agriculture sector with consumers.

The goal of this first conference is the development of strategies and linkages for the sector as we move forward.

Our foundation will continue to be active with our principal focus on the issues of diversity and the preservation of genetic resources.

In this newsletter we focus on issues both in Canada and throughout the world as it pertains to animal agriculture, gene resources and research. The Foundation is calling on its members both individual and corporations to continue to provide needed financial support 2012. Included with this newsletter is a membership application for the next year.

It is interesting to note that registrations for Guernseys are near the same level as the Canadian breed. Is there concern about the Guernsey breed in Canada?

There is also concern about the declining number of Holstein bulls that are sires of the majority of the world’s Holsteins and an apparent decline in reproductive performance.

Dr. Don Wilson
Foundation Co-Chair

Jim Dalrymple
Foundation Co-Chair

Fall Issue 2011- The Gene Scene

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Feeding A Hungry World (Part One)

Donald McQ. Shaver O.C. D.Sc.

The Genesis of this two-part conference dates from a luncheon in October 2008 co-hosted by Dr. Alastair Summerlee and Dr. David Johnston, for 25 so-called thinkers, three members of our Task Force were present. A paper presented advocated the establishment of a bipartisan commission for Sustainable Economic development, reporting direct to parliament. Its function was to, “sift the wheat from the chaff”, with respect to the world’s capacity to adequately support a population at 9 billion. What are the key factors involved, then prioritize the order in which they should be examined, utilizing the full resources of the state.

We need to count the cost, environmentally and otherwise of our way of life in the developed countries, where greed and over consumption, trump thrift and sustainability. Increasingly we must relearn that in order to have a society based on our democratic rights, we must embrace an ever-growing area of new responsibilities.

The U.N. estimates there are 1.4 billion out of a present population of 7 billion who exist at the poverty level, and do not receive 3 meals a day. Can we extrapolate this shortfall to the projected 9 billion for the late 2040’s? Lester Brown, President of the Earth Policy Institute, in his latest book *World On The Edge*, says- “we are building a new economy that is in sync with the earth, and its natural support systems, not one that is destroying them. One powered with carbon free sources of energy– wind, solar and geothermal, one that has a diversified transport system, and that reuses and recycles everything.”

Skeptics are right to say there have always been droughts, floods, freak weather, heat waves and temperature extremes. What is concern now, however, is that extreme weather events are occurring with greater intensity and more often.

For the real weather extremes in 2011, look to Australia, China, and the Southern USA. Floods in Queensland Australia were called the country’s worst natural disaster ever. We saw the greatest flood in U.S. history, with dykes voluntarily breached. In Mexico the temperature peaked at 48.8C in April, the warmest anywhere in the world, that month.

With today’s population and that projected thirty year’s hence, the effects of extreme weather events, is much more significant in its impact, than something similar a hundred years ago, when world population was less than 1/7th of our present population.

It cannot be business as usual-on into the future. All indicators are that we are witnessing a sea change in our circumstances. It behooves us to, without delay, determine how we will counter these changes and plan for our future. Have we the will to inform ourselves about the real pressing issues that will transform our future—and do we do it soon enough, to exert a positive influence over humanity’s fate?

Suggested Plan

- (a) As accurately as possible, outline what the real situation is with respect to world food supply.
- (b) Identify what animal agriculture can contribute towards efficient, sustainable supply. Highlight synergies.
- (c) The resources we are capable of bringing to bear, in performing our role.
- (d) Eventually, the scientific, technology and academic support, together with vast improvement in ethical governance will be essential to success.

We cannot plan for the future of one sector in isolation. We must understand as best we can, the universal circumstances in which we will operate.

Donald McQ. Shaver O.C. D.Sc.

ANIMAL REGISTRATIONS IN CANADA

Year	Ayrshire	Brown Swiss	Canadienne	Guernsey	Holstein	Jersey	Milking Shorthorn
2010	6,382	1,720	247	257	271,280	8,435	275
2005	7,052	2,217	254	298	232,964	6,384	224
2000	7,925	1,421	206	464	214,244	6,531	310
1995	8,812	1,775	209	1,005	202,102	6,565	277
1992	10,039	2,142	302	1,267	212,653	7,064	367

Source: Breed Associations & Canadian Livestock Records Corporation



OTTAWA, ONTARIO, OCTOBER 17-18, 2011

Delta Ottawa Centre

101 rue Lyon Street, Ottawa Ontario

www.farmcarefoundation.ca/feeding-a-hungry-world-summit/

Summit Agenda

Monday, October 17th, 2011

- 4:30 - 5:30 pm Registration
- 5:30 - 6:00 pm Welcome and Reception, Dr. John Kennelly, Conference Chair, Dean, Faculty of Agricultural, Life and Environmental Sciences, University of Alberta, Edmonton, Alberta
- 6:00 - 7:00 pm Dinner
- 7:30 - 9:00 pm Key Note Address & Discussion – Feeding a Hungry World: Hunger Has No Boundaries. Dr. Alastair Summerlee, President and Vice Chancellor, University of Guelph, Guelph, Ontario

Tuesday, October 18th, 2011

- 8:00 - 8:15 am Welcome, Chair, Crystal Mackay, Ontario Farm Animal Council/AGCare, Guelph, Ontario
- 8:15 - 8:45 am The Need for More – How Increasing Productivity will Help Save the Planet and Feed the World, Charlie Arnot, CEO, Center for Food Integrity, Gladstone, Missouri
- 8:45 - 9:15 am Meeting and Exceeding Canadian (And Global) Consumer Needs, Stephen Graham, Chief Marketing Officer, Maple Leaf Foods Inc., Toronto, Ontario
- 9:15 - 9:45 am Making Safe, Affordable and Abundant Food a Global Reality, Rob Aukerman, President U.S. Operations, Elanco Animal Health, Indianapolis, Indiana
- 9:45 - 10:15 am Refreshment Break
- 10:15 - 10:45 am Supporting Agricultural Innovation and Stewardship, Dr. Lorne Hepworth, President CropLife, Ottawa, Ontario
- 10:45 - 11:15 am Redefining Food Innovation for a Health and Hunger Challenged World, Dr. Mark Lyons, Vice President – Corporate Affairs, Alltech, Inc., Nicholasville, Kentucky
- 11:15 - 11:45 am Meeting Environmental and Climatic Change, Dr. Jean-Paul LaForest, Chair, Department of Animal Sciences, Université Laval, and Summit Vice-Chair, Québec City, Quebec
- 11:45 - 12:30 pm What Now, What Next: Food Security and the Prairies, Panel Discussion - Chair: Dr. Mary Buhr, Dean and Professor, College of Agriculture and Bioresources, University of Saskatchewan, Saskatoon, Saskatchewan
Panelists: John Oliver, Ted Bilyea and Dr. Tim McAllister
- 12:30 - 1:30 pm Lunch Break
- 1:30 - 2:30 pm Table Discussions Focused on the 5 Pillars, Chair, Charlie Gracey, Director, Alberta Livestock and Meat Agency (ALMA), Ancaster, Ontario
- 2:30 - 3:00 pm Individual Review of Feedback from Table Discussions
- 3:00 - 3:15 pm Refreshment Break
- 3:15 - 3:30 pm Themes and Directions from Table Discussions
- 3:30 - 4:00 pm Moving Forward With Our Strategy, David McInnes, President and CEO, Canadian Agri-Food Policy Institute (CAPI), Ottawa, Ontario
- 4:00 - 4:15pm Closing Remarks, Dr. John Kennelly, Conference Chair, Dean, Faculty of Agricultural, Life and Environmental Sciences, University of Alberta, Edmonton, Alberta
- 4:15 pm Adjourn

Swine Improvement- An Ongoing Process

Jim Dalrymple

The Canadian Centre for Swine Improvement (CCSI) created in 1994, recently held its 2011 annual meeting in Ontario. The CCSI continues to work to make progress in spite of the recent disastrous prices in the Canadian pork industry. Current research will continue to provide producers with the latest genetic improvement opportunities that should enhance the many quality pork products for Canadian consumers and foreign markets.

Canadian purebred swine are recognized throughout the world and the CCSI with the support of producers, government and industry looks to ways to continue to enhance pork production and pork products. The CCSI's mandate is to enhance the ability of the Canadian Swine Industry to compete domestically and abroad, by providing leadership, coordination and services for swine genetic improvement.

The Board of Directors consists of representation from:

Canadian Pork Council, Canadian Meat Council, Canadian Swine Breeders Association, Atlantic Swine Centre, Centre De Developpement Du Porc Du Quebec Inc., Ontario Swine Improvement Inc., and the Western Swine Testing Association

The past year was a positive year financially for CCSI and saw accomplishments in each of its main areas of focus including national standards, the national database, genetic improvement and research and development. CCSI participates in the National

Pork Value Chain Round Table (NPVCRT) and the stakeholders identified six key priority areas:

Animal Health • Meat and Carcass Quality • Production Efficiency • Food Safety & Bio-Security • Diversity & Bio-Resources • Environmentally Responsible Production

Genetic Improvement Services

There were 82,757 pigs tested under the Canadian Swine Improvement Program between April 1st, 2010 and March 31st, 2011. This number included 78,683 purebred pigs.

Pigs Scanned In 2010 By Breed

Yorkshire 50% • Landrace 29% • Duroc 14%
Crossbreds 5% • Other 2%

Genetic Evaluations

Routine national bi-weekly evaluations are provided for 7 breeds (Yorkshire, Landrace, Duroc, Lacombe, Hampshire, Pietrain, Tai Zuma) for the following traits:

-Age, backfat, lean depth, lean yield, loin eye area, feed conversion ratio

-Litter size, perinatal piglet survival, number of piglets weaned per litter, litter weight at weaning, age at first farrowing and farrowing interval,

-number of functional teats

-piglet birth weight variability

Genetic Improvement

The table below shows the genetic gains obtained this past year compared to previous years, assuming a crossbreeding system using a terminal Duroc boar on a Landrace X Yorkshire hybrid sow. There was an acceleration of genetic change for lean yield and loin eye area. The rate of genetic progress on days to market, backfat, loin muscle depth and feed conversion ratio was maintained in 2010 when compared to the previous five years, while the genetic gain on litter size was lower.

Trait	Units	Ave. Change Per Year 2004-2009	Gains In 2010
Days to market	Days	-1.24	-1.20
Lean Yield	%	+0.07	+0.10
Loin Eye Area	cm ²	+0.27	+0.38
Feed Conv.	Ratio km feed/km gain	- 0.017	-0.017
Backfat	mm	-0.15	0.13
Loin	Muscle Depth mm	+0.35	+0.35
Litter Size at Birth	piglets/litter	+0.19	+0.11

Research Projects

CCSI coordinates or collaborates with numerous organizations on projects of value to the Canadian industry. These include:

- Genome Canada project on swine health
- Canadian Swine Health Board project with PigGen Canada
- Alberta Livestock Genomics Program
- USDA project on PRRS
- Development of a solution for boar taint

Development of new genomic tools for swine genetic improvement

The project, development of a solution for boar taint, is led by Ontario Swine Improvement in collaboration with CCSI and aims to develop a solu-

tion for boar taint via genetic markers. Researchers at the University of Guelph have developed genetic markers for boar taint based on candidate genes that encode the enzymes involved in the synthesis and degradation of the boar taint compounds.

The specific objectives of the project are to investigate the association between genetic markers and boar taint levels in major Canadian swine breeds, to study the relationship between economically important performance traits and genetic markers for boar taint and to develop methods for the potential selection against boar taint using genetic markers.

Upcoming Events

ICAR Conference 17th International Congress On Animal Reproduction

“Celebrating The Past And Embracing The Future”

This ICAR event is scheduled for Vancouver, British Columbia July 27th to August 2nd, 2012.

Plenary sessions will include:

- Global health and the future of domestic animal reproduction
- Post-natal consequences of prenatal development
- Beyond the bench-expanding the educational impact of reproduction

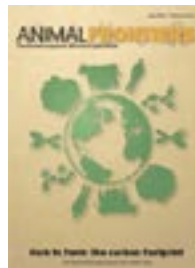
Symposia include:

- Stem and germ cell research and its application
- Cloning research and its application
- Oocyte and embryo health
- A new understanding of sperm cell development and its function

For further information contact::

Advance Group Conference Management Inc.
Suite 101-1444 Alberni Street
Vancouver, B.C. V6G 2Z4
Tel: 1-604-688-9655 (Extension 2)
Email: info@icar2012.com

Interesting Reading



Animal Frontiers

This review magazine of animal agriculture is co-published by the American Society of Animal Science (ASAS), the Canadian Society of Animal Science (CSAS), and the European Federation of Animal Science (EAAP).

What is Animal Frontiers?

Each issue of Animal Frontiers will consist of a series of invited, peer-reviewed articles that present several international perspectives on the status of a high-impact, global issue in animal agriculture today.

The primary missions of the ASAS, CSAS, and EAAP have been to encourage and promote communication of the best animal science research worldwide and to ensure that decisions affecting animal agriculture consumers are made based on current and relevant scientific information.

To read the July issue of Animal Frontiers, “Fork to Farm: The Carbon Footprint,” visit <http://www.animalfrontiers.org/2011/Vol1/full.pdf>

CRYOCONSERVATION OF AVIAN GENETIC MATERIAL

F. G. Silversides, PhD

Agriculture and Agri-food Canada, Agassiz Research Centre

September 7, 2011

The avian genome can be accessed at different times in the birds' life cycle providing several alternatives to the historically difficult problem of storing genetic material. Keeping living birds is expensive and populations are routinely discarded if they aren't being used. Semen can be frozen, stored in liquid nitrogen and recovered, and genetic conservation doesn't require the high levels of fertility needed by industry but the "w" chromosome and mitochondrial DNA are lost and reconstitution of a line by backcrossing is slow. Unlike in mammals, the female zygote and the embryo don't provide access to the germline because of the structure of the avian egg. In the embryo, primordial germ cells (PGC), those cells that will produce the gametes, have been proposed for conservation and their use has been demonstrated to a very limited degree. Unfortunately, the efficiencies of isolation and recovery of PGC is so low that they don't provide a method for storing genetic resources. However, the PGC migrate to populate the gonads,

and the gonads provide a convenient access point to the germline when the chicks hatch.

Song and Silversides (2007) used pure lines of Barred Plymouth Rocks and White Leghorns to show that avian ovaries from day-old chicks can be transplanted into ovariectomized day-old chicks, and that the transplanted ovaries are functional and produce donor-derived chicks. Liu et al. (2010) showed that ovaries of Japanese quail could be vitrified (very rapid cooling), stored, and recovered with efficiency comparable to that of fresh tissue. These studies provide the basis for an efficient and economical method of preserving, storing, and recovering avian genetic material.

With the availability of techniques for cryoconservation, Silversides et al. (under review) compared costs of maintenance in vivo with those of preservation, storage, and recovery of avian populations using cryoconservation (Table 1).

Table 1. Straws stored, time for recovery, and costs of preservation, storage, and recovery of avian lines with $N_e=50$

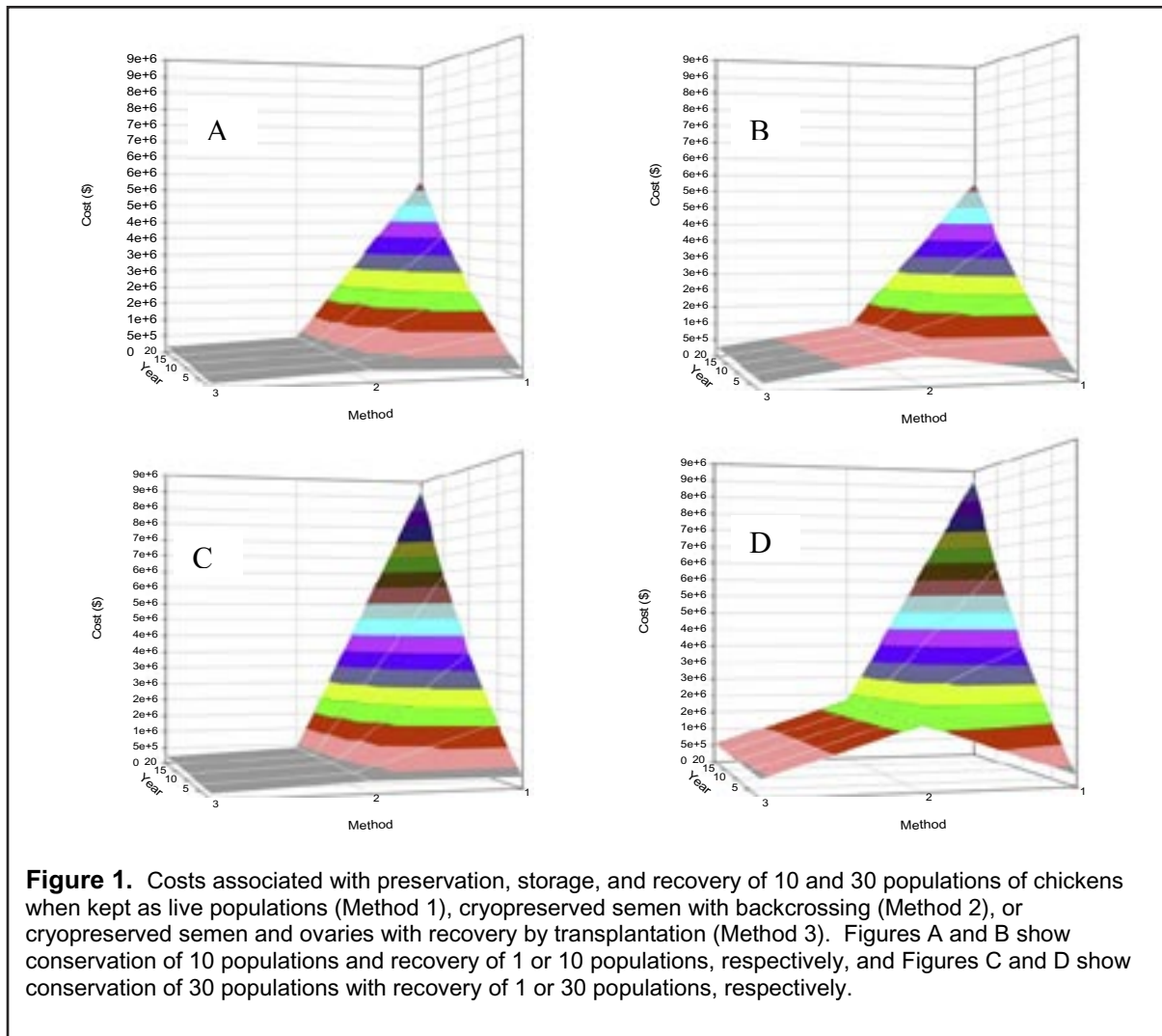
Method	Straws per line	Recovery time	Preservation		Annual cost		Recovery	
			1 line	20 lines	1 line	20 lines	1 line	20 lines
Live	0	0	0	0	\$104,479	\$236,010	0	0
Backcrossing with semen	188	3 yr	\$2,370	\$21,947	\$1,614	\$2,364	\$263,578	\$1,144,280
Ovaries and semen	113	43 wk	\$2,295	\$29,540	\$1,614	\$1,864	\$91,720	\$301,655

They then applied these costs to an overall conservation program and calculated compounded costs over 20 years using the three approaches.

Figure 1 (page 7) shows that if a population is not being used, any potential benefit of a conservation program must be very large to justify its maintenance as a living population. However, either method of cryopreservation and recovery may be practical because the costs of recovery are incurred in the period immediately before any potential use, and the yearly costs of storage are near zero. Cryoconservation and recovery of ovaries takes less than a year to complete and recovers the complete genome. Overall, keeping live populations to

conserve genetic variation in poultry has been a failure, and arguments in favor of live populations have been ineffective, almost surely because the costs are large and the future benefits are undefined. Storage and recovery of gonads provides an economical and efficient method of maintaining avian populations.

The technology developed at Agassiz in collaboration with UBC has changed how we can think about conserving avian genetic resources and allows us to think further than the 18 avian populations currently



think further than the 18 avian populations currently maintained. The avian research community has searched for a solution to declining genetic resources and we've provided the technological background which could be used to follow a model used for other organisms, such as the Jackson Lab for mice, to allow us to cryoconserve avian genetic material and bring it back as living birds on demand to serve both agriculture and basic research. The gonadal transplant technology has been developed for conserving poultry genetic resources, but it has wide potential applications in the study of reproduction in birds, and the possibility of interspecific transplants (Song et al., in press) makes it of great interest in the conservation of rare species.

Liu, J. N., Y. Song, K. M. Cheng., and F. G. Silversides. 2010. Production of donor-derived offspring from cryopreserved ovarian tissue in Japanese quail (*Coturnix japonica*). *Biol. Reprod.* 83:15-19.

Silversides F. G., P. H. Purdy, and H. D. Blackburn. Relative costs of storing and recovering chicken genetic material using live populations, cryopreserved semen, and cryopreserved semen combined with cryopreserved ovaries. *Poult. Sci.* under review.

Song, Y. and F. G. Silversides, 2007. Offspring derived from orthotopic ovarian transplants in chickens. *Poult. Sci.* 86:107-111.

Song, Y., K. M. Cheng, M. C. Robertson, and F. G. Silversides. Production of donor-derived offspring after ovarian transplantation between Muscovy (*Anas platyrhynchos*) and Pekin (*Cairina moschata*) ducks. *Poult. Sci.* in press.

Canadian Farm Animal Genetic Resources Foundation Board of Directors—2011

Co-Chairmen:

Dr. Don Wilson,
1403 Lake Fraser Court SE.,
Calgary, Alberta T2J 7G4
Tel: 403-225-1085
Email: drbitti@telus.net

Mr. Jim Dalrymple,
#14282 County Road #2,
R.R. #4 Brighton, Ontario K0K 1H0
Tel: 613-475-2701
Email: jrdalrymple@hotmail.com

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Queen's Square Terrace,
10 Melville Street North,
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Greeley, Ontario K4P 1M6
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2708 West 30th Street
Vancouver, British Columbia V6L 1Y9
Tel: 604-822-2480 C: 604-218-2468
Fax: 604-822-4400
Email: kmtc@mail.ubc.ca

Mr. Keith Flaman,
Holstein Canada,
Box 610, Brantford, Ontario N3T 5R4
Tel: 519-756-8300 Fax: 519-736-3502
Email: kflaman@holstein.ca

Dr Peter Hunton,
R.R. #4, West River Road, Cambridge,
Ontario N1R 5S5
Tel: 519-622-3714 Email:
phunton@sympatico.ca

Dr. Jean-Paul Laforest, Chair,
Department of Animal Science
Universite Laval, Pavillon Paul-Comtois,
2425 rue de l'Agriculture,
Quebec, Quebec G1V 0A6
Tel: 418-656-2131 Ext: 8349
Fax: 418-656-7806
Email: fsaa@fsaa.ulaval.ca

Mr. Ted Lawrence,
221 Clarence Street,
Ottawa, Ontario K1N 5P9
Tel/Fax: 613-789-1081
Email: ted@storm.ca

Dr Pramod Mathur,
60 Farden Way, Ottawa Ontario K1G 4N4
Tel: 613-738-0528
Email: pramod.mathur@rogers.com

Dr Stephen Moore,
Dept. of Food and Nutrition,
University of Alberta,
4-10 Agriculture Forestry Centre,
Edmonton, Alberta T6G 2P5
Tel: 780-492-0169
Email: Stephen.moore@nfns.ualberta.ca

Dr. Dian Patterson,
Associate Vice-President Academic,
Box 550,
Nova Scotia Agricultural College,
Truro, Nova Scotia, B2N 5B4
Tel: 902-896-2464 Fax: 902-893-3430
Email: DPATTERSON@nsac.ca

Dr Reuben Maplettoft,
Distinguished Professor,
Dept. of Large Animal Clinical Sciences,
Western College of Veterinary Medicine,
University of Saskatchewan,
Saskatoon, Saskatchewan, S7N 5B4
Tel: 306-966-7149 Fax: 306-966-7159
Email: reuben.maplettoft@usask.ca

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OTTAWA, ONTARIO, OCTOBER 17-18, 2011

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Corporate Member Name: _____

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Corporate	Individual
Platinum : 2000 \$ _____	
Gold : 1000 \$ _____	Gold: 150 \$ _____
Silver : 500 \$ _____	Silver: 100 \$ _____
Bronze : 100 \$ _____	Bronze: 50 \$ _____

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Website: www.cfagr.com

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