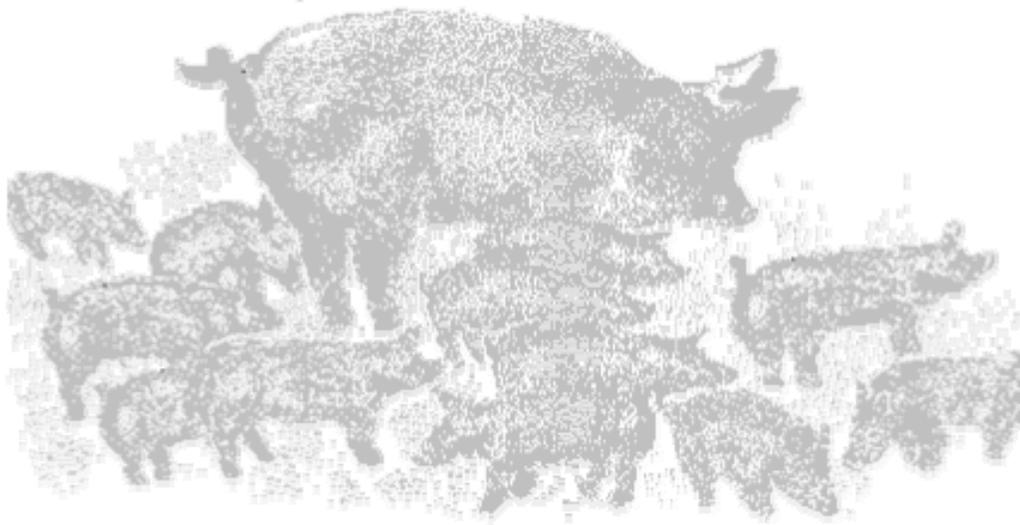


Canadian Centre for Swine Improvement

Annual Report 2004/2005



Annual Meeting
June 15, 2005
Quebec City





The Canadian Centre for Swine Improvement Inc. is a national organization managed by a Board of Directors with representatives from the following member organizations:

CANADIAN PORK COUNCIL

CANADIAN MEAT COUNCIL

CANADIAN SWINE BREEDERS ASSOCIATION

ATLANTIC SWINE CENTRE

QUEBEC CENTRE FOR SWINE IMPROVEMENT INC.

ONTARIO SWINE IMPROVEMENT INC.

WESTERN SWINE TESTING ASSOCIATION

CCSI's mission 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.

Central Experimental Farm, Building # 54, Ottawa, Ontario, K1A 0C6
Telephone: (613) 233-8872 - FAX: (613) 233-8903
E-mail: info@ccsi.ca Internet: www.ccsi.ca



Canadian Centre for Swine Improvement Inc.

Annual Report 2004/2005

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1. Message From The Chairman

In the last year the Board of CCSI has been busy with the financial aspect of the organization. All of our reserves have been depleted and the Board felt the urgent need to make CCSI operate within a balanced budget. After some discussion a decision was made for a substantial increase in the fees collected from users of CCSI genetic evaluation services. We are happy for the contribution given by the government for the research and development work that CCSI is conducting. In the coming year we will continue working within the framework of a balanced budget and also become more aggressive in marketing our technical services to the livestock industries, thus creating a more positive cash flow.

CCSI is close to signing an agreement with GENTEC of Belgium for the exclusive rights for testing for the IGF2 gene in Canada. These tests will soon be available to the breeding stock industry. It is our hope that this will give CCSI a greater exposure in the Canadian industry.

It is important that CCSI plays a leading role in examining meat quality of pigs with the IFG2 gene, pigs fed Paylean additives and pigs with European genes that have been added to our gene pool. We would also assess the effect these changes have on the heavier carcasses that the market is demanding.

Since Canada is ranked on top as a pork-exporting nation with well recognized meat quality, it is most important to give this our immediate attention as these new techniques become available. We must ensure that the Canadian Breeding stock will continue to produce hogs of the highest quality for our domestic and international markets. Therefore we would do well to strengthen our relationship with the regional centres, marketing boards and packers, federal and provincial governments, Universities, and research facilities in Canada and abroad.

In conclusion I would like to thank all the Board members for their time and effort. Thank you to Brian for managing CCSI. And thank you to the CCSI staff for their diligent work and service to CCSI and their clients. I would like to wish everyone a good and profitable year in the hog industry.

Chairman

John Vande Glind

2. Proposed Agenda for June 15, 2005

1. Message from Chair
2. Approval of agenda
3. Approval of minutes from last Annual Meeting - June 18, 2004
4. Activity reports
 - 4.1 General Manager's report
 - 4.2 Chief Geneticist's report
 - 4.3 Computer Services Manager's report
5. Presentation and approval of financial report
 - 5.1 Financial report for year completed March 31, 2005
 - 5.2 Selection of Auditor
6. CCSI awards
7. Names of Directors appointed to CCSI's 2005/06 Board
8. Other business
9. Adjournment

3. Minutes From Last Annual Meeting

**ANNUAL MEETING OF THE CORPORATION
Delta Hotel, Winnipeg, Manitoba
June 18, 2004**

Board of Directors 2003/04

André Auger	Canadian Swine Breeders Association
Stanley Boudreau	Canadian Pork Council
Larry Campbell	Canadian Meat Council
Bernard Dion	Centre de Développement du Porc du Québec
Lloyd Evans	Atlantic Swine Improvement Centre
Pierre Falardeau	Centre de Développement du Porc du Québec
John Gough	Ontario Swine Improvement
Pat O'Meara	Western Swine Testing Association
Adrian Power	Atlantic Swine Improvement Centre
Phil Smith	Ontario Swine Improvement
John Vande Glind	Western Swine Testing Association

Board of Directors 2004/05

André Auger	Canadian Swine Breeders Association
Stanley Boudreau	Canadian Pork Council
Larry Campbell	Canadian Meat Council
Bernard Dion	Centre de Développement du Porc du Québec
Pierre Falardeau	Centre de Développement du Porc du Québec
John Gough	Ontario Swine Improvement
Donald MacDonald	Atlantic Swine Improvement Centre
Phil Smith	Ontario Swine Improvement
John Vande Glind	Western Swine Testing Association
Alfred Wahl	Western Swine Testing Association

Directors present at the meeting were Auger, Boudreau, Dion, Falardeau, Gough, MacDonald, Smith and Wahl. Wim Van Berkel attended in place of John Vande Glind as a director from Western Swine Testing Association.

1. Message from Chair

Pierre Falardeau opened the meeting at 10:44 am. The Chair's message is shown on page 3 of the 2003/04 Annual Report.

2. Approval of Agenda

Moved by Gough. Seconded by Van Berkel. Carried.
That the agenda be approved as circulated.

3. Approval of minutes from the last Annual Meeting

Moved by Wahl. Seconded by Dion. Carried.
That the minutes be approved as circulated.

4. Activity Reports**4.1 General Manager's Report**

The General Manager's report was read by B. Sullivan and is shown on pages 7 and 8 of the 2003/04 Annual Report.

4.2 Chief Geneticist's Report

The report of the Chief Geneticist was presented by Dr. P.K. Mathur and is shown on pages 9 to 12 of the Annual Report.

4.3 Computer Services Manager's Report

The report of the Computer Services Manager was presented by J. Groves and is shown on page 13 and 14 of the Annual Report.

5. Presentation and Approval of CCSI's Financial Statements**5.1 Financial statements for year completed March 31, 2004**

Moved by Wahl. Seconded by Auger. Carried.

That CCSI's financial statements for 2003/04 be approved as circulated.

5.2 Selection of an Auditor

Moved by Wahl. Seconded by Gough. Carried.

That Bath Haché LLP be selected as the firm to conduct the next financial audit for CCSI.

6. CCSI Awards

John Vande Glind was the winner of the Brian Kennedy Memorial Award for 2003/04. Wim Van Berkel received the award on John's behalf. George and Tony Matejka were the winners of the CCSI Swine Breeders' Merit Award. Alfred Wahl presented the award to George Matejka.

7. Names of Directors appointed to CCSI's 2004/05 Board

Members of the Board of Directors for 2004/05 are listed in Appendix 1 of the Annual Report.

Moved by Gough. Seconded by Dion. Carried.

To invite Agriculture and Agri-Food Canada to join CCSI as an Associate Member.

8. Other business

There was no other business.

9. Adjournment

Moved by Van Berkel and seconded by Auger that the meeting be adjourned.

The meeting was adjourned at 11:30 am.

4. Activity Reports

4.1 General Manager's Report

The WTO replaces GATT. The Russian Mir space station greets first Americans as US shuttle docks with station. O.J. Simpson is acquitted of double murder. A bomb blast kills 169 in Oklahoma City. The NO side on Quebec sovereignty wins a narrow victory. Windows 95 is released. So what were you doing ten years ago, as CCSI was just starting its first year of operations? As we report on CCSI's 10th year of operations, I would like to take the opportunity to look back at how things were in 1995 and highlight a sample of changes that have taken place.

Willard MacPhail chaired CCSI's annual meeting in Stratford, Ontario on June 21, 1996 to report on the first year of operations. Other members of the Board were Bernard Tracey, Adrian Power, André Auger, Serge Lebeau, Allan Faris, Tim Lambert, Walter Weber, Rennie Heare, David Craven, Larry Campbell and Jacques Ruel. Jacques Chesnais was the General Manager.

The programs which CCSI inherited from Agriculture Canada consisted of a weigh and probe program to collect data for age and backfat evaluations. These two traits were combined into a simple index for selection on lean growth. There was also a sow productivity program which was used to varying degrees across the country. Genetic evaluations for litter size and a dam line index were being produced, but only for dams and maternal grandsires of participating breeders.

Today the program has expanded to include ultrasonic measurement of loin muscle depth, and genetic evaluations for lean yield, loin eye area, loin muscle depth and feed conversion ratio. Litter size evaluations and dam line index are computed on all pigs, not just ancestors, and evaluations for all traits are available on the day of probing.

In 1995, data was sent to CCSI on computer tapes every 3 months, and after running new evaluations on the Department's IBM mainframe, printed reports were produced for sires and dams, and mailed to producers about 1 month after the end of each quarter. Computer tapes containing national evaluations were distributed to the regional centres to be used in computing interim evaluations on new pigs for backfat and age.

Today, data is transferred to CCSI several times a month using self-serve applications on the CCSI web site. In many cases new data is transferred over the Internet directly from on-farm software on the day of testing. New data can be loaded into the national database on demand 24 hours a day, 7 days a week. Once loaded, tools for customized selection and tools to help with planned mating decisions can be used right away. Interim genetic evaluations are available for newly tested pigs within minutes and full national evaluations are updated twice a month. There is a wealth of interactive tools available through the web site to help breeders make selection decisions and monitor results.

All these enhancements certainly add convenience and many useful tools, but the proof of value is really in the results. As you can see in other sections of this report, we have seen substantial genetic improvement in new traits such as litter size and loin eye area, and much faster rates of improvement in general for traits of economic value to the

industry. This is particularly true in the last two years, as shown in the Chief Geneticist's Report.

As we start into CCSI's 11th year of operations, we are also poised to integrate new evaluation systems for piglet survival, several meat quality traits, number of functional teats and conformation into the existing array of selection and mating tools. Molecular genetics research has advanced to the point where there are now some very promising gene tests available that will also be integrated into the program. Many more exciting opportunities are developing in the area of molecular genetics discoveries. Promising research is on-going which we expect will lead to such things as selection based on live predictions of pork quality and genetic selection for general disease resistance.

More and more there is also a focus on helping the commercial industry make the best use of genetics. Tools will be available to assist producers and others in monitoring slaughter and productivity data, and to help optimize the use of genetics and other management tools. Development of commercial tools is particularly important for the breeding sector, as they will serve to both quantify the value of genetic improvement and to help customers make the best use of their genetic products.

We can predict with very little doubt, that ten years from now we will look back and see again such large new developments that have taken place. Simply developing and integrating today's known technologies into existing programs will achieve this result. Keeping abreast of new research discoveries and being prepared to take advantage of the newest technologies will lead to even greater achievements.

In Canada, we are fortunate to be among the world leaders in swine genetic improvement. We can thank the visionaries in governments and Canadian universities who recognized the opportunities this would create for the Canadian pork producing industry. More recently, we can thank the leadership of CCSI's Board and the willingness of the industry to continue to support genetic improvement in the past 10 years since the programs have been privatized. The future success is now in good hands with strong industry and government support, and I very much look forward to the 20th anniversary. It will be here much faster than many of us would anticipate.

I would like to express my personal gratitude to the Board of Directors, to CCSI's member organizations, to Agriculture and Agri-Food Canada and to all the users of CCSI services for their confidence and support. Thank you also to the staff at CCSI for their continued dedication and professionalism. The support we have from industry and government is a reflection of the high quality of service provided. We are making a tremendous difference for the Canadian industry and I look forward to many more exciting and successful years together at CCSI.

Brian Sullivan

General Manager, CCSI

4.2 Chief Geneticist's Report

Another year of additional developments in genetic evaluation services and in research and development has been completed. Given below is a summary of some of the main activities.

1. Genetic evaluations for production traits

The production runs for genetic evaluations for backfat, age, carcass traits and litter size and for evaluation of connectedness have continued on a regular pace. Testing for bi-weekly evaluations has been done for several months now. The process requires more resources in addition to the monthly runs and additional data for evaluations during the middle of the months. Parallel developments have been made on the web tools and direct transfer of data to CCSI through new data transfer techniques. The total number of pigs tested on the national program has remained steady with some increase in testing activities in Western Canada. Summaries of the home tests for production and sow productivity traits are given in appendices 4 and 5, respectively.

2. Genetic improvements

There have been significant genetic improvements for traits evaluated in the Canadian Swine Improvement Program in 2004, following the trend in 2003. The genetic changes in Yorkshire, Landrace and Duroc breeds and expected genetic improvements in market hogs are given in appendix 6. The improvements in Duroc as a sire line and F1 crosses between Yorkshire and Landrace maternal lines are expected to contribute significantly to the economics of the commercial herds. The trends of improvements in different traits have continued as shown in Appendix 7. As a result, the new gilts and sows from the national program are expected to be more efficient and cost effective. The commercial herds should take advantage of these improvements in genetics by replacing the older sows, especially those that have fertility and feet and leg problems.

The table below shows expected improvements in hogs for the last year two compared to the average of the previous five years.

Trait	Unit	Value (\$/unit)	Average annual gain 1998-2002	Gain in 2003	Gain In 2004
Age	Days	-0.27	-1.4	-1.6	-1.4
Lean Yield	%	1.17	0.12	0.14	0.17
Loin Eye Area	sq cm	0.08	0.20	0.30	0.40
Feed Conversion	kg/kg	-18.75	-0.020	-0.023	-0.021
Backfat	Mm	-1.83	-0.25	-0.30	-0.30
Lean Depth	Mm	?	0.13	0.20	0.20
Number Born	Pigs/litter	24.74	0.20	0.27	0.33

The market hogs in commercial herds are therefore expected to have faster growth, better feed efficiency, higher lean yield and larger loins.

3. New services

Several new applications and reports have been added to CCSI's website. The Herd Activity Monitor (HAM) reports have been revised to include new traits. New applications include "Pig Query" and "Pig EBVs" which are important additions to "Pigs on The Web" to get information on a large number of pigs through a single click. More applications for on-line genetic evaluations such as those for number of teats and other conformation traits have been developed. Breeders on the national program are encouraged to make use of these new applications in their selection programs for further increasing the rate of genetic progress in their herds. More information is available in the report from Jim Groves, CCSI's Computer Services Manager. In addition to these services, protocols and procedures have been developed for collection of blood and tissue samples for DNA extraction and tests for specific genes such as IGF2.

4. Services to CSBA

CCSI is working closely with CSBA. The new services through this collaboration include electronic registration and other services through the new CSBA website hosted by CCSI. This also offers opportunities for representation of the genetic sector in national meetings and committees.

5. New evaluations

Programs for genetic evaluations for six different feet and leg traits, four traits for toes as well as for number of teats have been developed. The EBVs are calculated through a self-serve web application that will also serve as model for other new traits. Further developments in the evaluation procedures have been identified that include, computation of economic weights, selection indices, adjustments for heterogeneous variances, etc. As there is an increase in the litter size, new genetic evaluations have been developed for piglet survival. Pilot testing is being done with several herds. These evaluations require recording of the new variables such as number of piglets alive after 24 hours, level of assistance during farrowing, stillbirths, etc. according to the guidelines developed by CCSI earlier. In some cases the programs used through regional centres will have to be adapted to collect the required data and transfer them to CCSI. The evaluation programs for meat quality traits are also ready to be used. Data have been collected on a large number of pigs in Western Canada and Quebec. These will be used for computing breeding values and selection for improving important attributes of pork such as marbling, colour, pH and water holding capacity.

6. New research projects

Two new major research projects that have begun intensively at CCSI are supported by the ACAA program of Agriculture and Agri-Food Canada and CCSI's member organisations. One of them relates to the use of molecular information for current emerging issues and the other one relates to demand for heavier carcass weights. Summaries of these projects are given in Appendix 8. Two projects on study of the new Swine Disease Resistance (SDR) test developed by PharmaGap are in progress, one in collaboration with CDPQ and another with International Genetics PEI. The newly started WSTA project on meat quality has begun working in full swing. Over 800 pigs have been slaughtered and evaluated for the meat quality traits.

In addition to providing services to the member organisations, these projects have been a significant source of revenue and have helped boost CCSI's image in the Canadian swine industry.

7. National committees

The Pork Value Chain Roundtable is one of the important initiatives by Agriculture and Agri-Food Canada and the Canadian Swine Industry that CCSI participates in. This has led to a benchmarking study as well as developments of a Canadian pork story and a strategic plan to develop a distinct Canada brand and promote the image of the swine industry in the international markets. Another important activity initiated by the Canadian Pork Council is the development of systems to trace back from pork to pig and from pig to the farm of origin. CCSI has participated in the National Hog Identification and Traceability System Working Committee and the business plan committee and provided input regarding the identification systems used for purebreds. CCSI also participated on behalf of CSBA in the Canadian Agriculture and Food International (CAFI) Program committee that has reviewed the guidelines for the projects used to promote export of Canadian genetics internationally. A national centre for genetic resources has been established in Saskatoon with initiative from the Canadian Farm Animal Genetic Resources Foundation (CFAGRF) and support from Agriculture and Agri-Food Canada. More information about the foundation's activities are given in the "Gene Scene" newsletter which is also available through the foundation's website.

I would like to thank the members of these committees for their cooperation.

8. International activities

CCSI's geneticists have attended several international workshops and seminars. They presented reports as well as gained new knowledge about international activities and trends and established new contacts. These include the Meeting of the European Association for Animal Production (EAAP) in Slovenia, Swine Research Days in France, the International Society of Animal Genetics (ISAG) meeting in Japan, the SPACE trade-show in France in collaboration with CSEA, and the trade mission for the Canadian Swine Genetics Seminar in China and Taiwan. Recently a delegation of senior geneticists from China visited Canada and discussed with CCSI our national genetic improvement program. Presentations on the Canadian Swine improvement program have also been made to other foreign delegations.

9. Collaboration with organisations in the US

CCSI has been participating in the meetings of the National Swine Improvement Federation (NSIF) in the US. Recently there has been more interaction with NSIF, the National Swine Registry (NSR), Iowa State University and Purdue University. CCSI will be hosting the next meeting of NSIF on December 1-2, 2005 in Ottawa. This will include participation from breeders, producers and research communities in US, Canada and other parts of the world.

10. Training activities

CCSI has continued to be involved in providing training to technicians and breeders in swine genetic improvement. The recent training sessions focused on principles of

selection and use of the Breeding for Profit program in selection decisions. There has been a positive interest and support from participants.

11. Genetic evaluations for goats, sheep and rabbits

CCSI continues to provide genetic improvement services for the Canadian dairy goat industry. The research project on juvenile selection for dairy goats supported by Ontario Ministry of Agriculture (OMAF) has completed two years. Discussions have taken place recently with the rabbit industry in Quebec, and a proposal to provide genetic evaluation services for rabbits has been developed for implementation over a 3-year period. Discussions have also taken place with the sheep industry in Quebec and Ontario to provide services related to genetic evaluations and improvements.

12. Sharing the common vision

Our involvement with the national organisations in the pork value chain, through various committees and meetings over the past two years, has made it possible for us to share a common vision with other industry partners. We are now part of the planning and implementation process. This allows us to understand the future needs of the pork industry in Canada, position the genetic sector to be prepared years ahead to meet those needs and also convey our current role to other industry partners, research institutions and the government. Given the support from the industry, the member organisations and Agriculture and Agri-Food Canada, CCSI is now in position to provide better services to its members and to the entire industry.

I would like to end by acknowledging contributions from the member organisations, dedicated technicians across Canada, staff of the regional centres and genetics committee members. Thanks to Brian, Yuefu, Laurence, Jim, David, Li, Tracy-Lynn and Francine for their contributions.

A list of the reports on some of the activities during the year 2004 is given in Appendix 9. These reports are available on CCSI's website at: www.ccsi.ca/reports_2004/main.cfm

Pramod Mathur
Chief Geneticist, CCSI
June 2005

4.3 Computer Services Manager's Report

1. New server

A new server has been purchased to replace the aging Unix server that performs the monthly evaluations, holds the CCSI database, and supports research and development tasks. It is running the Linux operating system and the r3 release of Ingres, both of which are open-source software. This allows the use of non-proprietary hardware, resulting in an enormous cost saving.

Technically, it has dual 3.6 GHz processors, a total of 600 GB of hard drive space, and 8 GB of memory. This compares to 185 GB of hard drive space and 1 ¾ GB of memory for the current machine.

Although there are many variables when comparing performance, one part of the evaluation that takes about 12 ½ hours to complete currently, took 1 ½ hours to finish on the new server. There is no doubt that there will be a substantial increase in performance!

There is some effort involved in transferring the evaluations and database to the new server, especially given that the new machine is a different architecture than the current one. This essentially means that nothing can simply be copied over and “work”, it will need to be modified in some fashion. Work is currently under way to do this, and it is expected that the new server will be in production within the next several months.

2. Website Tools and Reports

We are always adding and updating reports and tools on the website. Some recent additions include:

- On Experimental Farm Software. This is web-based on-farm software developed to allow entry of the information that CCSI requires for evaluations.

It includes forms for all routine information, such as probe, pedigree, litters, weaning, conformation, etc. In addition, there are reports such as sow cards, recent litters, sows due to farrow, etc. It is also integrated with the Mating Plans application.

- Mating Plans. A different version of computer dating that is based on the “shopping cart” concept. Sows and boars of interest are easily added and removed and are kept between sessions. There are many enhancements, including the use of on-farm EBVs, integration with the CCSI on-farm software, and different reporting options.
- The ability to divide a herd into “lines” to allow separating a herd for reporting and other purposes.

- Sire usage report. Shows the number of litters and progeny of a sire by herd and breed.
- Crossbred phenotypic information. Shows by breed cross, adjusted phenotypic data and predicted loin eye area and lean yield.
- Pig EBV and Pig Query. Retrieve EBVs and animal information for one or more tattoos in a format suitable for importing into other applications.
- Thumbtacks. You can associate notes with a pig or herd that you can then reference by clicking on the thumbtack icon throughout the website.
- Website Styles. Users can specify a specific “style” for the website. There are currently two, the default orange and yellow and a blue and maroon. There will be more in the future.
- Goat website. Improvements continue on the goat site, including a new predicted matings application, updated top kids, and several reports.
- Automatic Registration. The concept of automatically registering animals based on testing data is currently being implemented. This will enable a herd to register every animal probed (and its ancestors, if necessary) with no manual intervention by the breeder or CCSI.

3. Data Transfer

A great deal of effort continues on our effort of streamlining the transfer of data between CCSI and our members. We currently have 24 users sending data, using either the CCSI On Experimental Farm software, Herdsman, or by sending flat files.

Integration between CCSI and third party on-farm software continues. OSI is installing Herdsman for breeders throughout Ontario, and SIGA Farm Software has just released Siga Pig 3, which will also be able to send data to CCSI directly from the program.

Many web pages have been created to aid in the transfer process. These include pages to display and fix any data related problems, show probe records, crossbred phenotypic information, and on-farm EBVs. In addition, other reports have been updated to take advantage of the on-farm EBVs.

Many internal updates and changes have been made to the various applications and servers that process the data, to increase stability and performance. Since the servlets that process the data have been in production, they have accepted over 29 000 probe records, and sent out over 50 000 EBVs!

4. Performance / Stability / Reliability

There has been much effort, which will continue, on increasing the overall performance of the computer systems at CCSI. Some of these include:

- Analyzing existing source code for efficiencies.
- Fine tuning the servers for optimal performance (new memory, tweak configurations, etc)
- Increasing internet throughput by 3 times.
- Implemented compression on web pages – 75% savings
- Performance of the new server will be felt with the website and faster evaluations.
- Accept zip files for EDI.

Stability and reliability are complex topics because they encompass different hardware and software, and typically this means increased investment. It involves monitoring and configuration changes to servers, as well as adding additional hardware for back-up purposes. As an example, the new server is being implemented with a RAID 1 configuration. This involves using twice the number of disk drives, so that if any one disk drive fails, the system is able to recover and not be out of service.

Our intention is to have fail-over capabilities for the major parts of the information systems. This might include having redundant servers (web, java, and database), an additional internet connection, and automatic notification of problems.

5. Website Hosting

CCSI continues to host and update the CSBA, WSTA, and CSEA websites. Dynamic applications have been added to all the websites, allowing up to date content from the CCSI database. In addition, two breeders will also have their website hosted at CCSI this year.

Jim Groves, Computer Services Manager, CCSI

5. Appendices

Appendix 1. Members of the Board of Directors

Appendix 2. People at CCSI

Appendix 3. Genetics Committee Members & Participants

Appendix 4. Home Test Summary for Backfat and Age at 100 Kg

Appendix 5. Sow Productivity Summary (2004)

Appendix 6. Genetic change in purebreds and market hogs

Appendix 7. Genetic Improvement trends

Appendix 8. New Research Projects

Appendix 9. Reports on Activities

Appendix 10. Breeders Participating In The National Program

Appendix 11. Participating A.I. Centres

Appendix 1. Members of the Board of Directors, 2004-2005

André Auger, Canadian Swine Breeders Association

Stanley Boudreau, Canadian Pork Council

Bernard Dion, Quebec Centre for Swine Improvement Inc.

Pierre Falardeau, Quebec Centre for Swine Improvement Inc.

John Gough, Ontario Swine Improvement Inc.

Donald MacDonald, Atlantic Swine Centre

Phil Smith, Ontario Swine Improvement Inc.

John Vande Glind, Western Swine Testing Association

Alfred Wahl, Western Swine Testing Association

John Webb, Canadian Meat Council

Appendix 2. People at CCSI

Brian Sullivan, General Manager

Pramod Mathur, Chief Geneticist

Francine Roy, Secretary and Office Manager

Jim Groves, Computer Services Manager

David Bates, Programmer/Database Administrator

Laurence Maignel, Geneticist

Li Li, Programmer/Analyst

Yuefu Liu, Geneticist

Tracy-Lynn Reside, Researcher, Dairy Goat Genetics



Appendix 3. Genetics Committee Members

Name	Organization
Andy Robinson, Chair	University of Guelph
André Fortin	Agriculture and Agri-Food Canada
Austin Murray	Agriculture and Agri-Food Canada
Bob Kemp	Keystone Pig Advancement Inc.
Brian Sullivan	Canadian Centre for Swine Improvement
Charles Rodrigue	Alliance Duroc
Dave Vandenbroek	Ontario Swine Improvement
David Trus	Agriculture and Agri-Food Canada
Frédéric Fortin	Centre de développement du porc du Québec inc
Isabelle Faucher	Centre de développement du porc du Québec inc
Jim Groves	Canadian Centre for Swine Improvement
Jon Meadus	Agriculture and Agri-Food Canada
Laurence Maignel	Canadian Centre for Swine Improvement
Margaret Quinton	University of Guelph
Muriel Power	Atlantic Swine Centre
Murray Duggan	Fast Pigs Inc.
Nicole Dion	Sogéporc
Patrick Charagu	Hypor
Pius Mwansa	Keystone Pig Advancement Inc.
Pramod Mathur	Canadian Centre for Swine Improvement
Roger Cue	McGill University
Shane Morris	Agriculture and Agri-Food Canada
Wim Van Berkel	Western Swine Testing Association



Appendix 4. Home Test Summary For Backfat And Age At 100 Kg

April 1, 2004 to March 31, 2005

		#herds	#pigs tested	male averages			female averages		
				#boars	backfat (mm)	Age (days)	#gilts	backfat (mm)	Age (days)
Atlantic	Yorkshire	4	1609	489	9.8	144	1120	10.5	147
	Landrace	5	692	225	9.7	146	467	10.2	146
	Duroc	4	637	303	10.3	151	334	10.9	157
	All 3 breeds	5	2938	1017	9.9	147	1921	10.5	148
Québec	Yorkshire	41	14354	4818	9.9	149	9536	10.7	157
	Landrace	33	9520	3312	10	149	6208	10.4	157
	Duroc	29	6004	3008	9.9	147	2996	11	153
	All 3 breeds	45	29878	11138	9.9	148	18740	10.6	156
Ontario	Yorkshire	20	7124	1455	10.7	150	5669	11.1	157
	Landrace	18	5930	770	10.5	148	5160	11.4	152
	Duroc	16	2514	1041	11	152	1473	11.4	156
	All 3 breeds	22	15568	3266	10.7	150	12302	11.3	155
West	Yorkshire	20	14674	2890	11.1	150	11763	11.7	155
	Landrace	22	12617	2590	11	149	10027	11.6	153
	Duroc	17	4616	2084	11.1	154	2472	11.9	160
	All 3 breeds	23	31907	7564	11.1	151	24262	11.7	155
Canada	Yorkshire	85	37761	9652	10.4	149	28088	11.2	156
	Landrace	78	28759	6897	10.4	149	21862	11.2	154
	Duroc	66	13771	6436	10.5	150	7275	11.4	156
	All 3 breeds	95	80291	22985	10.4	149	57225	11.2	155

Note: 4023 animals from other breeds were also tested on the program over the period

Appendix 5. Sow Productivity Summary (2004)

	Parity	#herds	total pigs born		pigs born alive		pigs weaned	
			N	Average	N	average	N	average
Yorkshire	1	97	7632	11.5	6638	10.6	7216	9.5
	2	92	6489	11.8	5536	11	6218	9.9
	3	90	4944	12.4	4275	11.5	4699	9.9
	4	86	3812	12.6	3231	11.4	3611	9.8
	5	80	2833	12.7	2367	11.4	2710	9.8
	6	69	1913	12.4	1536	11.2	1802	9.7
	7	70	2157	11.5	1741	10.3	2018	9.4
	ALL	100	29780	12.1	25324	11.0	28274	9.7
Landrace	1	88	5381	11.3	4745	10.5	5037	9.5
	2	83	4771	11.3	4269	10.7	4594	9.8
	3	80	3671	11.8	3282	11.2	3489	9.9
	4	74	2490	11.9	2173	11.1	2382	9.8
	5	69	1842	11.6	1532	10.7	1782	9.7
	6	64	1318	11.2	1032	10.3	1258	9.6
	7	61	1414	10.6	1120	9.7	1324	9.3
	ALL	93	20887	11.4	18153	10.7	19866	9.7
Duroc	1	63	1450	9.6	1304	8.6	1317	8.3
	2	61	829	10.1	724	9.1	777	8.6
	3	57	523	10.6	461	9.5	476	8.5
	4	51	307	10.5	271	9.6	271	8.3
	5	39	161	10.3	138	9.4	141	8.4
	6	25	69	10.1	61	9.1	65	8.1
	7	22	51	9.4	43	8.7	43	7.8
	ALL	66	3390	10.0	3002	9.0	3090	8.4
All 3 breeds	1	110	14463	11.2	12687	10.3	13570	9.4
	2	108	12089	11.5	10529	10.7	11589	9.8
	3	104	9138	12.1	8018	11.2	8664	9.8
	4	97	6609	12.2	5675	11.2	6264	9.7
	5	94	4836	12.2	4037	11.1	4633	9.7
	6	83	3300	11.9	2629	10.8	3125	9.6
	7	82	3622	11.1	2904	10.1	3385	9.4
	ALL	111	54057	11.7	46479	10.8	51230	9.6

Note: 816 litters from other breeds were born over the period

Appendix 6: Genetic change in purebreds and market hogs**Yorkshire**

Trait	1998		2004		Average annual gain	Gain in 2004
	#pigs	EBV average	#pigs	EBV average		
Sire Line Index (points)	41971	50	38512	104	9	9
Dam Line Index (points)	41971	46	38512	106	10	14
Lean Yield (%)	41971	-0.41	38512	0.03	0.07	0.08
Loin Eye Area (cm ²)	41971	-0.4	38512	0.1	0.08	0.2
Age (days)	41971	7.7	38512	-0.6	-1.38	-1.4
Feed Conversion (kg/kg)	41971	0.103	38512	-0.008	-0.019	-0.019
Backfat (mm)	41971	0.9	38512	0	-0.17	-0.1
Lean Depth (mm)	41971	-0.1	38512	0.1	0.02	0.1
Number Born (pigs/litter)	41971	-1.43	38512	0.2	0.27	0.42
Sire Line Index (\$)	41971	-23	38512	2	4.2	4
Dam Line Index (\$)	41971	-29	38512	3	5.3	7

Landrace

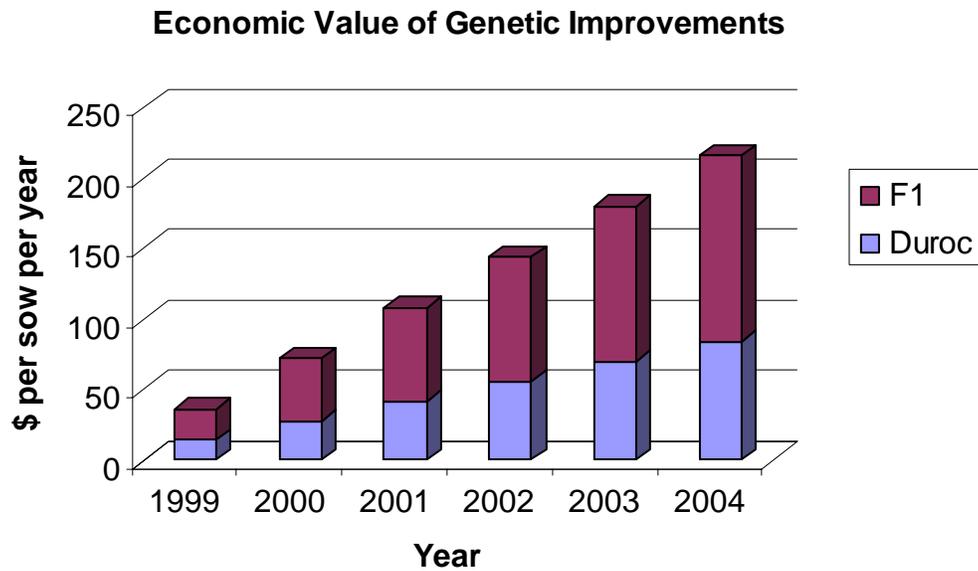
Trait	1998		2004		Average annual gain	Gain in 2004
	#pigs	EBV average	#pigs	EBV average		
Sire Line Index (points)	32016	60	29683	103	7.2	6
Dam Line Index (points)	32016	51	29683	105	9	10
Lean Yield (%)	32016	-0.5	29683	0.03	0.09	0.08
Loin Eye Area (cm ²)	32016	-1	29683	0.1	0.2	0.2
Age (days)	32016	6.3	29683	-0.4	-1.1	-1
Feed Conversion (kg/kg)	32016	0.089	29683	-0.006	-0.016	-0.014
Backfat (mm)	32016	1	29683	-0.1	-0.2	-0.1
Lean Depth (mm)	32016	-0.6	29683	0.1	0.1	0.2
Number Born (pigs/litter)	32016	-1	29683	0.12	0.19	0.25
Sire Line Index (\$)	32016	-20	29683	1	3.7	3
Dam Line Index (\$)	32016	-23	29683	2	4.2	5

Duroc

Trait	1998		2004		Average annual gain	Gain in 2004
	#pigs	EBV average	#pigs	EBV average		
Sire Line Index (points)	17977	37	13383	107	11.7	14
Dam Line Index (points)	17977	50	13383	105	9.3	11
Lean Yield (%)	17977	-0.94	13383	0.13	0.18	0.27
Loin Eye Area (cm ²)	17977	-1.9	13383	0.2	0.35	0.5
Age (days)	17977	8.7	13383	-0.7	-1.6	-1.6
Feed Conversion (kg/kg)	17977	0.131	13383	-0.013	-0.024	-0.027
Backfat (mm)	17977	1.9	13383	-0.2	-0.4	-0.5
Lean Depth (mm)	17977	-1.3	13383	0.1	0.2	0.3
Number Born (pigs/litter)	17977	-0.03	13383	0.02	0.01	0.01
Sire Line Index (\$)	17977	-38	13383	4	7	9
Dam Line Index (\$)	17977	-16	13383	2	2.8	3

Change in Commercial Sows (F1s) and Hogs due to genetic improvement in Canada from 1998 to 2004					
Trait	Sire Line Duroc	Dam Line			Market Hogs
		Yorkshire	Landrace	F1s	
Sire Line Index (points)	70				
Dam Line Index (points)		60	54	57	
Lean Yield (%)	1.07	0.44	0.53	0.49	0.78
Loin Eye Area (cm ²)	2.1	0.5	1.1	0.8	1.5
Age (days)	-9.5	-8.3	-6.7	-7.5	-8.5
Feed Conversion	-0.143	-0.112	-0.095	-0.103	-0.123
Backfat (mm)	-2.2	-1	-1.1	-1	-1.6
Lean Depth (mm)	1.4	0.1	0.7	0.4	0.9
Number Born (pigs/litter)		1.63	1.13	1.38 pigs	
Sire Line Index (\$)	\$ 42				
Dam Line Index (\$)		\$ 32	\$ 25	\$ 57	

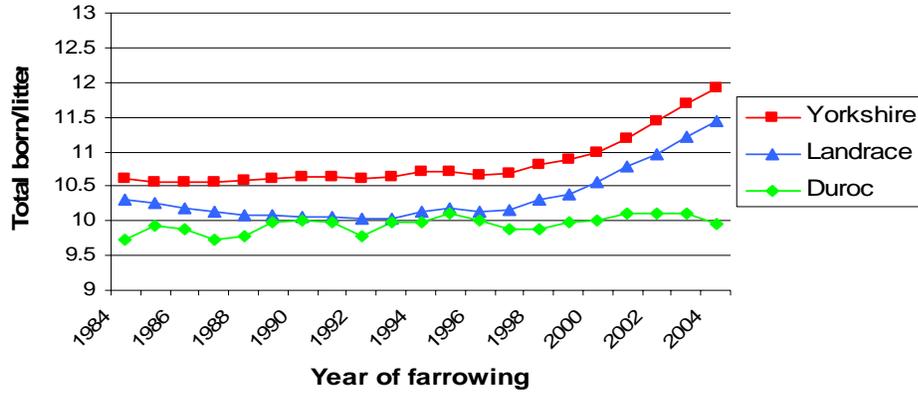
Genetic Improvement in Commercial Herds



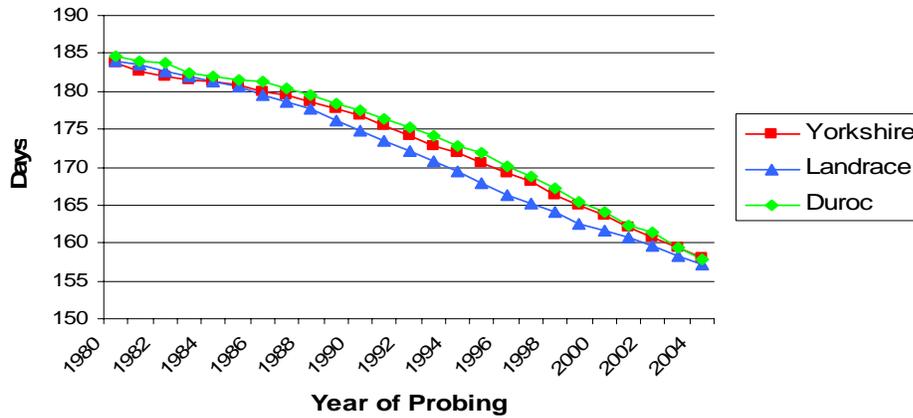
Sows are about \$216 per year more productive today than 6 years ago due to genetic improvements in growth, feed efficiency, lean yield and litter size.

Appendix 7: Genetic Improvement Trends

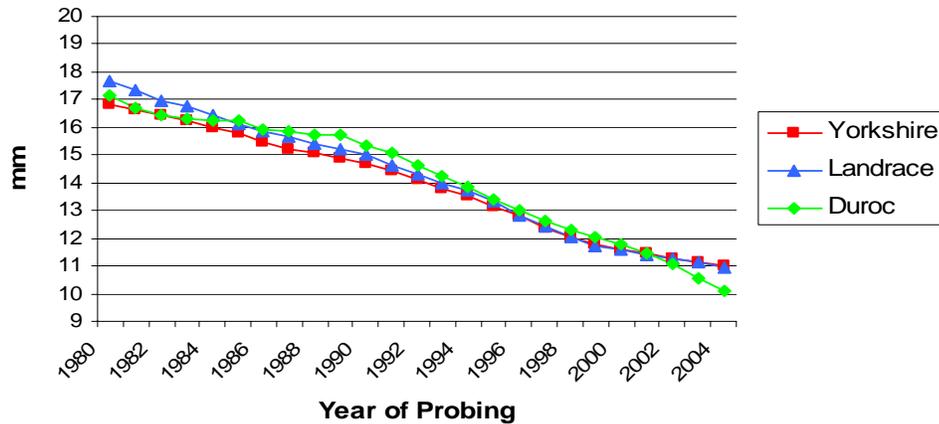
Genetic Trends for Litter Size



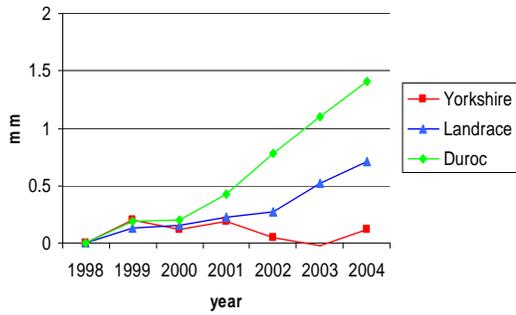
Genetic Trends for Age at 100kg



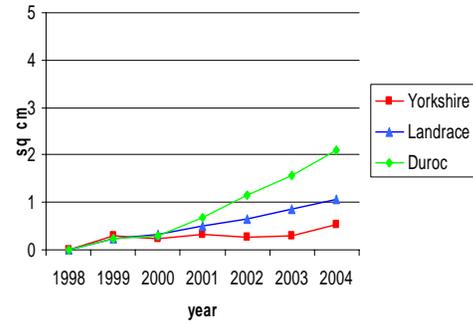
Genetic Trends for Backfat at 100kg



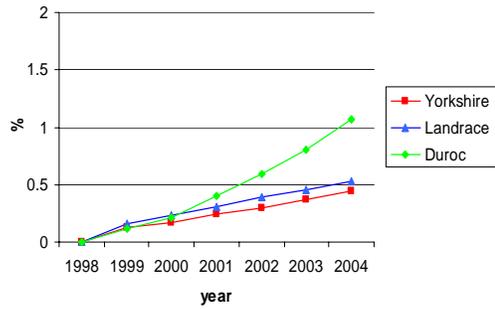
Lean Depth at 100kg



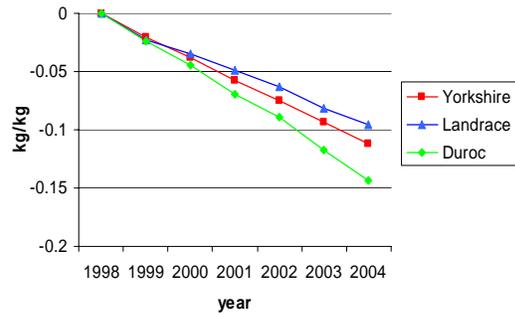
Loin eye area



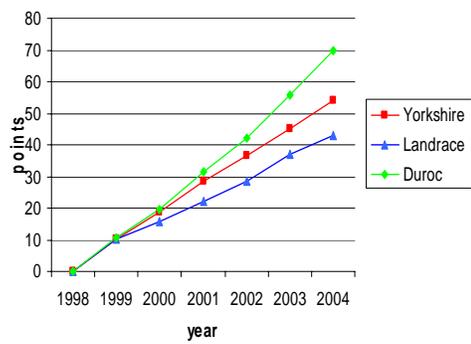
Lean Yield



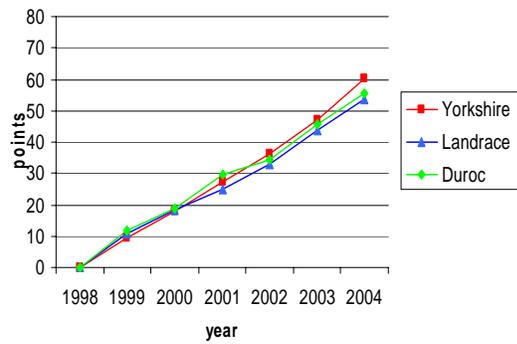
Feed Conversion Ratio



Sire Line Index



Dam Line Index



Appendix 8. New Research Projects



Heavier carcass weights and pork quality : performance testing of purebred pigs from the Canadian Swine Improvement Program



Summary

Pork continues to be the world's most-eaten meat, with consumption continuing to grow. Canada is well positioned as a major pork exporter in a highly competitive global community, as Canadian pork is lean, high yielding and carries a reputation for wholesomeness and freedom from residues. However, challenges are emerging with new requirements in both domestic and international markets, regarding meat safety and quality standards. Pork quality is an important issue in this area. A recent market survey ("Québec Market Reference") made by Centre de Développement du Porc du Québec, has shown the growing requirements for heavier hog carcasses expressed by several segments of the pork value chain, as well as the need for limited leanness, uniformity and enhanced meat quality. Moreover, in 2003 CCSI co-organized, with CPC and CMC, a consultation forum on pork quality, where the needs for a common vision and strategy on pork quality improvement were expressed by all different levels of the industry.

There has been increased demand from the packing industry in Canada and US at a higher carcass weight than what is currently produced by pork production sector. This is a challenging issue as this increasing weight could have unfavourable consequences on muscle quality, fat deposition, feed efficiency, etc.

There is a need to address this by systematic scientific investigation. This project was designed to bring updated information on purebred pig performance, in order to assess parameters used in the Canadian Swine Improvement Program, but also to work on standardized methods of recording for carcass traits, meat quality and conformation.

The main objectives of the project are:

- to compare pork quality attributes with the current and heavier carcass weights
- to estimate required parameters for selection at heavier weights
- to estimate the value of live measurements to predict meat quality and their interest in selection
- to develop models and procedures for genetic evaluation and selection for producing desired meat quality at higher carcass weight
- to explore the relationships among a large number of traits including growth, feed efficiency, carcass and meat quality, conformation.
- to provide a portrait of each breed for muscle metabolism and fibres characteristics, in order to understand mechanisms dealing with meat quality.

This project is quite unique and innovative and deals with several aspects of pig production that are relevant for all industry. First of all, the Canadian Swine Improvement Program will get more efficiency from parameters provided by the project. Secondly, it will provide innovative selection tools and methods for improving pork quality, and knowledge about the mechanisms behind meat quality and its relationships with other traits, at the classical carcass weight and at heavier weights. The various segments in the swine industry will benefit from the improved genetics to meet the market requirements and consumer demands for superior quality pork. The Canadians will therefore benefit from good quality pork that can be offered at a competitive price



Uses of molecular information for addressing current and emerging issues for the quality of Canadian pork



Summary

Canada ranks number one among the pork exporting countries of the world. Domestically, the pork industry is also recognized as a major industry sector in agriculture. Superior pork quality and desired leanness contribute to the solid reputation of Canadian pork world wide. However, it is becoming more and more challenging to maintain this leading position especially due to new emerging requirements in the Canadian and export markets and increasing competition. The classical quantitative selection has provided opportunities for significant improvements in production efficiency and carcass quality. However, very little effort has been done towards improvement of meat quality. At times, there also contradicting requirements. For example a good level of carcass leanness is required also for efficiency. However, this can automatically result in lower intramuscular fat (marbling) due to inherent genetic correlations between the two traits. Use of Candidate genes provides unique opportunities to achieve best of both, i.e. desired levels of marbling and leanness.

On Nov. 26, 2003, about 50 representatives from different segments of the pork value chain came together to discuss and seek the solutions for the emerging issues of pork quality. During this “Consultation Forum on Canadian Pork Quality”, the participants put intramuscular fat on the top of the list suggested for R&D activities. Intramuscular fat in Canadian pork loin is generally too low for both international and domestic markets, especially for Japanese market. Recently, there are more and more concerns about the extreme leanness of Canadian hog carcass. According to the “Quebec Market Reference”, a market survey conducted by Centre de developpement du porc du Quebec (2003), 19% of hog carcasses have less backfat thickness than 13.6 mm which is the lower limit of the desired range. About 20% of hog carcasses have lean yield percentage higher than the demanded upper threshold of 62.9%. Some extreme lean pork was discounted in some region such as West Canada.

A recently completed research project, entitled “Development of new genetic evaluation and selection methods for swine using advancements in molecular genetics” supported by the Canadian Swine Industry and CARD program of AAFC, has identified a number of genes and markers that are useful for solving the emerging issues identified above. For example, the HFABP gene can be used for increasing intramuscular fat content up to 0.4% without changing the backfat thickness. IGF2 gene can increase or decrease the carcass lean yield by 2% and at the same time increase uniformity by 25% according to results obtained in Belgium (Buys. 2003). The carcass uniformity and leanness can be further improved by using other fat-metabolism genes such as LEPT gene, LPTR gene, AFABP gene, FAT1 QTL, HDAC gene etc.

The proposed research project will validate the effects of the useful genes under Canadian condition based on the results of DNA lab tests and their statistical data analyses, and propose a detailed guideline for use of the genes for solving emerging issues in Canadian swine industry. This project will further improve and enhance the achievements of Canadian swine industry in the international markets for the benefit of breeders, producers and processors. The ultimate beneficiary will be the Canadian consumers and tax payers who will receive the desired quality of pork for many more years to come.

Appendix 9. Reports on Activities

1. Heavier carcass weight and meat quality
2. Molecular Genetics for emerging issues
3. Review of genetic research on swine melanoma
4. Review on genetic mitigation of greenhouse gas emission
5. A simplified method for estimation of QTL effects through marker-trait association (Poster for ISAG 2004 meeting)
6. Use of Genomic Information in Canadian Swine Improvement (invited presentation at ISAG 2004 meeting)
7. Strategic plan for use of molecular information for the swine industry
8. Repeatabilities and confidence intervals for EBVs and Indices
9. Genetic evaluation for perinatal piglet survival - Preliminary report
10. Detection of hypoprolific boars potentially carrying chromosomal abnormalities
11. Improvement of sow productivity in French maternal lines
12. Use of foreign EBVs in genetic evaluation (Paper presented at EAAP 2004)
13. Evaluating disease resistance of pigs using an in-vitro test (Abstract, EAAP 2004)
14. Development of Disease Resistant Pigs (Presentation to PharmaGap)
15. Presentations to the Genetics Committee - Quebec City, May 2004
 - a) International Development in Swine Genetics
 - b) National Swine Identification and Traceability Pilot Study
 - c) The Pork Value Chain Roundtable
16. Reports from Congresses and Seminars
 - a) 20th Brian Kennedy Memorial Colloquium
 - b) 4th International Workshop on Genetic Evaluation in Pigs (Slovenia, April 2004)
 - c) 55th Annual Meeting of the European Association for Animal Production (EAAP) (Bled, Slovenia, September 2004)
 - d) 36th Swine Research Days (France, February 2004)
17. The Genetic Edge - Proceedings from Ontario Producers Meeting
18. Considerations of Genetics - Proceedings from 'How to Profit from the OlyWest Contract'
19. Pork roundtable refines vision for the future

These reports are available on CCSI's website at: www.ccsi.ca/reports_2004/main.cfm.

Appendix 10. Breeders Participating In The National Program

Atlantic Swine Centre	
International Genetics PEI Ltd. Box 43 Mount Stewart, PE C0A 1T0	PigCo Genetics Inc. 231 Dingwell Road RR #3, Morell, PE C0A 1S0
Point View Farms RR #3 Bellriver, PE C0A 1B0	Reg & Donald Macdonald Box 43 Mount Stewart, PE C0A 1T0
Sunriver Farms R.R. #4 Cornwall, PE C0A 1H0	Terry Brink R.R. #1 Alberton, PE C0B 1B0
Topline Swine RR #3 Earnscliff, PE C0A 2E0	Willowdale Farms R.R. #1 York, PE C0A 1P0

Centre du développement du porc du Québec	
Beauchemin, Sylvie 380, 1er Rang est Saint-Joachim J0E 2G0	Cie 2427 3963 Québec inc. 2693, boulevard Labelle, C.P. 484 Prévost J0R 1T0
Excel-Gène inc. 462, 2e Rang est Saint-Simon J0H 1Y0	Ferme Agral & fils inc. 160, route 363 Lac-aux-Sables G0X 1M0
Ferme Beau-Porc enr. 1691, 11e Rang Saint-Valérien J0H 2B0	Ferme C.-M. Labrecque enr. 1580, rang Saint-Étienne nord Sainte-Marie-de-Beauce G6E 3A7
Ferme Claude Forget inc. 841, 4e Rang Saint-Ambroise-de-Kildare J0K 1C0	Ferme Clauvie-Porcs (2002) inc. 202, rang 6 est Saint-Donat G0K 1L0
Ferme Cogeporc inc. 404, Saint-François Saint-Narcisse-de-Beaurivage G0S 1W0	Ferme Denis Vadnais inc. 3320, Chemin Tourville St-Nicéphore J2A 3Y8
Ferme du Berceau inc. 94, 1er Rang ouest Saint-Gervais-de-Bellechasse G0R 3C0	Ferme du Laurier 167, rang de la Montagne Saint-Gervais-de-Bellechasse G0R 3C0
Ferme du Murier inc. 137, route Soucy, C.P. 154 Saint-Édouard de Lotbinière G0S 1Y0	Ferme F. Pilote et fils enr. 410, rang Saint-Pierre Saint-Irénée G0T 1V0
Ferme Géni-Porc inc. C.P. 1378 Bedford J0J 1A0	Ferme Grenier Pouliot inc. 2515, chemin Lehoux, R.R. 3 Coaticook J1A 2S2
Ferme J.-M. Nadeau et fils inc. 496, route Sainte-Thérèse ouest Sainte-Hénédiène-de-Dochester G0S 2R0	Ferme J.P. Dion et fils inc. 154, rang Charlotte Saint-Liboire J0H 1R0
Ferme J.R. Raby senc 4222, rang de la Colline Adstock G0N 1S0	Ferme Jacques Ouellet 223, 6e Rang est Saint-Joseph-de-Kamouraska G0L 3P0

Centre du développement du porc du Québec	
Ferme Liloporc inc. 414, rang Saint-Pierre Saint-Irénée G0T 1V0	Ferme Lorix-Québec enr. 841, chemin Tomifobia Stanstead J0B 3E0
Ferme Luc & Estelle Forget inc. 2553, rang Saint-Jacques Saint-Jacques J0K 2R0	Ferme Maguy enr. 810, St-Pierre Laurierville G0S 1P0
Ferme Nico enr. 473, rang Saint-Nicolas Saint-Irénée G0T 1V0	Ferme Perfo-Porcs inc. 1735, rang 10 Notre-Dame-du-Bon-Conseil J0C 1A0
Ferme Pleinchamps inc. 460, rang Saint-Pierre Saint-Anselme-de-Dorchester G0R 2N0	Ferme Porasseny inc. 16, des Prairies Saint-François G0R 3A0
Ferme porcine DAJO senc 135, rue Principale Saint-Simon J0H 1Y0	Ferme Porcine de Beauce inc. 1640, rang Saint-Gabriel sud, R.R. 2 Sainte-Marie-de-Beauce G6E 3A8
Ferme porcine Jagari inc. 6330, route 112 Garthby G0Y 1B0	Ferme Raymond Coutu et fils senc 1861, route 158 Saint-Thomas J0K 3L0
Ferme Rechamakayajo enr. 507, rue Desjardins Mandeville J0K 1L0	Ferme René Gauthier inc. 404, rang Saint-Pierre Saint-Irénée G0T 1V0
Ferme Rouslay s.e.n.c. 954, rang La Ferme Sainte-Perpétue J0C 1R0	Ferme Saniporc enr. 167, chemin de la Montagne Saint-Gervais-de-Bellechasse G0R 3C0
Ferme Ste-Catherine enr. 404, rue Saint-François Saint-Narcisse-de-Beaurivage G0S 1W0	Ferme Triporc inc. 3251, Haut-de-la-Rivière Sainte-Elizabeth J0K 2J0
Ferme Victorien Fortin inc. 1346, rang Sainte-Anne Métabetchouan-Lac-à-la-Croix G8G 1A3	Groupe Dynaco Coopérative agroalimentaire 41, route 287 sud Saint-Philippe-de-Neri G0L 4A0
Hybrilia SEC 156, rue Grenier Laurierville G0S 1P0	J. & R. Perreault inc. 184, Saint-Jacques Saint-Patrice-de-Lotbinière G0S 1B0
Lemieux, Jean-Marc 76, rang 2 est Saint-Gervais-de-Bellechasse G0R 3C0	Élevage Auger (91-50-0561 Québec inc.) 850, chemin des Acadiens Yamachiche G0X 3L0
Les élevages Technos Itée 2080, rang 8 sud Adstock G0N 1S0	Les Porgreg inc. 8795, Chemin du Rapide-Plat Sud Saint-Hyacinthe J2R 2A6
S.C.A. Disraëli 815, avenue Champlain Disraëli G0N 1E0	S.C.A. Langevin 188, route 204, C.P. 39 Sainte-Justine G0R 1Y0
Sogéporc inc. - Filière des Érables 1025, rang Saint-Pierre Notre-Dame-de-Lourdes G0S 1T	Sogéporc inc. - Filière des Marées 60, chemin du Cenellier La Trinité-des-Monts G0K 1B0

Ontario Swine Improvement	
BMR Genetics Rod deWolde 12 Huston Street Millbrook, ON LOA 1G0	Bodmin Swine Genetics George Procter R.R. #5 Brussels, ON N0G 1H0
Carlisle Farm Robin Carlisle R.R. #4 Stirling, ON K0K 3E0	Clarion Swine Genetics Clare and Kent Martin R.R. #2 Drayton, ON N0G 1P0
Dietrich Farms Inc. Don and Paul Dietrich R.R. #1 Shakespeare, ON N0B 2P0	Dora Lee Genetics Ross and Betty Small R.R. #3 Harriston, ON N0G 1Z0
Haren Yorkshires Steve Zehr R.R. #1 Shakespeare, ON N0B 2P0	Ja-Viv Yorkshires Jack and Doug Nethercott R.R. #1 Arkona, ON N0M 1B0
Laurel Lee Acres Ltd Henry Groenestage R.R. #7 Orangeville, ON L9W 2Z3	Lone Willow Farm Bill and Sheila Collins R.R. #5 Kincardine, ON N2Z 2X6
Martinsheim Farm Richard Stroebel R.R. #2 Granton, ON N0M 1V0	Marwill Acres Reink Wiegersma R.R. #1 Bluevale, ON N0G 1G0
Monoway Farms Wayne and Paul Fear R.R. #4 Brussels, ON N0G 1H0	Novastar Genetics John & Enid Gough R.R.#3, 7959 Falconbridge MT. Brydges, ON N0L 1W0
PSP Farm Genetics George Socket R.R. #3 Wingham, ON N0G 2W0	Ribanwood Yorkshires Bancroft, Peter R.R. #1 Newton, ON N0K 1R0
SGO Inc. Embro Division R.M. Matheson R.R. #3 Embro, ON N0J 1J0	SGO Inc. Goderich Division R.R. #6 Goderich, ON N7A 3Y3
SGO Inc. Monkton Division Joe Kolkman R.R. #2, 6439 line 49 Logan Monkton, ON N0K 1P0	Stardobie Farm Doug and Rob McLeod R.R. #5 Embro, ON N0J 1J0
University of Guelph – Arkell Swine Research Tom Parker R.R. #2 Guelph, ON N1H 6H8	UPB Canada C. & J. Monden R.R. #5 Mitchell, ON N0K1N0
Vista Villa Farms Ltd. Bob and Scott Robinson R.R. #4 Walton, ON N0K 1Z0	West Lane Acres Wayne Brubacher R.R. #1 Wallenstein, ON N0B 2S0

Western Swine Testing Association	
CAN-AM Genetics Inc. Box 278 Ookville, Manitoba R0H 0Y0	Lorne Penner PO Box 29C Ste. Anne, Manitoba R0A 1R0
Evergreen Colony Box 247 Oakville, Manitoba R0H 0Y0	Pembina Hog Farm General Delivery Darlingford, Manitoba R0G 0L0
Norquay Hog Farm Box 247 Oakville, Manitoba R0H 0Y0	Fast Pigs Inc. Box 903 Spiritwood, SK S0J 2M0
Acadia Breeders Ltd. R.R. #3 Lacombe, AB T0C 1S0	Bloomsbury Farms Ltd. General Delivery Bloomsbury, AB T0G 0G0
F&S Farms Box 1795 Camrose, Alberta T4V 1X7	Five Lakes Farms Ltd. Box 537 Mayerthorpe, AB T0E 1N0
Gwynne Vista Farms R.R. 2 Gwynne, AB T0C 1L0	Horst & Linda Gollnick Box 95 Warburg, AB T0C 2T0
Huvenaars Farms Ltd. Box 142 Hays, Alberta T0K 1B0	Jakubec Farms Box 557 Viking Alberta T0B 4N0
Matejka Purebred Swine Box 779, R.R. #1 Sylvan Lake, AB T0M 1Z0	Morinville Colony R.R. #2 Morinville, AB T8R 1P5
Neufeld Farms Ltd. Box 105 Acme, AB T0M 0A0	Outlook Pork Box 186 Nobleford, AB T0L 1S0
PEAK Swine Genetics #217 - 5904B - 50 ST. Leduc, AB T9E 6J4	Jurgen Preugschas Box 537 Mayerthorpe, AB T0E 1N0
Rosebriar Farm Box 73 Alcomdale, AB T0G 0A0	Herman Simons R.R. #1 Tees, AB T0C 2N0
Avicolas de Alba Quinta Avenida No. 1001, Aguascalientes, Ags., Mexico	Venagen 688 Azucena Tlacuepacue Guadalajara, Mexico 45570

Appendix 11. Participating A.I. Centres

<p>Alberta Swine Genetics Co. c/o Gregory Lebowa, Manager Box 3310 Leduc, AB T9E 6M1 Tel: (780) 986-1250 Fax: (780) 986-6523 Email: asgc@oanet.com</p>	<p>OSI Swine A.I. Centre P.O. Box 400 Innerkip, ON N0J 1M0 Tel: (519) 469-3010 Fax: (519) 469-8692 Email: mgingerich@osi.org www.osi-inc.on.ca</p>
<p>CIPQ inc. (St-Lambert) a/s Ronald Drapeau 1486, rang St-Aimé Saint-Lambert, PQ G0S 2W0 Tél: (418) 889-9748 Fax: (418) 889-8210 Email: cipq@cipq.com</p>	<p>CIPQ inc. (Roxton) a/s Ronald Drapeau 2100, Rang 6 Roxton Falls, PQ J0H 1E0 Tél: (514) 375-9977 Fax: (514) 375-2077 Email: cipq@cipq.com</p>
<p>Cobiporc Québec (St-Patrice) a/s Sébastien Leclerc 2537, rang St-Jacques, C.P. 2030 St-Jacques-de-Montcalm (Québec) J0K 2R0 Tél: (450) 839-7844 Fax: (450) 839-2992 Email: info@cobiporcquebec.com</p>	<p>Magnum Swine Genetics Box 1514 Fort Macleod, AB T0L 0Z0 Tel: (403) 553-4844 1-888-553-4844 Fax: (403) 553-4845 Email: sales@magnumswine.com www.magnumswine.com</p>
<p>National Swine Genetics 8817 Glengyle Drive Strathroy, ON N7G 3H3 Tel: (519) 245-6868 Fax: (519) 245-4884 Email: jmosborne@sgo.on.ca www.sgo.on.ca</p>	<p>International Genetics PEI Ltd. Box 43 Mount Stewart, PE C0A 1T0 www.peipork.pe.ca/quality/aiunit</p>
<p>C-Prim inc. a/s Daniel Desrosiers 3250, Haut-de-la-Rivière Sainte-Elizabeth (Québec) J0K 2J0 Tél: (450) 756-5068 Fax: (450) 756-5068 Email: marysesauve@hotmail.com</p>	<p>Keystone Pig Advancement, Inc. Box 278, 101-2nd Street Oakville, MB R0H 0Y0 Tel: (204) 267-2813 Fax: (204) 267-2841 Email: kpa@mb.sympatico.ca www.kpapiigs.com</p>