

August 06 - 10, 2017, Winnipeg, Manitoba

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## **Trip Report by Ike Edeogu, VP Membership, CSBE | SCGAB**

### **Overview**

The CSBE-SCGAB hosted its annual general meeting (AGM) and technical conference at the Canad Inns Destination Centre Polo Park in Winnipeg, MB, this year. The next AGM and technical conference will be held in Guelph, Ontario (likely in July) in 2018.

The 2017 meeting and conference was held jointly with the CIGR (Commission Internationale du Génie Rural) International Commission of Agricultural and Biosystems Engineering, Section VI: Postharvest Technology and Process Engineering. It boasted over 200 participants (government, government agencies, research and development institutions, universities & colleges, consultants, business owners, professionals and retirees) from across Canada and internationally (USA, Brazil, India, New Zealand, etc.), including the American Society of Agricultural and Biological Engineers (ASABE) Past President, Maynard Herron (AGCO CORP, Hesston, KS).

### **Program**

Click the following link to view the [2017 CSBE-SCGAB AGM and conference program](#). Ample networking opportunities were provided throughout the conference program, facilitating the renewal of old networks and establishment of new ones.

Note, there are some hyperlinks or email addresses included in some of the notes below, in case you would like to know a little bit more about the facility, research, or other attributes, and to facilitate networking.

### **Meetings**

<b>Date</b>	<b>Session</b>	<b>Session Name</b>	<b>Comments</b>
Aug. 06		Final 2016/17 Council Meeting	<ul style="list-style-type: none"><li>• CSBE-SCGAB President, President-Elect, VP Regional, VP Membership, Society Manager, Journal Editor and ASABE Past President were in attendance.</li></ul>
Aug. 07		Annual General Meeting	<ul style="list-style-type: none"><li>• 2016/17 CSBE-SCGAB President chaired the meeting, with minutes recorded by the Society Manager.</li></ul>

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Date	Session	Session Name	Comments
			<ul style="list-style-type: none"> <li>The CSBE-SCGAB presidency was handed over to the 2016/17 President-Elect.</li> <li>ASABE Past President gave an official address to the audience.</li> </ul>
Aug. 09		First 2017/18 Council Meeting	<ul style="list-style-type: none"> <li>CSBE-SCGAB President, Past President, VP Membership, Saskatchewan Regional Director, Society Manager, Journal Editor, ASABE Past President and CIGR Section VI representative, were in attendance.</li> </ul>

### Plenary and Invited Speaker Sessions

Date	Session	Session Name	Comments
Aug. 07	Plenary-1	Food to Health Continuum and Changing Trends in How the Public Views Food and Food Processing	<ul style="list-style-type: none"> <li>Speaker: Dr. Peter Jones, Executive Director, Richardson Centre for Functional Foods and Nutraceuticals</li> </ul>

#### **Summary:**

- Consortium of advanced bioprocessing and product development facilities (similar to Agri-Food Discovery Place) that is focused on the optimum, value-added, utilization of crops unique to the Canadian Prairies.
- Emphasis on linkage (research, development, and commercialization) between primary agricultural crops, and subsequently processed foods, towards the enhancement of human health (social attribute) and reduced environmental footprint (attribute) associated with agricultural production, i.e., crop-based versus livestock-based products/nutrients.
- About 25% of employment in Manitoba is accounted for by its food processing sector (economic attribute)
- Emphasized importance of utilizing partnerships (multi-disciplinary) in achieving holistic (from farm to consumer) research, development and commercialization realities.
- Affiliated with Canadian Centre for Agri-Food Research in Health and Medicine; Manitoba Agri-Health Research Network; Food Development Centre, Manitoba, among others

Date	Session	Session Name	Comments
Aug. 07	Speakers-1	Food Innovation and Industry Perspectives	<ul style="list-style-type: none"> <li>Four invited speakers. See summaries below.</li> </ul>

#### **Summary:**

- 1) Speaker: Tom Price, VP Project Planning and Engineering, G3 Canada
- Application of computer simulation tools (models) in the engineering design, development

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(construction) and effective operation of railway transportation and transfer of grain, and grain handling technology specifications at the Vancouver shipyard.

2) Speaker: Alphonsus Utioh, Research and Development Manager, Food Development Centre, Manitoba

- Emphasis on sustainability attributes - economic, environmental, social.
- Social considerations include human health, food safety, diverse ethnicities, need for convenience, shifts in preferences/values of various demographic entities (e.g. millennial)
- Food Processing Industry is the largest in the manufacturing sector in Canada.
- Also emphasised the importance of partnerships (multi-disciplinary) and adopting a holistic approach that encompasses the entire value chain.
- A current primary focus is to explore the prospects of “total utilization” of agricultural products (and by-products) to optimize the returns and limit any untapped potential in the development of a diversified, value-added production-based economy.

3) Speaker: Claude Vielfaure, President, HyLife, Manitoba

- HyLife adopts an integrated pork production model in the pork value chain (farm to consumer)
- The company has subsidiaries that design engineered pig production facilities; raise pigs for market or breeding; livestock transportation system coupled with truck washes and disinfection bays; pork processing facilities in Manitoba and Mexico; environmental and nutrient management; meat processing research and development; marketing (including a restaurant in Japan that serves as an outlet for marketing their pork products in Tokyo)

4) Speaker: Dongxiao Sun-Waterhouse, New Zealand Institute of Food Science

- Member, CIGR Section VI
- Exploration into functional/wellness foods; global factors that affect food consumption and human lifestyle (e.g., new findings that people 50 years and older require more meat protein than originally thought); modification of diets to meet modern lifestyles.
- Food development processes should incorporate food-related clinical and sensory tests/trials.

Date	Session	Session Name	Comments
Aug. 08	Plenary-2	The Emerging Cannabis Industry and Opportunities for Cultivation and Processing Technologies	<ul style="list-style-type: none"> <li>• Speaker: Rob Sorba, VP Global Sales, Conviron, Manitoba</li> </ul>

**Summary:**

- Conviron is invested in the design, manufacture and supply of greenhouse production facilities, growth chambers and environmental control systems (temperature, light, humidity)
- Provide consultation services to clientele engaged in cannabis research and production in Canada (including ABCann Medicinals Inc. with Alberta-based partnership clinics and companies; and Aurora Sky’s prospective cannabis production facility under construction near

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Edmonton International Airport), and clientele in the USA.

- Continue to support technological improvements in cannabis production efficiencies, reduction in input costs, etc.

Date	Session	Session Name	Comments
Aug. 08	Speakers-2	Bio-Fibre and Sustainability	• Four invited speakers. See summaries below.

**Summary:**

1) Speaker: Eric Liu, Research and Development Specialist, Manitoba Agriculture

- Title - Bio-Innovation and Sustainability
- Golden, J.S. and R.B. Handfield. 2014. Why Bio-Based? Opportunities in the Emerging Bioeconomy. Report submitted to the United States Department of Agriculture, Office of Procurement and Property Management, BioPreferred Program®.
- Golden and Handfield (2014) provided a definition for Bioeconomy as follows: “The Bioeconomy is the global industrial transition of sustainably utilizing renewable aquatic and terrestrial resources in energy, intermediate, and final products for economic, environmental, social and national security benefits.”
- In 2014 the European Commission estimated Europe’s Bioeconomy to be worth about \$2.7 trillion (USD), creating about 20 million jobs.
- In 2012, the USA projected its Bioeconomy to be worth \$1.25 trillion (USD).
- Canada’s Bioeconomy is projected to be worth about \$90 billion (CAD)
- In 2016, biocomposites alone contributed \$3.8 billion (USD) to the global economy
- Manitoba’s focus is on the use of biomass for energy or to produce reusable material
- Growing Green - The Manitoba Bioproducts Strategy

The strategy’s goals are:

- Total biomass utilization (holistic approach)
- Cluster development (consortium of localized companies working together towards total biomass utilization)
- Innovation and partnership throughout the value chain
- Bioresource management
- Increased emphasis on biofibre production from flax crop; France/Europe is world leader in biofibre production from flax, while Canada has traditionally focused on seed (for vegetable oil) production.

2) Speaker: Shawna DuCharme, Principal Engineer, Product Innovation, CIC, Manitoba

- CIC - Composites Innovation Centre
- Title - Biofibre and Biocomposites
- Biomaterials cluster that includes automobile, aerospace and recreational vehicle industries
- Affiliated with Biomass Quality Network Canada (BQNC) among several other organizations

3) Speaker: Joe Hogue, President, Straw Logic, Manitoba

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- Member of Life Sciences Association of Manitoba
- Affiliated with Fiber Operations, SWM – Schweitzer-Mauduit Canada Inc. , Manitoba
- SWM Canada (Manitoba) has Permanent Decorticating Facility for processing flax fibre
- Emphasis is also on total crop utilization and advancing the bioeconomy

4) Speaker: Matt Candleless, Executive Director, International Institute for Sustainable Development (IISD) Experimental Lakes Area (ELA) , Ontario

- IISD-ELA
- Not-for-profit research group located about 150 km from the Manitoba border and 300 km from Winnipeg
- Receives partial funding from Ontario government
- Research is conducted in natural lakes
- Stressors are applied to one or more out of 58 lakes
- Lakes have to be returned to their pristine condition at the end of each study

Date	Session	Session Name	Comments
Aug. 09	Plenary-3	Biomass to Bioenergy Processes - A Utilities Perspective	• Speaker: Denis St. George, Senior Biosystems Engineer, Manitoba Hydro

**Summary:**

- Top ranked renewable energy sources with ample production capacity in Manitoba include hydropower and biomass related energy production.
- Manitoba's total ban on coal utilization for electricity generation (even on an emergency basis) and heat production will be in effect in 2019
- Ban on coal and petroleum coke is in effect as of July 2017
- Subsequent tax on coal and petroleum coke (\$50/tonne CO<sub>2e</sub> CAD) to follow shortly
- Revenue from tax will be applied towards "Biomass Innovation"
- Emphasis for biomass utilization is towards green heat production due to higher utilization efficiency compared to electricity generation
- One of options under consideration is "District Heating", whereby biomass is used to boil water at a centralized facility and then the hot water is distributed to a number of building facilities via a network of buried pipes
- "Partnerships" with First Nations, municipalities, consultants, private business, etc., is considered essential to the successful implementation of "Manitoba's Climate Change and Green Economy Action Plan"

Date	Session	Session Name	Comments
Aug. 09	Speakers-3	Innovation and Product Design	• Three invited speakers. See summaries below.

**Summary:**

1) Speakers: Kiera Young, Director of Design Engineering and Ben Foster, Product Manager, MacDon Industries, Manitoba

- Specialize in agricultural harvesting equipment

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- Headquarters (and manufacturing) in Manitoba, with sales offices in Canada, United States, Australia, Russia and Brazil
- Some key design considerations:
  - Diverse jurisdictional regulations - Right to Repair Act, use of glyphosate as a pre-harvest crop desiccant; harmonization of vehicle regulations - transportation width of agricultural equipment (type-approval/homologation)
  - Among all cereal, oilseed and legume production in Manitoba (prairies), canola production is highest, with yields doubling in 35 years
  - Use of straight cut headers (allowing for one pass during harvest) have increased with the creation of shatter-resistant canola varieties, compared to traditional swathers (cut and then field dry, involving two passes in the field during harvest)
  - Land prices in Manitoba have increased so land utilization has to be optimized, e.g., via the cultivation of high yielding crops with maximum value-added potential
  - Increased demand and recognition of benefits associated with controlled traffic farming (repeated use of dedicated field equipment wheel tracks/tramlines).
  - Influence of field drainage measures
  - Tillage practices – not till, strip till, vertical till
  - Precision farming

2) Speaker: Dr. Geoff Waterhouse, The MacDiarmid Institute for Advanced Materials and Nanotechnology, New Zealand

- Monitoring incidence of change (e.g., onset of disease) in food products via the use of electro-photocatalytic and optoelectronic sensing techniques
- Development of electrochemical immuno sensors

3) Speaker: Geoff Gunn, Principal Investigator, IISD Water Program, Manitoba

- Title - Manitoba Bioeconomy Atlas
- Project is supported by Manitoba's Growing Forward 2 program
- Emphasis is on economic (biomass inventory) and environmental sustainability (P management) forecasting
- Biomass inventory map will include crop residue, forestry residue and wetland/cattail distribution
- Cattails can recover up to 88% of the phosphorus in surface, fresh water bodies

### Concurrent Technical Sessions

Date	Session	Session Name	Comments
Aug. 07	1C	Agricultural Structures	• Attended three presentations. See below. Fourth presentation was cancelled.

**Summary:**

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- 1) Presenter: Desmond Essien, University of Manitoba, MB
- Title: Effectiveness of negative air ionization for removing viral bioaerosols in an enclosed space.
  - Emphasis seemed to be on human (likely barn workers) and not livestock health
- 2) Presenter: Md Sharmin Ahamed, University of Saskatchewan, SK
- Title: Evaluation of Cloud Cover Based Model for Simulation of Hourly Global Solar Radiation in Western Canada.
  - The model predictions would apply towards identifying prime locations for future greenhouse development and solar applications.
- 3) Presenter: Shuyao Dong, University of Saskatchewan, SK
- Title: Thermal environment modelling of the Chinese mono-slope solar greenhouse for cold regions.
  - Hoop-shaped greenhouse has an opaque solar wall on one side that is used to trap, store and provide heat to the enclosed airspace in the cold winter months.

Date	Session	Session Name	Comments
Aug. 07	2B	Soil & Water: Mitigating Environmental Impact	• Attended one presentation, then went to Session 2A. See below.

**Summary:**

- 1) Presenter: Patrick Brassard, Research and Development Institute for the Agri-Environment (IRDA) and McGill University, QC
- Title: Effect of six engineered biochars on greenhouse gas emissions from a loamy sand and a silt loam.
  - The woody biomass were from jack pine and black spruce feedstock.
  - A combination of type of feedstock and thermal treatment conditions were used to produce the six different biochar products.

Date	Session	Session Name	Comments
Aug. 07	2A	Biomass as a Sustainable Feedstock for Solid Fuel	• Attended three presentations. See below. Attended first presentation in 2B - see above.

**Summary:**

- 1) Presenter: Joy Agnew, Prairie Agricultural Machinery Institute, SK
- Title: Replacing fossil fuels with biomass for heating in the Canadian Prairies: evaluation of costs and biomass supply logistics
  - Assessment seemed to have been made in relation to the prevalent, large round bales.
- 2) Presenter: Charley Joanne-Sprenger, University of Saskatchewan, SK
- Title: Pelletization of Refuse-Derived Fuel Fluff to Produce High Quality Feedstock
  - Biomass physical properties seem to have significant influence on the effectiveness and efficiencies associated with various bioconversion processes whether it be for materials

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handling, energy production, chemical production, etc. Of course any pre-treatment of the raw biomass feedstock also has its economic and other implications.

3) Presenter: Tanner Fontaine, University of Manitoba, MB

- Title: Durability and combustion values of compacted oat straw biomass with manure binder
- Cattle manure (probably dairy cattle) was used as the binder.

Date	Session	Session Name	Comments
Aug. 08	3A	Biodiesel, Biogas, and Pre-treatment	<ul style="list-style-type: none"> <li>• Attended three presentations. See below. Fourth presentation was cancelled.</li> </ul>

**Summary:**

1) Presenter: Elsie Maria Jordaan, University of Manitoba, MB

- Title: Consistent monitoring and analysis of reactor operation and microbial community composition over five years delivers insight into the stability and resilience of an anaerobic dairy manure digester.
- Very interesting view of the effects of enhancements (DDGS) or toxins (copper sulphate) on microbial populations responsible for methane production in biodigesters. However, the microbial analysis that preceded decreases in methane production due to the presence of the toxin (3 occurrences) showed that microbial populations remained in a steady state during the disturbance period, but decreased later on. The suspicion is that whenever manure with copper sulphate was introduced to the biodigester, it shocked and impaired performance (loss of appetite, etc.) of the associated microbes at the onset, but did not immediately reduce the population count.

2) Presenter: Obiora Samuel Agu, University of Saskatchewan, SK

- Title: Microwave-assisted alkali pretreatment and enzymatic saccharification of selected agricultural residues.
- Alberta used a commercial microwave for thermal disinfection of hay prior to sale to Japan in the late 1990s. The microwave is located in the Peace country, but is not in use currently. Contact has been made with the company that owns the equipment to explore the prospects for research on the use of this technology towards commercial bioprocessing.

3) Presenter: Obiajulu Nnaemeka, University of Manitoba, MB

- Title: Turning winter into summer: Operating a truck with B100 biodiesel all year round in cold regions.
- The next phase of this project is to validate the results of the computer simulation.

Date	Session	Session Name	Comments
Aug. 08	4A	Bio-Fibre and Biomaterials: Production and Characterization	<ul style="list-style-type: none"> <li>• Attended six presentations. See below.</li> </ul>

**Summary:**



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- 1) Presenter: Jean-Christophe Habeck, University of Manitoba, MB
- Title: Effect of Field Retting in Manitoba on Pectin Content of Hemp (*Cannabis sativa* L.) and Flax (*Linum Usitatissimum*) Fibres Using ATR FTIR Spectroscopy.
  - In southern Alberta, the prospect of using irrigation retting to supplement dew retting (of canola stalks, for example) could be explored.
- 2) Presenter: Tasneem Vahora ([vahorat4@myumanitoba.ca](mailto:vahorat4@myumanitoba.ca)), University of Manitoba, MB
- Title: Fourier Transform Mid-Infrared Spectromicroscopy Analysis for Canola (*Brassica napus* L.) and Flax (*Linum Usitatissimum*) stems
  - No comments. See Tasneem Vahora or contact Professor Jason Morrison at: [jason\\_morrison@umanitoba.ca](mailto:jason_morrison@umanitoba.ca)
- 3) Presenter: Koushik Chakma ([chakmak@myumanitoba.ca](mailto:chakmak@myumanitoba.ca)), University of Manitoba, MB
- Title: Fibre extraction efficiency, quality and characterization of cattail fibres for textile applications.
  - No comments. See Koushik Chakma or contact Professor Nazim Cicek at: [nazim\\_cicek@umanitoba.ca](mailto:nazim_cicek@umanitoba.ca)
- 4) Presenter: Lucas Kenneth Bowlby ([c7mce@unb.ca](mailto:c7mce@unb.ca)), University of New Brunswick, NB
- Title: Synthesis of High-Surface-Area Biochar Particles Using Microwave Pyrolysis Technique
  - Further on, the biochar is used as carbon reinforcement in biocomposite rebars, exhibiting high tensile and compressive strength properties.
  - Alberta used a commercial microwave for thermal disinfestation of hay prior to sale to Japan in the late 1990s. The microwave is located in the Peace country, but is not in use currently. Contact has been made with the company that owns the equipment to explore the prospects for research on the use of this technology towards commercial bioprocessing.
  - Also contact Professor Muhammad Afzal at: [mafzal@unb.ca](mailto:mafzal@unb.ca)
- 5) Presenter: Clifford James Dueck ([dueckc37@myumanitoba.ca](mailto:dueckc37@myumanitoba.ca)), University of Manitoba, MB
- Title: : Lignocellulosic biomass compaction - a review
  - No comments. See Clifford James Dueck or contact Professor Stefan Cenkowski at: [stefan\\_cenkowski@umanitoba.ca](mailto:stefan_cenkowski@umanitoba.ca)
- 6) Presenter: Hui Xu ([umxu68@myumanitoba.ca](mailto:umxu68@myumanitoba.ca)), University of Manitoba, MB
- Title: : Development of High-performance Nanocellulose from Natural Sources
  - Very interesting innovative work, towards the establishment of a prospective new industry in Canada. See Hui Xu or contact Professor Wen Zhong at: [zhong@cc.umanitoba.ca](mailto:zhong@cc.umanitoba.ca)

Date	Session	Session Name	Comments
Aug. 09	5A	Innovative Approaches to Bioenergy Production	• Attended four presentations. See below. Fifth presentation was cancelled.

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**Summary:**

1) Presenter: Ana Teresa Morato Lopez, University of Alberta, AB

- Title: Assessing the Potential to Generate Electricity from Agricultural Residue Biomass in Bolivia
- Bolivia has a population of about 10 million.
- Only about 66% of the population (mostly urban) has access to electrical power
- Natural gas, produced in abundance in Bolivia, is used for electricity generation and is a primary export commodity.
- However, the natural gas reserves are diminishing rapidly and are projected to be exhausted in less than 15 years (?if I heard Ana right)

2) Presenter: Saeed Ghanbari, University of Saskatchewan, SK

- Title: Conceptual Design and Feasibility Study of A Multi-Feed Integrated Biomass Production - Conversion System In The Prairies
- Saeed used a simulation model to assess the feasibility of the system, hypothetically to be located in Saskatchewan
- He consulted a lot of professional and industrial sources for input data, and based the simulation on outputs from the application of single (not integrated), commercial bioconversion systems.
- Feasibility seemed low, but there were also areas identified for improved efficiencies, and hopefully reduced cost

3) Presenter: Edson Nogueira Junior, University of Alberta, AB

- Title: Water Footprint of Diluent and Hydrogen Production via Thermochemical Conversion of Algae
- Interesting work. Could we see industrial photobioreactors (PBRs), aka “greenhouses” dedicated to algae production in Alberta in the future?
- Could pond-based algae production supplement PBR production in warmer weather?
- For more information see Dr. Adetoye Oyedun (oyedun@ualberta.ca) or contact Professor Amit Kumar at: amit.kumar@ualberta.ca

4) Presenter: Prashant Patel, University of Alberta, AB

- Title: Assessing the Potential to Generate Heat and Electricity from the Wastes Produced in Alberta Industrial Heartlands
- Prashant consulted Alberta Agriculture and Forestry for input data with respect to agricultural feedstock.
- For more information see Dr. Mahdi Vaezi (mvaezi@ualberta.ca) or contact Professor Amit Kumar at: amit.kumar@ualberta.ca

Date	Session	Session Name	Comments
Aug. 09	6A	Animal Housing	• Attended six presentations. See below.

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- 1) Presenter: Araceli Dalila Larios-Martinez, Institut de Recherche et de Développement en Agroenvironnement (IRDA-Canada); Institut National de la Recherche Scientifique (INRS-ETE - Canada); and Instituto Tecnológico Superior de Perote (ITSPe-México)
  - Title: Development of passive flux samplers as a technology for the estimation of N<sub>2</sub>O emission from livestock buildings: commercial scale evaluation
  - Measurements were conducted at two commercial pig farms in Québec
  - Although the emphasis was using zeolite as an adsorbent to capture nitrous oxide (N<sub>2</sub>O) emissions (typically low in livestock housing systems, i.e., buildings or feedlots), future work is focusing on other adsorbents, such as biochar, that can capture all three GHGs (i.e., CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O).
  
- 2) Presenter: Xiaojie Yan, University of Manitoba, MB
  - Title: Effect of Slatted Floor Configuration on Air Quality and Floor Cleanliness in Sow Gestation Rooms
  - 2014 Canadian “Code of Practice for the Care and Handling of Pigs” has mandated that all sow housing systems in Canada must provide ample room for pigs to “turn around or exercise periodically, or....allow greater freedom of movement”, such as group sow housing systems, effective July 1, 2024.
  
- 3) Presenter: Dr. Bernardo Predicala (bernardo.predicala@usask.ca), Research Scientist - Engineering, Prairie Swine Centre Inc., SK
  - Title: Impact of re-designing ventilation system of gestation barns converted from stalls to group sow housing system
  - Computer simulation in previous study indicated that a horizontal airflow system (inlet vents installed in the wall at one end of a room and outlet fans in the opposite wall) resulted in optimum airflow through the room in comparison to a traditional airflow system (inlet vents installed in the ceiling and wall fans).
  
- 4) Presenter: Joahnn Palacios, Institut de Recherche et de Développement en Agroenvironnement (IRDA-Canada)
  - Title: Impact of floor type on odor and gas emissions in swine housing: literature review and preliminary study
  - Odour sampling was conducted outside the building, including in cold weather, without the use of insulation and heat tape around the sampling tubes and the sampling “lung” (device). This is an issue because of the incidence of condensation in the sampling tube and bag. The condensation of the barn air can cause odorants to be removed from the sampled air, and subsequently results in a misrepresentation of actual concentration of the barn odour.
  
- 5) Presenter: Jingjing Cabahug, Prairie Swine Centre Inc. and University of Saskatchewan, SK
  - Title: Design and evaluation of a prototype mechanically ventilated swine transport trailer with air filtration system

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- The prototype trailer system (shell is from Europe) is being retrofitted with the desired heating, ventilation and air conditioning (HVAC) system.
- For more information see Dr. Bernardo Predicala at: [bernardo.predicala@usask.ca](mailto:bernardo.predicala@usask.ca)

### Technical Tours

<b>Date</b>	<b>Site</b>	<b>Comments</b>
Aug. 10	1) <u>Richardson Centre for Functional Foods and Nutraceuticals</u> Guide: Prof. Rotimi Aluko  2) <u>Alternative Village</u> Guide: Prof. Kris Dick  3) <u>Canadian Wheat Board Centre for Grain Storage Research</u> Guide: Prof. Fuji Jian  4) <u>Manitoba Institute for Materials</u> Guides: Ms. Jennifer Low; Dr. Abdul Khan; Dr. Ravinder Sidhu; Dr. Kevin McEleney	<ul style="list-style-type: none"><li>• Attended three (#2, #3 &amp; #4) of four available tours.</li><li>• Insufficient time available to tour all four locations.</li></ul>

For more information contact:

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