Educational leadership chair in sustainable agricultural building design

Duration: 2018-2023

Highlights

- Between 2008 and 2015, capital spending in Quebec's livestock production assets fell from $475M to $300M.
- Major reinvestments were made beginning in 2017 ($500M/year) to modernize livestock production facilities and boost their competitiveness.
- In order to support these investments, Quebec needs skilled labour capable of providing sound advice to the province's roughly 10,500 farmers.
- The Chair will train engineers and agronomists specializing in quality and competitive infrastructure, integrating the latest standards in animal welfare and environmental protection.
- Research projects will focus on new sustainable concepts for animal production such as sustainable grazing methods for dairy cattle, low-emission aviary systems for laying hens and advanced ventilation systems for broiler chickens and hogs.
- The Chair's activities will provide up-to-date technical documentation to help farmers make informed investment decisions.
- Optimizing farm building design and the efficient use of agricultural equipment could help cut annual infrastructure costs by 1%.

Objectives

The Chair aims to support training, research and knowledge transfer in animal production engineering. With a view to ensuring the long-term sustainability of Quebec's livestock facilities, research will focus on improving animal welfare, reducing farms' environmental impact and improving farm competitiveness. Knowledge and skill development for future university graduates as well as concerned stakeholders revolves around the following four pillars:

- Advanced production systems;
- Advanced environmental control;
- Optimal management of resources and waste;
- Energy efficiency and alternative energy sources.

Results and potential benefits

The Chair will provide training to engineers and agronomists specializing in quality and competitive infrastructure, integrating the latest standards in animal welfare and environmental protection.

The Chair will also be an opportunity to experiment, with support from graduate students, with new concepts in sustainable dairy production such as sustainable grazing areas, solar roofs on stables and recycled manure bedding (RMB). The objective of the first project on raised terraces is to provide an opportunity for movement at any time of the year that is more cost-effective than tie-stalls. This is also a more acceptable option than wintering areas from an environmental standpoint. The goal of the second project on greenhouse-stables is to verify if the additional costs of this type of building are offset by the benefits that more natural, ambient conditions provide. The third project on RMB aims to demonstrate that biomethanization can generate a hygienized, pathogen-free digestate with the right physical characteristics to ensure the health and well-being of cows.

The Chair also intends to produce new tools that will be available on a web-based platform for all farmers and stakeholders in the sector.

In this regard, all activities aim to provide up-to-date information to help the province's roughly 10,500 livestock producers (dairy cattle, hogs, poultry, sheep and goats) make informed investment decisions when upgrading their facilities. Optimizing building design and the efficient use of animal production equipment could help cut annual infrastructure costs by 1%. Considering annual capital expenditures in the order of $500M, this would represent savings of $25M over five years.

Innovative aspects

- The Chair is the only academic institution in Quebec and Canada dedicated to training and knowledge transfer as related to agricultural buildings.
- The Chair is a catalyst of research projects focusing on livestock facilities.

Professionals trained

- **Alexandre Blouin**, **Ève-Marie Houde** and **François Savard** (B. Eng. – Agro-environmental engineering): Comparison of the economic and environmental performance of conventional stables and greenhouse-stables.
- **Zakary Picard** (B. Eng. – Agro-environmental engineering): Assessment of the environmental and energy performance of ventilation systems in livestock buildings.
- **Béatrice Dupont-Fortin** (B. Eng. – Agro-environmental engineering): Assessment of animal behaviour and well-being in outdoor exercise areas.
- **Andrea Katherin Carranza Diaz** (PhD – Soils and Environment): Development of simplified methods for measuring air-borne contaminants in livestock buildings.
- **Paz Elizabeth Álvarez-Chávez** (PhD – Soils and Environment): Demonstration of environmental and economic efficiency of the raised terrace concept as a sustainable grazing method for tie-stalled dairy cattle.
- **Sebastian Gutierrez Pacheco** (PhD – Ecological engineering): Instrumentation and controls in agriculture and precision breeding.

For further information

- Presentation of students' work at the Chair's annual meetings.
- Creation of a website and a Facebook page dedicated to the Chair's work.
- Presentations at local (e.g. Forum Novalait and the Symposium sur les bovins laitiers) and international (e.g. International Commission of Agricultural and Biosystems Engineering) events.
- Publication of general science articles in agricultural journals (e.g., *Le Bulletin des agriculteurs*).
- Participation in the organization and content development of online continuing education courses and Open House events organized by partners.

Financial contributions

The Chair is funded by a number of organizations and engineering/equipment consultants.

- Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec (MAPAQ)
- Novalait
- Union des producteurs agricoles du Québec (UPA)
- Institut de recherche et de développement en agroenvironnement (IRDA)
- Université Laval, Department of Agriculture and Food Sciences
- Industries Harnois
- Lactanet
- Équipements Jolco
- Consultants Lemay & Choinière
- Consumaj
- Les Consultants Mario Cossette
- Groupe Alco
- Intelia
- Maximus
- Zaxe Technologies
- Association des ingénieurs en agroalimentaire du Québec (AIAQ)

Total budget: $923,000

Contact persons

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