

Further notes on site selection criteria, with particular reference to the Central Experimental Farm

Since its establishment in 1886, the Central Experimental Farm has been a unique feature of the National Capital. A working agricultural research station that has and continues to contribute to Canadian agriculture through scientific excellence, the CEF has also been recognized throughout its existence as the jewel in the crown of greenspace at the heart of Canada's capital. The whole of the Farm is useful to its purposes of scientific research and speaks to its designation as a national historic site.

Regard for the purpose of the CEF must therefore be based upon its supreme importance to the Capital, and to the Nation. In terms of Capital significance, it ranks with the Parliament Buildings and Rideau Hall. It is of a superior order above the rank of general federal lands such as those used for general office needs (Tunney's Pasture), or for the management of urban development and institutional growth (the NCC Greenbelt). In determining whether any part of the CEF should be considered for new development, only Capital-specific criteria should be applied to ensure that decisions benefit Canadians for generations to come.

There should therefore be a criterion in the site evaluation framework that takes into account the negative impact of selecting a site that is part of an existing land assembly with special capital purposes, such as the CEF.

Activities conducted on the CEF

The Central Experimental Farm is the home of Agriculture and Agri-Food Canada's Ottawa Research and Development Centre. The Centre leads Eastern Canada (Manitoba to Prince Edward Island) in crop development, targeting corn, soy, spring wheat, winter wheat, oats and barley.

The Ottawa Research and Development Centre also has a national mandate for assessing and utilizing biodiversity and environmental resources for Canadian agriculture.

The Centre has been at the forefront of pioneering gene isolation, gene transfer, and studying gene expression in crop plants for the last 25 years. It has a unique mandate to lead biosystematics research of vascular plants (botany), fungi, bacteria, and invertebrates (insects, arachnids and nematodes), relevant to agriculture.

It also supports research conducted at other Research Centres in the areas of food safety, mycotoxins, and biocontrol.

Four biological collections of national importance are located at Ottawa Research and Development Centre: the [Vascular Plant Collection](#), the [Canadian National Mycological Herbarium \(DAOM\)](#), the Canadian National Collection of Insects, Arachnids and Nematodes, and the Canadian Collection of Fungal Cultures.

The Centre is also one of nine national sites in the Agriculture and Agri-Food Canada (AAFC) Watershed Evaluation of Beneficial Management Practices project.

The Centre's main research focus lies in three areas:

- Crop genetic enhancement and genomics
- Biodiversity of vascular plant, fungi and bacteria, and invertebrates
- Integrated assessment of long-term environmental effect of agricultural practices

More details on the research activities conducted on the CEF can be found in Appendix 1.

The Centre is one of a network of research stations and offices maintained by AAFC across Canada as part of its program of science supporting an innovative and sustainable agriculture and agri-food sector. This sector is estimated to have contributed \$108 billion to Canadian Gross Domestic Product in 2014. <http://www.agr.gc.ca/eng/about-us/publications/economic-publications/alphabetical-listing/an-overview-of-the-canadian-agriculture-and-agri-food-system-2016/?id=1462288050282>)

Agriculture and Agri-Food Canada conducts longer term core research and development work to advance the understanding of: the resource base upon which agriculture depends; threats to Canadian agriculture production; mechanisms to protect and conserve Canadian bio-resources and genetic diversity; and future new opportunities for the sector. This program also maintains a strong network of world-class research centres and offices across the country with scientific expertise to meet the research needs of existing and emerging agricultural commodity groups, and to participate in collaborative partnerships with industry, academia, non-governmental organizations, and others that undertake research aimed at yield enhancement, input reductions, prevention of diseases or pests, market access, as well as risk mitigation, and development of new areas of opportunity for the sector. Planned program spending for 2016-17 is \$225,448,149, employing a staff of 1,739 full-time equivalent. <http://www.agr.gc.ca/eng/about-us/planning-and-reporting/reports-on-plans-and-priorities/2016-17-report-on-plans-and-priorities/?id=1455737253940>

The Centre, which also goes by the operating name Eastern Oilseeds and Cereal Research Centre, is registered with Industry Canada as a supplier of research products and services to industry, generating between \$1,000,000 and \$5,000,000 in annual sales. The Eastern Cereal and Oilseed Research Centre (ECORC) is described as developing new varieties of corn, wheat, barley, oats and soybeans for Eastern Canada; and biosystematic information and land resource management systems for sustainable production throughout Canada. At ECORC, more than 70 scientists and 240 support employees work in multidisciplinary teams, in partnership with national and international public and private sector organizations. More details on these activities can be found in Appendix 2.

As made clear by this description of activities, the CEF is a major centre of scientific research. This is why our proposed criteria include a criterion that takes into account the negative impact of selecting a site which has scientific value, such as the CEF.

Importance of the research conducted on the CEF

Research conducted on the CEF serves the international, national and local communities. Studies conducted on the CEF have been cited in international scientific journals and reports (e.g., by the Intergovernmental Panel on Climate Change). Environmental research includes studies that provide important data to understand the effects of climate change on agriculture as well as the ways that

agriculture can mitigate the effects of climate change. The scientific importance of this research has been underscored by international scientists in letters to federal ministers that voice their concern about the potential loss of CEF research land. Also, a recent BBC show described the international importance of science conducted on the CEF.

The CEF also serves national interests because new varieties of corn, soybeans, wheat, barley, oats, and other crops are being developed that improve returns for farmers and contribute significantly to the Canadian economy. To cite one example, the CEF was the site of the development of short-season soybeans, which currently add \$2 billion annually to our economy. Climate change is expected to result in more frequent and severe drought and crop diseases in this region; current crop-development research is focussed on developing drought- and disease-resistant crops that will allow farmers to adapt to a changing climate. National farm organizations from across Canada have acknowledged the benefits of research conducted on the CEF. In addition, the CEF is the training ground of university students and post-graduates, many of whom will join Canada's next cohort of agricultural and environmental scientists.

The CEF serves the local farming and urban communities as well. Local farmers want and need the practical cropping and management information that CEF research generates, now more than ever as we face the vagaries of growing conditions as climate continues to change. Farmers visit the CEF every year for field tours that provide this information; just recently, a group of farmers from the Ontario Soil and Crop Improvement Association visited the CEF to learn more about new crop varieties being developed and about management practices that improve soil conditions. The local urban community also has opportunities to learn about the importance of agriculture and the environment through open houses and field tours held every year on the CEF. This year hundreds of Ottawa citizens toured the CEF facilities during the Doors Open Ottawa event June 5.

The 60 acres of land on Field #1 of the CEF being considered for the new campus of the Ottawa Hospital represents about 1/6 of the total area devoted to research. The fragmentation of CEF land as a result of this loss will close down some studies and constrain future research programs. Over 20 studies are currently under way in the areas between Carling Avenue and the NCC Driveway, a site has been continuously under research for over 125 years. Some of the fields in question are in the middle of a long-term study that will provide advice on carbon capture through agricultural practices, a key component of meeting our global commitments on climate change. Moving the research to another site would put the research clock back to zero, an irreversible loss of great impact considering how few and far between long-term agricultural research sites are around the world. Canada's ability to make good environmental decisions and protect our economy into the future depends on the data generated by long-term studies, and the loss of CEF's long-term site would mean the end of an invaluable historical data set. Relocation would disrupt or displace many other important studies, cost millions of dollars, and result in the loss of decades of public research. This is the situation with Field #1, but all the research lands contribute to the scientific advances made here, so relocating the proposed Hospital to another site only perpetuates the negative impacts of this proposal.

The irreplaceable nature of the research on the CEF can be illustrated using the specifics of one

particular research platform. Food and food security is the ultimate end product for which agricultural research is engaged. The essential source basis for food and feed crops is soil operating in the context of weather and climate. The development of Canadian soils began following the last ice age, 10,000 years ago. Some agricultural practices have been unkind to soil, such as, overzealous soil tillage and cultivation. About fifty years ago on a world-wide scale researchers were investigating many soil tillage options from which has evolved a preference for minimum or zero tillage practices. For the last thirty years, soil and plant scientists have been evaluating the minimalist tillage and beginning to see soil health improvements as a result. Soil is very resilient but the time scale for remedial effects to happen is very long and require exceptionally long-term observation and testing.

The CEF is an open-air field laboratory. Soil scientists there are conducting on-going long-term experiments to improve the way farmers return the carbon to soil. Carbon, as organic matter, is critically important for effective water use and storage in soil as well as supplying nutrients to succeeding crops. Increased soil organic matter facilitates improved soil structure leading to stronger plant root systems and healthier overall soil biology. Healthier soil and plant systems are much better adapted to the changing and variable climate conditions which have been occurring recently. This is precisely the intention behind this research program and that of the national and international network with which they collaborate. Over a century of science has provided an extremely stable and irreplaceable foundation on which the research infrastructure is continually renewed both by new science staff and new problems to solve. This field-based laboratory provides a vital link to farmers across Canada via the highly collaborative science network and by direct participation of the farmers with the research program.

On August 31st 2016 we heard from the National Farmers Union participant at the stakeholders' meeting that the serious drought of 2016 in eastern Ontario is expected to destroy the very livelihood of farm families because of crop failures which have occurred as result of weather variability in a changed climate. Farmers want and deserve to have sound and timely science results both for the stronger economic contributions they make and for the better food security and livelihood for all. Canadian consumers in turn rely upon this research for the quality and cost of their food.

This is one example, of which there are many more, showing how the intricate network of a soil, climate and biological systems empowering agriculture can only meet the challenges of food production if a robust research program operates from a stable and secure foundation. Soil, the life giving living skin of the earth, is irreplaceable. Equally as important is to recognize that preconditioning soil for experiments is like building a foundation. AAFC has made a significant contribution to the building of numerous soil and biological foundations for the valuable research platforms on all the research fields of the CEF.

Appendix 1

Ottawa Research and Development Centre

Ottawa, Ontario



The Ottawa Research and Development Centre is located on the historical [Central Experimental Farm](#) which was established in Ottawa in 1886 by an act of Parliament. The Centre leads Eastern Canada (Manitoba to Prince Edward Island) in crop development, targeting corn, soy, spring wheat, winter wheat, oats and barley.

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Areas of Research

At the Ottawa Research and Development Centre, the number of research disciplines represented at the site facilitates working in multi-disciplinary teams. The Centre's areas of core research are aligned with national priorities to help the sector adapt and remain competitive in domestic and global markets. Greater participation in research networks and industry-led partnerships expands the Centre's innovation capacity.

Enhancing Environmental Performance

- Establishing environmentally sustainable ways to develop and use land for field crop production in eastern Ontario and western Quebec
- Formulating methods and models to evaluate the impact of agriculture on levels of carbon in the soil, as well as greenhouse gas emissions
- Evaluating and modeling the dynamics of agriculture-based contaminants in soil and water, and studying best management practices to reduce movements of contaminants into the environment
- Creating resource databases for land use and environmental assessments

Innovation and Advancing Knowledge

- Identifying and characterizing Canada's flora and fauna to define economically important fungi, insects, crops and weeds
- Studying ways to detect, measure and monitor biodiversity change, and biodiversity assessments to support conservation and sustainable use of Canadian biological resources
- Using systems such as molecular diagnostics to identify economically important fungi
- Using molecular techniques to determine the genetic diversity of crops and weeds
- Developing knowledge on the classifications and relationships of important insect groups

New Knowledge for Future Applications

- Diagnosing and identifying tools to facilitate border protection against the introduction of pests and invasive species
- Developing novel pest management strategies that exploit natural enemies and that can be integrated with current agricultural practices

Better Products for Stronger Markets

- Improving the genetic makeup of corn and corn populations that have been bred for desirable traits for the short-season areas of Canada
- Developing new varieties of soybeans for short-season areas of eastern Canada and Manitoba
- Developing winter and spring wheats, oats and barley for eastern Canada. Traits of importance are resistance to disease and insects, improved quality, early maturity and tolerance for cold and drought
- Developing methods to control *Fusarium* (a fungus disease of corn, wheat, barley and oats, as well as causing white mould in soybeans)

Investing in Healthier Crops

- Determining the best methods to produce crops by less frequent tilling of the soil, and making better use of organic nitrogen sources. Characterizing nitrogen and fertilizer needs and their use by crops; the interactions between crop yield and environment; optimal crop rotations, as well as methods of cultivating crops to reduce soil erosion
- Studying the interaction between plants and the bacteria or fungi that infect them, the effects of agricultural practices on crop diseases, and cereal seed fungi and treatments

Delivering Value through Science

- Isolating, characterizing and manipulating useful plant genes and the elements that control or regulate them to allow research to add product value, reduce environmental impacts on crops and increase resistance to insects and disease
- Identifying the molecular markers associated with important crop traits to facilitate the genetic enhancement of crops
- Evaluating and documenting the genetic profiles for corn, small grain cereals, canola and the fungi *Fusarium* and *Trichoderma*
- Evaluating the resistance of new cereals to the *Fusarium* fungus
- Developing inventive technologies to isolate new compounds from plants and other organisms
- Identifying those seed components that have high value, and methods for isolating, purifying and characterizing them

Facts, Figures and Facilities

- World-class national biological collections. These working collections include the:
 - [Canadian National Collection of Insects, Arachnids and Nematodes \(CNC\)](#) containing 17 million specimens;
 - [The Glomeromycota in vitro Collection \(GINCO\)](#) with 94 specimens with 14 available for distribution;
 - National Mycology Herbarium (DAOM) containing 350 thousand specimens; and
 - [National Vascular Plant Herbarium \(DAO\)](#) with 1.6 million specimens.
- 425 hectares of experimental fields and plots on the historic [Central Experimental Farm](#) in downtown Ottawa; 27000 square metres (m²) of laboratory space; and 2300 m² of greenhouses (integrated growth facility)
- More than 25 superior cultivars of wheat, oats, barley and soybeans developed in the past 5 years
- National mycotoxin analysis laboratory serving Departmental cereal breeders and *Fusarium* resistance research projects
- Electronics laboratory and machine shop
- National Arthropod Containment Facility providing a single entry point for exotic insects with beneficial biocontrol potential
- National Identification Services for insects, fungi, nematodes and plants
- National Soil Databases containing soil, climate, land use, crop yield and socioeconomic information for the agri-food sector and other Canadian industries.
- National bioinformatics network with capacity for functional and structural genomics including a 32 Central Processing Unit (CPU) high performance computing cluster

- Central genomics facility performing global gene expression profiling for a variety of organisms (plant, fungal, animal) using an extensive DNA sequence database, a DNA microarray printer and scanner, and robotic equipment
- Electronic microscopy and nuclear magnetic resonance center for use by AAFC scientists

<http://www.agr.gc.ca/eng/science-and-innovation/research-centres/ontario/ottawa-research-and-development-centre/?id=1180546650582>

Appendix 2

The Eastern Cereal and Oilseed Research Centre (ECORC)

Ottawa develops new varieties of corn, wheat, barley, oats and soybeans for Eastern Canada; and biosystematic information and land resource management systems for sustainable production throughout Canada. At ECORC, more than 70 scientists and 240 support employees work in multidisciplinary teams, in partnership with national and international public and private sector organizations.

Research and development programs are focused in three areas:

CROPS Research goals are to:

- Develop winter wheat, oats and barley, with disease resistance and value-added seed traits. -Develop soybeans and corn with early maturity, and tolerance to cool growing conditions.
- Develop supporting technologies for varietal development such as crop transformation, haploidy, market assisted selection, and disease diagnosis.
- Advance knowledge of the regulation, expression, isolation and characterization of genes for useful genetic modification of plants. - Define alternative land management practices relating crop adaptation advances to soil and atmospheric conditions.

LAND AND AGRONOMY Research and development goals are to:

- Cooperate with a network of land resource specialists to maintain and upgrade national soil and climate databases.
- Develop new knowledge in soil water, climate and crop-yield modelling; land use, cropping systems and remote sensing; soil quality; and the dynamics of agri-environmental indicators.
- Develop methodology to evaluate emerging environmental, soil conservation, land resource quality, and lands resource availability issues.

SYSTEMATICS ENTOMOLOGY/MYCOLOGY/BOTANY AND BIODIVERSITY Research and development goals are to:

- Develop identification aids, computerized and molecular information systems and predictive classification schemes for plants, insects and fungi.
- Identify crop and microbial genetic resources to support crop breeding programs. - Collaborate with national integrated pest management and biological control programs.
- Provide information essential to protect Canada's borders from invasive pests and support the Canadian strategy on biodiversity.

- Create and maintain collections and advanced databases on the systematic of plants, insects and fungi.

Environmental Profile Projects Undertaken: A 5 year Great Lakes Water Quality project, on pesticide persistence and leaching in Great Lakes Watershed soils; a 3 year St. Lawrence River Ecosystems project, on heavy metal ion binding and leaching in agricultural soils on the Raisin River Watershed; environmental indicators for agricultural ecosystems; a report on the health of Canada's agricultural soils; biotechnology for crop protection and crop variety development.

Scientific Network: Part of the Research Branch network of Centres of Excellence in Agri-Food research across Canada; collaboration with many University Departments; linkages with other Federal Departments and Provincial Governments; various agreements with private sector companies.

<http://www.ic.gc.ca/app/ccc/srch/nvgt.do;jsessionid=00019enfD2uERh3XKzmBugB-KzA:-44DMJN?lang=eng&prt1=1&sbPrtl=&estblmntNo=123456261327&profile=cmpltPrfl&profileId=1921&app=sold&searchNav=F>