



RESEARCH PRIORITIES

GRAIN FARMERS OF ONTARIO

Revised September 2015

Investment in research is a long-term strategic initiative of the Grain Farmers of Ontario for the benefit of all barley, corn, oat, soybean and wheat farmers. Ontario's grain farmers have sponsored and participated in decades of practical research that has resulted in economic gains and improved agricultural sustainability for Ontario farmers and the Ontario environment. Our goal is to target our research and innovation investments toward opportunities that will enhance our farmer members' returns.

Grain Farmers of Ontario aims to address the research needs of barley, corn, oat, soybean and wheat through four overall priority areas: **Agronomy and Production; Weed, Disease and Insect Pests; Crop Utilization and Crop Quality;** and **Breeding and Genetics**. Within each priority area, GFO invests funds in projects of high priority to Ontario farmers, strives to maximize public sector research investment, and encourages private sector research investment.

➤ **Agronomy and Production Priorities**

- Identifying soil health parameters and practices affecting crop resilience under various stresses
- Developing, evaluating, and/or improving resolution of testing procedures to measure key soil health parameters in production of barley, corn, oat, soybean, and wheat
- Effective integration of cover crops into field cropping systems including cover crop choice, and clarified crop, soil, and environmental benefits
- Identifying tillage and seeding systems that maximize yield, maintain soil health, and prevent erosion
- Developing integrated systems approaches to crop management that take into account the interactions among inputs and specific cropping practices, for increased production and sustainability
- Optimizing plant use efficiency and economics of nutrients, particularly nitrogen, phosphorus, and potassium (e.g., identifying effective placement, timing, application methods, and sources of nutrients)
- Improving the environmental sustainability of production practices, particularly as they relate to fertilizer use (e.g., water quality protection, energy efficiency)
- Developing and validating site-specific production practices and methods to delineate management zones within a field



- Validating precision agriculture technologies for use as agronomy research tools that improve efficiency and accuracy of data generation to better address experimental variables

➤ **Weed, Disease, and Insect Pests Priorities**

- Developing strategies to address emerging weed, disease, and insect pest risks from changing weather patterns and potential foreign introductions
- Develop integrated weed management strategies that consider management of herbicide resistance and/or biology and ecology of specific weed species
- Assessing performance of herbicide programs when few control options exist for specific weed species or cropping systems (e.g., non-GM soybeans, wild oat in cereals)
- Developing integrated management strategies for insect pests and diseases that may include chemical controls but also reflect the role of beneficial organisms and general production practices
 - Key diseases and insect pests include *Fusarium* in wheat and barley, *Gibberella* in corn, foliar pathogens, soybean cyst nematode (SCN), soybean sudden death syndrome (SDS), oat crown rust, seedling diseases, western bean cutworm, soybean aphid, and true armyworm
- Surveying and monitoring of weeds, diseases, and insect pests to identify changes in population structure and resistance to pest control strategies
- Developing strategies to prevent and/or manage resistance of pests (weeds, diseases, and insects) to pesticides and plant traits
- Developing effective management strategies for mycotoxin producing pathogens (*Fusarium*, *Penicillium*) and associated fungal toxin accumulation (e.g., DON, OTA) in the field and in stored grain
- Identifying the economic risks to crop production arising from soil insect pest pressure and improving early-season soil insect pest management strategies
- Developing best management practices for seed treatments and determining their economic value

➤ **Breeding and Genetics Priorities**

- Developing high-yielding, high-quality barley, oat, soybean (GM & non-GM), winter wheat and spring wheat varieties and corn inbreds adapted for Ontario
- Developing competitive new varieties for value-added, identity-preserved markets
- Developing genetic resistance to important diseases and insect pests in Ontario including *Fusarium* in wheat and barley, *Gibberella* in corn, foliar pathogens, soybean cyst nematode (SCN), soybean sudden death syndrome (SDS), oat crown rust, seedling diseases, western bean cutworm, soybean aphid, and true armyworm
- Identifying and breeding for traits that will enable crops to better tolerate environmental stresses (e.g., temperature and water stress)
- Improving performance trials and tools for variety selection



➤ **Crop Utilization and Crop Quality Priorities**

- Developing new bio-products from barley, corn, oat, soybean, and wheat (e.g., industrial products, fuel, and bio-plastics) linked to existing and emerging market opportunities for use of Ontario grain
- Developing new food uses for barley, corn, oat, soybean, and wheat as well as identifying beneficial human health properties linked to existing and emerging market opportunities for use of Ontario grain
- Identifying and characterizing quality and functional parameters relevant to specific end uses or identity-preserved market opportunities for barley, corn, oat, soybean, and wheat
- Identifying production practices that improve grain quality for specific end uses leading to value-added markets, including feed, food and bioproducts
- Developing effective, rapid, and sensitive testing methods for fungal toxins (e.g., DON) for use on-farm or at the first point of delivery
- Evaluating grain marketing strategies and methods to assist Ontario farmers in maximizing their returns
- Improving testing and grading technology to provide objective, rapid assessment of grain quality and functionality