



RESEARCH PRIORITIES GRAIN FARMERS OF ONTARIO

Revised June 2019

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 for 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, Grain Farmers of Ontario invests funds in projects of high priority to Ontario farmers, strives to maximize public sector research investment, and encourages private sector research investment.

Each year Grain Farmers of Ontario identifies specific priorities toward which it would like to target increased research investment. This year, Grain Farmers of Ontario is placing a particular emphasis on research proposals targeting the following research priorities:

- Developing **integrated weed management strategies** that consider management and prevention of herbicide resistance and/or biology of specific weed species
- Developing **integrated disease & insect pest management strategies** that consider management and prevention of trait and pesticide resistance and/or biology of **white mould, SDS, SCN, Gibberella, and Fusarium**
- Developing integrated management strategies for **Gibberella ear rot** to reduce the occurrence of **vomitoxin (DON)** in corn
- Quantifying the impact of standard field practices on soil health and developing strategies to improve or maintain **soil health**

Other important research priorities are listed for each of the four overall priority areas, below:

Agronomy and Production Priorities

- Optimizing plant use efficiency and economics of nutrients, particularly nitrogen, phosphorus, potassium, and sulfur (e.g., 4R nutrient stewardship), and validating 4R practices for effectiveness on farm
- Improving the environmental sustainability of production practices, particularly as they relate to phosphorous and nitrogen use (e.g., minimizing nutrient losses, water quality protection, energy efficiency)



- Developing, evaluating, and/or improving resolution of testing procedures to measure key soil health parameters in production of barley, corn, oat, soybean, and wheat
- Identifying soil health parameters and practices affecting crop resilience under various stresses
- Identifying tillage and seeding systems that maximize profit, maintain soil health, and prevent erosion
- Developing strategies to minimize and remediate impacts of soil degradation (e.g., soil compaction, loss of soil organic matter, water/tillage erosion, etc. on soil health)
- Developing a thorough understanding of the economic and environmental benefits and/or detriments of cover crops in field cropping systems
- Identifying and validating best management practices for effective integration of cover crops into field cropping systems
- Developing integrated systems approaches to crop management that take into account the interactions among inputs and specific cropping practices, for increased production and sustainability
- Developing innovative new cropping systems (e.g., intercropping winter wheat and soybeans, relay cropping soybeans into a standing crop, etc.) that provide novel approaches to improving productivity and profitability
- Developing and validating site-specific production practices that improve efficiency of inputs, support ecosystem services, and contribute to overall farmer profitability
- Applying precision agriculture technologies and emerging statistical methods to agronomy studies to better understand site-specific agronomy, ultimately supporting site-specific decision support tool development

Weed, Disease, and Insect Pests Priorities

- Develop integrated weed management strategies that consider management and prevention of herbicide resistance and/or biology of specific weed species
- Develop integrated disease & insect pest management strategies that consider management and prevention of trait and pesticide resistance and/or biology of specific diseases and insects
 - Key diseases and insect pests include *Fusarium* in wheat and barley, *Gibberella* in corn, white mould, western bean cutworm, soybean cyst nematode (SCN), soybean sudden death syndrome (SDS), corn nematodes and other nematodes, foliar pathogens (e.g., stripe rust, Northern corn leaf blight, powdery mildew, oat crown rust, etc.), seedling diseases, slugs, soybean aphid, and true armyworm
- Developing effective management strategies for mycotoxin producing pathogens (*Gibberella*, *Fusarium*, *Penicillium*) and associated fungal toxin accumulation (e.g., DON, OTA) in the field and in stored grain
- Developing strategies to address emerging weeds (e.g., waterhemp, Canada fleabane), disease (e.g., tar spot in corn), and insect pest risks from changing weather patterns and potential foreign introductions
- 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)



- Identifying, protecting and promoting beneficial microbes and insects to manage weeds, diseases, parasitic nematodes, and insect pests in cropping systems (*new priority for 2019-2020*)
- Surveying and monitoring of weeds, diseases, and insect pests to identify changes in population structure and resistance to pest control strategies
- 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

Crop Quality and Utilization Priorities

- Developing rapid, precise, and consistent sampling and testing methods for fungal toxins (e.g., DON) for use on-farm or at the first point of delivery
- Identifying and characterizing quality and functional parameters relevant to improving 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
- Improving testing and grading technology to provide objective, rapid assessment of grain quality and functionality
- 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

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, white mould, western bean cutworm, soybean cyst nematode (SCN), soybean sudden death syndrome (SDS), corn nematodes and other nematodes, foliar pathogens (e.g., stripe rust, Northern corn leaf blight, powdery mildew, oat crown rust, etc.), seedling diseases, 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 variety performance trials and tools for variety selection