RESEARCH PRIORITIES

GRAIN FARMERS OF ONTARIO

Revised September 2017

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, 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.

2018 Call for Research Proposals - Additional Notes:

- Each year Grain Farmers of Ontario identifies specific priorities it would like to target increased research investment in. This year, Grain Farmers of Ontario is placing a particular emphasis on research proposals targeting: i) pesticide resistance management and coping with breakdown of resistance; ii) management of grain corn ear mould incidence and reducing the occurrence of vomitoxin (DON). Other important research priorities are listed for each of the four overall priority areas, below.

- A new requirement in the 2018 Call for Research Proposals is that each research proposal must plan to demonstrate value to farmers through an economic analysis component, which quantifies the economic value of a given research result (i.e., return on investment, cost-benefit analysis, etc.), where applicable.

Agronomy and Production Priorities

- 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

- Optimizing plant use efficiency and economics of nutrients, particularly nitrogen, phosphorus, potassium, and sulfur (i.e., identifying effective placement, timing, application methods, and sources of nutrients)
- Identifying tillage and seeding systems that maximize profit, 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
- Developing innovative new cropping systems (i.e., intercropping winter wheat and soybeans, relay cropping soybeans into a standing crop, etc.) that provide novel approaches to improving productivity and profitability
- Identifying soil health parameters and practices affecting crop resilience under various stresses
- Improving the environmental sustainability of production practices, particularly as they relate to fertilizer use (i.e., 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
- Developing and validating site-specific production practices that improve efficiency of inputs, support ecosystem services, and contribute to overall farmer profitability
- 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 (i.e., 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, western bean cutworm, white mould, ergot, soybean cyst nematode (SCN), soybean sudden death syndrome (SDS), corn nematodes and other nematodes, foliar pathogens (i.e., stripe rust, Northern corn leaf blight, powdery mildew, oat crown rust, etc.), seedling diseases, , 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 (i.e., 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, western bean cutworm, white mould, ergot, soybean cyst nematode (SCN), soybean sudden death syndrome (SDS), corn nematodes and other nematodes, foliar pathogens (i.e., 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 (i.e., 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 (i.e., industrial products, fuel, and bio-plastics) 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
- 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 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 and sampling methods for fungal toxins (i.e., DON) for use on-farm or at the first point of delivery
- Improving testing and grading technology to provide objective, rapid assessment of grain quality and functionality