

2019-2020 REPORT

# Transformation and Growth from the Inside out to Enhance Sustainable Food Security



*Growing science for life*

**GIFS** | GLOBAL INSTITUTE  
FOR FOOD SECURITY

Nutrien - a Founding Partner



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# About GIFS

Finding solutions to the challenges facing the global food system requires an innovative and collaborative approach that moves at the speed of business.

Founded in 2012 in a partnership between Nutrien, the Government of Saskatchewan and the University of Saskatchewan (USask), the Global Institute for Food Security (GIFS) works with a diverse range of partners to discover, develop and deliver innovative solutions for the production of globally sustainable food.

At GIFS, we invest in relevant technology platforms that provide scale and transform our scientific competencies and capabilities into capacities for stakeholders, making us a catalyst for partnerships and innovation world-wide. We have a track-record for managing and delivering on large-scale, multi-disciplinary programs, including the \$37-million Plant Phenotyping and Imaging Research Centre (P<sup>2</sup>IRC) funded by a Canada First Research Excellence Fund (CFREF) grant to USask.

Located within one of the world's strongest agri-science ecosystems, we are helping to build a food-secure world from Saskatchewan-out, working with academics, industry, producers, consumers and governments both at home and abroad to decrease the time between the discovery of innovative science and its delivery to market at home and around the globe.

## GIFS: Enabling the Agriculture Biotechnology Ecosystem to Deliver Sustainable Food Security

GIFS is a part of Saskatchewan's thriving agriculture biotechnology ecosystem, which also includes Nutrien, the USask Crop Development Centre, the USask Colleges of Agriculture and Bioresources and Pharmacy and Nutrition, the Canadian Light Source, Agriculture and Agri-food Canada, the Global Institute for Water Security, VIDO-InterVac, Genome Prairie, Ag-West Bio and many more players.

Collaboration is critical for any ecosystem to function successfully. Recognizing this, GIFS' mission is to work with partners to discover, develop and deliver innovative solutions for the production of globally sustainable food. To fulfill this mission, GIFS works as a connector, bringing diverse partners together, and as a catalyst, complementing the great work already being done in the ecosystem to enhance production agriculture and food processing systems.

As part of its role as a catalyst, GIFS has designed technology platforms, including OPAL and others focused on cell biology and data management and analytics, to support research and development of stakeholders in the ag biotechnology ecosystem – enhancing digital agriculture, accelerating plant breeding, increasing quality crop yield and building plant resilience to climate change. By providing these needed services, GIFS is helping to advance sustainable food security from Saskatchewan out, in a manner that is economically, environmentally and socially sustainable.



*Growing science for life*

Nutrien - a Founding Partner



# Vision

Our vision provides direction

A world where everyone has access to safe and nutritious food – that’s our vision.

# Mission

Our mission creates focus

We work with partners to discover, develop, and deliver innovative solutions for the production of globally sustainable food.

# Values

Our values help support our vision and guide our behaviors, shaping our culture and identity

Innovation. Excellence. Collaboration. Integrity. Equity, Diversity and Inclusion.

# Strategic Intent

GIFS is creating value to advance food security through impact, scale, synergy and sustainability.

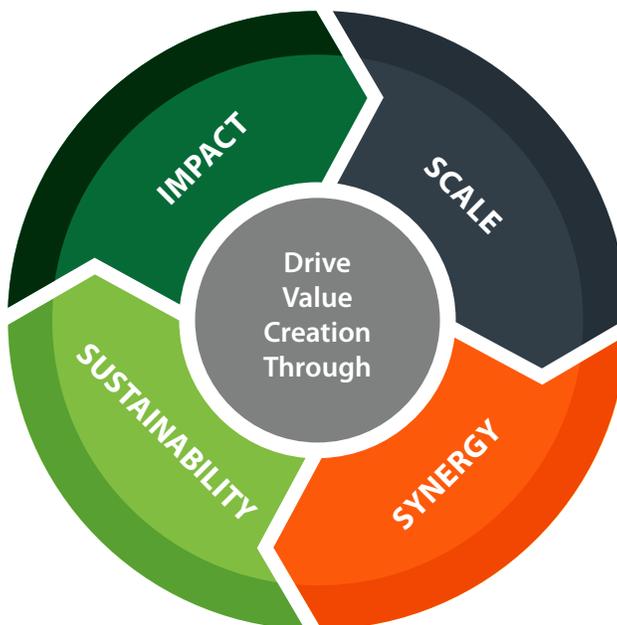
# Strategic Drivers



Aligning impact with mission helps us understand and meet customers needs and informs future investment decisions



Integrated sustainability (environmental, economic and social) creates long-term value



Building scale supports strategic growth within a sustainable framework



Synergy helps create a value culture that is complementary, helps drive teamwork, open communication and results

# GIFS in Numbers



\* This number includes publications from our P<sup>2</sup>IRC program.

## Our Founding Partners:





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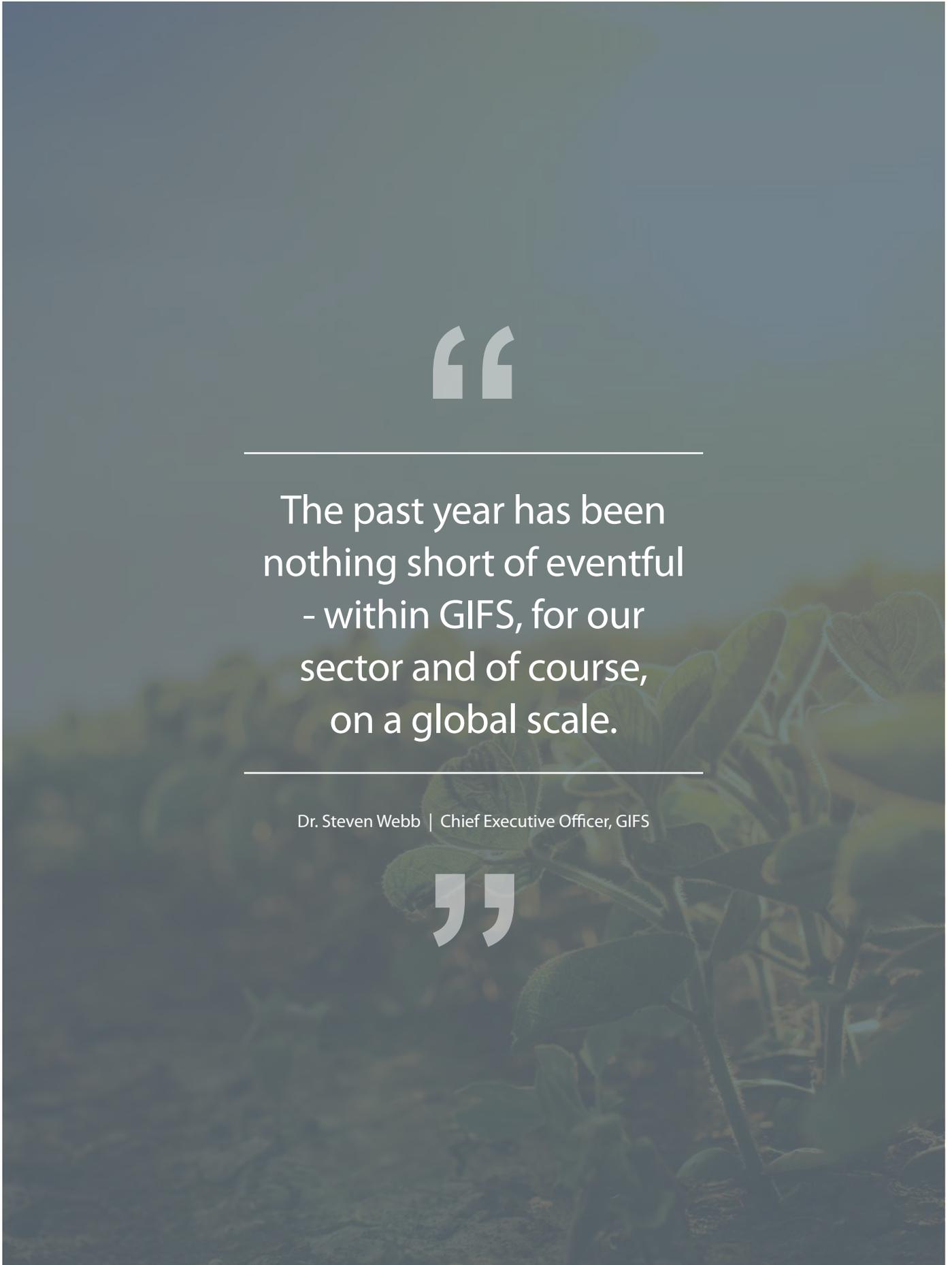
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The past year has been nothing short of eventful - within GIFS, for our sector and of course, on a global scale.

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Dr. Steven Webb | Chief Executive Officer, GIFS

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# GIFS Board of Directors

The Board of Directors of the Global Institute for Food Security (GIFS) consists of highly engaged, supportive members with skills and expertise in a variety of fields to strengthen the growth of the institute. This support and strength is vital to enhancing GIFS' profile, and adds important value to its reputation.

			
			
		<ul style="list-style-type: none"> <li>1 <b>Alanna Koch</b>   Board Chair</li> <li>2 <b>Lorne A. Babiuk</b>   Board Vice-Chair</li> <li>3 <b>Timothy Hawryluk, Q.C.</b>   Corporate Secretary to the Board</li> <li>4 <b>Rick Burton</b>   Deputy Minister, Saskatchewan Ministry of Agriculture</li> <li>5 <b>Karen Chad</b>   Vice-President Research, University of Saskatchewan</li> <li>6 <b>Candace Laing</b>   Vice President, Sustainability and Stakeholder Relations, Nutrien (Joined May 2020)</li> <li>7 <b>Marco Ferroni</b>   Chair, CGIAR System Management Board</li> <li>8 <b>Dr. Lutz Goedde</b>   Partner, McKinsey &amp; Company (Until May 2020)</li> <li>9 <b>Dr. Steven Webb</b>   Executive Director and Chief Executive Officer, Global Institute for Food Security</li> <li>10 <b>Stephen Visscher CBE</b>   Director of Strategic Partnerships and Chief Operating Officer, Global Institute for Food Security</li> </ul>	

# GIFS International Scientific Advisory Panel

The International Scientific Advisory Panel (ISAP) provides GIFS with independent expert science. The panel is made up of internationally recognized scientists in areas of expertise that align with GIFS' research and development areas of focus.

- Margaret Gadsby**  
MSc, PAg, ISAP Chair; Dean's Advisory Board Member, Faculty of Science, McMaster University and former Global Head of Regulatory Affairs, Bayer CropScience Seeds Business.
- Joerg Bohlman**  
PhD, Professor and Distinguished University Scholar, Michael Smith Laboratories, University of British Columbia
- Julia Bailey-Serres**  
PhD, Professor of Genetics, Department of Botany and Plant Cell Biology, University of California, Riverside
- Gijs van Rooijen**  
PhD, Chief Scientific Officer, Genome Alberta

- Richard 'Dick' Flavell**  
PhD, DSc, CBE, FRS
- Kiran Sharma**  
PhD, CEO and Theme Leader for the Agribusiness and Innovation Platform, and Principal Scientist - Cell Biology at ICRISAT
- Prof German Spangenberg**  
FTSE PSM, Head, Agriculture Victoria Research for Agriculture Victoria; Professor (Plant Genetics & Genomics) and Head of School of Applied Systems Biology, La Trobe University; Director of AgriBio, Centre for AgriBioscience, Australia
- Note:** John Pickett, CBE, DSc, FRS – ISAP Chair (Until January 2020)\*

# Message from the Board Chair

**Alanna Koch**



With the events of the past few months, the year 2020 will go down in the history books as one not soon to be forgotten. I anticipate that generations yet unborn will continue to draw lessons from responses to COVID-19 and the impact of the pandemic on world economies.

Thankfully, GIFS was well-positioned to handle the changes to operations that came very quickly. Its new leadership in the persons of Dr. Steven Webb, who started as Chief Executive Officer not quite a year before, and Mr. Stephen Visscher CBE, Chief Operating Officer and Director of Strategic Partnerships, as well as the entire team, were able to successfully transition to remote working - while continuing to maintain operations and vital relations with various partners.

As someone deeply invested in Canada and Saskatchewan's agriculture sector, I take great personal and professional interest in GIFS' new vision, mission and strategy. I believe Saskatchewan is at the centre of Canada, when it comes to agriculture biotechnology, and the world needs to understand the exciting innovations the province has to offer, to help build food security. We have a thriving ecosystem, made up of excellent research institutes and industry, and supported by business and sector-friendly government and regulations. GIFS is well-positioned to take advantage of this ecosystem, working together with diverse partners to enhance food production and processing systems, while leveraging Saskatchewan's strengths.

This past year, the GIFS Board said goodbye to Dr. Lutz Goedde, after his much-appreciated service on the Board for a number of years. I want to thank Lutz for his wisdom and insight that he provided to the Board and to GIFS leadership. His astute knowledge of the industry is always very welcome and while we will miss his contributions on the Board, we know he'll continue to informally provide valuable advice to GIFS. On the other hand, I am very pleased to mention that we welcomed two

new Board members from our Founding Partners. Dr. Karen Chad joined us from the University of Saskatchewan in 2019 and Ms. Candace Laing joined us from Nutrien in 2020. Both directors have already been a great resource to the Board and GIFS leadership, and I have no doubt they will continue to offer insightful oversight and direction to the institute.

As countries and regions around the world work hard to recover from the impacts of the pandemic, we must not be satisfied with just recovering but rather, think ahead to how we can make the best of the situation and see opportunity through it. By understanding and anticipating the regional, national and global needs of the agriculture sector, I believe we can succeed at that.

On behalf of the Board, thank you to all at GIFS for your hard work over the past year and your relentless pursuit of sustainable food security. Thank you to the International Scientific Advisory Panel for your dedication and the advice you provide to help ensure excellence in the institute's scientific approach. Finally, thank you to our Founding Partners and my colleagues on the Board for your unwavering commitment to GIFS and the agriculture sector. Together, we are indeed all helping to build a world where everyone has access to safe and nutritious food.

# Message from the CEO

Dr. Steven Webb



Since joining GIFS in the summer of 2019, I continue to be truly appreciative of its unique model as a private-public partnership in agri-innovation, working to build sustainable food security. Its tripartite nature with three distinct founders from industry, government and academia are indeed a strength of the institute.

This model means we are able to play an important role as a connector, successfully bringing diverse partners together to accelerate the discovery and development of important agriculture solutions. We also recognize our position as a catalyst, complementing the great work that is already underway to enhance production agriculture and value-added processing and, by extension, advance food security—here in Saskatchewan and beyond our borders.

The past year has been nothing short of eventful - within GIFS, for our sector and of course, on a global scale. At GIFS, it was a time of immense transformation and growth from the inside out, as we took the time needed to re-strategize for our future. Building on the solid foundation laid in our first few years, we developed a new and inclusive strategy that builds on a simple but bold vision of a world where everyone has access to safe and nutritious food.

Our strategy is aligned with the mandate entrusted to GIFS by our Founders: to “build on the existing strengths of Saskatchewan, and lead in the discovery, development and commercialization of new and innovative knowledge and technologies to sustainably meet escalating global demand for food.”

Recognizing the important role collaboration and partnerships will play in achieving this vision and mandate, we are committed, through our mission, to work with partners to discover, develop and deliver innovative solutions for the production of globally sustainable food.

## We recorded a number of accomplishments over the past year, including:

- A successful soft launch of the Omics and Precision Agriculture Laboratory (OPAL), which will enable world-class at-scale capabilities in omics and precision agriculture for researchers, industry, producers and other clients.
- Increased provincial, national and global impact through international collaboration, e.g., with the Government of Bangladesh and multidisciplinary and multi-institutional partners. This partnership will serve to strengthen the trade relationship between Bangladesh, Canada and Saskatchewan, particularly important as Bangladesh is a top export market for our province and both jurisdictions have agriculture as a key driver for their economies.
- Demonstrating expertise in managing large multidisciplinary and multisector research programs, e.g. the multimillion-dollar Canada Excellence Research Chair and Plant Phenotyping and Imaging

Research Centre (P<sup>2</sup>IRC) programs. The P<sup>2</sup>IRC program successfully completed its mid-term review during the year.

- Achieved innovative breakthroughs, including our first patent application, as well as new digital tools to enable the rapid analysis of agricultural field imagery that converts data into actionable information for researchers. Both the patent application and digital tools are successful outcomes of the P<sup>2</sup>IRC program.
- Continued to strengthen our relationships within the university and across the local, national and international agriculture and food innovation ecosystem.

Twelve months ago, no one could have anticipated the effect of the coronavirus on the world in 2020. With a pandemic declared and the ensuing global lockdown to flatten the curve, economies the world over are feeling the impact of the shutdown of business, trade and industry. The disruption to food systems threatened food security across the world including here at home. COVID-19 has created a paradox where we are experiencing the insecurity caused by food waste on farms due to the disruption of the supply chain and the inability to get groceries to market.

These happenings have led to GIFS being even more relevant today than when it was first established. The COVID-19 pandemic highlights the need for a flexible and responsive strategy to help build an economically resilient, transparent and environmentally sustainable food production system. We know we must continue to invest in this system, and by working together with our diverse partners and pooling our strengths, we can collectively affect food security, production agriculture and food processing systems positively for Saskatchewan, Canada and the rest of the world.

As we look forward to the future, my sincere appreciation goes to our Founding Partners, the members of our Board of Directors and our International Scientific Advisory Panel (ISAP), for their guidance and support of GIFS over the years and particularly in this my first year as CEO. I want to recognize Professor John Pickett who retired as ISAP Chair in 2020, for his worthy years of service. Thank you to Ms. Margaret Gadsby who took on the mantle of leadership as Chair of the Panel in 2020; I also welcome new member, Professor German Spangenberg, who is providing valuable advice to GIFS.

My appreciation and thanks also go to the leadership team and all of our staff at GIFS for their unwavering commitment and contributions to the institute's success. Your patience and ability to adapt to the transitions in the mode of work and operations is impressive. Finally, I want to thank our affiliates, partners and stakeholders for their support.

We all have a role to play in enhancing global access to safe and nutritious food. At GIFS, we recognize no one party can do it alone. By working together, we can indeed help build sustainable food security – here in Saskatchewan, in Canada and across the world.



# Our New Strategy



## Moving at the speed of business to bring innovation to market

Increased collaboration with partners to advance sustainable global access to safe and nutritious food is the focus of GIFS' new strategy as we enter our next phase of operations.

GIFS' first phase involved a number of successes for the institute, including publishing well over 100 papers, creating partnerships with over 30 research institutions, establishing the Plant Phenotyping and Imaging Research Centre (P<sup>2</sup>IRC), recruiting world-renowned scientist Dr. Leon Kochian and subsequently establishing the Canada Excellence Research Chair (CERC) in Global Food Security. Since its inception, GIFS has grown its staff strength to over 70 multi-disciplinary employees from a diverse range of countries and backgrounds.

Our new strategy sets the direction for our next phase, focusing on maximizing our scientific capacities and capabilities to achieve our Vision of a world where everyone has access to safe and nutritious food. This is a bold vision, and we know we can't accomplish it alone. Working together with diverse partners and stakeholders, GIFS will develop and deliver technologies and tools that enhance the food production system and that are environmentally, socially and economically sustainable. We will do all this while paying careful attention to our Mission to work with partners to discover, develop and deliver innovative solutions for the production of globally sustainable food.

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## We are guided by our Values, which are core to how we operate at GIFS:

Innovation. Excellence. Collaboration. Integrity. Equity, Diversity and Inclusion.

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## The strategy is already being brought to life through meaningful changes at GIFS, including:

- **Building technology platforms to maximize our capabilities:** Our new platforms are scientific systems designed to support research and development that will enhance digital agriculture, accelerate plant breeding, increase quality crop yield and build plant resilience to climate change. The platforms make GIFS an agile science organization because they are based on capabilities, competency and capacity to enable solving key problems at scale. These platforms will serve not only our programs

but also our stakeholders.

One example is the Omics and Precision Agriculture Laboratory (OPAL). Managed by GIFS, OPAL is Canada's first laboratory that combines the digital data analysis of plant genes and traits with the latest precision agriculture technologies—such as remote aerial imaging of plants using drones—to improve crop yield, profitability and sustainability in the agri-food sector. OPAL is the first laboratory in Canada to provide integrated crop data and precision agriculture technologies to support a wide range of research and commercial stakeholders. The program's capabilities and agility were put to the test in the summer of 2020, when GIFS redeployed OPAL equipment and supplies to the Saskatchewan Health Authority (SHA) in order to help scale testing for the COVID-19 crisis.

- **Establishing relevant programs:** To achieve expanded capacity, we have built a foundation of four main scientific programs: Resilient Agriculture, Root-Soil-Microbiome Interactions, Plant Improvement (P<sup>2</sup>IRC) and International Partnerships. These programs will work together, using their unique backgrounds and drawing on our technology platforms to accomplish GIFS' goals.
- **Creating avenues for listening and collaborating:** In order to be responsive, GIFS is focused on opening avenues for interactions with industry, partners and stakeholders. As part of our new strategy, we are creating a Grower Advisory Panel to provide expert advice on food producers' science and technology needs, industry market trends and recommendations on how best to translate science into impactful solutions for producers.

We have designed a plan that supports our intent to be a connector, bringing diverse partners together, and a catalyst, complementing the great work already being done to enhance production agriculture and food processing systems. We will do all this while moving at the speed of business to advance food security from here in Canada and beyond.



L-R: PhD candidate Maryam Honari and GIFS Research Associate Joanne Ernest studying plant specimens in the GIFS lab. (Credit: David Stobbe).



His Excellency Mizanur Rahman, Bangladesh High Commissioner to Canada (second from right) and other delegates on a lab tour at GIFS. (Credit: Olufunke Okochi).



# GIFS Strategy Map



## Our **VISION** provides direction

A world where everyone has access to safe and nutritious food – that's our vision

## Our **MISSION** creates focus

We work with partners to discover, develop, and deliver innovative solutions for the production of globally sustainable food

## Our **VALUES** help support our vision and guide our behaviors, shaping our culture and identity

Innovation | Excellence | Collaboration | Integrity | Equity, Diversity and Inclusion.

## STRATEGIC INTENT

GIFS is creating value to advance food security through impact, scale, synergy and sustainability.

### STRATEGIC DRIVERS

#### IMPACT:

Aligning impact with mission helps us understand and meet customer needs and inform future investment decisions

#### SCALE:

Building scale supports strategic growth within a sustainable framework

#### SUSTAINABILITY:

Integrated sustainability (environmental, economic and social) creates long-term value

#### SYNERGY:

Synergy helps create a value culture that is complementary, helps drive teamwork, open communication, and results

### GIFS GOALS

#### FINANCIAL

- Grow Revenue/Resources
- Diversify Revenue/Resource Sources
- Practice Excellent Financial Stewardship

#### EXTERNAL STAKEHOLDER

- Collaboratively Advancing Food Security Through the Discovery, Development and Delivery of Innovative Solutions
- Enhance Profile, Reputation, and Awareness of GIFS
- Globally Recognized Preferred Research Partner

#### INTERNAL

- Expand Research Capabilities & Capacity
- Increase Institutional Effectiveness
- Enhance Internal Synergy

#### LEARNING & GROWTH

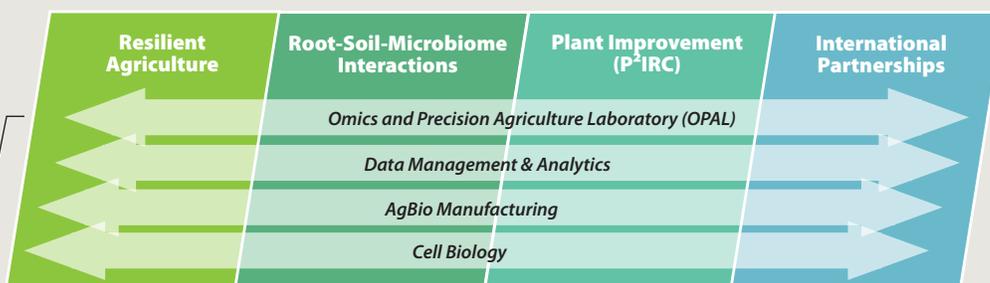
- Multidisciplinary, Solution-oriented, Entrepreneurial Approach to Research
- Attract, Retain and Develop Talent
- Continuous Learning Culture

### SCIENCE MATRIX

#### OUR PROGRAMS

#### OUR TECHNOLOGY PLATFORMS

- Adding scale
- Increasing our impact
- Enhancing synergy in our ecosystem



# Our People: A Collaborative Approach to Food Security

At the Global Institute for Food Security (GIFS), our people are our most valuable assets.

Our team of researchers and staff has grown significantly in the past year from just over 50 to more than 70 people. GIFS staff hail from over 20 countries around the globe, including Canada, the United States, Australia, Mexico, India and China. As part of our new strategy, our diverse staff are collaborating more than

ever, bringing their multidisciplinary skills in scientific research, engineering, computer science, administrative support and more together to provide a well-rounded and innovative approach to food security research and development.

In addition to our in-house staff and partnerships with USask centres and colleges, we are collaborating with over 30 research institutions around the world including in Bangladesh, the United States, the European Union, Brazil and more.

## Our Technology Platform Leads

Peta-Gaye Burnett	Platform Leader, Omics and Precision Agriculture Laboratory (OPAL)
Dr. Marco Pellino	Platform Leader, Data Management and Analytics
Dr. Renata Pagliarini Fuganti	Platform Leader, Cell Biology

## Our Program Leads

Dr. Leon Kochian	Associate Director; Canada Excellence Research Chair in Global Food Security and Program Lead, Roots-Soil-Microbial Interaction
Dr. Andrew Sharpe	Director of Genomics and Bioinformatics; Director, Plant Phenotyping and Imaging Research Centre (P <sup>2</sup> IRC)
Dr. Raju Datla	Program Lead, Resilient Agriculture
Stephen Visscher CBE	Director of Strategic Partnerships and Chief Operating Officer; Program Lead, International Partnerships



# Staff Testimonials



I love my job here at the Global institute for Food Security. I work as a Research Technician, and in this position I can fully utilize my academic and professional knowledge. It is also a good start for my life in Canada. I am sure my career will flourish with this good start.

**Zhijian Chan**  
*GIFS Research Technician, Omics and Precision Agriculture Laboratory*



We are very lucky to have the group of people at GIFS that we do. Our cultural diversity and welcoming environment combine to make GIFS a unique workplace that thrives on the contributions of talented individuals coming together for an important common goal—creating a world where everyone has access to safe and nutritious food.

**Diane Brososky**  
*GIFS Executive Assistant to the Director of Genomics and Bioinformatics*



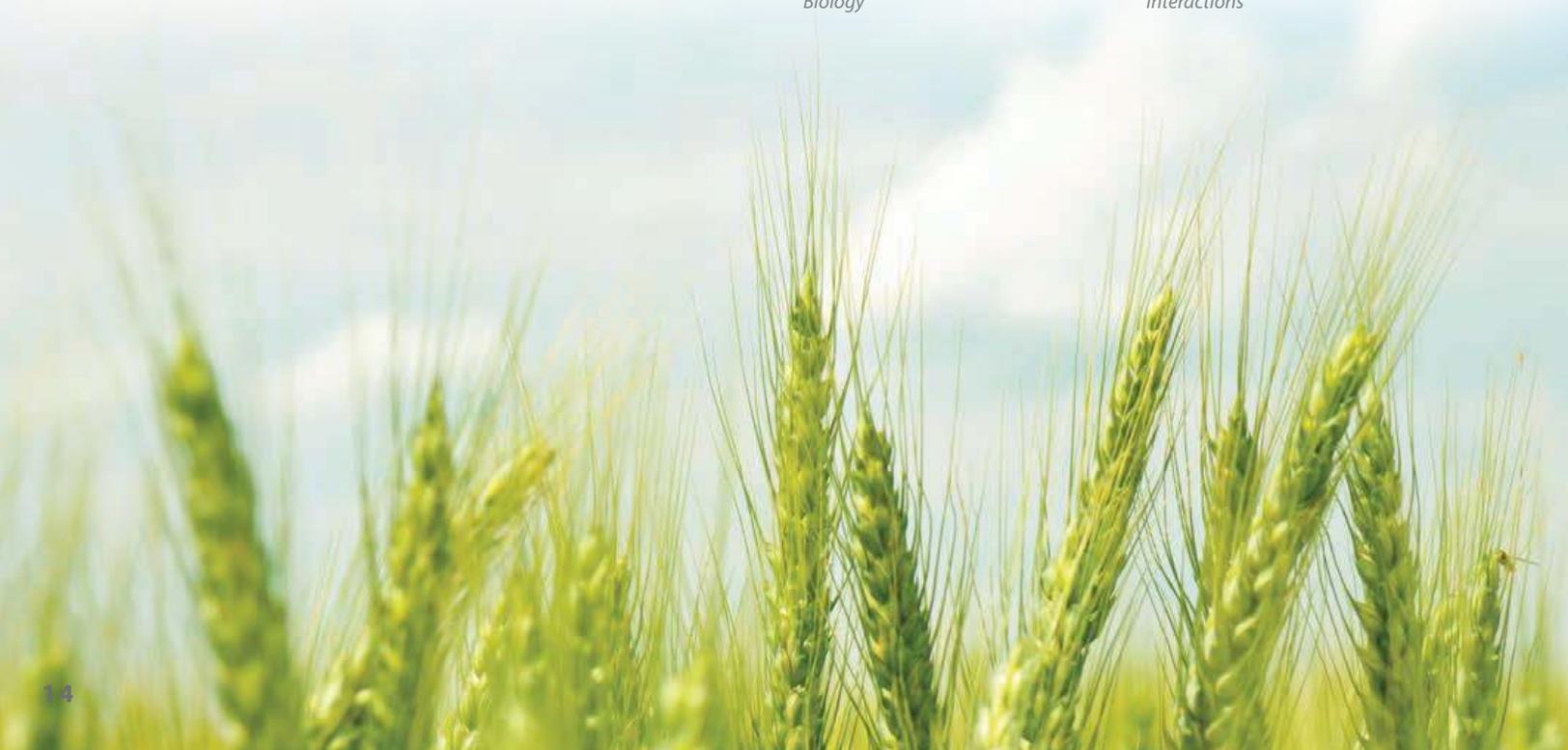
Our new strategy focuses on partnerships at home and abroad as well as close cooperation within GIFS. It's this collaborative spirit and willingness to adapt to real-world problems that made our recent successful application to the Agricultural Development Fund (ADF) in Saskatchewan possible. Taking into account the changing climate and importance of canola and soybean to Canadian farmers, we will be working to generate high performing, early-sowing crops to increase output and strengthen the Canadian economy.

**Joanne Ernest**  
*GIFS Research Associate, Seed and Developmental Biology*



One of the benefits of working at GIFS is the opportunity to interact in meaningful ways not only with national and international partners, but also our community in Saskatoon and on the USask campus. GIFS' commitment to community partnerships was evident during the early months of the COVID-19 pandemic, when they supported my work with the College of Engineering to print 3D masks for the Saskatchewan Health Authority on top of providing their own equipment and supplies. I'm excited to work at a place that values community relationships as much as I do.

**Grant Tingstad**  
*GIFS Research Engineer, Root-Soil-Microbial-Interactions*



# GIFS Affiliates

GIFS partners with a variety of multidisciplinary and multi-sector researchers in fields including biology, computer science, engineering, the social sciences and more. Working collaboratively on a variety of programs and projects, we are leveraging our combined strengths to contribute to help build a world where everyone has access to safe and nutritious food.

## Curtis Pozniak

Professor and Director, Crop Development Centre;  
co-lead, P<sup>2</sup>IRC Flagship 1

- Project: Wheat Genome Project

## Stuart Smyth

Assistant Professor, USask Agri-Food Innovation and Sustainability Enhancement Chair, College of Agriculture and Bioresources; co-lead, P<sup>2</sup>IRC Social Sciences Platform Program

- Project: Research Chair in Dept of Bioresource Policy, Business and Economics (3)
- Project: Economic and Environmental benefits of Bio Tech enhanced crops in Canada and evaluates Canadas Regulatory System
- Project: Assessment of Sask Ag Greenhouse Gas Emissions
- Project: Canadian Institute for Science & Innovation Policy (CISIP)

## Albert Vandenberg

Professor and NSERC - Saskatchewan Pulse Growers Industrial Research Chair in Genetic Improvement of Lentil, College of Agriculture and Bioresources; Researcher, Crop Development Centre

- Project: Effect of Biofortified Lentils on Iron and Selenium Status (EBLISS)
- Project: GIFS Enhancement Chair

## Carol Henry

Associate Professor, Nutrition and Dietetics and Assistant Dean, College of Pharmacy and Nutrition; P<sup>2</sup>IRC Project co-lead

- Project: Scaling up Pulse Innovations for Food Nutrition Security in Southern Ethiopia

## Bobbi Helgason

Professor, College of Agriculture and Bioresources;  
co-lead, P<sup>2</sup>IRC Flagship 2

- Project: Affiliate Chair in Soil-root-microbial interactions.

## Dwayne Hegedus

Research Scientist, Agriculture and Agri-Food Canada and Adjunct Professor, College of Agriculture and Bioresources

- Project: Developing Camilina Sativa as a Modern Crop Platform

## Isobel Parkin

Research Scientist, Agriculture and Agri-Food Canada; Adjunct Professor, USask; co-lead, P<sup>2</sup>IRC Flagship 1

- Project: Developing Camilina Sativa as a Modern Crop Platform

## Lana Awada

Senior Policy Fellow, Centre for the Study of Science and Innovation Policy, Johnson Shoyama Graduate School of Public Policy

- Project: Assessment of Sask Ag Greenhouse Gas Emissions

## Michael Nickerson

Associate Professor, College of Agriculture and Bioresources;  
Ministry of Agriculture Strategic Research Chair

- Project: Development of innovative therapeutic food products for treating malnutrition and responding to emergencies within high risk communities

## Peter Phillips

Distinguished Professor, Johnson Shoyama Graduate School of Public Policy; Director, Centre for the Study of Science and Innovation Policy; Associate Member, College of Agriculture; co-lead, P<sup>2</sup>IRC Social Science Platform Program

- Project: Canadian Institute for Science & Innovation Policy (CISIP)

## Kirstin Bett

Professor, College of Agriculture and Bioresources; Researcher, Crop Development Centre; co-lead, P<sup>2</sup>IRC Flagship 3, University of Technology, Sydney - USask

- Project: Hybrid Mimics in Grain Legumes – Lentil
- Project: Hybrid Vigour and Hybrid Mimics in Lentil (9)
- Project: University of Technology, Sydney – USask Hybrid Vigour and Hybrid Mimics in Lentil (9)



GIFS scientists Rick Goertzen and Zhijian Chai in the lab. (Credit: David Conlin).



# GIFS Affiliate Making Impact

Developing nutritious and accessible food products: USask researcher addressing malnutrition through innovative GIFS project.

***One eighth of the world's population goes without sufficient food and nutrition every day.***

In young populations, the issue is especially acute: the World Health Organization (WHO) estimates that 2.5 million children under five die every year due to malnutrition. Poor nutrition accounts for almost 50 per cent of all childhood mortality under the age of five. It's a global crisis that University of Saskatchewan (USask) researcher Dr. Michael Nickerson is hoping to address through a project funded by the Global Institute for Food Security (GIFS).

Nickerson and his team are developing innovative food products using blended pulse and cereal flours, fortified with vitamins and minerals as well as other bioactive ingredients that could be used to treat moderate or acute malnutrition within high-risk communities. The aim of the project is to produce a cereal that can be used on its own or as an ingredient in traditional food formulations, along with a lipid-based, ready-to-eat nutritional supplement.

In contrast to other therapeutic food products, the developed products are free of Genetically Modified Organisms (GMOs) and common allergens like soy or corn, and will include raw materials like barley and chickpea that are grown locally in Saskatchewan and Ethiopia.

Employing a range of social science methods, Nickerson and team also looked at socioeconomic dynamics of nutrition-sensitive food security in Ethiopia and sub-Saharan Africa with the goal of understanding the challenges that impede the use of therapeutic food aid products and pathways to the development of new supply chain relationships for therapeutic food products.

The next step for the project will involve its commercialization, as Nickerson's team works with partners to explore patenting the formulations and facilitating technology transfer by forming connections with non-governmental organizations.



The strength of this project is in its multi-disciplinary approach. Our diverse team has focused on both the innovative science needed to address malnutrition and the barriers to implementation around the world.

**Dr. Michael Nickerson** | Associate Professor, College of Agriculture and Bioresources, Ministry of Agriculture Strategic Research Chair (Photo credit: Dave Stobbe)



# Our External Stakeholders

## Our Partnerships

With collaboration key to how we operate, GIFS works with partners across the agri-innovation ecosystem - including government, industry, research institutes, food production and more - to provide innovative solutions for an accessible, safe, nutritious and reliable food system.

## Our USask Campus Partnerships

GIFS is conveniently located at USask, in the heart of a massive agriculture biotechnology industry. The province is home to 30 per cent of this industry in Canada, and USask alone contains one of the world's largest clusters for agri-food and bioscience—with centres like the Crop Development Centre, the College of Agriculture and Bioresources, the Global Institute for Water Security

(GIWS), the Fedoruk Centre, the Canadian Light Source and the Johnson-Shoyama Graduate School of Public Policy.

This location means we are quickly able to connect with our valuable partners in the USask community, on various programs and projects, complementing the great research already underway in this region. For instance, our USask location enables our P<sup>2</sup>IRC program to benefit from the unique ecosystem that supports the discovery, development and delivery of new crop varieties. This end-to-end capability and interaction with grower and producer groups is essential to ensure alignment with market need.

Our location on the USask campus also means we can work efficiently with partners such as the National Research Council of Canada and the Canadian Light Source, where fluorescence imaging using synchrotron light is helping researchers gain better knowledge of plants. This data will enhance breeding strategies and help farmers be more resource-efficient in their field operations.

### Legend: GIFS Partners

- 1 Syvlia Fedoruk Canadian Centre for Nuclear Innovation
- 2 Saskatchewan Centre for Cyclotron Sciences
- 3 National Research Council Building/GIFS
- 4 Agriculture and Agri-Food Canada
- 5 Canadian Light Source
- 6 Agriculture and Bioresources
- 7 Pharmacy and Nutrition
- 8 Arts and Science
- 9 Computer Science
- 10 Biology
- 11 Chemistry
- 12 Plant Sciences
- 13 Soil Science
- 14 Food and Bioproduct Sciences
- 15 Animal & Poultry Science
- 16 Ag & Resource Economics
- 17 Crop Development Centre
- 18 School of Environment and Sustainability
- 19 Johnson Shoyama Graduate School of Public Policy
- 20 Engineering
- 21 Crop Science Field Laboratory





Learn about some of our partnerships:

## GIFS-Bangladesh Partnership

An international partnership to enhance food security, maximizing Saskatchewan's expertise in agriculture-biotechnology.

In February 2020, GIFS and the Bangladesh Agricultural Research Council (BARC) entered into a multidisciplinary research, training and development partnership to help promote sustainable food security in the country.

The five-year agreement, defined in a Memorandum of Understanding (MOU), will advance knowledge and technologies for agricultural research and development in Bangladesh. This work will take place through a consortium jointly led by GIFS and BARC, the council which coordinates the National Agricultural Research System on behalf of the Bangladesh Ministry of Agriculture.



ABOVE PHOTOS: The GIFS-BARC MOU was signed by both parties at a ceremony in Bangladesh. In attendance were Canada and Bangladesh's High Commissioners, Bangladesh and Saskatchewan's Ministers of Agriculture and representatives from the governments of Bangladesh, Canada and Saskatchewan.

The groundwork for the international partnership was laid in 2019, and was further cemented by a working visit to GIFS of the Bangladesh High Commissioner to Canada, His Excellency Mizanur Rahman, in September of that year. Together with representatives from Bangladesh's ministries of agriculture and education, as well as from its leading research and training institutions, they participated in weeklong meetings and negotiations at GIFS. The delegates also visited research institutes on the USask campus, to learn about transferrable research, training and development opportunities.

Saskatchewan is a leading Canadian agri-food exporter, with **\$13.4 billion in sales in 2018**. Bangladesh is one of the province's top 10 markets: **2018 exports totaled \$306 million, with major products being lentils, wheat, peas and potash.**

The Saskatchewan visit was followed by a visit to Bangladesh in February 2020, led by GIFS. This mission included representatives from USask research organizations such as: the Global Institute for Water Security; the Colleges of Agriculture and Bioresources, Arts and Science, and Pharmacy and Nutrition; and the Canadian Light Source, as well as from the National Research Council of Canada.



Saskatchewan is an important partner of Bangladesh, with hundreds of millions of dollars in trade flowing between both parties every year, and I am pleased with the strong ties that exist between our country and the province. I look forward to even closer ties and an exchange of knowledge, skills and expertise that will help further strengthen our agriculture sector.

His Excellency Mizanur Rahman | Bangladesh High Commissioner to Canada



GIFS is working with these teams and other partners in Bangladesh to design and deliver programs focused on enhancing farmer incomes, addressing the effects of climate change in Bangladesh, and strengthening the country's delivery of the United Nations Sustainable Development Goals.



We are excited to be able to develop this initiative with Bangladesh, in a relationship that will enhance food security and support Saskatchewan and Canada's trade strategies with key markets, while highlighting the strengths of our agriculture, research and development sectors.

Steve Visscher CBE | GIFS Director of Strategic Partnerships and Chief Operating Officer



This partnership is just one example of GIFS working as a connector, bringing diverse partners together, and as a catalyst, complementing the great work already being done in the ecosystem to enhance production agriculture and food processing systems – in Saskatchewan, Canada and across the world.



## GIFS-Agriculture Victoria Research Partnership

Cross-continental cooperation to promote agri-innovation, leveraging shared strengths in agriculture, research, development and technology.

GIFS and Agriculture Victoria Research (AVR) established an agreement to work together to promote scientific collaboration, the exchange of personnel and the sharing of knowledge in agricultural and biological sciences, as well as related technologies.

AVR is a key division of the Australian state government of Victoria's Department of Jobs, Precincts and Regions (DJPR), under its agriculture portfolio. Its focus is to deliver innovation for economic growth in Victoria's agriculture through leading science and strong science capacity. The organization undertakes research and development in genomics and cellular sciences, microbial sciences, plant sciences, plant and animal production sciences and agriculture resources sciences. AVR aims to develop novel genetics and innovative farming systems to deliver economic value and environmental benefit in the temperate zone of south-east Australia, helping food and fibre producers increase competitiveness and minimize risk.

With similar goals to deliver innovation to food production systems, the GIFS-AVR partnership will work to expand scientific cooperation between both partners.



GIFS and AVR have similar objectives to advance innovative solutions in agriculture, through the strengths and resources of our respective regions and the value that diverse stakeholders bring to the table. Our partnership will promote knowledge sharing between both our organizations to help enhance our shared objectives.

**Professor German Spangenberg**  
FTSE PSM, Head, Agriculture Victoria Research



There are many players in the food security ecosystem, including producers, institutions, industry and distributors, and it is clear that no single player can work in isolation to enhance agriculture and food production. Working together with partners like AVR, we can share knowledge, collaborate on projects, cross-train our people and speed up the process of delivering improved food security more resourcefully for our regions, countries and a growing world.

**Dr. Steven Webb**  
Chief Executive Officer, GIFS



## Social Science and Policy Research Partnerships

Keeping social sustainability front and centre in innovation.

Social science plays an important role in research, providing tested and factual information about the adoption and adaptation of new products and services. Recognizing this importance, GIFS provided a \$675,000 grant to USask, to investigate social science impacts on food security and barriers to agri-food innovation.

The grant from GIFS is funding collaborative studies with experts in USask's Centre for the Study of Science and Innovation Policy (CSIP) in the Johnson Shoyama Graduate School of Public Policy and in the university's College of Agriculture and Bioresources.

The work is led by Distinguished Professor Peter Phillips in CSIP and USask Agri-Food Innovation and Sustainability Enhancement Chair Stuart Smyth, who is also associate professor in the university's department of agricultural and resource economics.

Advancing Canada and Saskatchewan's vital agriculture and agri-food sector requires new thinking and cooperation with diverse stakeholders. This alliance with skilled social scientists supports GIFS' collaborative approach to discover, develop and deliver novel production agriculture solutions that are economically and environmentally sustainable, and have the social license to operate.



Innovation is much more than invention. Demonstrating an innovation will create market demand, scaling up and commercializing new technologies and products is all an art. Getting all this right takes significant research and analysis, which this funding from GIFS will enable.

**Peter Phillips**  
Distinguished Professor  
USask



With the uncertainty regarding the speed or frequency of climactic changes on Canadian agriculture, it is more important than ever to have efficient regulatory and commercialization systems that are capable of rapidly delivering new crop varieties. Our social science research will keep the needs of producers and end-users in perspective. This will help ensure delivery of well-tailored solutions to market and enhance Canada's contribution to improving global food security.

**Dr. Stuart Smyth**  
USask Agri-Food Innovation and Sustainability Enhancement Chair





## Ag-West Bio Partnership

Connecting with the ag-biotechnology industry to drive innovation in the ecosystem.

GIFS is a member of Ag-West Bio Inc., Saskatchewan's bioscience industry association and catalyst for the growth of the bioeconomy. The organization works with industry stakeholders, innovators and investors, providing leadership for Saskatchewan's biotech cluster. Launched in 1989 by Saskatchewan's Ministry of Agriculture, Ag-West Bio's goal is to help move research to market and grow biobusiness in the province by:

- 1 Promoting the development and adoption of emerging technologies
- 2 Creating connections
- 3 Enabling and accelerating commercialization
- 4 Advocating for science
- 5 Building awareness of Saskatchewan's research cluster

Membership in Ag-West Bio provides GIFS the platform to connect with other organizations across the biotechnology, bioproducts and biofuels, environment, health and nutrition sectors. This connection is important to develop innovative and sustainable ways to tackle the challenge of food insecurity in Saskatchewan, Canada and across the world.



Saskatchewan is home to one of the most vibrant bioscience innovation clusters in Canada, and is at the heart of the country's agricultural biotechnology sector. Our research and development ecosystem continues to attract organizations that boost the province's strengths in agriculture and related sectors. The Global Institute for Food Security is an important part of this ecosystem. Its focus on working with diverse partners plays a vital role in advancing food security in a way that is environmentally, economically and socially sustainable.

**Dr. Karen Churchill** | *Chief Executive Officer, Ag-West Bio*



# GIFS Achievements

The past year has been one of growth for GIFS as we worked to set the stage for our future and new mode of operations by laying the foundation for our new technology platforms and programs, while adding to the strength of our local, national and international partnerships. Building on our role as a connector and a catalyst for agricultural innovation, we have begun the process of expanding our capabilities and capacities to be an even stronger partner.



GIFS joins federal partners to pilot first 'omics' and precision agriculture laboratory in Canada.

In the fall of 2019, GIFS rolled out the Omics and Precision Agriculture Laboratory (OPAL). A one-stop-shop, OPAL is Canada's first laboratory combining the digital data analysis of plant genes and traits with the latest precision agriculture technologies to improve crop yield, profitability and sustainability in the agri-food sector. The state-of-the-art laboratory provides genomics, phenomics and bioinformatics services to Western Canadian producers, in addition to public and private research organizations.

Using OPAL analyses, plant breeders can ensure crop inputs such as fertilizer and plant protection products are used at the correct time and place to increase productivity and maximize yields, in a sustainable manner. Through OPAL, GIFS will provide the latest omics' technologies and support the use of next generation agricultural technology, such as advanced camera systems, drones and digital phenotyping.

OPAL is an excellent example of collaboration across various scientific and other research partners, to achieve a common outcome with benefits in Canada and beyond. With funding from Western Economic Diversification Canada, the GIFS-managed initiative is a collaboration between the University of Saskatchewan, the National Research Council of Canada, and Agriculture and Agri-Food Canada.

The initiative will provide a complete solution tailored to crop data and analysis for client stakeholders, and will support existing, emerging and transformative precision agriculture techniques. The outcome will be accelerated crop breeding, in addition to reduced waste and increased efficiency for agronomists, breeders, producers and other clients.

## P<sup>2</sup>IRC

P<sup>2</sup>IRC completes successful mid-term review and site visit

The Plant Phenotyping and Imaging Research Centre (P<sup>2</sup>IRC) completed a successful site visit as part of its Canada First Research Excellence Fund (CFREF) midterm review in November. The GIFS-managed program, founded in 2015 with a \$37.2 million award from CFREF, was designed to develop innovative tools to revolutionize crop improvement, accelerating the process of plant breeding and transforming food production capacity through cutting-edge research.

The feedback from the review committee was overwhelmingly positive, and highlighted P<sup>2</sup>IRC's success in establishing strong multidisciplinary teams and in fostering collaboration between a diverse range of researchers, including biologists, computer scientists and engineers.



Dr. Andrew Sharpe. (Credit: Dave Stobbe)



## GIFS researchers help crack canola genome

GIFS researchers and affiliates were members of an international consortium of key academic and global seed company leaders from Canada, the United States, Europe and Israel that successfully sequenced the genome for canola.

The canola consortium was led by Dr. Isobel Parkin (PhD), GIFS affiliate researcher and research scientist from Agriculture and Agri-Food Canada (AAFC), and Dr. Andrew Sharpe (PhD), director of genomics and bioinformatics from GIFS and the director of P<sup>2</sup>IRC.

The genome research is essential to enhancing the quality and yield of the major oil crop. The project reached a key milestone in completing the full assembly and mapping the genomes of 10 diverse canola varieties, cultivated in Canada, the United States and Europe. The genome assembly and complete mapping was done using Israeli-based genomic big data company NRGene's DeNovoMAGIC technology.



“

This was truly a combined effort, made possible with the support and contributions from various parties. The results will advance breeding for rapeseed and canola, benefiting research, industry, producers and consumers. This progress also has immense economic value for Canada, which is one of the world's leading producers and exporters of canola.

**Dr. Andrew Sharpe (PhD)** | *Director of genomics and bioinformatics*

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## P<sup>2</sup>IRC delivers innovative approach to seed selection through PlotVision

The future of seed development is set to become more efficient thanks to PlotVision, a new image analysis software product from the P<sup>2</sup>IRC program.

Developed by P<sup>2</sup>IRC research associate William van der Kamp and his team under the leadership of USask computer scientist Ian Stavness, PlotVision is a Software as a Service (SaaS) product for analysis of agricultural field imagery that has become the basis for an early-stage start-up.

van der Kamp, a USask computer science graduate, was recognized for his innovative project by Saskatchewan technology incubator Co.Labs at the finale of a competition for early-stage tech startups in 2019, winning a \$10,000 prize and a spot in the next Co.Labs cohort under the startup name Cropper.

PlotVision identifies individual field plots within unmanned aerial vehicle images and uses artificial intelligence (AI) to analyse their colour, 3D shape and more, helping to predict outcomes such as harvest yield and disease resistance. Researchers can use this data to identify the most viable pesticides, fertilizers, and crop varieties. Unlike similar software on the market, PlotVision does not rely on human analysis, instead using automation and artificial intelligence to reduce costs and turnaround times while increasing the quality of information generated.



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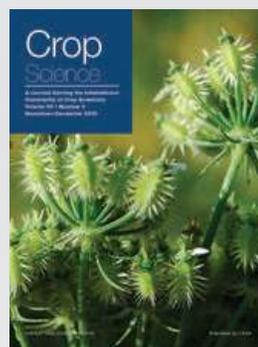
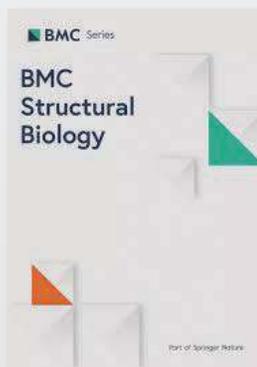
It's an exciting time for Saskatchewan innovators. The local tech sector is a thriving, motivated community, and the University of Saskatchewan is producing lots of great research and skilled personnel to fuel that growth.

**William van der Kamp** | GIFS Research Technician

”



GIFS staff and affiliates successfully published 84\* articles, book chapters, and materials that featured in a variety of journals.



\*This includes publications from our P<sup>2</sup>IRC program.



“

Plant breeding researchers and seed companies have to assess a large number of field plots to create new crop varieties and PlotVision will help increase the efficiency of this process and the quality of insights,” said Stavness, lead of P<sup>2</sup>IRC’s Deep Learning for Phenomics project. “PlotVision has the potential to play an important role in improving the seeds that farmers use.

**Dr. Ian Stavness (PhD)** | USask Computer Scientist

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## GIFS awarded over \$600,000 for project to help extend prairie growing season

A grant from Saskatchewan's Agriculture Development Fund (ADF) is helping researchers at GIFS pursue a project that could help extend the growing season for canola and soybean in Saskatchewan and in temperate climates around the world.

The grant, which totals \$604,000, was awarded to Leon Kochian, GIFS Associate Director and Canada Excellence Research Chair in Global Food Security at USask, and Joanne Ernest GIFS postdoctoral fellow. Kochian and Ernest will combine their research expertise in roots, soil and plant reproductive biology in a project to develop seeds with improved tolerance to cold and other abiotic (physical) stresses, allowing for extended sowing onto cold May soils.

The collaborative project is just one more example of how GIFS focuses on start-to-finish solutions to advance production agriculture. Cold temperatures are one of the major abiotic stresses for crops in temperate regions and have been shown to deform plant parts and slow the growth of young seedlings, adversely affecting the final yield. The recommended minimum soil temperature for germination is 10 degrees Celsius, meaning there is a risk to early sowing in the cold months.

Early sowing of both canola and soybean will result in a number of benefits to producers, including optimal flowering and seeding filling stages during the moist summer period and reduced risk of frost damage in the fall.



Producers are hesitant to sow seed in cold soil temperatures as this may impact germination, emergence and especially root establishment. By identifying cold-tolerant varieties with reduced days to germination and threshold temperature at which germination can occur, we are helping reduce that risk for producers.

**Dr. Joanne Ernest (PhD) | GIFS Research Associate**



Dr. Joanne Ernest (left) and Dr. Leon Kochian (right) in a GIFS lab (Credit: GetMyPhoto.ca)



Innovation.  
Excellence.  
Collaboration.  
Integrity. Equity,  
Diversity and  
Inclusion.



# GIFS in the Community

Community investment goes beyond philanthropy. At GIFS, we are committed to building partnerships not only with industry, government and academia, but also with our various communities by establishing a presence at events, promoting volunteerism with our staff and providing support when it is needed.

## GIFS Employee Recognized by Saskatoon Open Door Society (SODS)

Zhijian Chai, Research Technician in the Omics and Precision Agriculture Laboratory (OPAL), was recognized by the Saskatoon Open Door Society (SODS) in February. Zhijian was featured by SODS at its annual Diversity Awards Gala as one of its success-story clients and successfully employed immigrant.

Funded by the federal, provincial and municipal governments, SODS' mission is to assist newcomers to Canada to become participating members of an inclusive and diverse community and country. The annual Diversity Awards gala takes place every year to exclusively celebrate workforce diversity.



“I love my new job here in Global Institute for Food Security. I work as a Research Technician, and at this position I can **fully utilize my academic and professional knowledge**. It is also a good start for my life in Canada. I am sure my **career will flourish with this good start.**”

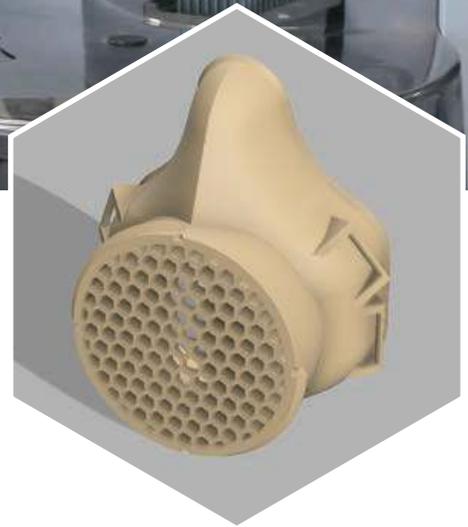
- **Zhijian**



Zhijian Chai. (Credit: Ariadne Valadares Souza)



GIFS Lab Manager Marco Pellino, working on the KingFisher™ Flex  
(Credit: Pierre-Luc Pradier)



Once the provincial government declared a state of emergency, we began to think about different ways to support the SHA. When we learned there was a need for testing supplies and equipment, we had no doubt that donating what we could was the right thing to do.

**Dr. Marco Pellino (PhD)** | *GIFS Data Management and Analytics Platform Lead*



## GIFS Supports Saskatchewan Health Authority COVID-19 Testing

GIFS answered the Saskatchewan Health Authority's (SHA) call for help during the COVID-19 crisis, providing research equipment to support diagnostic testing for COVID-19.

Using GIFS' KingFisher™ Flex instrument, the SHA has been able to run additional diagnostic tests for COVID-19.

"We know how important testing is to understanding the spread and occurrence of COVID-19, and we wanted to do our part at GIFS to support the Saskatchewan Health Authority's efforts with this," said GIFS Chief Executive Officer Steve Webb. "A number of the tools and technologies used in agriculture and food research and development are also used in medical science and GIFS has both scale and capacity that can help address challenges in medical diagnosis."

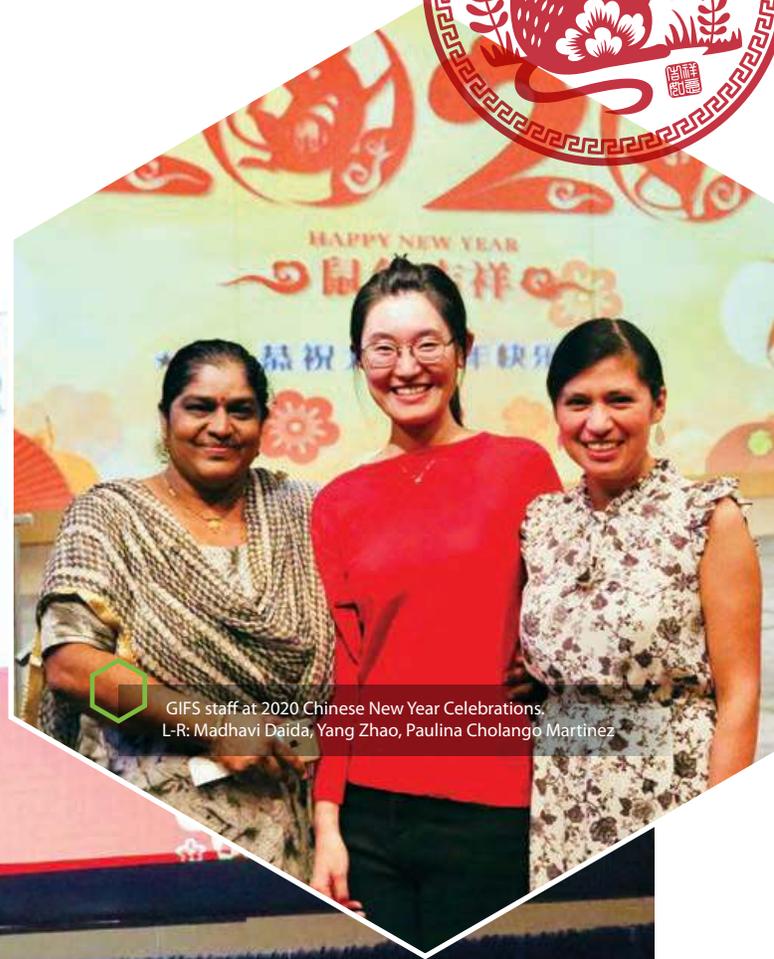
Manufactured by ThermoFisher Scientific, the KingFisher™ Flex is a lab instrument used for extracting and purifying DNA, RNA, protein and cells from a large number of samples. Extremely versatile, the machine can be used for various high throughput (very large scale and automated) applications including genetic testing and sequencing, virus detection, protein analysis, and RNA gene expression.

In addition to the KingFisher™, GIFS donated testing supplies, disposable tip combs and microplates, for the SHA's use in testing equipment.

GIFS also assisted USask's College of Engineering efforts in designing 3D-printed N95 masks for use by emergency room doctors and nurses. Grant Tingstad, research engineer at the institute, worked with the engineering college team, while GIFS provided 3D printing materials and use of its laboratory and equipment.

## Fostering Community: Chinese New Year Celebrations 2020

Once again, GIFS staff had a strong presence at the 2020 Chinese New Year celebrations in Saskatoon, coming away with smiles and some prizes. With a number of GIFS staff hailing from China, the celebrations represent a chance to strengthen our connection with the greater Saskatoon community as we recognize GIFS' unique diversity.



GIFS staff at 2020 Chinese New Year Celebrations.  
L-R: Madhavi Daida, Yang Zhao, Paulina Cholango Martinez





## Fostering Connections: GIFS' 2019-20 Sponsorships

At GIFS, we are pleased to be both a catalyst for innovative science and an important connector in the wider AgTech and Saskatoon communities. One way that we strengthen these connections is by investing in events that help foster scientific and cultural relationships alike—all as part of our mission to work with our partners to discover, develop, and deliver innovative solutions for the production of globally sustainable food.

Listed below are some of the events that we have sponsored in the past year:

### Canola Days 2019

A conference focused on the latest information on genomics, soil, nutrient, pest management, and the newest innovations affecting the only Made-in-Canada crop.

### 2019 Agri-food Innovation Conference

The 2019 Agri-food Innovation Conference focused on the increasing impact of artificial intelligence (AI) and robotics on the agri-food sector in Canada.

### Global Biotech Week 2019

Organized by Ag-West Bio, Saskatchewan's Global Biotech Week features a week full of activities, including industry networking events and workshops, as well as public outreach events, in Saskatoon and Regina.

### Canada 2020 Agrifood Forum

The peak gathering of Canada 2020's Food Brand Project, which is studying a global agri-food system at a crossroads: recognizing that it must remain a resilient and dependable producer of safe, high quality food while coping with rising consumer expectations around nutrition, sustainability, and trust.





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I believe Saskatchewan  
is at the centre of  
Canada, when it  
comes to agriculture  
biotechnology.

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Alanna Koch | *Board Chair, GIFS*

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# Our Events

## Fourth Annual Plant Phenotyping and Imaging Research Centre Symposium

### Enhancing digital plant breeding for climate change resiliency

Every year, the Plant Phenotyping and Imaging Research Centre (P2IRC) hosts a symposium to showcase its recent and ongoing activities. The October 2019 symposium focused on innovative digital breeding technologies designed to make plants more resilient to climate change.

Attracting renowned researchers from Canada and across the world, as well as industry representatives and students, the symposium was especially significant as it highlighted new science and technology platforms created in P2IRC's first phase of operations and its agriculture and food production applications for the second phase of the innovative seven-year research, training and development program. The different innovations created within P2IRC's extensive program have the potential to transform crop breeding and provide innovative solutions to national and global food security. The new science developed in P2IRC will help elevate Canada's position as a global powerhouse in agricultural research.

Phase I accomplishments for P2IRC include the establishment of a multidisciplinary program involving industry engagement and experts in breeding, agronomy, genetics, genomics, engineering, physics, soil science, chemistry, computer sciences, and social sciences and economics. This collaboration led to the creation of a number of innovations, including additional tools for visualizing roots in soil and for the hyperspectral imaging of crops and soils. (Hyperspectral images contain highly detailed information of the subject's image pixels, providing an additional dimension of data).

In addition, P2IRC scientists—USask wheat breeder Curtis Pozniak and Andrew Sharpe, also the director of genomics and bioinformatics at GIFS—played a key role in helping to sequence the bread wheat genome that was published in 2018, as part of the International Wheat Genome Sequencing Consortium (IWGSC) initiative. The pair co-lead Canada's contribution to this initiative, working with other researchers at USask, across the country and globally.



UNIVERSITY OF SASKATCHEWAN  
Plant Phenotyping and  
Imaging Research Centre  
[www.p2irc.usask.ca](http://www.p2irc.usask.ca)



.....  
Two days. About 260 participants from North America and as far away as Europe. 30 local and international speakers. Over 30 poster presentations.  
.....

# P<sup>2</sup>IRC

## P<sup>2</sup>IRC Enters New Phase

Phase II of the P<sup>2</sup>IRC program is already focused on delivering technology to improve breeding efficiency and enhance sustainability, bringing net profit to farmers. Using digital breeding techniques and tools such as field and aerial sensors, artificial intelligence tools, satellite imaging, robotics and big data analytics, P<sup>2</sup>IRC will create “climate smart” crops, and enhance the yield potential of large-scale food crops.

## GIFS' Inaugural Science Day

Inaugural science open house to share GIFS' research with the community.

In November 2019, GIFS hosted its inaugural Science Day open house, to share its research and development solutions designed to enhance agriculture and food production in Saskatchewan, Canada and across the world.

The event took place at Marquis Hall at the USask campus, and featured talks, poster presentations, demonstrations and question-and-answer sessions by GIFS' research program leaders, affiliates and postdoctoral fellows—highlighting the institute's multidisciplinary approach to addressing global food security challenges.

Science Day featured sessions ranging from enhancing crop resiliency, improving plant roots, creating stronger plant seeds and digital agriculture tools to enhance and accelerate plant breeding.

USask professor and GIFS affiliate - Dr. Albert Vandenberg, NSERC-Saskatchewan Pulse Growers Industrial Research Chair in Genetic Improvement of Lentil – wrapped up the day's events delivering a plenary talk on the international perspectives of a plant breeder.





# **Global Institute for Food Security**

Financial Statements  
**April 30, 2020**



## *Independent auditor's report*

To the Board of Directors of Global Institute for Food Security

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### *Our opinion*

In our opinion, the accompanying financial statements present fairly, in all material respects, the financial position of Global Institute for Food Security (the Institute) as at April 30, 2020 and the results of its operations and its cash flows for the year then ended in accordance with Canadian accounting standards for not-for-profit organizations.

#### **What we have audited**

The Institute's financial statements comprise:

- the statement of financial position as at April 30, 2020;
- the statement of operations and changes in unrestricted net assets for the year then ended;
- the statement of cash flows for the year then ended; and
- the notes to the financial statements, which include a summary of significant accounting policies.

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### *Basis for opinion*

We conducted our audit in accordance with Canadian generally accepted auditing standards. Our responsibilities under those standards are further described in the *Auditor's responsibilities for the audit of the financial statements* section of our report.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

#### **Independence**

We are independent of the Institute in accordance with the ethical requirements that are relevant to our audit of the financial statements in Canada. We have fulfilled our other ethical responsibilities in accordance with these requirements.

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### *Responsibilities of management and those charged with governance for the financial statements*

Management is responsible for the preparation and fair presentation of the financial statements in accordance with Canadian accounting standards for not-for-profit organizations, and for such internal control as management determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

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*PricewaterhouseCoopers LLP*  
128 4th Avenue South, Suite 600, Saskatoon, Saskatchewan, Canada S7K 1M8  
T: +1 306 668 5900, F: +1 306 652 1315

"PwC" refers to PricewaterhouseCoopers LLP, an Ontario limited liability partnership.



In preparing the financial statements, management is responsible for assessing the Institute's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless management either intends to liquidate the Institute or to cease operations, or has no realistic alternative but to do so.

Those charged with governance are responsible for overseeing the Institute's financial reporting process.

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### *Auditor's responsibilities for the audit of the financial statements*

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with Canadian generally accepted auditing standards will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

As part of an audit in accordance with Canadian generally accepted auditing standards, we exercise professional judgment and maintain professional skepticism throughout the audit. We also:

- Identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Institute's internal control.
- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management.
- Conclude on the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Institute's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Institute to cease to continue as a going concern.
- Evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.



We communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

*Signed PricewaterhouseCoopers LLP*

Chartered Professional Accountants

Saskatoon, Saskatchewan  
September 18, 2020



# Global Institute for Food Security

Statement of Financial Position

As at April 30, 2020

	2020 \$	2019 \$
<b>Assets</b>		
<b>Current assets</b>		
Cash held by University of Saskatchewan (note 3)	23,335,102	26,107,939
Accounts receivable	49,111	30,137
Prepaid expenses	-	15,762
	<u>23,384,213</u>	<u>26,153,838</u>
<b>Liabilities</b>		
<b>Current liabilities</b>		
Accounts payable and accrued liabilities (notes 3 and 6a)	2,375,013	2,579,843
<b>Unrestricted net assets</b>	<u>21,009,200</u>	<u>23,573,995</u>
	<u>23,384,213</u>	<u>26,153,838</u>
<b>Economic dependence</b> (note 1)		
<b>Commitments</b> (note 6)		
<b>Contingencies</b> (note 7)		
<b>COVID-19 pandemic</b> (note 8)		

Approved by the Board of Directors

Director

Director

The accompanying notes are an integral part of these financial statements.

# Global Institute for Food Security

## Statement of Operations and Changes in Unrestricted Net Assets

For the year ended April 30, 2020

	2020 \$	2019 \$
<b>Revenue</b>		
Contributions from founding partners (note 4)	2,000,000	3,750,000
Interest income (note 3)	563,761	436,078
Fee for service and other income	91,242	22,513
	<u>2,655,003</u>	<u>4,208,591</u>
<b>Expenses</b>		
Research and education		
Grants and awards (notes 3 and 6a)	2,201,118	3,869,459
Occupancy costs (notes 6b and 9)	592,531	1,034,527
Salaries and benefits	251,909	551,199
Research equipment (note 5)	229,632	-
External science advisory	74,065	73,116
Conferences and lecture series	4,703	402,448
	<u>3,353,958</u>	<u>5,930,749</u>
Administration		
Salaries and benefits	1,136,801	1,045,435
Travel and recruitment	233,305	97,359
Communications and marketing	136,113	50,681
Occupancy costs (notes 6b and 9)	115,568	170,858
Office operations (note 3)	96,465	105,636
Board costs (note 3)	62,195	93,009
Consultants and contractors	51,925	394,456
Furniture and computers (note 5)	33,468	37,445
	<u>1,865,840</u>	<u>1,994,879</u>
	<u>5,219,798</u>	<u>7,925,628</u>
<b>Deficiency of revenue over expenses</b>	(2,564,795)	(3,717,037)
<b>Unrestricted net assets – Beginning of year</b>	<u>23,573,995</u>	<u>27,291,032</u>
<b>Unrestricted net assets – End of year (note 6)</b>	<u>21,009,200</u>	<u>23,573,995</u>

The accompanying notes are an integral part of these financial statements.



# Global Institute for Food Security

## Statement of Cash Flows

For the year ended April 30, 2020

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	2020 \$	2019 \$
<b>Cash provided by (used in)</b>		
<b>Operating activities</b>		
Deficiency of revenue over expenses for the year	(2,564,795)	(3,717,037)
Changes in non-cash working capital items		
Cash held by University of Saskatchewan	2,772,837	1,245,488
Accounts receivable	(18,974)	(30,137)
Prepaid expenses	15,762	92,623
Accounts payable and accrued liabilities	(204,830)	2,420,563
Deferred revenue	-	(11,500)
	<u>2,564,795</u>	<u>3,717,037</u>
<b>Net change in cash</b>	-	-
<b>Cash – Beginning of year</b>	-	-
<b>Cash – End of year</b>	<u>-</u>	<u>-</u>

The accompanying notes are an integral part of these financial statements.

# Global Institute for Food Security

## Notes to Financial Statements

April 30, 2020

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### 1 Nature of business

The Global Institute for Food Security (the Institute or GIFS) was established by a Memorandum of Agreement (the agreement) dated November 19, 2012 between the University of Saskatchewan, the Government of Saskatchewan, and Nutrien Ltd. (formerly Potash Corporation of Saskatchewan). The Institute is a Type B Centre of the University of Saskatchewan (the University) and is organizationally part of the University and subject to University management and control. As a Type B Centre, the Institute is not incorporated and is not legally distinct from the University.

The mission of the Institute is to work with partners to discover, develop and deliver innovative solutions for the production of globally sustainable food. The operation of the Institute is economically dependent on the funding from Nutrien Ltd. and the Government of Saskatchewan (note 4).

### 2 Summary of significant accounting policies

#### a) Basis of presentation

These financial statements include the accounts of the Institute and are presented in accordance with Canadian accounting standards for not-for-profit organizations (ASNPO).

#### b) Use of estimates

The preparation of financial statements in conformity with ASNPO requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements and the reported amount of revenue and expenditures during the reporting period. Actual results could differ from these estimates.

#### c) Revenue recognition

The Institute follows the deferral method of accounting for contributions which includes funding from the Government of Saskatchewan and Nutrien Ltd. as well as other funding sources.

Unrestricted contributions are recognized as revenue when received or receivable if the amount to be received can be reasonably estimated and collection is reasonably assured. Restricted contributions for expenses of the current period are recognized as revenue in the current period and restricted contributions for expenses of one or more future periods are deferred and recognized as revenue in the same period or periods as the related expenses are recognized.

Investment income earned on the cash held by University of Saskatchewan is recognized as revenue when the university can measure and transfer the income to the Institute.

Contributions of materials and services are recognized only when a fair value can be reasonably estimated and when the materials and services are used in the normal course of the Institute's operations and would otherwise have been purchased.



# Global Institute for Food Security

## Notes to Financial Statements

April 30, 2020

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d) Financial instruments

Financial assets and financial liabilities, consisting of cash held by University of Saskatchewan, accounts receivable and accounts payable and accrued liabilities, are initially recognized at fair value and subsequently measured at amortized cost. The Institute does not consider itself to have significant exposure to credit risk, currency risk, interest rate risk, liquidity risk, market risk or other price risk.

e) Tangible capital assets

The Institute is organizationally part of the University and is subject to University management and control. As such, tangible capital assets purchased using the Institute's funds are managed by the Institute but remain the property of the University of Saskatchewan, and as such are not recognized as tangible capital assets by the Institute (note 5).

### 3 Related party transactions

During the year ended April 30, 2020, the Institute purchased goods and services from the University of Saskatchewan in the amount of \$23,101 (2019 – \$9,832), which are included in office operations expenses. During the year, the University provided the Institute with access to facilities, phones, computer networks and financial administrative systems needed to support the operational needs of the Institute. Of the grants and awards made during the year ended April 30, 2020 by the Institute, \$1,939,096 (2019 – \$3,522,236) were made to the University of Saskatchewan, including individuals or entities related to or employed by the University. As at April 30, 2020, the accounts payable and accrued liabilities balance included \$2,337,500 (2019 – \$2,525,000) related to grants and awards (including research equipment) that had been approved by the Institute but had yet to be disbursed as of the year end date.

All funds received by the Institute are held in, and payments to vendors of the Institute are made from, bank accounts administered by the University, which are included on the statement of financial position as Cash held by University of Saskatchewan. The average monthly balance earned a rate of 2.28% during the year (2019 – 1.63%) and interest income of \$563,761 (2019 – \$436,078) was received from the University during the year.

During the year ended April 30, 2020 members of the Institute's Board of Directors received payments for per diems and expenses of \$62,195 (2019 – \$93,009).

All related party transactions described above are measured at the exchange amount, which is the consideration established and agreed to by the parties.

# Global Institute for Food Security

## Notes to Financial Statements

April 30, 2020

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### 4 Contributions from founding partners

The agreement (note 1) features a funding commitment of \$15 million from the Government of Saskatchewan over seven years ending April 30, 2020 and a provisional donation to the Institute of up to \$35 million by Nutrien Ltd. over seven years, subject to an annual review of the Institute including certain reporting requirements being met and satisfactory performance against certain objectives and metrics. The provisional donation from Nutrien Ltd. may be structured such that funds are provided evenly over the seven year period, or proportionally matched with the growth of the Institute, or by some other agreed upon manner. Nutrien Ltd. will determine on an annual basis whether or not to make a contribution during any fiscal year.

As of April 30, 2020, the funding received to-date is \$15 million (2019 – \$13 million) from the Government of Saskatchewan and \$35 million (2019 – \$35 million) from Nutrien Ltd.

### 5 Capital assets

The Institute transfers funds to researchers for the purpose of purchasing research equipment, which is reported within Grants and awards. The Institute also purchases research equipment directly for the use of researchers, which is reported within “Research equipment”. The research equipment is managed by the Institute, however the title to the research equipment remains with the University of Saskatchewan, and as such is not reported as a tangible capital asset by the Institute.

The total amount of research equipment, furniture and computers purchased during the year ended April 30, 2020 is approximately \$358,455 (2019 – \$37,445), including amounts included within “Grants and awards”. As of April 30, 2020, the total amount of research equipment, furniture and computers purchased since the Institute’s formation, including amounts reported within “Grants and awards”, is approximately \$1,480,343 (as of April 30, 2019 – \$1,121,888).

### 6 Commitments

#### a) Funding awards

One of the core activities of GIFS is to provide grants to eligible scientific investigators for the purpose of research in a wide range of issues related to food production and food security. As at April 30, 2020, the total remaining maximum commitment on active funding commitments with multi-year grants is approximately \$7,544,000, including the \$2,337,500 in accounts payable and accrued liabilities at April 30, 2020. During the year ended April 30, 2020 an amount of \$2,430,750 (including research equipment) was funded (2019 – \$3,869,459)



# Global Institute for Food Security

Notes to Financial Statements

April 30, 2020

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Total anticipated maximum commitments over the next five years, in addition to the \$2,337,500 included in accounts payable and accrued liabilities at April 30, 2020, are as follows:

	\$
2021	1,851,666
2022	1,514,443
2023	1,040,000
2024	40,000
2025	40,000
Thereafter	<u>720,000</u>
	<u>5,206,109</u>

Included in the maximum commitments disclosed above is a contribution of up to \$499,999 from GIFS to Divseek International Network Inc. (DIN) in relation to the award entitled “Building Global Research Collaboration for Mobilising Crop Diversity”. The contributions are to be made over a term of April 1, 2019 to March 31, 2022 and are conditional upon a member of the University becoming and remaining a Board member for DIN for that term and receipt by the University of certain reporting from DIN. Any unspent funds are to be returned to GIFS within 30 days of the end of the term. The total amount of commitments that remain under this arrangement as at April 30, 2020 are \$236,109.

Also included in the maximum commitments disclosed above is an annual contribution of \$1 million from GIFS to the university, for a 7-year period commencing in the year ended April 30, 2017, related to the \$10 million Canada Excellence Research Chair (CERC) funding which was awarded to the University during the year ended April 30, 2017. The Research Chair is held by the Associate Director of GIFS and supports the Roots pillar of GIFS’ strategic plan to address food sustainability. As at April 30, 2020, the accounts payable and accrued liabilities balance includes \$2,000,000 related to this arrangement and the total amount of remaining commitments are \$3,000,000.

Also included in the maximum commitments disclosed above is an annual contribution to the university of \$40,000 from GIFS, for a 25-year period commencing during the year ended April 30, 2017, related to funding the Dr. Donald Baxter Scholarship for Global Food Security, which was created during the year ended April 30, 2017 by means of a gift of \$1 million to the University. The scholarship fund will be endowed and awarded annually from the scholarship fund administered by the University by a committee comprised of members from GIFS and the University. The total amount of commitments that remain under this arrangement as at April 30, 2020 are \$920,000.

During the year ended April 30, 2016 the Canada First Research Excellence Fund (CFREF) Steering Committee approved funding to the University, for the application entitled Designing Crops for Global Food Security submitted by the University, for a total amount of \$37.24 million between September 2015 and August 2022. The university delegated management of the research program and fund management responsibilities to the CEO and Executive Director of GIFS. The program focuses on the “Digital Agriculture” pillar of GIFS’ strategic plan to address food sustainability. GIFS has no financial commitments related to the CFREF funding and no responsibilities as an organization beyond those delegated and designated to its CEO and Executive Director.

# Global Institute for Food Security

## Notes to Financial Statements

April 30, 2020

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- b) The University is party to License to Occupy Premises at the National Research Council agreements on behalf of the Institute for office and laboratory space. The minimum future commitments under the agreements are as follows:

	\$
2021	553,628
2022	422,146
	<hr/>
	975,774
	<hr/>

Included in the minimum future commitments immediately above is \$90,000 per year for the estimated fit-up and leasehold improvement costs for the 2021 through 2022 fiscal years.

## 7 Contingencies

In the normal course of operations, the Institute becomes involved in legal actions. Some of these potential liabilities may become actual liabilities when one or more future events fails to occur. To the extent that the future event is likely to occur, and a reasonable estimate of the loss can be made, an estimated liability is accrued and an expense recorded. Management believes any resulting outcome would not have a material effect on the statement of financial position or the statement of operations and changes in unrestricted net assets.

## 8 COVID-19 pandemic

On March 11, 2020, the World Health Organization (WHO) declared the outbreak of a novel coronavirus (COVID-19) as a global pandemic resulting in significant public health measures and restrictions being put in place. Restrictions such as travel bans, closure of non-essential businesses and physical distancing have caused disruption to businesses and a significant decline in global capital markets resulting in an economic slowdown.

Management has assessed the financial impact of COVID-19 at April 30, 2020, including the collectability of receivables, assessment of provisions and contingent liabilities, timing of revenue recognition, and changes to operations. Management did not identify any impact to its financial statements as at April 30, 2020.

Although public health restrictions and related guidelines have resulted in the Institute having to transition to remote working arrangements, there is no significant impact anticipated with respect to the Institute's ability to continue to deliver on its core initiatives.

The long-term impact of the pandemic on the Institute and the economy is not yet known and information surrounding the global economic impact of COVID-19 and the estimated length of the pandemic continues to evolve. Future impacts of the pandemic may have a financial effect on the Institute's future revenues and operating results. It is not possible to estimate any results of future financial impacts of COVID-19 on the Institute subsequent to April 30, 2020.



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Saskatchewan is home to  
one of the most vibrant  
bioscience innovation  
clusters in Canada.

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Dr. Karen Churchill | *Chief Executive Officer, Ag-West Bio*

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# Publications

The following lists from 2014 to April 2020 include publications from our P<sup>2</sup>IRC program.

## 2020

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# Notes



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