



GIFS

GLOBAL INSTITUTE
FOR FOOD SECURITY

Growing science for life

Nutrien - a Founding Partner

2020 - 2021 REPORT

Growing *forward*

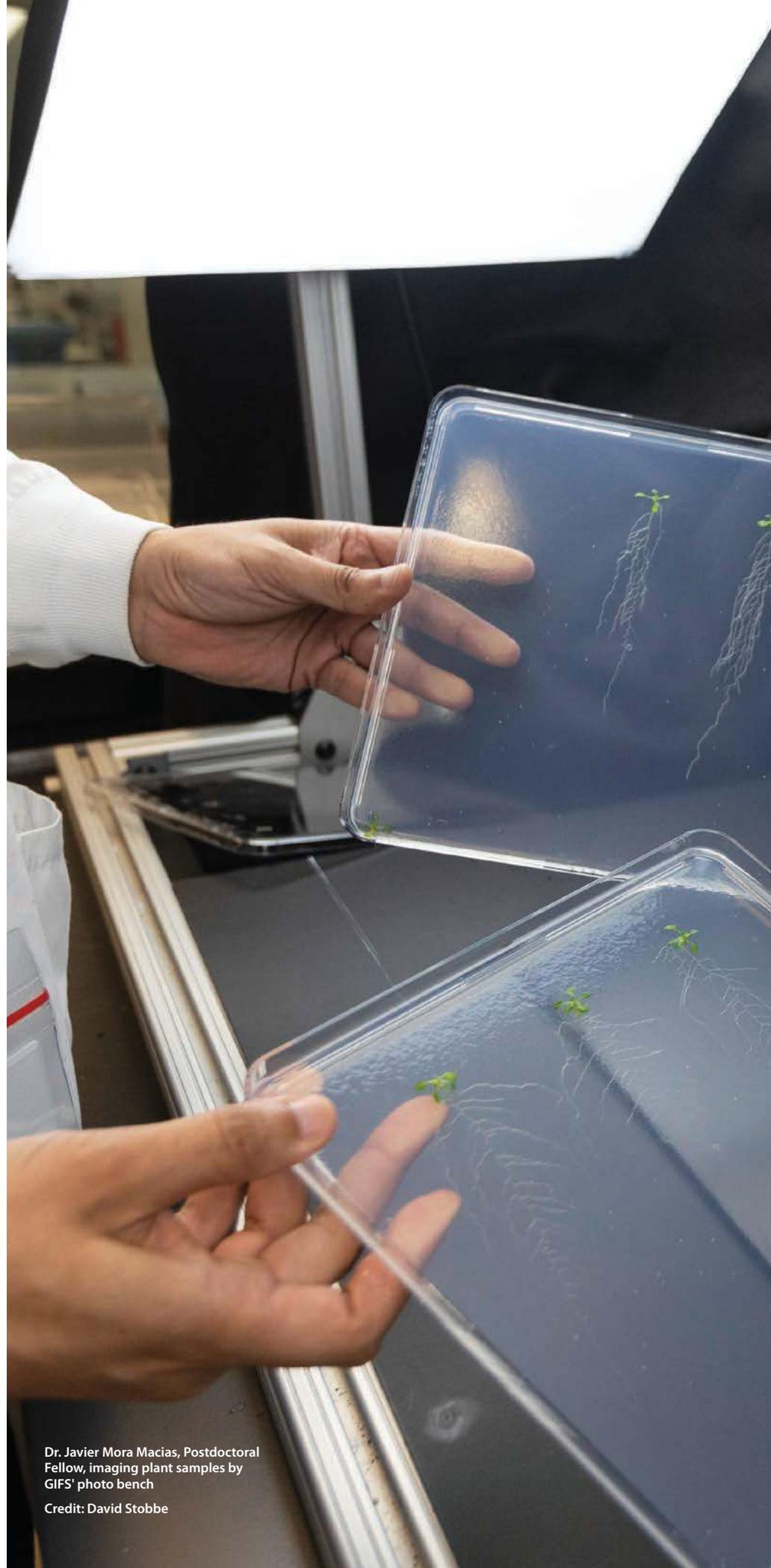
| delivering
value.





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Dr. Javier Mora Macias, Postdoctoral Fellow, imaging plant samples by GIFS' photo bench
Credit: David Stobbe



About GIFS

Finding solutions to the challenges facing the global food system requires an innovative and collaborative approach that delivers value to all stakeholders.

The Global Institute for Food Security (GIFS) at the University of Saskatchewan (USask) works with partners to discover, develop and deliver innovative solutions for the production of globally sustainable food. Serving as 'agriculture's innovation catalyst', GIFS is connecting the agri-food ecosystem, advancing innovation and bridging the gap to commercialization to deliver resilient and sustainable food security for all stakeholders.

Founded in 2012 in a partnership between Nutrien, the Government of Saskatchewan and USask, GIFS' vision is a world where everyone has access to safe and nutritious food. Striving towards this bold vision, 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 (P²IRC) 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, industry, producers, consumers, academics 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, Bayer, Corteva, 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, and many more players.

Collaboration is critical for any ecosystem to function successfully. Recognizing this, GIFS works as a **connector**, bringing diverse partners together, and as a **catalyst**, complementing the strengths of the ecosystem to enhance production agriculture and food processing systems.

As part of its role as a catalyst, GIFS has designed technology platforms, including its Omics and Precision Agriculture Laboratory (OPAL), its Cell Biology and Data Management and Analytics platforms and its soon to be established Agriculture Biomanufacturing (engineering biology) Centre, to support the 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 food security from Saskatchewan out, in a manner that is economically, environmentally and socially sustainable.

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

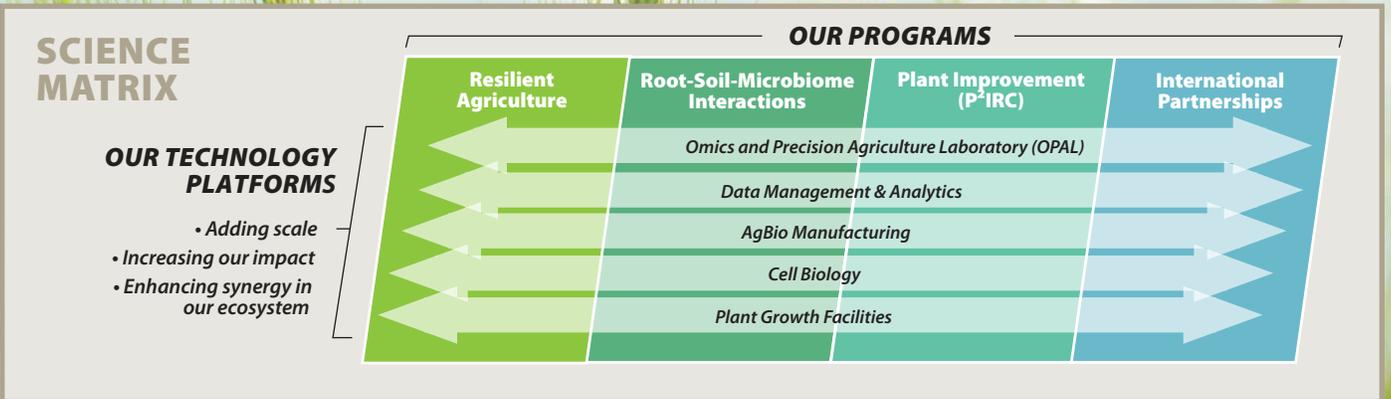
Our VALUES help support our vision and guide our behaviors, shaping our culture and identity

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:	SCALE:	SUSTAINABILITY:	SYNERGY:
	Aligning impact with mission helps us understand and meet customer needs and inform future investment decisions	Building scale supports strategic growth within a sustainable framework	Integrated sustainability (environmental, economic and social) creates long-term value	Synergy helps create a value culture that is complementary, helps drive teamwork, open communication, and results

GIFS GOALS	FINANCIAL	EXTERNAL STAKEHOLDER	INTERNAL	LEARNING & GROWTH
	<ul style="list-style-type: none"> Grow Revenue/Resources Diversify Revenue/Resource Sources Practice Excellent Financial Stewardship 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> Expand Research Capabilities & Capacity Increase Institutional Effectiveness Enhance Internal Synergy 	<ul style="list-style-type: none"> Multidisciplinary, Solution-oriented, Entrepreneurial Approach to Research Attract, Retain and Develop Talent Continuous Learning Culture



Our **vision** provides direction

A world where everyone has access to safe and nutritious food.

Our **mission** creates focus

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

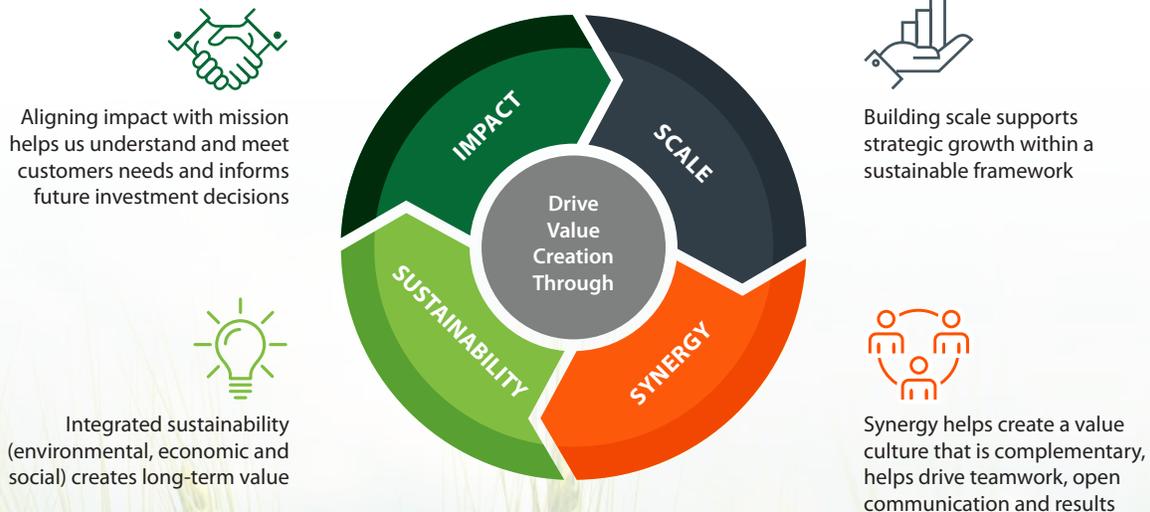
Our **values** help support our vision and guide our behaviors, shaping our culture and identity

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

Our **purpose**

GIFS is agriculture's innovation catalyst, connecting the agri-food ecosystem, advancing innovation and bridging the gap to commercialization to deliver resilient and sustainable food security for all stakeholders.

Our **strategic drivers**



Our Founding Partners:



GIFS in Numbers

PATENTS +
INTELLECTUAL
PROPERTY OUTPUTS:

10



STAFF
COUNTRIES:

23

RESEARCH
NETWORK SIZE:

250+

GIFS
PUBLICATIONS:

83*

USASK
COLLABORATIONS:

20+

PRESENTATIONS:

25

FUNDING
LEVERAGED:

\$88M



* This number includes publications from our from our P²IRC program.

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.



Alanna Koch
Board Chair



Lorne A. Babiuk
Board Vice-Chair



Timothy Hawryluk, Q.C.
Corporate Secretary to the Board



Rick Burton
Deputy Minister, Saskatchewan
Ministry of Agriculture



Candace Laing
Vice President, Sustainability and
Stakeholder Relations, Nutrien



Dr. Baljit Singh
Vice President of Research,
University of Saskatchewan



Marco Ferroni
Chair CGIAR System Management
Board



Dr. Steven Webb
Executive Director and Chief
Executive Officer, Global Institute for
Food Security



Stephen Visscher CBE
Director of Strategic Partnerships
and Chief Operating Officer, Global
Institute for Food Security



Dr. Karen Chad
Former Vice President of Research,
University of Saskatchewan
(Until February 2021)

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
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

GIFS Grower Advisory Panel Members

The Grower Advisory Panel has been set up to provide GIFS with 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.

Alanna Koch, Chair
Chair, GIFS Board of Directors
Saskatchewan

Dr. G. Kee Jim
Managing Director,
Feedlot Health & GK Jim Group of Companies
Alberta

Jack Froese
Board of Directors,
Canadian Canola Growers Association
Manitoba

Chantelle Donahue
Vice President,
Commercial Leader, Cargill
Saskatchewan

Kristjan Hebert
Managing Partner and CEO,
Hebert Grain Ventures
Saskatchewan

Maurice Delage
President and CEO,
Delage Farms
Saskatchewan

Board Chair

■ Alanna Koch

There is no doubt that the COVID-19 pandemic has made the world more food-insecure, impacting global supply systems and the agriculture and food sector. But those looking for a reason to be optimistic need to look no further than the Canadian agri-food sector, which has responded quite effectively in the face of the challenges of the pandemic.

If there is one lesson to take away from the past year, it's that the world needs agricultural innovation more than ever and that this innovation can only be achieved by working together. There is no better time for an organization with the mandate of GIFS to be a catalyst for innovation and a connector in the agri-food sector. The time is now.

With its new strategic direction, GIFS is well-positioned to continue investing in its growth. Increased investment means stronger results for our partners and stakeholders—results made possible by its innovative technology platforms and scientific programs.

As a farmer and an advocate for agriculture in Saskatchewan, I know there is no better place for GIFS to be located. The strength of our province's agri-food sector is a major asset, and I am proud to see GIFS drawing on the expertise and resources in this ecosystem as the organization continues to look for innovative ways to improve our sector. Also as a farmer, I'm so pleased to see producers'



confidence in GIFS as they've invested in projects that matter to farmers - covering cattle, forage, canola, pulse and wheat. The establishment of the Grower Advisory Panel is a major step in helping GIFS keep a finger on the pulse of industry, allowing the institute to bring innovative science from the lab bench to the field much quicker. Thank you to every member that has joined this panel to provide this much-needed insight.

This past year, the GIFS Board said goodbye to Dr. Karen Chad, former Vice President of Research at the University of Saskatchewan. I want to thank Karen for her dedication and service as the university's representative on the Board since 2019. In her place, we welcomed Dr. Baljit Singh,

the university's new Vice President of Research. Baljit is a highly accomplished veterinary researcher, educator and administrator and has already proven to be an important resource to the Board and GIFS leadership since joining in February of 2021.

I would like to thank everyone at GIFS for your resilience and hard work over the past year as you navigated the changing mode of working. My sincere appreciation also goes to the International Scientific Advisory Panel for your input and advice to drive GIFS forward. Finally, I thank our Founding Partners for re-upping their commitment to GIFS with a renewed Memorandum of Agreement, and thank my colleagues on the Board for your unwavering commitment to the institute. I am excited for the direction GIFS is headed and for its potential in the agricultural sector, as we continue to help build a world where everyone has access to safe and nutritious food.

CEO

| Dr. Steven Webb

This past year has been a transformative one for GIFS. Despite the global challenges brought on by the pandemic, our team has thrived at every opportunity and helped us continue to grow into an institute on the cutting-edge of innovation in Canada, and a valuable resource to organizations and governments looking to get ahead in agtech and beyond.

There is no doubt that the last year was trying for everyone, from our own team to our partners, stakeholders and beyond. The COVID-19 pandemic changed the nature of work for everyone and threatened barriers to collaboration. But perhaps the greatest achievement of our team was in overcoming these barriers to make GIFS more accessible and relevant for our partners and stakeholders in Saskatchewan, Canada and around the world - in line with our strategic plan.

At GIFS, we not only built a pandemic preparedness plan that allowed us to avoid any workplace outbreaks, but we overcame many hurdles in order to move safely into a new facility at Innovation Place. Our new labs, structured around our strategic plan to increase efficiency and capacity, are creating opportunities for partnerships that didn't exist before and are allowing us to share our technology platforms to collaboratively advance food security around the world. Our team's ability to build and operate new platforms and facilities safely in the face of a global pandemic stands out as a significant achievement in a difficult year.

The result of the last year was the successful execution of our new strategic plan, which lays the foundation for our technology platforms and scientific programs and sets the direction to make us a catalyst and a connector in the agricultural industry. Innovation truly is a team sport and we are committed to bringing diverse partners together to strengthen our sector. We work on the big challenges, but we also work with partners to help solve their big challenges.



Among our many accomplishments over the past year was the extension of the Memorandum of Agreement by our Founding Partners: Nutrien, the Government of Saskatchewan and the University of Saskatchewan. By reinvesting in GIFS, they are affirming their belief in our direction and vision and giving us the tools to grow and deliver value. My sincere appreciation goes to our Founding Partners for continuing to demonstrate their commitment to our vision of building a world where everyone has access to safe and nutritious food.

Our commitment to driving innovation in the agri-food sector was on full display this year. We saw the successful hard launch of our new Omics and Precision Agriculture Laboratory (OPAL), a state-

of-the-art facility and one-stop shop for the complete analyses of microbial, plant and animal samples for the agriculture and agri-food sectors. We also received multi-million dollar funding from the Canadian Foundation for Innovation (CFI) to establish a new biomanufacturing (engineering biology) centre that will serve as the agriculture and food node for Canada.

GIFS has also partnered with Ag-West Bio, Innovation Place and the Saskatchewan Food Industry Development Centre Inc. to establish the Global Agri-Food Advancement Partnership (GAAP), which will help develop and deliver opportunities to create innovative products and services by providing a soft landing for existing companies looking to gain access to the North American Market, growing

early-stage technology within Canada and advancing innovation from around the world.

I would like to thank GIFS' Board of Directors and International Scientific Advisory Panel (ISAP) for the continued support and leadership they provide to GIFS. I also welcome our new Grower Advisory Panel and appreciate their commitment to provide independent expert grower, producer and market advice to our institute. I would also like to extend my sincere thanks to Viterra for their significant investment in our institute, and to all of our affiliates, partners and stakeholders for their support.

Finally, I would like to thank the leadership team and our multidisciplinary staff at GIFS for showing strength and ingenuity in the face of a changing workplace and world. Your resilience and innovative approaches to research are what keep our organization driving forward, and your patience in adapting to new ways of working has been commendable to say the least. I look forward to many more years of success with a team that keeps growing in both size and expertise.

We all have a role to play in making the world more food-secure, and at GIFS we know that 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.



Dr. Peng Gao, GIFS Research Associate, processing samples in a PCR machine.
(Credit: David Stobbe)

A New Phase

Renewed commitment from Founding Partners

Following a successful phase of operations, the Government of Saskatchewan, Nutrien and the University of Saskatchewan (USask) have endorsed GIFS' new strategic direction, committing over \$8 million in funding to the institute for its next phase of growth.

Founded in 2012 in a partnership between the Government of Saskatchewan, Nutrien and USask, GIFS was entrusted with a mandate 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."

"At GIFS, we have a bold vision of a world where everyone has access to safe and nutritious food, and Saskatchewan's thriving agri-food ecosystem has the building blocks to help make this vision a reality," said GIFS' Chief Executive Officer, Steven Webb (PhD).

Building on the entrusted mandate and the successes of its first phase of operations, the institute renewed its strategic direction in 2020, with a focus on collaboration and mission-oriented research and development. Its renewed vision is "a world where everyone has access to safe and nutritious food," and it strives towards this bold picture driven by a new mission to "work with partners to discover, develop and deliver innovative solutions for the production of globally sustainable food."

The new strategy was adopted by the institute's Founding Partners and Board of Directors and the result was a recommitment from every Founding Partner for a second phase of operations for GIFS. This recommitment was captured in a renewed Memorandum of Agreement (MOA) endorsed by every Founding Partner.

There are numerous challenges to global food security, including climate change, nutrition, the covid-19 pandemic as well as limited land, water, nutrients and other resources. To address these, GIFS is bringing diverse stakeholders together to design whole solutions that work in Saskatchewan and Canada and are adaptable across the world.

"We are grateful to our Founding Partners for their confidence in GIFS and for their continued support and financial commitment to our vision, which we are bringing to life through our mission to work with partners to discover, develop and deliver innovative solutions for the production of globally sustainable food."

– Steve Webb, GIFS CEO

A new way of working and a new location

GIFS immediately set to work executing its strategy, including transforming its mode of operations from science pillars to technology platforms that cut across its scientific programs. As its innovative work advanced and expanded, the institute quickly found the need to move locations to a facility in the Innovation Place Research Park in Saskatoon that would house all its offices as well as its growing research and development operations needs.

"The move reflects our growth and is an important part of enabling our new strategic plan. It gives us the room we need to consolidate our offices and facilities (labs, greenhouses and growth chambers) into one location and restructure how we work with our state-of-the-art technology platforms such as the Omics and Precision Agriculture Laboratory (OPAL)."

GIFS' new strategy, renewed MOA and new location have all contributed to its growth in the 2020-21 fiscal year. Collectively, the institute attracted over \$15 million in funding from government, industry, grower groups and research institutes across the country.

"It's an exciting time for us at GIFS, as we strive to serve the agriculture and food sectors as a connector and agriculture's innovation catalyst," said Webb. "We're just getting started."



(Credit: David Stobbe)

Our People

Building Community During a Pandemic

The past year saw GIFS employees faced with unprecedented challenges, and in the face of those challenges our team responded with impressive patience, resilience and teamwork. A successful move to new labs at Innovation Place required a full team effort and our team delivered, adjusting to new circumstances and processes with a positive spirit and hard work. Every single member of GIFS has a role to play in delivering sustainable food security and the last year saw countless staff members step up into leadership roles to help achieve that goal in line with GIFS' new strategy, setting a standard for other organizations to follow in trying times.



Dr. Renata Fuganti Pagliarini,
Cell Biology Platform Lead working
with transformed canola
(Credit: Paulina Cholango Martinez)

STAFF TESTIMONIALS



"GIFS has an opportunity to lead not only within Canada, but also on the international level. Through our partnerships with countries like Bangladesh, we are planning to establish an Agricultural Technology Center (ATC) that will develop and deliver technologies and tools to enhance sustainable food security in accordance with the key UN Sustainability Development Goals, especially zero hunger, climate action, and partnership."

Hasan Ahmed | International Program Development Manager; PhD Candidate



"We're constantly reviewing our procedures at GIFS and making adjustments to ensure we're on the right track for continuous improvement. One example is in the area of project management, where we've brought in new software and focused on sharing expertise so that our managers and scientists are well-equipped to deal with large-scale and small-scale projects alike, allowing us to be more efficient when working with our partners and stakeholders. By building the right processes, we can keep our projects on track and increase our capacity to deliver innovative science."

Sylvia FitzGerald | Program Manager, Root-Soil-Microbial Interactions



"The most impressive thing about our strategy at GIFS is that it isn't just lip service – our strategy is built into the structure of our new labs and helps direct everyday activity at our facilities. We are living the strategy every day with our processes and operations as we look to be a catalyst for innovation and a connector in the agri-food sector."

Pierre-Luc Pradier | Director of Operations



"The past year has been challenging but it's been exciting to watch my co-workers adapt to a changing work environment and be successful in the process. Our new facilities are set up to support our research and development work more effectively and provide the opportunity for a collaborative atmosphere and efficient workflow."

Dr. Karine da Costa Bernardino | Postdoctoral Fellow, Root-Soil-Microbial Interactions



Dr. Lifang Zou, Cell Biology Research Technician, sampling Arabidopsis for DNA extraction
(Credit: Paulina Cholango Martinez)



Rick Goertzen, OPAL Senior Research Technician using GIFS' flow cytometry machine
(Credit: David Stobbe)



Jaclyn Prystupa, OPAL Senior Research Technician, examining samples
(Credit: David Stobbe)



Dr. Zhigang Liu, Postdoctoral Fellow, performing rice drought tolerance experiment
(Credit: Paulina Cholango Martinez)

GIFS Gracias: Recognizing Achievements

At GIFS, our people are our most important asset, and we know that recognizing staff contributions is an important part of building an inclusive, successful team that operates with excellence and lives our core values. An in-house recognition system is a clear way to improve as an organization by building a strong and motivated team, and in the past year, we set to work to develop such a system.

Following feedback we sought from our staff, and consultation with our Employee Engagement Committee, we created and introduced GIFS Gracias. Our in-house recognition program, GIFS Gracias allows colleagues to recognize one another for exemplifying values of Innovation, Excellence, Collaboration, Integrity, and Equity, Diversity and Inclusion in the work that they do.



Structured across four levels (Thank You, Bronze, Silver and Gold), the peer-to-peer program has received much uptake from staff, with 32 awards given out since it was rolled out in the fall of 2020. Congratulations to all of our Gracias recipients from the past year, including gold recipients Ariadne Valadares Souza, Program Manager Cell Biology, and Hasan Ahmed, International Program Development Manager and PhD Candidate. Ariadne was recognized for helping to develop GIFS' corporate strategy, facilitating the activities and operations of an in-house dedicated Strategy Working Group over several months, while Hasan was recognized for his pivotal role building a strong foundation and strategic partnership between GIFS and Bangladesh.



Hasan Ahmed
(Get My Photo.ca)

Ariadne Valadares Souza
(Credit: David Stobbe)

GIFS Affiliates and Local Research Collaborators

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 help build a world where everyone has access to safe and nutritious food.

OUR AFFILIATES

STUART SMYTH – Assistant Professor, Industry Research Chair in AgriFood Innovation, College of Agriculture and Bioresources; P2IRC Social Sciences Platform Program co-lead

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)

BOBBI HELGASON – Professor, College of Agriculture and Bioresources

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

PETER PHILLIPS – Distinguished Professor, Johnson Shoyama Graduate School of Public Policy; Director, Centre for the Study of Science and Innovation Policy; Associate Member; P2IRC Social Sciences Platform Program co-lead

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

KIRSTIN BETT – Professor, College of Agriculture and Bioresources; P2IRC Phenometrics co-lead

Project: Hybrid Mimics in Grain Legumes – Lentil



Curtis Pozniak
(Credit: David Stobbe)

OUR LOCAL RESEARCH COLLABORATORS

CURTIS POZNIAK - Professor, College of Agriculture and Bioresources; P2IRC Phenometrics co-lead

Project: Wheat Genome Project

ALBERT VANDENBERG – Professor and NSERC Industrial Research Chair, College of Agriculture and Bioresources

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; P2IRC Project co-lead

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

BOBBI HELGASON – Professor, College of Agriculture and Bioresources

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

DWAYNE HEGEDUS - 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; P2IRC Phenometrics co-lead

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



Dr. Andrew Sharpe
(Credit: David Stobbe)

Our Partnerships

A Catalyst for Innovation

With collaboration key to our mission, GIFS enjoys partnerships across the agri-innovation ecosystem. We continue to work collaboratively - regionally, nationally and internationally - with stakeholders in industry, government, research institutes, food production and more, to deliver on sustainable food security.

Learn about some of our partnerships.

▶ Driving Innovation in Agtech: The Global Agri-Food Advancement Partnership

Partnering to advance the development of agriculture technology in Saskatchewan and Canada

As a catalyst for agricultural innovation, GIFS connects the agri-food ecosystem, advancing innovation and bridging the gap to commercialization to deliver resilient and sustainable food security for all stakeholders.

Recognizing and building on our country's global strengths in the agriculture and agri-food sectors, GIFS partnered with Ag-West Bio, Innovation Place and the Saskatchewan Food Industry Development Centre Inc. to establish the Global Agri-Food Advancement Partnership (GAAP).

GAAP was created to foster and drive innovation and the growth of these sectors – to permanently position Canada as a world leader in these areas. There is abundant opportunity for innovation in agri-food and GAAP will help develop and deliver those opportunities by providing a soft landing for existing companies looking to gain access to the North American Market, growing early stage technology within Canada and advancing innovation from around the world.

Located at Innovation Place, Saskatoon, within Saskatchewan's rich agri-food and biotechnology network, GAAP is ready to support and develop agriculture technology (agtech) startups for Canada and the world.



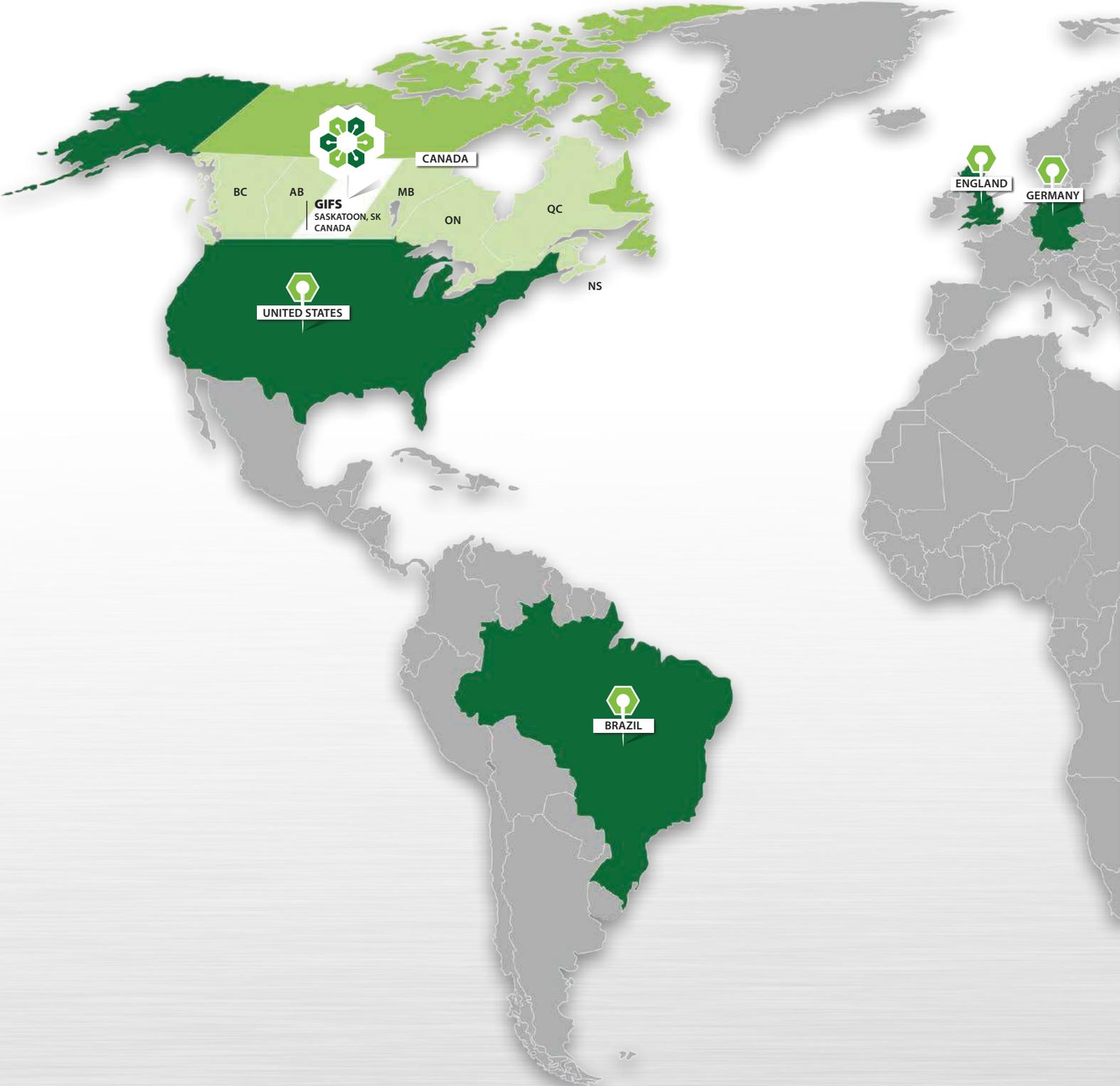
(Credit: Paulina Cholango Martinez)

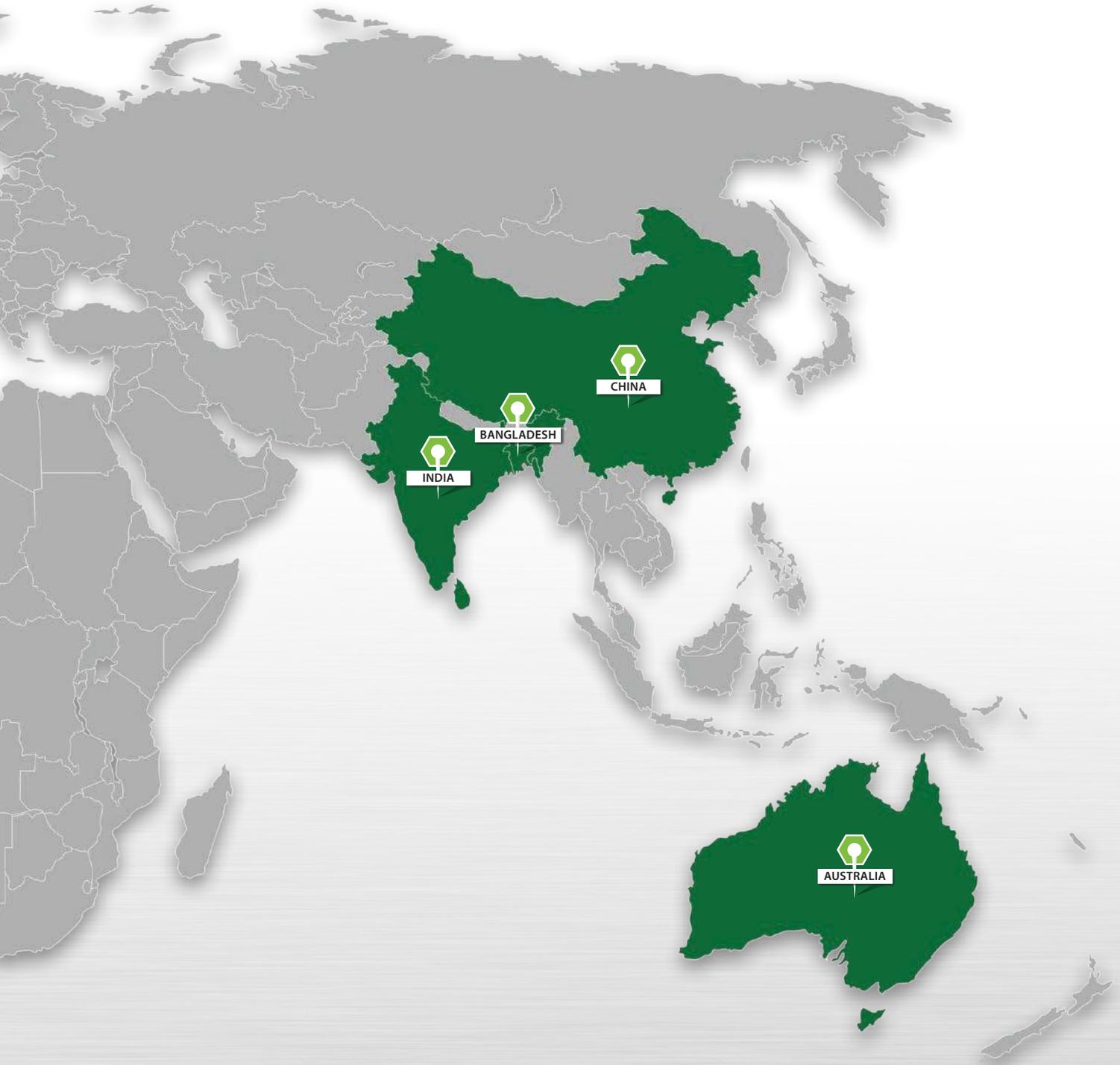


(Credit: David Stobbe)

Partners Around the World

GIFS is global, with partners across the globe.







Dr. Lifang Zou, Research Technician,
Cell Biology.

(Credit: David Stobbe)

▶ Working with Industry: Grower Advisory Panel

Listening to Growers to design and deliver relevant, tailored agriculture and agri-food innovation

GIFS values connecting with and listening to stakeholders, to ensure it is designing sustainable solutions that are tailored to needs and that will be accepted and adopted by the end users. To this end, and as part of its strategy of collaboration, the institute set up a Grower Advisory Panel to bridge the gap between research and development and food producers.

The Panel will 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.

Members of the panel include crop and livestock producers from across Western Canada.

"The Grower Advisory Panel is an important connection for GIFS, as we seek to address big issue challenges in agriculture and accelerate innovation in the sector," said Webb. "With the panel's support, we want to ensure that the innovation we deliver is relevant, timely, aligns with the future direction of the industry and meets the needs of stakeholders, particularly producers."

▶ Agtech Hub

Supporting the development of agricultural technology to deliver sustainable food production more efficiently

In March 2021, GIFS was pleased to launch the Agtech Hub – a system designed to help speed up and manage the development of agricultural technology (agtech) from within GIFS, USask and outside the university. Saskatchewan has rich agriculture and biotechnology sectors and the Agtech Hub will support organizations and individuals looking for help developing new technology that would address challenges in these sectors, as well as help identify possible innovations and recommendations to advance these areas.

The Hub includes two 'portals':

- An IP Portal built to simplify the intellectual property (IP) discovery and protection process for researchers within the Plant Phenotyping and Imaging Research Centre (P2IRC) program.
- A GIFS Ideas Portal to connect industry, government and academic partners with resources and support to advance agtech.



Saskatchewan is home to a large portion of Canada's agriculture biotechnology industry, and USask in particular is located right in the heart of this industry, blessed with one of the world's largest clusters for agri-food and bioscience and with strengths in agriculture, sustainability and food security

Chris Barker | GIFS Director of Business Development



This Saskatchewan advantage uniquely-positions USask to help lead innovation in agriculture in our province, and to help make Canada a world leader in agtech. Through this Agtech Hub, we are providing a listening ear for opportunities that can advance the sector, and an agile approach to managing those opportunities right through to development.

Steve Webb, CEO | GIFS



GIFS will review submissions to the Ideas Portal using defined procedures, working with stakeholders to evaluate the submissions for licensing technologies, new partnerships and collaborations to create new technology and development opportunities. The Portal will connect external stakeholders to the appropriate USask schools, colleges and research centres for further advancement. The intent is to increase the velocity at which the agriculture, food and biotechnology sectors and stakeholders move from ideas through to agreements - to support the development and commercialization of technologies.

Saskatchewan has a thriving agri-food and biotechnology ecosystem at USask and in Saskatchewan. The Hub will make that ecosystem more accessible and efficient.



▶ The Omics and Precision Agriculture laboratory (OPAL)

Canada's only laboratory providing integrated omics analyses and precision agriculture technologies

GIFS launched the Omics and Precision Agriculture Laboratory (OPAL) in January 2021, after one year of pilot testing, prototyping and service delivery. OPAL is a state-of-the-art facility and one-stop shop for the complete analyses of microbial, plant and animal samples for the agriculture and agri-food sectors. It combines the digital data analysis of microbial, plant and animal genes and traits with the latest precision agriculture technologies (agtech).

The first of its kind in Canada, OPAL is the only facility in the country to provide integrated analytical and computational services including genomics, phenomics and bioinformatics. These are combined with the use of the latest imaging and agricultural technologies (agtech), such as global positioning systems, unmanned aerial vehicles, aerial imaging of plants and in-field environmental monitoring – to provide clients with a complete diagnostic profile of samples.

As a technology platform at GIFS, OPAL uses advanced tools and digital agtech to address big issue challenges facing the agriculture and food sectors, like climate change, limited water and nutrient resources. For example, using OPAL's precision agtech, farmers will be able to target plants with the precise amount of inputs – water, fertilizers and crop protection products – needed in their fields. This precision in agriculture means a more efficient use of resources, leading to accelerated breeding (crops, animals), reduced impact

on the environment, increased quality crop yield, less waste and enhanced efficiency for breeders, agronomists, producers and other clients.

These integrated omics and precision agriculture services provide clients with enhanced value, time and cost savings, through its 'one-stop shop'.

“

Thanks to the invaluable support of our partners, we have been able to set up a highly equipped facility that is a one-stop shop for the comprehensive analyses of microbe, plant and animal samples, and we are very pleased to have these advanced services available here to complement Saskatchewan's thriving biotechnology ecosystem.

Steve Webb, CEO | GIFS

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Led by GIFS, OPAL is a partnership between the National Research Council of Canada, Agriculture and Agri-Food Canada, and the University of Saskatchewan, with a strategic investment from Western Economic Diversification Canada.. Its goal is to speed up innovation towards new products and services that would enhance profitability and sustainability across the agriculture and food sectors.



(Credit: David Conlin)

▶ The Ag Biomanufacturing Centre

Canada's first biomanufacturing centre focused on sustainably scaling up production in the agriculture and food sectors

Engineering biology (or biomanufacturing) refers to the biological machinery of cells to make useful tools and products. It involves redesigning/remodelling organisms for new, functional purposes or redesigning existing systems for useful, value-added purposes. This revolutionary area combines automation, biology and computation to do this redesign – combining these disciplines in ways that will deliver efficient results faster and on larger scales (automation and computation will help with this). Examples of how engineering biology may be applied include creating enzymes to make plant-based burgers taste like meat-based burgers and developing new plant varieties that can withstand climate change.

A 2020 report estimates engineering biology and the ongoing bio revolution will have a global economic impact of up to \$4 trillion in the next 10 to 20 years. More than a third of this direct annual impact will be in agri-food.

“

The new centre is part of GIFS' suite of technology platforms designed to support research and development that will enhance digital agriculture, accelerate breeding, increase quality and yield, and build plant resilience to climate change.

Steve Webb, CEO | GIFS

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Helping to advance this relatively new area in Canada, GIFS' biomanufacturing platform will support multiple sectors of the economy, particularly helping to scale up numerous 'creative' processes in several different sectors - agriculture and food, healthcare, energy, the environment, manufacturing, etc. Using the platform, industry will be able to create reagents, proteins and peptides that can be used to: make food production more efficient; increase the nutritional value of food; create entirely new food products and also make plants and animals more resistant to drought.

The new Centre will provide industry with the building blocks needed to scale up production, while also rapidly delivering products that support research and innovation in agri-food and biotechnology (e.g. enzymes). The outcome will be accelerated discovery, development and delivery of innovative products that meet market demand efficiently and sustainably (economically, environmentally and socially).

In Canada and across the world there is increasing demand for plant-based products and meat alternatives. This is particularly relevant to Western Canada which produces various proteins, including lentils and peas. The biomanufacturing platform will enable the rapid production of bulk proteins from these crops to satisfy market demand – nationally and internationally. It will also enable the scaling up of production at levels to meet the huge demand for alternative proteins and improve the value of production at the farm gate and downstream, to help deliver finished products to the market place.

▶ DivSeek International Network

Connecting with a global community to share information on plant genetic resources for more efficient and sustainable crop improvement and production

GIFS supports and hosts the DivSeek International Network, a global network committed to unlocking the potential of crop biodiversity so that it can be used to enhance the productivity, sustainability and resilience of crops and agricultural systems.

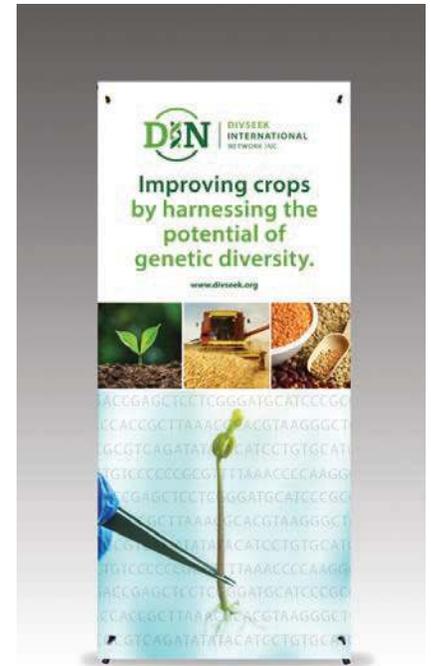
Established in 2012, DivSeek International has over 70 member organizations from 30 different countries who are working to manage, characterize and share information about plant genetic resources. The Network's key role is to facilitate and encourage the open dissemination of information about plant genetic resources and to promote benefit-sharing derived from their use, while respecting indigenous knowledge and the international treaties and conventions established to protect them.

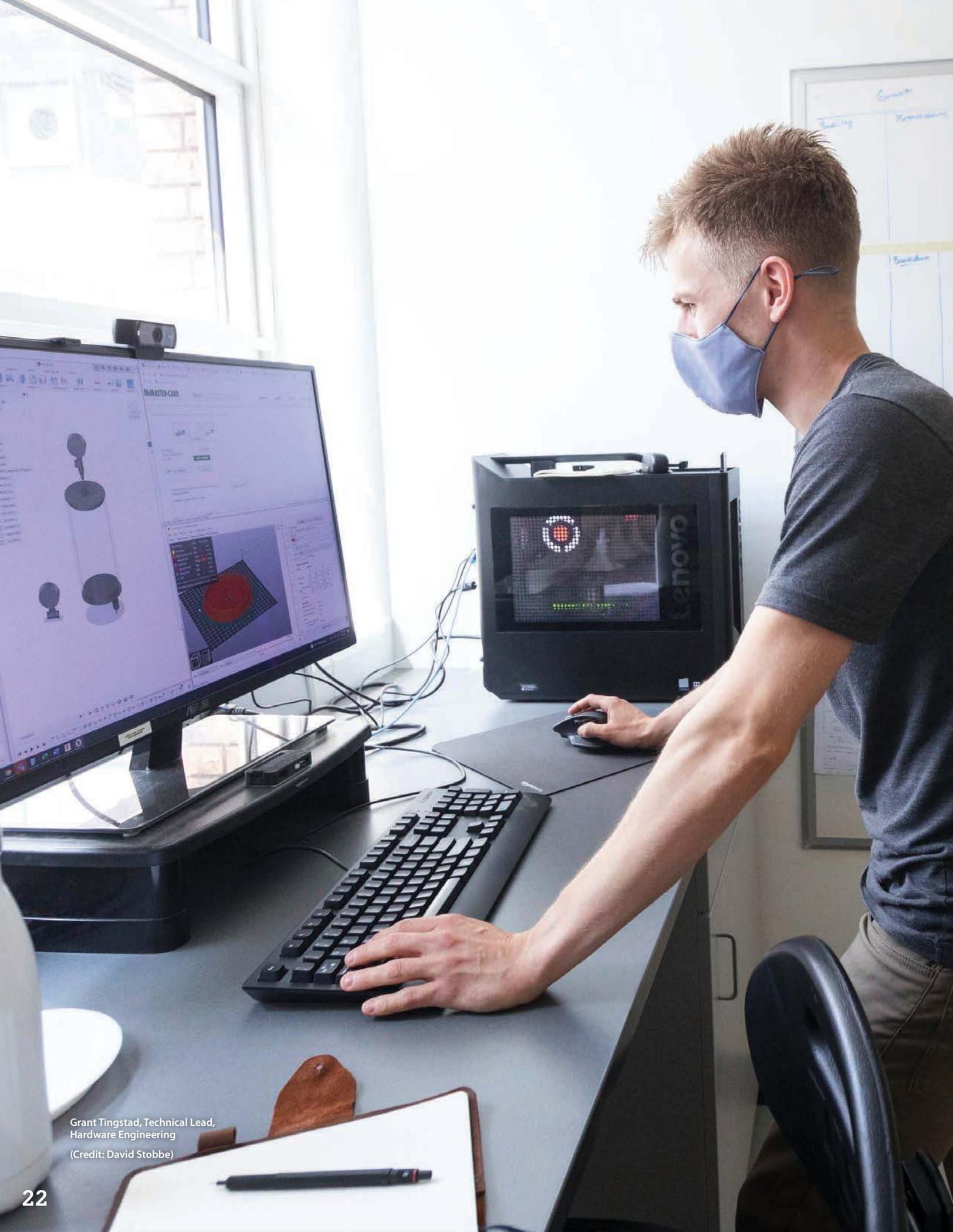
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At GIFS we recognize that in the quest to deliver sustainable food security, one size does not necessarily fit all. This is why we engage in international partnerships with stakeholders in various global communities to ensure our solutions take the strengths of GIFS, Saskatchewan and local communities to deliver solutions suited to the communities' needs. DivSeek is one of such partnerships. Its focus on using crop biodiversity to enhance sustainable production aligns very strongly with GIFS' mission to deliver global food security sustainably.

Stephen Visscher CBE, | GIFS Director of International Partnerships and Chief Operating Officer

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Grant Tingstad, Technical Lead,
Hardware Engineering
(Credit: David Stobbe)



Achievements and News

The 2020-21 year saw a number of notable contributions from GIFS and its partners that made local, national and international news. As the institute continues to position itself as agriculture's innovation catalyst, its impact is resonating across Saskatchewan, Canada and internationally.

In the past year, GIFS received coverage in major international publications, including ScienceDaily, Business Insider, Yahoo! and Nature.

▶ Nature article shares how agtech can help in a pandemic

GIFS Chief Executive Officer Dr. Steven Webb was the lead author of an article that appeared in Nature Biotechnology in 2020, sharing how agtech can come to the rescue during a pandemic.

The article explains how, just as redeploying a fleet of small British fishing boats helped during the Battle of Dunkirk, marshalling the research equipment and expertise of the many agtech labs around the world could help combat pandemics.

Sophisticated agtech labs and equipment used for crop and animal breeding, seed testing, and monitoring of plant and animal diseases could easily be adapted for diagnostic testing and tracing in a human pandemic or epidemic.

The authors urge a national and international effort to coordinate rapid redeployment of digital agriculture infrastructure for pandemic preparedness. This approach would relieve the pressure on limited testing tools in the health sector and speed up the ability to respond with treatment and measures to contain the spread and occurrence of disease.



Agtech has the infrastructure and capacity to support this need through its versatile equipment that can be used for very large-scale and automated applications including genetic testing and sequencing, virus detection, protein analysis, and gene expression.

Steve Webb, CEO | GIFS



▶ USask-led study sequences genomes of 15 wheat varieties around the world

In a landmark discovery for global wheat production, a University of Saskatchewan-led international team sequenced the genomes for 15 wheat varieties representing breeding programs around the world, enabling scientists and breeders to much more quickly identify influential genes for improved yield, pest resistance and other important crop traits.



It's like finding the missing pieces for your favorite puzzle that you have been working on for decades. By having many complete gene assemblies available, we can now help solve the huge puzzle that is the massive wheat pan-genome and usher in a new era for wheat discovery and breeding.

Dr. Curtis Pozniak | Professor and Director, Crop Development Centre; Co-Lead, P2IRC Flagship 1



The project, led by Plant Phenotyping and Imaging Research Centre (P2IRC) flagship co-lead and director of the USask Crop Development Centre (CDC) Curtis Pozniak, provides the most comprehensive atlas of wheat genome sequences ever reported. The collaboration involved more than 95 scientists from universities and institutes in Canada, Switzerland, Germany, Japan, the U.K., Saudi Arabia, Mexico, Israel, Australia, and the U.S.

Dr. Andrew Sharpe, Director of Genomics and Bioinformatics at GIFS, completed sequencing work for the project through GIFS' Omics and Precision Agriculture Laboratory (OPAL), a state-of-the-art laboratory that provides genomics, phenomics and bioinformatics services. Funding and support were also provided to the project by GIFS-led P2IRC.

► GIFS researchers help decode Black mustard genome

An international team headed by GIFS-led P2IRC and researchers at Agriculture and Agri-Food Canada (AAFC) decoded the full genome for the black mustard plant— in research that will advance breeding of oilseed mustard crops and provide a foundation for improved breeding of wheat, canola and lentils.

The team, co-led by P2IRC researchers Andrew Sharpe and Isobel Parkin, used a new genome sequencing technology (Nanopore) that results in very long “reads” of DNA and RNA sequences, providing information for crop breeding that was previously not available.

Black mustard (*Brassica nigra*), commonly used in seed form as a cooking spice, is grown on the Indian sub-continent and is closely related to mustard and canola crops grown in Canada. The research provides a clearer, “higher resolution” view of the plant’s genes and gives researchers and breeders a more defined view of which genes are responsible for which traits.



It’s like finding the missing pieces for your favorite puzzle that you have been working on for decades. By having many complete gene assemblies available, we can now help solve the huge puzzle that is the massive wheat pan-genome and usher in a new era for wheat discovery and breeding.

Dr. Andrew Sharpe | GIFS Director of Genomics and Bioinformatics



► GIFS awarded over \$330,000 to provide missing genetic information for key forage crop

GIFS received a \$331,870 grant from Saskatchewan’s Agricultural Development Fund (ADF) for a project to help unlock key genetic information for brome grass, an essential forage crop for cattle.

The project, led by GIFS Director of Genomics and Bioinformatics Dr. Andrew Sharpe (PhD), also received support from the Saskatchewan Cattlemen’s Association (SCA) and the Saskatchewan Forage Seed Development Commission (SFSDC).

The knowledge produced by the project will allow breeders to select the most nutritious and resilient varieties of brome grass that will extend pasture productivity, produce the largest yield and improve sustainability through an increase in the capture of carbon.

Dr. Jieyu Chen, Research Associate,
Root Soil Microbial Interaction.

(Credit: David Stobbe)





“

The genomic resources that are available for other crops are currently not available for bromegrass, and that has a direct impact on the ability of breeders to improve the crop. Our goal is to build a catalogue of genetic information that will allow breeders to be efficient in their targeting of desired traits and provide a boost to the beef industry

Andrew Sharpe | GIFS

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▶ GIFS partners on supercluster project to advance sustainable pesticide use

GIFS digital agriculture researchers are part of a new Protein Industries Canada (PIC) consortium that will develop technology to help lower pesticide use across Canada, making crop protection more efficient and providing economic benefits for farmers.

PIC is one of Canada's five innovation superclusters. The \$26.2-million PIC project will see the use of artificial intelligence to target weeds and other pest crops, and is led by a consortium of partners - Precision.ai Inc., Sure Growth Technologies, Exceed Grain Marketing, and GIFS. PIC is investing \$12.8 million in the project, with the partners investing the remaining \$13.4 million.

USask participation in the project will be delivered through the Plant Phenotyping and Imaging Research Centre, led by GIFS on behalf of the university. Lead researcher is GIFS Enhancement Chair Dr. Ian Stavness, an expert in artificial intelligence and machine learning applied to agriculture.



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The aim is to develop new methods to spray weeds or other pests in a targeted way. The university's role is to develop a way to find out precisely where the weeds are so that they can be sprayed more efficiently to reduce pesticide use and help protect the environment. We will develop software to automatically sort through drone images of fields to identify weeds.

Dr. Ian Stavness (PhD) | GIFS Enhancement Chair

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Steve Webb, Chief Executive Officer, GIFS
(Credit: David Stobbe)

▶ GIFS receives \$3.2M to build first-in-Canada engineering biology centre for ag innovation

GIFS received \$3.2 million from the Canada Foundation for Innovation (CFI) to build a unique biomanufacturing facility that will use cutting-edge “engineering biology” technologies to accelerate agri-food innovation and help address food security needs.

Developing canola varieties more resistant to climate change, flavourings for the plant-based meat industry, and non-animal enzyme alternatives for the dairy industry are a sample of the innovations to be advanced by the new centre which is currently being established to be one of GIFS’ technology platforms.

Researchers in industry and academia will be able to order from the centre’s bio-manufacturing facility or “biofoundry” the DNA, RNA, peptides, and other proteins needed for their studies. The CFI funding, made through its Innovation Fund, will be used for critical infrastructure including robots, computers, cell culture systems, and other equipment for the centre. Another \$5 million is being provided from private and public sources.



Engineering biology integrates automation, biology and computation—the ‘ABC’ approach—to advance research and new product development by accelerating the design-build-test-and-learn cycle. This technology platform provides the capacity for research and development that is beyond the reach of traditional approaches..

Steve Webb, CEO | GIFS



▶ GIFS Board Chair Alanna Koch named to Top 50 in Canadian Agriculture list

GIFS Board Chair Alanna Koch’s influence as a mentor and an ‘advocate’ in the Canadian agri-food sector was highlighted in 2021 when she was included as one of Canadian Western Agribition’s Top 50 in Canadian Agriculture.

A long-time agriculture champion and senior government executive, Alanna served as Deputy Minister to the Premier and Cabinet Secretary. Prior to that, she was the Saskatchewan Deputy Minister of Agriculture for nine years. As one of the longest serving Agriculture Deputy Ministers in Saskatchewan and Canadian history, Alanna worked closely with farmers and industry with priority to build and maintain public trust in agriculture by focusing on science-based decision making and communicating the benefits of modern tools and technology.

In 2020, she spoke at a World Food Day virtual event hosted by the Food and Agriculture Organization of the United Nations (FAO). Speaking on the theme of Innovation, Koch highlighted its evolution and role in agriculture, as well as its potential to help address global challenges. She concluded her remarks by emphasizing the importance of continued investments in innovation and agriculture’s relevance to building global sustainable development.



Alanna Koch, Chair, GIFS
(Credit: David Stobbe)



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"If there is one lesson to take away from the past year, it's that the world needs agricultural innovation more than ever and that this innovation can only be achieved while working together."

– Alanna Koch | Board Chair

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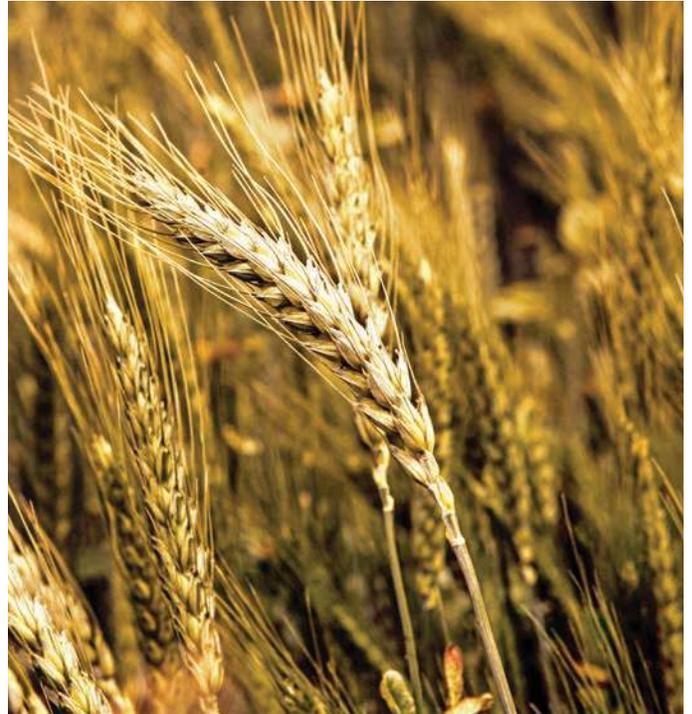


Community

GIFS + Community: Supporting Ecosystems

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. Being community-minded involves supporting three main ecosystems: our local Saskatoon community, where we contribute through initiatives that match our corporate social responsibility program; our local agri-food ecosystem, where we're part of a system of university, government, and industry partners who make Saskatchewan the place to be for agriculture research and development; and our national and international agri-food communities, which present an opportunity for GIFS to be a leader and collaborator with some of the world's brightest and most innovative minds and organizations.

Although the pandemic interrupted a number of annual in-person events, GIFS was still able to contribute to a number of different community initiatives in 2020-2021.



Community Funding Initiatives

► 2020 Fill the Plate Holiday Campaign

GIFS was pleased to support the Saskatoon Friendship Inn's 2020 **Fill the Plate Holiday Campaign** to help make sure no one has to worry about going hungry during the Christmas holiday season.



► The 2020 Global Wheat Head Detection Challenge

GIFS proudly funded the **Global Wheat Head Detection Challenge**. The challenge was created to develop a computer software model for more effectively counting wheat heads (the grain-bearing tip) using image analysis. This advancement will benefit agricultural producers, breeders and researchers studying plant traits for genetic improvement. Over 2,000 teams from around the world competed in the 2020 edition, providing diverse and rich perspectives and drawing winners from Japan, the United States and Vietnam.

► 2020 National Index on Agri-Food Performance Webinar: Metrics and Benchmarks

GIFS is an active partner of the National Index on Agri-Food Performance project. The partnership is investigating how Canada's agri-food sector can design appropriate benchmarks to demonstrate its leadership and progress to a national and international audience. A webinar with thought-leaders from Canada and abroad was held on September 16, 2020, to discuss this topic.



Our Events

Fifth Annual Plant Phenotyping and Imaging Research Centre (P²IRC) Symposium

Enhancing digital plant breeding for climate change resiliency

Despite challenges of the pandemic and ensuing restrictions, GIFS hosted the 5th Annual Plant Phenotyping and Imaging Research Centre (P²IRC) Symposium. Taking place virtually via an online platform, the 2020 symposium was the most accessible yet, with 351 participants registered to attend.

The theme of the two-day event was Collaboration. Innovation. Results, and was an opportunity to explore progress in Phase II of the P²IRC program.

With speakers from across Canada, the United States and Europe and participants from all over the world, the symposium continued its truly international reach, with its online platform allowing participation from anywhere registrants had an internet connection.

Symposium presentations remain available to all registrants until October 2021 – to truly derive the most benefit from the international conference.



Bangladesh Economic Seminar

A bi-lateral seminar to advance trade and export opportunities between partners

In September 2020, GIFS partnered with the Bangladesh High Commission to Canada and Ag-West Bio, Saskatchewan's bioscience industry association and catalyst for the growth of the bioeconomy, to host an economic seminar focused on investment and trade opportunities for Saskatchewan and Canada in Bangladesh.

His Excellency Mizanur Rahman, former Bangladesh High Commissioner to Canada highlighted Bangladesh as an emerging trade and investment destination with pro-business and pro-investment policies, vast interconnectedness within the South East Asia region, growing exports, expanding infrastructure and strong domestic demand.

The half-day seminar was an outcome of a multidisciplinary research, training and development partnership established between the Government of Bangladesh and GIFS in February of 2020, designed to help promote sustainable food security in the country.

Using Saskatchewan's strengths in the agri-food and biotechnology sectors, the partnership will deliver programs to Bangladesh that are focused on enhancing farmer incomes, addressing the effects of climate change, and strengthening the country's delivery of the United Nations Sustainable Development Goals, including around reducing hunger and empowering women.

Key economic sectors in Bangladesh that were highlighted at the seminar include investment opportunities in agri-tech and biotechnology, manufacturing, agri-food processing, mining, farm machinery, information technology, renewable energy and capacity development.

Panel discussions explored investment and trade benefits offered in Bangladesh and opportunities for Canadian businesses. Other topics covered the untapped potential of trade and technology between Saskatchewan and Bangladesh.

Canada's diplomatic relationship with Bangladesh dates back to 1972, following the latter's independence in the previous year. The seminar, and partnership with GIFS, present opportunities to further strengthen that relationship through increased trade, investment and cooperation between both countries.



Farmer harvesting rice, a staple crop in Bangladesh.



Financial Highlights

for the year ended April 30, 2021

The Global Institute for Food security (GIFS) had a successful financial year that places the Institute in stable financial position. GIFS realized a 44% increase in revenue from 2020. Revenue was derived from founding partner contributions, research grants, expansion of fee-for-service offerings, and interest income. Founding partner contributions comprised 21% of total revenue and research grants (federal, provincial, and industry) supplied 72% of total revenue – consistent with prior years.

Fee-for-service revenue expanded from 1% to 4% of total revenue due to the successful public launch of the Omics and Precision Agriculture Laboratory (OPAL).

Operating expenditures comprised of salaries and benefits, supplies, maintenance, travel, and other expenses totaled \$17,384. This is a 17% increase from 2020 due to growth in research programs activity and fee-for-service laboratory operations. As well, salaries, operational supplies, and maintenance expenditures increased 24% from 2020.

Operating expenditures also include capital assets expenditures of \$2,802. These assets are expensed in the year in which they are purchased in accordance with restricted fund accounting policies. The total fixed assets managed by the Institute reflect a life-to-date acquisition cost of \$7,512 (net asset balance \$5,208).

The total net asset position of the Global Institute for Food Security as at April 30, 2021 is \$23,796. This is comprised of \$15,268 of restricted net assets bound by research and operating agreements and \$8,528 of unrestricted net assets.



Financial Highlights at a Glance

FOR THE YEAR ENDED APRIL 30, 2021



REVENUE

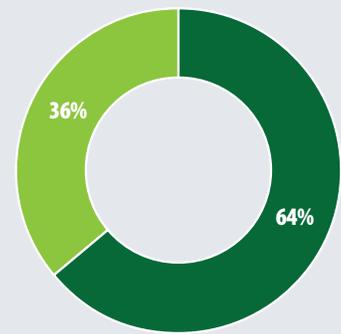
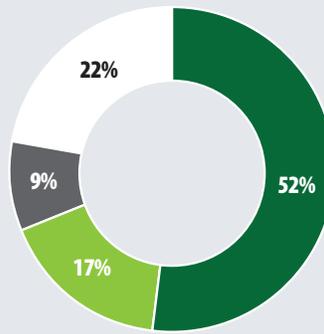
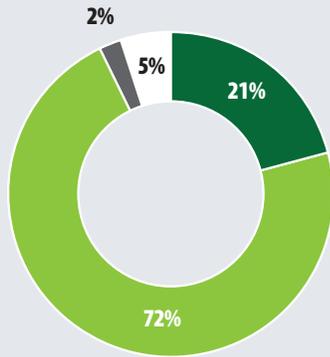
Contributions from founding partners	\$ 3,000,000
Research grants	10,003,967
Interest income	340,594
Fee for service and other income	618,997
Total revenue	\$ 13,963,558

EXPENSES

Salaries	\$ 9,107,684
Operational Supplies and Expenses	2,954,352
Maintenance, Rental and Renovations	1,586,083
Other Expenses	3,735,591
Total expenses	\$ 17,383,710

NET ASSETS

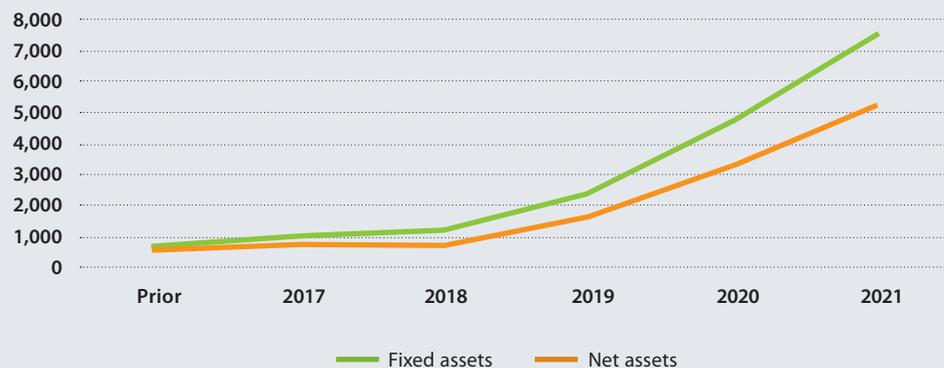
Restricted	\$ 15,268,037
Unrestricted	8,528,267
Total	\$ 23,796,305



NET DEFECIT
\$ (3,420,151)

- Contributions from founding partners
- Salaries
- Restricted
- Research grants
- Operational Supplies and Expenses
- Unrestricted
- Interest income
- Maintenance, Rental and Renovations
- Fee for service and other income
- Other Expenses

FIXED ASSET PORTFOLIO



Publications

- Alaniz-Fabián, J.; Xiang, D.; Toro-De León, G. del; Orozco-Nieto, A.; Gao, P.; Sharpe, A.; Kochian, L.; Selvaraj, G.; Springer, N.; Abreu-Goodger, C.; Datla, R.; Gillmor, C. S. *Maternal Genome Dominance in Early Plant Embryogenesis*. bioRxiv 2020, 2020.01.14.905992. <https://doi.org/10.1101/2020.01.14.905992>.
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