



Economic Impacts of Genome Prairie

August 2022



GenomePrairie

EXECUTIVE SUMMARY

Background and Study Purpose

Genome Prairie has a significant contribution to employment and economic development in the provinces of Saskatchewan and Manitoba. This study examines the economic impacts generated from Genome Prairie’s operations between 2012 and 2022. In the case of Genome Prairie, economic impacts refer to the economic contribution of Genome Prairie’s investments and operations in Saskatchewan and Manitoba. The three major components of economic impact are direct, indirect, and induced impacts which together encapsulate how Genome Prairie impacts the local and provincial economies.

Economic Impacts of Genome Prairie

Genome Prairie’s operations create economic activity in a variety of ways that fit into three main categories:

- 1. Economic impacts created by Genome Prairie’s investments and co-investments in projects** – This category includes the economic impacts generated through Genome Prairie’s investments and related co-investments in projects in Saskatchewan and Manitoba.
- 2. Economic impacts enabled by Genome Prairie’s investments in projects** – This category includes the economic impacts that result from additional spending on leveraged funds from other sources as a result of the initial investment from Genome Prairie. These impacts are difficult to quantify due to data limitations, and thus is estimated through testimonials provided by Genome Prairie’s project partners.
- 3. Economic impacts created by Genome Prairie’s office operations** – This category includes the economic impacts generated through Genome Prairie’s office operations in Saskatchewan and Manitoba. Genome Prairie’s office operations generate economic impact through expenditures on goods and services and the employment and staff.

For every dollar invested in Genome Prairie activity by the provinces, another five dollars of short-term economic impact is generated. From 2012 to 2022, Genome Prairie, together with its partner organizations and co-funders, has generated approximately \$158 million in economic impact in Saskatchewan and Manitoba. Genome Prairie’s economic impact throughout the provinces of Saskatchewan and Manitoba is reflected in the 1,550 total full-time equivalents (FTEs) that are supported by Genome Prairie’s operations and approximately \$120 million generated in total GDP.

	Output	GDP	Employment (FTEs)	Federal Tax	Provincial Tax	Municipal Tax
Total Economic Impacts in Saskatchewan and Manitoba						
Office Operations	\$ 19,682,278	\$ 15,024,833	196	\$ 1,839,326	\$ 1,372,049	\$ 83,927
Investments and Co-Investments	\$ 138,456,563	\$ 104,603,929	1354	\$ 12,326,667	\$ 9,453,744	\$ 652,870
Total	\$ 158,138,841	\$ 119,628,762	1550	\$ 14,165,993	\$ 10,825,793	\$ 736,797

OVERVIEW

Overview of Genome Prairie

Genome Prairie is a non-profit organization that supports stakeholders in capturing and maximizing the benefits of advanced research in genomics and related biosciences through large-scale projects. Founded in 2000, Genome Prairie has offices located in Saskatoon and Winnipeg and is one of six Genome centers in Canada. Genome Prairie has worked to build the foundation for genomics research and application in Manitoba and Saskatchewan and through success, has demonstrated that a better understanding of living systems through genomics has led to improvements of our health, our environment, and our economy.

Genome Prairie's areas of influence are:

1. **Existing regional expertise.**
2. **Resources to develop projects and initiatives for regional impact.**
3. **Stakeholder engagement through business intelligence and active communications. Resource support from both provinces.**
4. **Promotion of genomics research and adoption through past research.**



Today, Genome Prairie supports Saskatchewan and Manitoba researchers and industry groups that are working on genomics and related biosciences projects addressing regional priorities. Genome Prairie plays a pivotal role in advancing genomics research through facilitating collaborations between universities, research institutes and industry, promoting awareness of research findings, and aligning partners and resources. These outcomes are achieved through the following activities:

- **Project Development:** Genome Prairie identifies and refines new project opportunities, facilitates national and international collaborations on projects, and aligns partners and resources to ensure that the projects meet the set goals and objectives.
- **Research Management:** Genome Prairie provides project management oversight to ensure that the projects meet the set goals and objectives.
- **Community Engagement:** Genome Prairie conducts a wide range of outreach and communication activities aimed at building relationships with stakeholders and increasing public awareness of its research priorities.



Project Development



Research Management



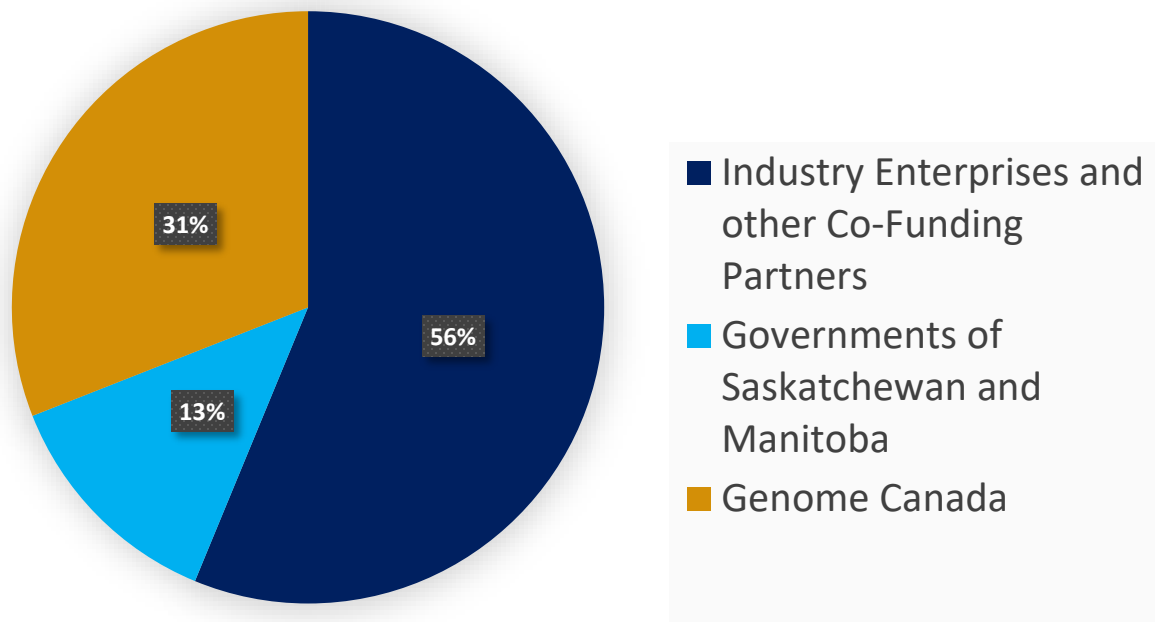
Community Engagement

Genome Prairie's Partners and Co-Funders

Genome Prairie's investments collectively have significant economic and social benefits that extend beyond the region. These investments have not only raised the international profile of the bioeconomy in the Prairies, but also in Canada and across the world. Genome Prairie funded projects and the operation of the Saskatchewan and Manitoba offices contribute to economic activity within the region which then cascades to generate additional revenues for governments, generates high quality jobs and adds to GDP. For every dollar invested in Genome Prairie activity by the provinces, another five dollars of short-term economic impact is generated. The long-term economic impact of investments in projects is more difficult to quantify as their impacts are far reaching and complex, often spanning multiple industries and organizations. In this report, long-term impacts are measured by testimonials from partner companies and academic research programs supported by Genome Prairie's activities.

Between 2012 and 2022, Genome Prairie, together with its partner organizations and co-funders, invested approximately \$177 million across 30 genomic projects. Genome Prairie partners widely with different industries and organizations to fund, deliver, and disseminate results, including the Saskatchewan Wheat Commission, Saskatchewan Pulse Growers, the Manitoba Crop Alliance, Western Grains Research Foundation. Genome Prairie partner organizations and co-funders include Genome Canada, the provincial governments of Saskatchewan and Manitoba, the University of Saskatchewan, the University of Manitoba, Global Institute for Food Security (GIFS), Agriculture and Agri-Food Canada (AAFC), National Research Council (NRC), PrairiesCan, Parks Canada, Environment and Climate Change Canada, and several non-profit organizations. Of the \$177 million in project funding raised by Genome Prairie between 2012 and 2022, approximately 31 percent (55.0 million) came from Genome Canada, 56 percent (99.5 million) came from industry enterprises and other national and international co-funding partners, and 13 percent (22.5 million) came from the Governments of Saskatchewan and Manitoba. Figure 1, below, shows the distribution of Genome Prairie's investments by source.

Figure 1: Share of Genome Prairie's Investments by Source (2012-2022)



Genome Prairie's Key Areas of Investment

The key areas of Genome Prairie's investments are agriculture, the environment and natural resources, and human and animal health. Select projects recently supported by Genome Prairie that are led by Saskatchewan or Manitoba researchers in each of these focus areas are described below.

AGRICULTURE

Genome Prairie supports the agriculture sector in Saskatchewan and Manitoba through investment in genomic research targeted towards improving quality and productivity of crops and livestock. Some of Genome Prairie's projects in agriculture include:



- **4D Wheat: Diversity, Discovery, Design and Delivery (2019-2023) - \$11.2 million total**

University of Saskatchewan wheat breeder Curtis Pozniak and Agriculture and Agri-Food Canada molecular geneticist Sylvia Cloutier are in the process of using genomics to improve the genetic diversity, breeding, and production of wheat, a vitally important crop in global food security and major export product of the Prairies.



- **Enhancing the Value of Lentil Variation for Ecosystem Survival (EVOLVES) (2019-2023) - \$7.4 million total**

Building on a history of lentil breeding success, University of Saskatchewan plant scientists Kirstin Bett and Bert Vandenberg aim to improve lentil productivity through genomics and enable Canadian producers to further capture huge international market opportunities.



- **Genomic ASSETS (Antimicrobial Stewardship Systems from Evidence-based Treatment Strategies) for Livestock (2019-2023) - \$5.7 million total**

A multidisciplinary team led by Cheryl Waldner, University of Saskatchewan professor of large animal clinical sciences, and Simon Otto, University of Alberta professor of public health, will study diagnostic testing for antimicrobial resistance in livestock management. Managing such resistance is an increasingly urgent issue for both livestock and human health.

ENVIRONMENT AND NATURAL RESOURCES

In response to potential and actual threats to our environment, Genome Prairie supports research to enable better monitoring of industrial effluents, to clean up our environment and assist crop breeders to develop new varieties that are better adapted to Canada's unpredictably changing growing season. Some of Genome Prairie's projects in this area include:



- **GENICE (2016-2022) - \$10.7 million total**

Climate change has led to focused attention on Arctic oil exploration in the future and the risk of an oil spill in the Arctic Ocean. In preparation for such a risk, Casey Hubert of the University of Calgary and Gary Stern of the University of Manitoba used microbial genomics to generate credible, science-based knowledge on the role and potential of bioremediation – the biodegradation of oil by naturally occurring microorganisms.

- **GENICE II (2021-2025) - \$6.5 million total**

Building off the GENICE I project, Gary Stern and Eric Collins of the University of Manitoba will use genomics and high-sensitivity remote sensing techniques to develop a mechanistic understanding of the fate of oil in the Arctic, as well as social, policy, and economic research to further our knowledge of Monitored Natural Attenuation (MNA) as a rational response strategy for oil spills.



- **EcoToxChip: A Toxicogenomics Tool for Chemical Prioritization and Environmental Management (2016-2021) - \$6.3 million total**



Working with industry partners, the project's aim is to develop a commercial testing tool that will help regulatory agencies and industry assess the safety of thousands of chemicals in the environment. The EcoToxChip will deliver cost savings of more than \$27 million a year in conducting environmental risk assessments, reduce the time needed for testing by seven-fold and reduce the need for toxicity in animals by as much as 90 percent.

HUMAN HEALTH

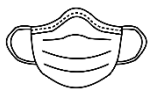
Genome Prairie invests in functional genomics research aimed at improving the understanding of human disease genes and finding new ways to improve patient outcomes, Some of Genome Prairie's projects supported in human health include:

- **Canadian Prairie Metabolic Network (CPMN) (2021-2024) - \$6.1 million total**



CPMN is developing timely and cost-effective delivery of innovative and relevant genomic testing in the Prairies for rare, in-built errors of metabolism in patients across the Prairies. It is doing this by developing rapid, inexpensive mitochondrial DNA testing not available elsewhere. CPMN looks to provide access to a full range of multidisciplinary expertise, develop best practice approaches, and provide, as needed, clinical specialist coverage for generalist physicians and their patients.

- **Canadian COVID-19 Genomics Network (CanCOGeN) (2020-2022) – \$1.2 million total**



With the CanCOGeN project, Genome Prairie provided advanced DNA sequencing technology to public health laboratories in the Prairie Region in order to provide genomic solutions to a very complex problem, specifically, COVID-19. Funding provided by Genome Canada supported the provincial labs increasing local capacity and facilitating COVID-19 sequencing in the provinces of Manitoba and Saskatchewan.

- **COVID-19 Rapid Regional Response (COV3R) (2020-2022) - \$0.5 million total**



University of Regina professor Andrew Cameron is in the process of using genome capture to tackle the problem of detecting co-infections in humans, especially in context of the COVID-19 pandemic and in the process providing powerful new tools for public health.

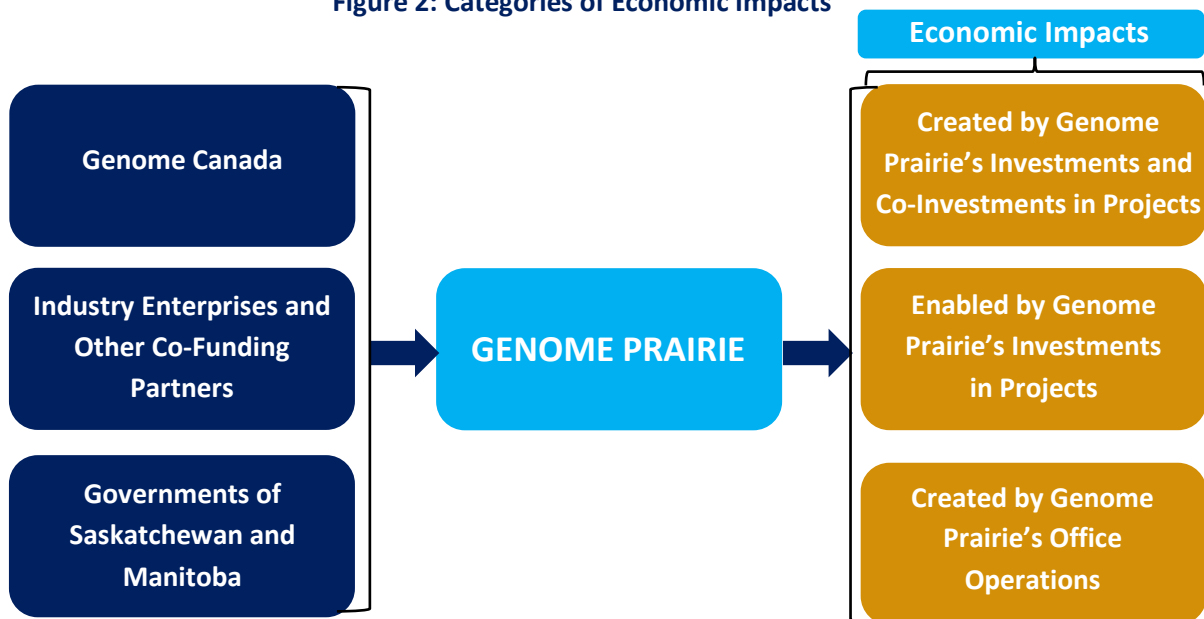
ECONOMIC IMPACTS OF GENOME PRAIRIE

Categories of Economic Impact

Genome Prairie’s activities create economic activity in a number of ways that can be classified into three distinct categories:

- 1. Economic impacts created by Genome Prairie’s investments and co-investments in projects** – This category includes the economic impacts generated through Genome Prairie’s investments and related co-investments in projects in Saskatchewan and Manitoba.
- 2. Economic impacts enabled by Genome Prairie’s investments in projects** – This category includes the long-term economic impacts that arise from Genome Prairie’s investments after the project contract with Genome Prairie has expired. This category is difficult to quantify, and thus is estimated through testimonials provided by Genome Prairie’s partners.
- 3. Economic impacts created by Genome Prairie’s office operations** – This category includes economic activity related to genome Prairie’s own operations in Saskatchewan and Manitoba. Genome Prairie’s operations generate impacts in the Saskatchewan and Manitoba economies through its expenditures on goods and services, and the employment of staff.

Figure 2: Categories of Economic Impacts



Overview of Economic Impact Analysis

- **Direct Impacts:** Direct impacts are changes that occur in “front-end” businesses that would initially receive expenditures and operating revenue as a direct consequence of the operations and activities of an industry, organization, or project.
- **Indirect Impacts:** Indirect impacts are due to changes in the activity of an industry, organization, or project’s suppliers. Indirect impacts include the spending that Genome Prairie’s suppliers make when purchasing goods and services from their own suppliers in order to meet the demand generated by Genome Prairie.
- **Induced Impacts:** Induced impacts are due to shifts in spending on goods and services as a consequence of the payroll of the directly and indirectly affected businesses. In the case of Genome Prairie, induced impacts reflect the additional spending by the employees of Genome Prairie, Genome Prairie’s suppliers (primary suppliers), and their suppliers’ suppliers (secondary suppliers).

Economic Impacts Created by Genome Prairie’s Investments and Co-Investments in Projects

In this section we present the economic impacts arising from the spending on projects funded by Genome Prairie and its co-funders. While not all of the investments in these projects have come from Genome Prairie, these projects would not have proceeded without Genome Prairie’s initial funding and alignment of project partners. Thus, the analysis presented in this section has considered the impacts of the funding provided by both Genome Prairie and its co-funders. For examples and details of economic impact terminology used in this section as well as the methodology used to develop the findings, please refer to the Appendix (Page 13).

Table 1 summarizes the distribution of Genome Prairie’s investments and related co-investments in projects between 2012 and 2022 by province based on investment data provided by Genome Prairie.

Table 1: Genome Prairie’s Investments and Co-Investments in Projects by Province (2012-2022)

	Expenditures in Saskatchewan	% in SK	Expenditures in Manitoba	% in MB	Expenditures Outside of Saskatchewan and Manitoba	% Outside of SK and MB	Total Expenditures
Salaries	\$ 32,715,939	38%	\$ 14,890,579	17%	\$ 37,686,064	44%	\$ 85,292,582
Consumables	\$ 11,245,564	40%	\$ 2,613,706	9%	\$ 14,278,308	51%	\$ 28,137,578
Services from others	\$ 9,748,089	20%	\$ 7,980,805	16%	\$ 31,461,173	64%	\$ 49,190,067
Equipment	\$ 2,842,673	33%	\$ 2,770,325	32%	\$ 3,110,920	36%	\$ 8,723,918
General and administrative	\$ 2,836,883	50%	\$ 524,721	9%	\$ 2,363,892	41%	\$ 5,725,496
Total	\$ 59,389,148	34%	\$ 28,780,136	16%	\$ 88,900,357	50%	\$ 177,069,641

From 2012 to 2022, Genome Prairie, along with partners and co-funders of Genome Prairie, has invested approximately \$177 million across 30 genomic projects across industry and academia. Of this \$177 million, 50 percent (88.9 million) of the expenditures were made outside of Saskatchewan and Manitoba, 34 percent (59.4 million) of the expenditures were made in Saskatchewan, and 16 percent (28.8 million) of the

expenditures were made in Manitoba. Another key observation from the table above is that nearly half of the total project expenditures made were for salaries of project trainees (MSc, PhD students, post doctorate fellows) and researchers, at a total of \$85.3 million, with 38 percent (32.7 million) occurring in Saskatchewan, 17 percent (14.9 million) in Manitoba, and 44 percent (37.7 million) occurring outside of Saskatchewan and Manitoba. The most equally distributed category of expenditures across the three locations was spending on equipment with approximately one-third of the total of \$8.7 million coming from each location. The highest portion of expenditures spent outside of Saskatchewan and Manitoba was for services from others with 64 percent (31.5 million) of the \$49.2 million total occurring outside Saskatchewan and Manitoba.

Table 2 summarizes the estimated economic impacts arising from Genome Prairie’s investments and co-investments in projects in Saskatchewan between 2012 and 2022.

Table 2: Estimated Impacts Created by Genome Prairie’s Project Investments in Saskatchewan (2012-2022)

SK Investments	Output	GDP	Employment (FTEs)	Federal Tax	Provincial Tax	Municipal Tax
Direct	\$ 59,389,148	\$ 48,935,201	\$ 448	\$ 6,106,501	\$ 4,176,866	\$ 138,778
Indirect & Induced	\$ 33,614,711	\$ 20,989,102	418	\$ 2,268,466	\$ 1,958,242	\$ 338,750
Total	\$ 93,003,859	\$ 69,924,303	866	\$ 8,374,967	\$ 6,135,108	\$ 477,529

As displayed in the table, Genome Prairie’s project investments in Saskatchewan from 2012 to 2022 generated approximately \$33.6 million in additional output for a total output of close to \$93.0 million. In terms of GDP, or net output, the direct impact of Genome Prairie measured at \$48.9 million. Including indirect and induced impacts, the total impacts are approximately \$69.9 million, province wide. Genome Prairie’s investments in Saskatchewan supported a total of 866 full-time equivalents (FTEs), with 448 FTEs being directly related to these project investments, while 418 FTEs are indirect and induced. The direct tax contribution from Genome Prairie’s investments in Saskatchewan to all levels of government are estimated to be approximately \$10.4 million. This consists of \$6.1 million (59 percent) towards the federal government, \$4.2 million (40 percent) towards the provincial government, and \$0.1 million (1 percent) towards the municipal government. Including indirect and induced effects, the total tax contribution is \$15.0 million. The federal government receives \$8.4 million (56 percent of the total), the provincial government receives \$6.1 million (41 percent of the total), and the municipal government receives \$0.5 million (3 percent of the total). The direct employment estimate is based on the average salaries paid to employees in the Professional, Scientific and Technical Services Subsector (NAICS 541) as reported by Statistics Canada’s Survey of Employment, Payrolls and Hours (SEPH).

Table 3 summarizes the estimated economic impacts arising from Genome Prairie’s investments and co-investments in projects in Manitoba between 2012 and 2022.

Table 3: Estimated Impacts Created by Genome Prairie’s Project Investments in Manitoba (2012-2022)

MB Investments	Output	GDP	Employment (FTEs)	Federal Tax	Provincial Tax	Municipal Tax
Direct	\$ 28,780,136	\$ 24,053,508	306	\$ 2,847,425	\$ 2,270,667	\$ 54,522
Indirect & Induced	\$ 16,766,874	\$ 10,697,020	184	\$ 1,112,767	\$ 1,054,190	\$ 121,304
Total	\$ 45,547,010	\$ 34,750,528	489	\$ 3,960,192	\$ 3,324,857	\$ 175,826

In Manitoba, Genome Prairie’s project investments from 2012 to 2022 generated approximately \$16.8 million in additional output, resulting in a total output of \$45.5 million. The significance of Genome Prairie on the Manitoba economy is demonstrated by the direct economic impact on GDP which was measured as \$24.1 million. Including the indirect and induced impacts, this leads to a total impact of \$34.8 million. In terms of employment impact, Genome Prairie’s investments in Manitoba supported an estimated 489 FTEs. This comprises of 306 FTEs from direct impacts and 184 FTEs from indirect and induced impacts. The direct tax contribution from Genome Prairie’s investments in Manitoba to all levels of government are estimated to be approximately \$5.2 million. This consists of \$2.8 million (54 percent) towards the federal government, \$2.3 million (45 percent) towards the provincial government, and \$0.05 million (1 percent) towards the municipal government. Including indirect and induced effects, the total tax contribution is \$7.5 million. The federal government receives \$4.0 million (53 percent of the total), the provincial government receives \$3.3 million (44 percent of the total), and the municipal government receives \$0.2 million (3 percent of the total). The direct employment estimate is based on the average salaries paid to employees in the Professional, Scientific and Technical Services Subsector (NAICS 541) as reported by Statistics Canada’s Survey of Employment, Payrolls and Hours (SEPH).

Economic Impacts Enabled by Genome Prairie’s Investments in Projects

Genome Prairie has been important to the success of several projects and companies bringing numerous benefits through the collaborations such as the development of new technologies or solutions for industries. The following are just a few of examples provided by a handful of our collaborators.

“Working with Genome Prairie is enabling us to enhance our market position as the premier supplier of agile, technically advanced, and optimally fuel-efficient urban vehicles, particularly in environmentally conscious regions such as the West Coast of the United States. This improved design is a new component to our marketing strategy that continues to bring customers back to the agility and access of the Go-4 platform in a highly competitive space.

We look forward to working closely with Genome Prairie to implement ideas to help build Westward Industries to its fullest potential.”

– Westward Industries

“Our partnership with Genome Prairie was instrumental in the success of our application and subsequent completion of the MGCB2 project. This success facilitated new partnerships, including those that have greatly enhanced financial support for our research programs, and contributed to raising our profiles in the community.

One of the greatest contributions of our successful collaboration is the training of dedicated and talented highly qualified personnel. We hope to continue to find new opportunities to work together and advance our respective programs.”

– David Levin and Richard Sparling

“Our partnership in the PLM project has been highly successful. The highlight is that the work conducted during the funding period has resulted in the development of a microbial treatment that will be evaluated as a candidate for commercial launch. Underlying this has been the development of competencies and capabilities, spanning production, formulation and other factors impacting the development of microbial treatments that improve plant performance under certain environmental stress.

This partnership represents a successful public/private collaboration on finding solutions impacting time to market of innovative agricultural products. Indigo is hopeful that this relationship has opened doors for additional opportunities for similar partnerships that bring value to the growers and the environment.”

– Indigo Agriculture

Economic Impacts Created by Genome Prairie’s Office Operations

Office operating expenditures data provided by Genome Prairie was used to estimate the direct, indirect, and induced economic impacts created by Genome Prairie’s office operations in Saskatchewan and Manitoba. Genome Prairie’s office operations generate economic impacts in Saskatchewan and Manitoba through the expenditure on goods and services, the creation of employment opportunities, and the generation of tax revenues for federal, provincial, and municipal governments.

Table 4 shows the distribution of Genome Prairie’s total operating expenditures by province between 2012 and 2022. All other expenditures include rent, board expenses, professional fees, communications, office expenses, travel, and other expenditures.

Table 4: Genome Prairie’s Office Operations Expenditures by Province (2012-2022)

Expenditure by Category	Expenditures in Saskatchewan	Expenditures in Manitoba
Salaries, Wages and Benefits	\$ 7,130,417	\$ 1,614,231
All Other Expenditures	\$ 2,986,084	\$ 562,954
Total	\$ 10,116,501	\$ 2,177,185

From 2012 to 2022, Genome Prairie paid employees \$7.1 million in Saskatchewan and \$1.6 million in Manitoba, resulting in a total of \$8.7 million spent in salaries across both provinces. Genome Prairie’s other office expenditures resulted in an accumulated total of \$3.6 million, with the majority of these expenditures, \$3.0 million, coming from the Saskatchewan office and \$0.6 million coming from the Manitoba office.

Table 5 summarizes the estimated economic impacts of Genome Prairie’s office operations expenditures in Saskatchewan between 2012 and 2022.

Table 5: Estimated Impacts Created by Genome Prairie’s Office Operations in Saskatchewan

SK Office	Output	GDP	Employment (FTEs)	Federal Tax	Provincial Tax	Municipal Tax
Direct	\$ 10,116,501	\$ 8,449,264	79	\$ 1,105,963	\$ 754,554	\$ 19,222
Indirect & Induced	\$ 6,018,529	\$ 3,756,606	75	\$ 406,833	\$ 346,092	\$ 54,194
Total	\$ 16,135,031	\$ 12,205,870	154	\$ 1,512,796	\$ 1,100,646	\$ 73,417

Genome Prairie’s Saskatchewan office operations generated approximately \$6.0 million in induced and indirect impacts from 2012 to 2022 combined with a direct impact of \$10.1 million for a total economic impact of \$16.1 million. In terms of GDP, direct, indirect, and induced impacts measured at \$12.2 million total, with \$8.4 million being direct impacts and \$3.8 million being indirect and induced impacts. Genome Prairie’s office operations supported a total of 154 full-time equivalents (FTEs). 79 of these FTEs were direct Genome Prairie employees while the remaining 75 were created due to indirect and induced impacts. The total tax contribution of Genome Prairie’s office operations in Saskatchewan was approximately \$2.7 million. The federal government receives \$1.5 million, the provincial government receives \$1.1 million, while the municipal government receives \$0.1 million.

Table 6 summarizes the estimated economic impacts of Genome Prairie’s office operations expenditures in Manitoba between 2012 and 2022.

Table 6: Estimated Impacts Created by Genome Prairie’s Office Operations in Manitoba

MB Office	Output	GDP	Employment (FTEs)	Federal Tax	Provincial Tax	Municipal Tax
Direct	\$ 2,177,185	\$ 1,938,431	28	\$ 234,458	\$ 186,007	\$ 3,224
Indirect & Induced	\$ 1,370,062	\$ 880,532	15	\$ 92,072	\$ 85,396	\$ 7,287
Total	\$ 3,547,248	\$ 2,818,963	42	\$ 326,530	\$ 271,403	\$ 10,511

In Manitoba, Genome Prairie’s office operations generated approximately \$3.6 million in total output, with \$2.2 million coming from direct impacts and \$1.4 million coming from indirect and induced impacts. Genome Prairie office operations in Manitoba had a direct impact of \$1.9 million and an indirect and induced impact of \$0.9 million on the GDP of the province, resulting in a total impact of \$2.8 million on the GDP. The office operations of Genome Prairie in Manitoba supported 28 FTEs directly and led to 15 FTEs being created through indirect and induced impacts. The total tax contribution of Genome Prairie’s office operations in Manitoba was approximately \$0.6 million. The federal government receives \$0.3 million, the provincial government receives \$0.3 million, and the municipal government receives \$0.01 million.

Summary of Genome Prairie’s Economic Impacts

The total estimated economic impacts arising from Genome Prairie’s office operations and project investments and co-investments in Saskatchewan are summarized in Table 7.

Table 7: Total Economic Impacts of Genome Prairie in Saskatchewan (2012-2022)

	Output	GDP	Employment (FTEs)	Federal Tax	Provincial Tax	Municipal Tax
Economic Impacts Created by Genome Prairie's Office Operations in Saskatchewan						
Direct	\$ 10,116,501	\$ 8,449,264	79	\$ 1,105,963	\$ 754,554	\$ 19,222
Indirect & Induced	\$ 6,018,529	\$ 3,756,606	75	\$ 406,833	\$ 346,092	\$ 54,194
Total	\$ 16,135,031	\$ 12,205,870	154	\$ 1,512,796	\$ 1,100,646	\$ 73,417
Economic Impacts Created by Genome Prairie's Investments and Co-Investments in Saskatchewan						
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Indirect & Induced	\$ 33,614,711	\$ 20,989,102	418	\$ 2,268,466	\$ 1,958,242	\$ 338,750
Total	\$ 93,003,859	\$ 69,924,303	866	\$ 8,374,967	\$ 6,135,108	\$ 477,529
Total	\$ 109,138,889	\$ 82,130,173	1019	\$ 9,887,763	\$ 7,235,754	\$ 550,945

The total estimated economic impacts arising from Genome Prairie's office operations and project investments and co-investments in Manitoba are summarized in Table 8.

Table 8: Total Economic Impacts of Genome Prairie in Manitoba (2012-2022)

	Output	GDP	Employment (FTEs)	Federal Tax	Provincial Tax	Municipal Tax
Economic Impacts Created by Genome Prairie's Office Operations in Manitoba						
Direct	\$ 2,177,185	\$ 1,938,431	28	\$ 234,458	\$ 186,007	\$ 3,224
Indirect & Induced	\$ 1,370,062	\$ 880,532	15	\$ 92,072	\$ 85,396	\$ 7,287
Total	\$ 3,547,248	\$ 2,818,963	42	\$ 326,530	\$ 271,403	\$ 10,511
Economic Impacts Created by Genome Prairie's Investments and Co-Investments in Manitoba						
Direct	\$ 28,780,136	\$ 24,053,508	306	\$ 2,847,425	\$ 2,270,667	\$ 54,522
Indirect & Induced	\$ 16,766,874	\$ 10,697,020	184	\$ 1,112,767	\$ 1,054,190	\$ 121,304
Total	\$ 45,547,010	\$ 34,750,528	489	\$ 3,960,192	\$ 3,324,857	\$ 175,826
Total	\$ 49,094,257	\$ 37,569,491	532	\$ 4,286,723	\$ 3,596,260	\$ 186,337

BROAD ECONOMIC AND SOCIAL CONTRIBUTIONS

- Leveraging of Funding



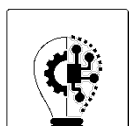
Genome Prairie’s investments in projects have led to raising additional funding from other sources, both within and outside Canada thereby generating additional economic benefits for the provinces of Saskatchewan and Manitoba.

- **Development of Partnerships and Collaboration**



Projects supported by Genome Prairie’s investments have resulted in local, national, and international partnerships and collaboration between universities, research organizations, institutions, and government agencies. Genome Prairie’s support for genomics research and technological development has contributed to raising the profiles of Saskatchewan and Manitoba in research, both nationally and internationally.

- **Development of New Technologies and Discoveries**



Some of the projects supported by Genome Prairie investment have led to development of new technologies and discoveries. For example, the 4DWheat project, led by Curtis Pozniak, led to the development of a software pipeline package for genomic cross prediction. Also, the On-Seed Survival (OSS) project, led by Christopher Yost of the University of Regina, discovered new strains of Bradyrhizobium with superior desiccation tolerance that were isolated and characterized using genome sequencing.

- **Development and Advancement of Companies**



Some of Genome Prairie’s research partners have continued to establish spin-off entities. For example, Lallemand Plant Care, a bioproducts company that sells biological inoculants for crops was established as part of the On-Seed Survival (OSS) project, led by Christopher Yost of the University of Regina. Also, the MAVEN project helped Contango Strategies, an environmental testing and remediation start-up in Saskatoon to augment their microbial diagnostics assays by adding more sensitive and less expensive DNA sequencing analysis.

- **Acquisition of Patents**



Some of the projects in which Genome Prairie invests have led to acquisition of patents for novel discoveries. For example, the OLIG1 mini-promoters, which potentially could be used to identify and treat brain tumors was invented through the ReVAMP project, which was led by Drs. Volker Gerdts, Andrew Potter, and Robert Hancock.

- **Development of Solutions for Industries**



A number of projects supported by Genome Prairie are aimed at developing solutions for agriculture, health, and the environment. For example, the FiCoGEN project, co-led by the University of Manitoba and the Composites Innovation Center in Winnipeg aims to demonstrate the use of fibres such as flax and hemp for the development of vehicle parts for the automotive industry.

- **Contribution to Training and Employment Opportunities**



Many undergraduate, graduate, and post-doctorate students have had opportunities to work on projects supported by Genome Prairie, thereby gaining the experience and skills required to excel in the genomics field.

APPENDIX

Definitions

Direct Impacts: Direct impacts are changes that occur in “front-end” businesses that would initially receive expenditures and operating revenue as a direct consequence of the operations and activities of an industry, organization, or project. Direct impacts are related to original purchases or “direct sales” from primary suppliers. For Genome Prairie, examples of direct impacts include spending on salaries for Genome Prairie employees for office operations or invested projects spending on equipment.

Indirect Impacts: Indirect impacts are due to changes in the activity of an industry, organization, or project’s suppliers. Indirect impacts include the spending that Genome Prairie’s suppliers make when purchasing goods and services from their own suppliers (i.e., secondary suppliers) in order to meet the demand generated by Genome Prairie. For Genome Prairie, examples of indirect impacts include when Genome Prairie spends money on office equipment such as computers, technology equipment companies in turn purchase inputs necessary to meet the demands of customers. The spending by these technology equipment companies reflects the indirect impacts of Genome Prairie’s spending on office equipment.

Induced Impacts: Induced impacts are due to shifts in spending on goods and services as a consequence of the payroll of the directly and indirectly affected businesses. In the case of Genome Prairie, induced impacts reflect the additional spending by the employees of Genome Prairie, Genome Prairie’s suppliers (primary suppliers), and their suppliers’ suppliers (secondary suppliers). For Genome Prairie, examples of induced impacts are additional wages received by Genome Prairie’s employees, technology equipment companies’ employees, and computer part suppliers’ employees “induced” spending. These employees, in turn, make consumer purchases that are considered induced impacts.

Gross Domestic Product (GDP): GDP is the additional value of a good or service over the cost of inputs used to produce it from the previous stage of production. Thus, GDP is equal to net output, or the difference between revenue and expenses on intermediate inputs. It is the incremental value created through labour or mechanical processing. Total GDP is a more meaningful measure of economic impact than output, as it avoids double counting during each round of impacts.

Government Tax Revenue: Government tax revenue is the total amount of tax revenue generated for different levels of government, including municipal, provincial, and federal taxes.

Output: The total gross value of goods and services produced by a given organization, industry, or project measured by the price paid to the producer. This is the broadest measure of economic activity.

Employment (Full-time Equivalents): The number of full-time equivalents (FTEs) or person years generated by a particular source. Because certain jobs may only be part-time or seasonal, the number of jobs is generally greater than the number of FTEs.

Methodology

To assess economic impacts arising from Genome Prairie, an input-output methodology was used given multipliers published by Statistics Canada. Many studies across Canada and internationally agree that input-output methodology is a resourceful methodology when performing an economic impact analysis and thus is

the most widely used and acceptable approach. The recognizability of this report structure also leads to comparisons between reports across companies and industries. In preparing this report, research was done related to Genome Prairie’s operations and investments using Genome Prairie’s website and publicly available publications, articles, and reports. Genome Prairie’s expense reports and project reporting data was also collected and compiled for analyzation. Assumptions and approaches used in this report were chosen based on a previous study that was commissioned by MNP as well as similar reports in the industry and across Canada.

This report is provided for information purposes and is intended for general guidance only. It should not be regarded as comprehensive or as a substitute for personalized, professional advice. The accuracy and reliability of the findings expressed in this report are conditional upon the completeness and accuracy of data and information provided by Genome Prairie and partners. The conclusions presented in this study constitute judgements as of the date of the publication and are thus subject to change.

ECONOMIC IMPACTS OF GENOME PRAIRIE’S OFFICE OPERATIONS

The direct, indirect, and induced impacts of Genome Prairie’s office expenditures were estimated by using Genome Prairie’s annual operating expense reports. Table 9, below, shows the operating expenditures of Genome Prairie categorized by the type of expense and separated by each province.

Table 9: Genome Prairie’s Total Office Expenditures by Province (2012-2022)

Expenditure by Category	Saskatchewan	Manitoba
Salaries, Wages and Benefits	\$ 7,130,417	\$ 1,614,231
Board Expenses	\$ 216,457	\$ 49,599
Rent	\$ 673,286	\$ 332,820
Professional Fees	\$ 211,543	\$ -
Communications	\$ 242,475	\$ 26,942
Office Expenses	\$ 395,183	\$ 43,909
Travel	\$ 459,045	\$ 51,005
Other	\$ 788,096	\$ 58,679
Total	\$ 10,116,501	\$ 2,177,185
FTEs (Full-Time Equivalents)	79	28

ECONOMIC IMPACTS OF GENOME PRAIRIE’S INVESTMENTS AND CO-INVESTMENTS IN PROJECTS

The direct, indirect, and induced impacts of Genome Prairie’s investments and co-investments were estimated by using spending data for each individual project given by Genome Prairie. The data provided included figures for each expenditure category, these categories were consumables, services from others, equipment, general

and administrative, and salaries. Each expenditure also specified the location in which it was incurred, thus only expenditures that occurred within Saskatchewan and Manitoba were included to estimate the economic impact of Genome Prairie’s investments and co-investments in projects. Expenditures incurred outside of Saskatchewan and Manitoba were excluded for the purpose of this study. Table 10, below, summarizes Genome Prairie’s investments and related co-investments in projects between 2012 and 2022 by province based on investment data provided by Genome Prairie.

Table 10: Genome Prairie’s Investments and Co-Investments in Projects by Province (2012-2022)

	Expenditures in Saskatchewan	% in SK	Expenditures in Manitoba	% in MB	Expenditures Outside of Saskatchewan and Manitoba	% Outside of SK and MB	Total Expenditures
Salaries	\$ 32,715,939	38%	\$ 14,890,579	17%	\$ 37,686,064	44%	\$ 85,292,582
Consumables	\$ 11,245,564	40%	\$ 2,613,706	9%	\$ 14,278,308	51%	\$ 28,137,578
Services from others	\$ 9,748,089	20%	\$ 7,980,805	16%	\$ 31,461,173	64%	\$ 49,190,067
Equipment	\$ 2,842,673	33%	\$ 2,770,325	32%	\$ 3,110,920	36%	\$ 8,723,918
General and administrative	\$ 2,836,883	50%	\$ 524,721	9%	\$ 2,363,892	41%	\$ 5,725,496
Total	\$ 59,389,148	34%	\$ 28,780,136	16%	\$ 88,900,357	50%	\$ 177,069,641