

INDUSTRY PROFILE STUDY



In 2020 BAM conducted a study of the bioscience industry in Manitoba. We took care to measure all aspects of the industry in order to evaluate growth and contribution to the local economy. These are our results.

Thank you to our sponsors:



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We wish to express our gratitude to the survey participants who contributed to the development of this study. I hope you will find your story in the pages that follow and appreciate the role you play in making Manitoba's bioscience community a diverse and fast-growing industry.

This report is designed to profile our unique industry and highlight its successes, challenges, trends and future direction. In developing this report, we aligned our definitions and terminologies with those used by bioscience associations across the country. This helped us to gather salient data and create a richly dense report that will be used to further our understanding of the industry and prepare us for what is to come.

Manitoba bioscience industry brims with problem solvers who are eager and passionate about providing key solutions to global health, agricultural, food and economic issues. With a stable level of anticipated investment, we can expect this industry to continue to grow.

Thank you to Miles Consulting Services and Swish Design for their excellent work in developing this robust industry report.

For more information or inquiries, please contact me at kim@biomb.ca



Kim Kline, President
Bioscience Association Manitoba

MISSION

Our mission is to enable commercial success for Manitoba bioscience companies by acting as a catalyst for innovation, expanding industry skills capacity and providing a unified voice to create awareness locally and internationally.

VISION

Our vision is for a vibrant Manitoba bioscience industry, which drives economic growth through commercialization of innovative solutions.

mission

(noun)

mi-SHen

Definition of misison

an important assignment carried out for political, religious or commercial purposes, typically involving travel.

Synonym assignment, commission, expedition, journey, trip, errand, undertaking.

bioscience

(noun)

bio·sci·ence

Definition of bioscience

any of the areas of scientific study that relate to living things:

Synonym life science

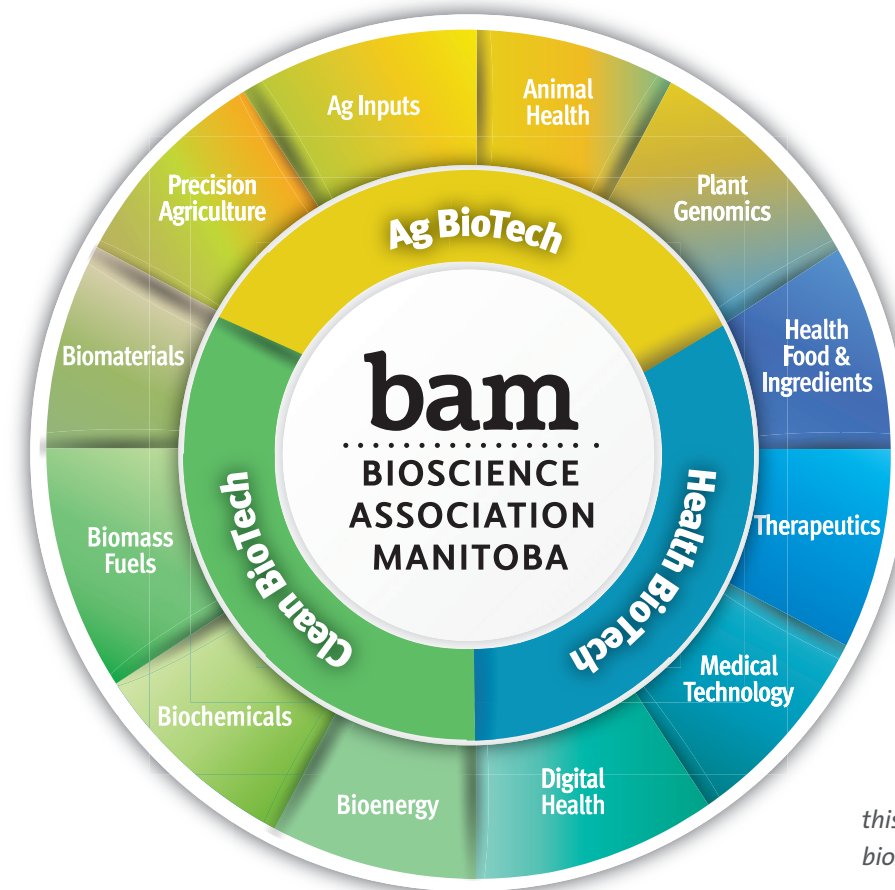
Bioscience companies manufacture, process, distribute (wholesale and retail), provide services (various consulting and testing) and conduct research and development. Often, bioscience companies will operate in more than one industry segment or type of operation.

The Manitoba bioscience industry is large, diverse and highly educated, with many long-standing companies that have reached or are near the product expansion and maturity stage. These larger, older companies tend to use their own revenues to finance research and development projects. Conversely, significant private sector investment also allows smaller companies to undertake research and development projects. Well designed and administered government funding programs and initiatives are required to balance the funding gaps and ensure an efficient and equitable distribution of funding throughout the industry.

Manitoba bioscience companies export significant volumes of goods and services to the United States, Europe, the rest of Canada, and other areas across the world.

Between 2017 and 2019, total bioscience industry revenues grew by 12%, from \$9.4 billion to \$10.4 billion. The total number of employed persons in the industry grew by 14% from 14,300 to 16,300. All sectors inclusive of Health Biotech, Ag Biotech, Clean Biotech, and Research and Development contributed to this growth.

Bioscience companies are largely “green” by the nature of the goods and services provided, the products and processes that they create and develop, and the workforce they employ. The percentage of organizations reporting a “green” component grew from 38% to 44% between 2017 and 2019, with Ag Biotech organizations specifically increasing their “green” activities.



Bioscience Association Manitoba (BAM) uses this graphic to classify the bioscience industry, which is comprised of several diverse subsectors.

THE BIOSCIENCE INDUSTRY INCLUDES COMPANIES AND ORGANIZATIONS OPERATING IN THE FOLLOWING SUBSECTORS:



Clean Biotech

Includes Bioenergy, Biochemicals, Biomass Fuels and Biomaterials



Ag Biotech

Includes Plant Genomics, Animal Health, Ag Inputs and Precision Agriculture



Health Biotech (Biohealth)

Includes Healthy Food and Ingredients, Therapeutics, Medical Technology and Digital Health



The Bioscience Industry



The **CLEAN BIOTECH** sector uses materials from or with living organisms to generate new value-added products, with the goal to reduce negative impacts on the environment. Clean Biotech companies work in the areas of renewable fuels, industrial bioproducts and bioremediation technologies.



The **AG BIOTECH** sector focuses on developing and commercializing innovations and tools related to agricultural plants or animals for the purpose of increasing yields, production efficiencies and/or impacts and/or improving nutritional profiles. For example, Ag Biotech companies work in the areas of plant genomics, precision agriculture and health treatments for animals.



HEALTH BIOTECH consists of companies developing and commercializing innovations that allow for the early identification, prevention and/or treatment of illness and disease. The Health Biotech sector traditionally focuses on treatments, diagnostics and therapeutics. It includes functional (healthier for you) foods and ingredients; and natural health products.

now

THE FOLLOWING ARE THE KEY FINDINGS OF THIS REPORT

Bioscience industry **revenues grew by 12%** between 2017 and 2019, approximately **5% annually** (two-year compound annual growth).

Industry employment **grew by 14%** over the same period.

The bioscience industry **ranks 4th** among all major industries in Manitoba with respect to Direct GDP Contribution to the province at **\$5.6 billion in 2019**, behind only real estate rental and leasing, manufacturing, and healthcare and social assistance. This is largely driven by a few large Health Biotech companies and one large Ag Biotech subsector.

Median revenue has increased in all three sectors (Health Biotech, Ag Biotech, and Clean Biotech) between 2017 and 2019.

The United States and the rest of Canada are the main export destination for Manitoba bioscience goods and services, and in 2019, **more bioscience companies are exporting** to all three major export destinations (United States, rest of Canada, and Europe) as compared to 2017.

Profitability is increasing or staying the same for most responding organizations.

Although raising capital was reported as less of a challenge or obstacle in 2018 than in 2016, **raising capital has become more of a challenge** or obstacle again in 2020. This is reflected in the slightly lower capital raised by the industry in 2019 compared to 2017, and the lower amount of R&D being conducted using private capital.

Attracting a strategic partner for the purposes of investment, new technology, R&D and as a licensing partner **has become an increasing challenge** reported by organizations since 2016. This is reflected in the decreasing amount of private capital used for R&D over the study periods (2016 to 2020).

Total R&D expenditures by the industry **increased slightly** in 2019 from 2017.

Organizations report that the **Canadian operating environment is more conducive than Manitoba's** for growing a bioscience business; however, 41% report both operating environments as neutral.

Similar to the other study periods, workforce recruitment is significantly more of a challenge than retention; however, this gap is narrowing as recruitment has become less of a challenge. The **main workforce skills gaps** reported by organizations are **critical thinking, project management, and writing**.

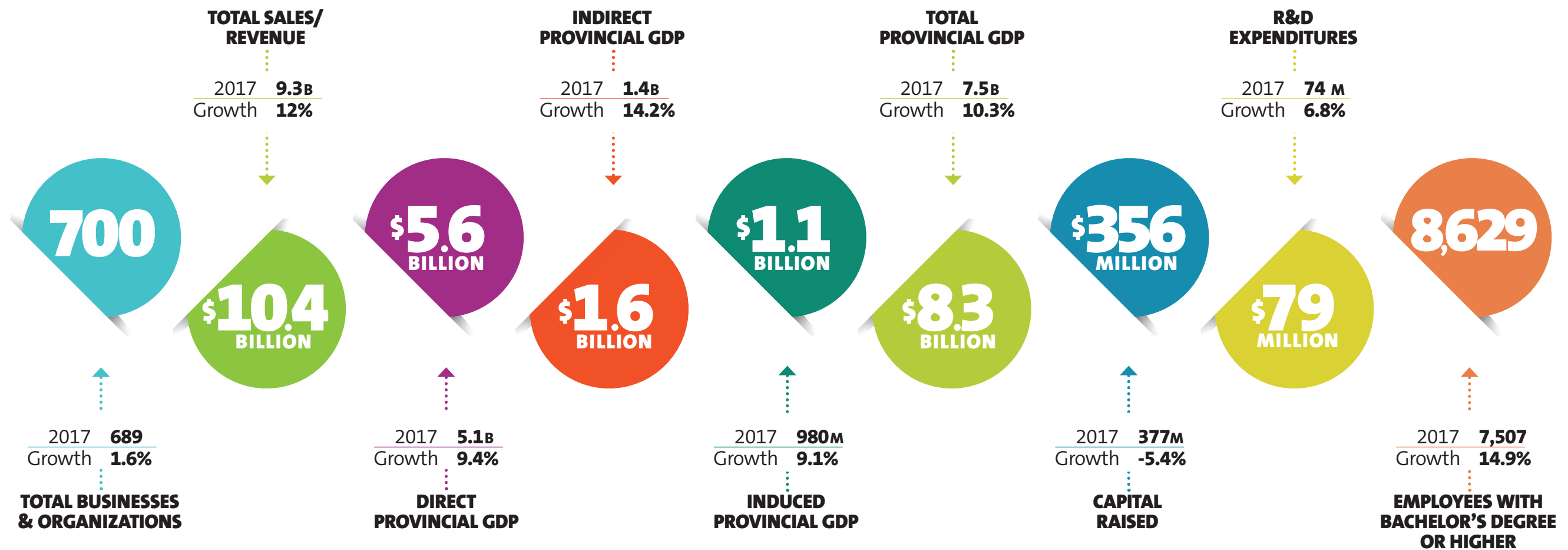
Manitoba bioscience organizations are reporting more recruitment from Manitoba universities and colleges than in previous years. A total of **93 co-op students were placed** within the 84 organizations responding. Although placement was reported in organizations of all sizes, **organizations with 50 FTEs or more** accounted for **most of the placements**.

The industry is becoming "greener", with 44% reporting "green" business activities (an increase from 38% in 2018). Ag biotech and Clean Biotech are the sectors reporting the greatest proportion of products or processes that **reduce environmental impacts** within the bioscience industry.

Contrary to many articles and media discussion surrounding the future of **work, technology and automation does not appear to be reducing** the number of individuals employed in bioscience organizations. If anything, certain occupations **are seeing increases** due to technology and automation.

Survey respondents see Bioscience Association Manitoba (BAM) very favourably, with respondents indicating that **BAM should be involved in many areas of business** and workforce development with its industry sector participants.

THE MANITOBA BIOSCIENCE INDUSTRY EMPLOYS **16,330 individuals**
 AND CONTRIBUTES **\$5.6 Billion** IN DIRECT PROVINCIAL GDP

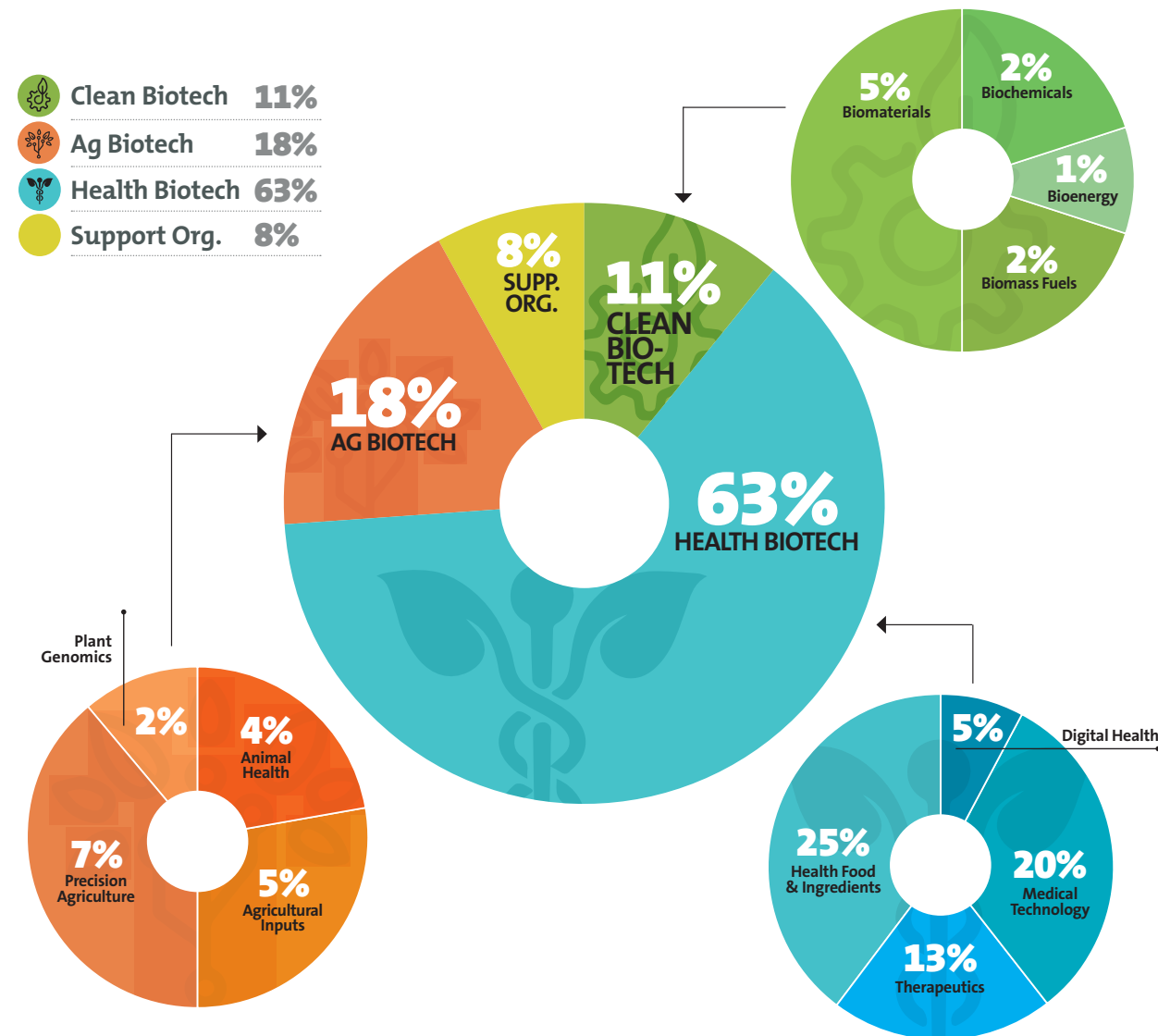


Key Performance Indicators

Industry Survey Respondents

The 2020 BAM Industry Survey resulted in data from a cross-section of Manitoba companies and organizations operating in the bioscience industry. The graphic below provides a detailed description of the sample obtained.

The majority of companies responding to the survey were Health Biotech (63%), followed by Ag Biotech (18%). Within the Health Biotech sector, 25% of the companies were primarily involved in Health Food and Ingredients followed by Medical Technology and Therapeutics. The abundance of Health Biotech responses in current and previous BAM surveys could be the reason why in previous studies, the Manitoba Health Biotech sector appeared significantly larger than the other sectors. However, once adjusted for the population of organizations in each sector using the Business Register business count data, Ag Biotech is the largest Manitoba bioscience sector with respect to the total number of businesses and sales/revenue.



revenue

(noun)

je-de-pe

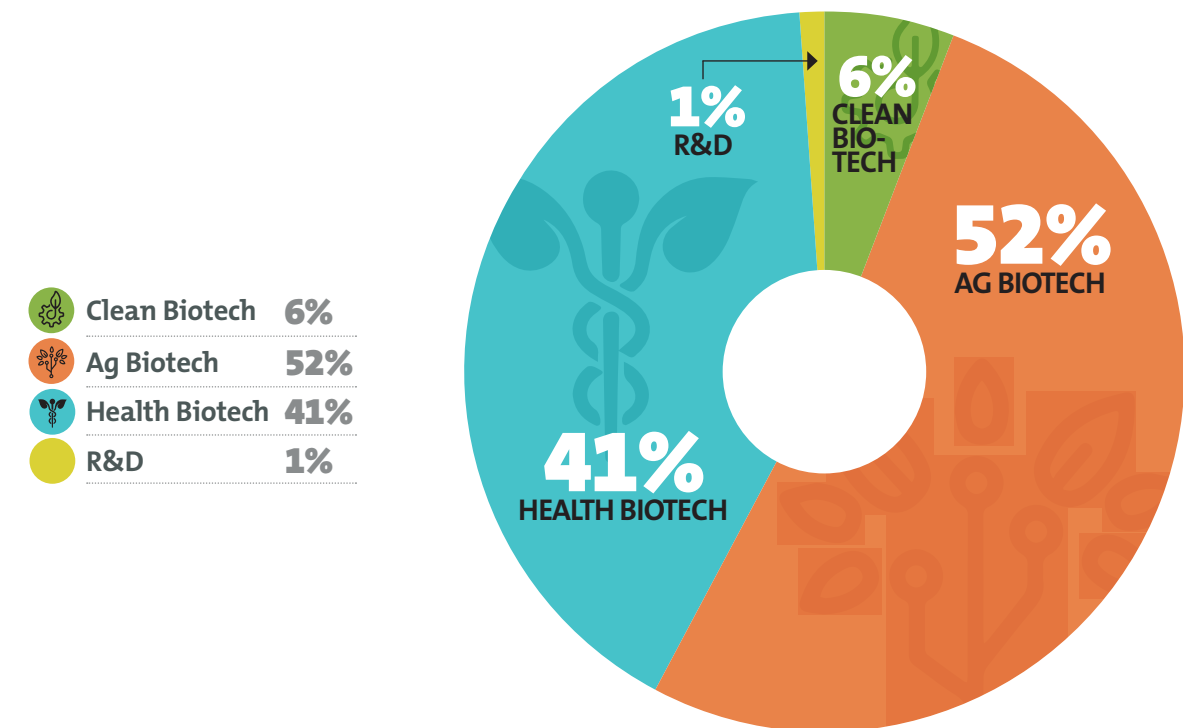
Definition of revenue

income, especially when of a company or organization and of a substantial nature.

Synonym assignment, commission, expedition, journey, trip, errand, undertaking.

Proportion of Total Revenue by Sector

The following graphic presents the proportion of industry sales/revenue by main subsector:



Ag Biotech contributes the largest share of total industry sales/revenue largely due to Manitoba's very large agricultural chemical and other farm supplies wholesale sector. Within Health Biotech, a few large companies contribute over 70% of total sector revenue.

GDP DEFINITIONS:

- 1 Direct GDP**
 The market value of final goods and services produced by the industry less the value of intermediate inputs required to produce the final goods and services.
- 2 Indirect GDP**
 The GDP contribution resulting from the inputs supplied required to produce final goods and services. These inputs are supplied by other businesses in the economy through a supply chain network.
- 3 Induced GDP (wage effect)**
 The expansion in economic activity caused by direct and indirect GDP which generates disposable income that individuals and households spend in the economy.

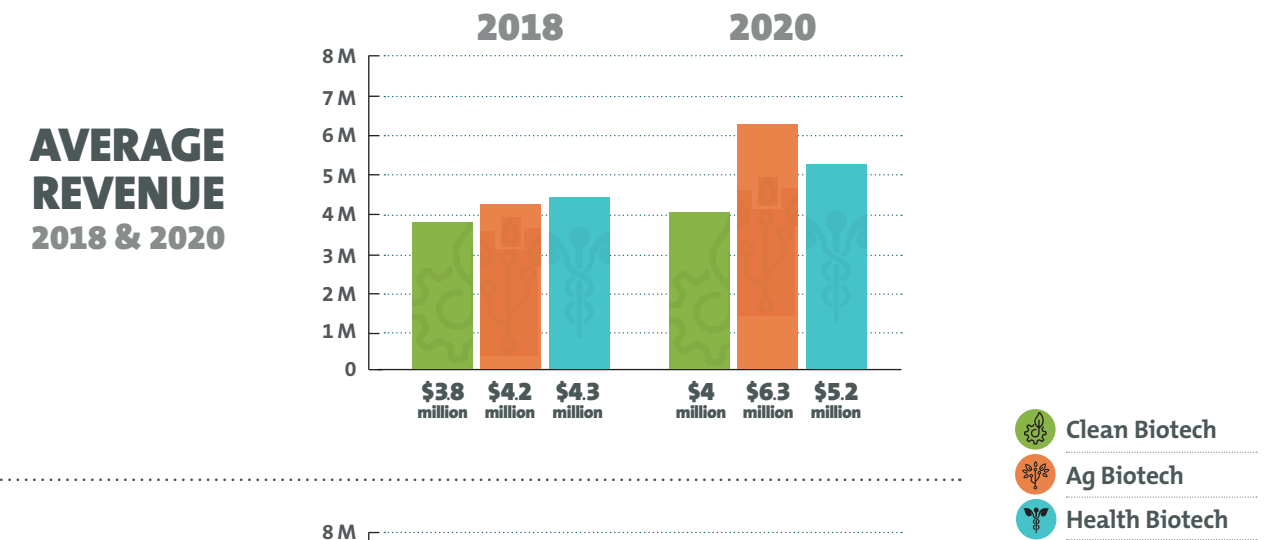
gdp
 (noun)

je-de-pe
 Definition of *gdp*
 short for gross domestic product.

Total industry revenue in 2019 is estimated at \$10.4 B. The following table provides industry revenue and businesses by subsector:

Sector	Total Revenue	Total Businesses	Revenue per Business Average
Ag Biotech	\$5,364M	325	\$16.5 M
Health Biotech	\$4,286M	231	\$18.6 M
Clean Biotech	\$626M	119	\$5.3 M
R&D	\$91M	26	\$3.5 M
TOTAL	10,368M	701	

For the purpose of analyzing population sales/revenue by sector, a separate category was created for organizations that primarily focus on R&D. The following table presents the average and median revenue by sector for the 2020 and 2018 study periods based on the samples obtained from the 2020 and 2018 BAM Industry Survey:



Between 2018 and 2020, median revenue for all sectors has increased.

5.1 Exports

The following table presents industry revenue by region of sales. The results are based on the sample obtained from the 2020 BAM Industry Survey.

INDUSTRY REVENUE

by region of sales, in millions of dollars, and percentage of total exports



The United States and the rest of Canada dominate the destination of Manitoba bioscience sales in terms of value. Since 2017, exports to the rest of Canada and Europe have increased slightly, while exports to the United States have declined.

Although yielding lower values of sales compared to other areas, 64% of companies sell their products domestically within Manitoba. 67% of companies sell to the rest of Canada while 48% export to the United States.

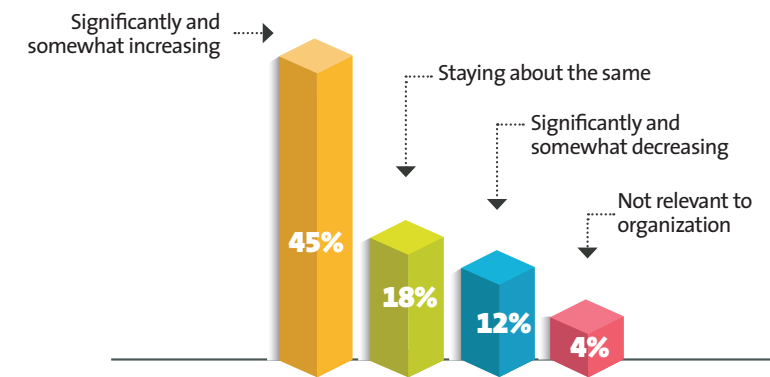
In 2019, 25% of companies sampled export to Asia and 23% export to another area of the world.

5.2 Profitability

This year, organizations were asked to indicate whether their earnings before interest, tax, depreciation, and amortization (EBITDA) was generally increasing, decreasing, or staying the same between 2017 (the last study period) and 2019. EBITDA is a measure commonly used to analyze organizations accounting profit.

CHANGES IN EBITDA* OVER THE 3-YEAR PERIOD

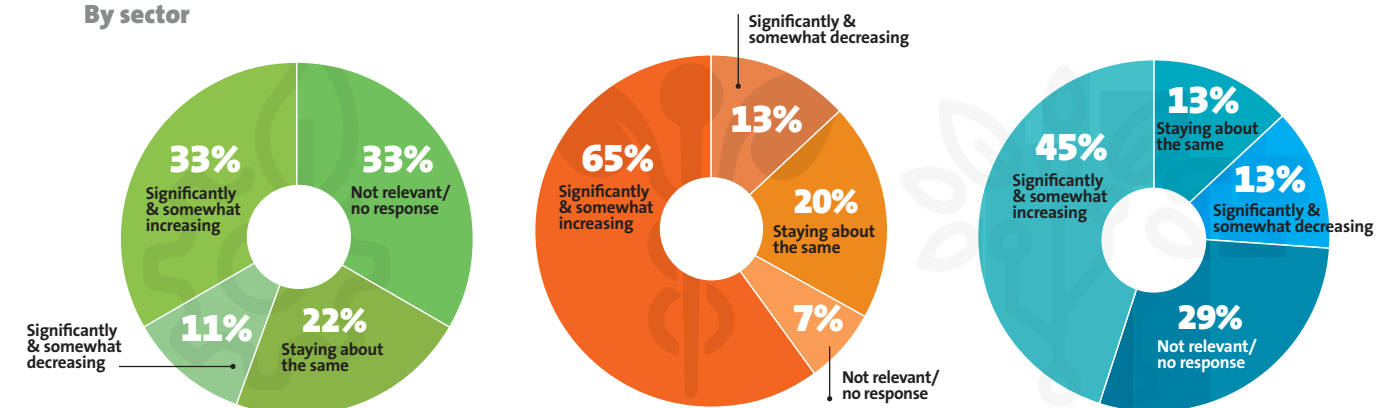
*earnings before interest, tax, depreciation & amortization



45% of responding organizations indicate that EBITDA is somewhat increasing. The proportions displayed in the table above indicate that organization profitability is generally increasing or staying the same with only 12% of organizations reporting decreasing EBITDA. The following table presents these proportions by sector:

CHANGES IN EBITDA* OVER THE 3-YEAR PERIOD

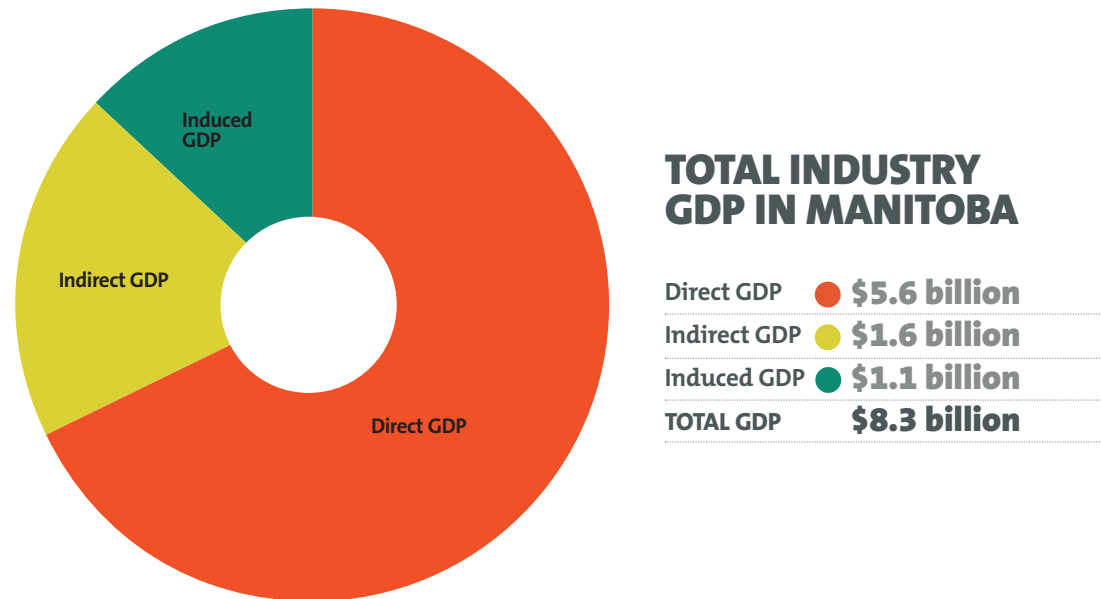
By sector



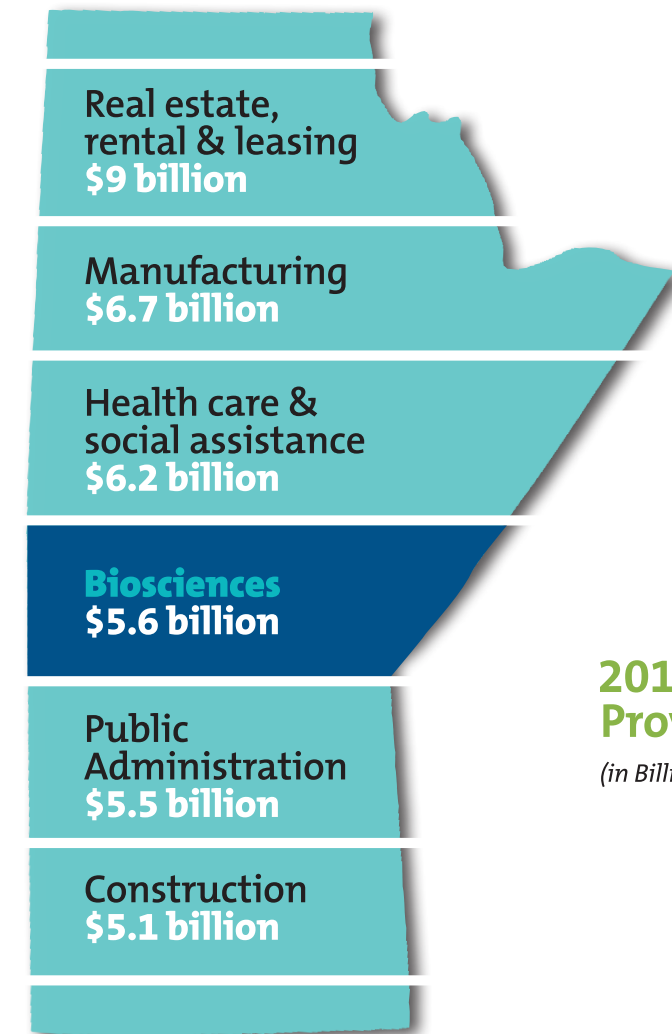
Ag Biotech companies are almost all reporting EBITDA either increasing or staying the same (80%). 58% of Health Biotech organizations are reporting EBITDA either increasing or staying the same, and 55% of Clean Biotech report these categories. About 11-13% of each category are reporting decreasing EBITDA.

- Clean Biotech
- Ag Biotech
- Health Biotech

The Manitoba bioscience industry contributed the following direct, indirect, and induced GDP within the province of Manitoba in 2019.



The following table presents the Within Province of Manitoba Direct GDP figures for other Manitoba industries:

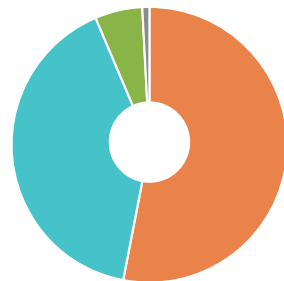


2019 Direct Provincial GDP
(in Billions of Canadian Dollars)

SUBSECTORS

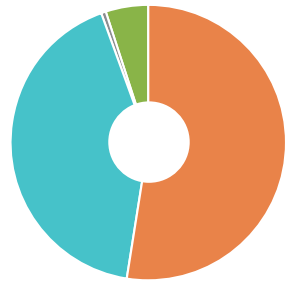
Total GDP

Clean Biotech	\$465M
Ag Biotech	\$4,393M
Health Biotech	\$3,346M
R&D GDP	\$77M



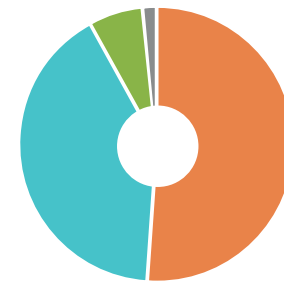
Direct GDP

Clean Biotech	\$273M
Ag Biotech	\$2,967M
Health Biotech	\$2,349M
R&D GDP	\$37M



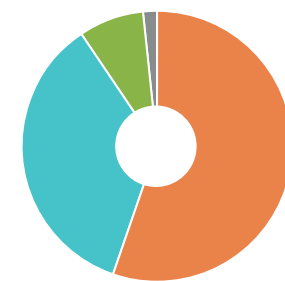
Induced GDP

Clean Biotech	\$68M
Ag Biotech	\$549M
Health Biotech	\$435M
R&D GDP	\$16M



Indirect GDP

Clean Biotech	\$123M
Ag Biotech	\$878M
Health Biotech	\$561M
R&D GDP	\$23M






In 2019, the Manitoba bioscience industry (including Ag Biotech) ranked fourth (4th) provincially in terms of direct GDP.

Bioscience organizations can be classified as follows based on the nature of the operation:

- 1 **Service** 39%
- 2 **Distribution** (wholesale & retail) 35%
- 3 **Manufacturing** 17%
- 4 **Processing** 5%
- 5 **Research & Development** 4%

The below table presents the number of companies and organizations by each subsector and type:

Subsector	R&D	Service	Distribution	Manufacturing	Processing	Total
CLEAN BIOTECH 	5	73	0	29	17	124
HEALTH BIOTECH 	17	89	62	60	19	247
AG BIOTECH 	5	114	180	31	0	329
TOTAL	27	276	242	120	36	700

Services include various consulting, environmental, testing and diagnostic laboratories and veterinary services.

start-up

(noun)

start-up

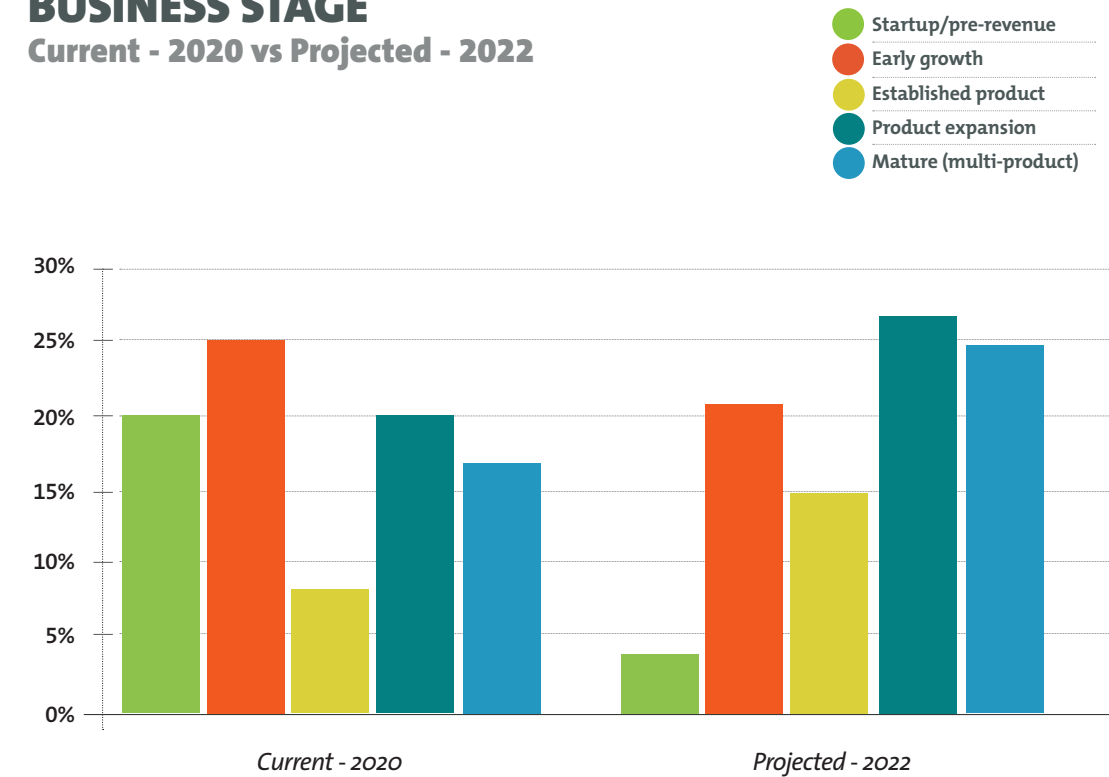
Definition of start-up

a small business that has just been started.

Survey respondents were asked opinions regarding their current business stage and what business stage they anticipate their company will be at in two years:

BUSINESS STAGE

Current - 2020 vs Projected - 2022



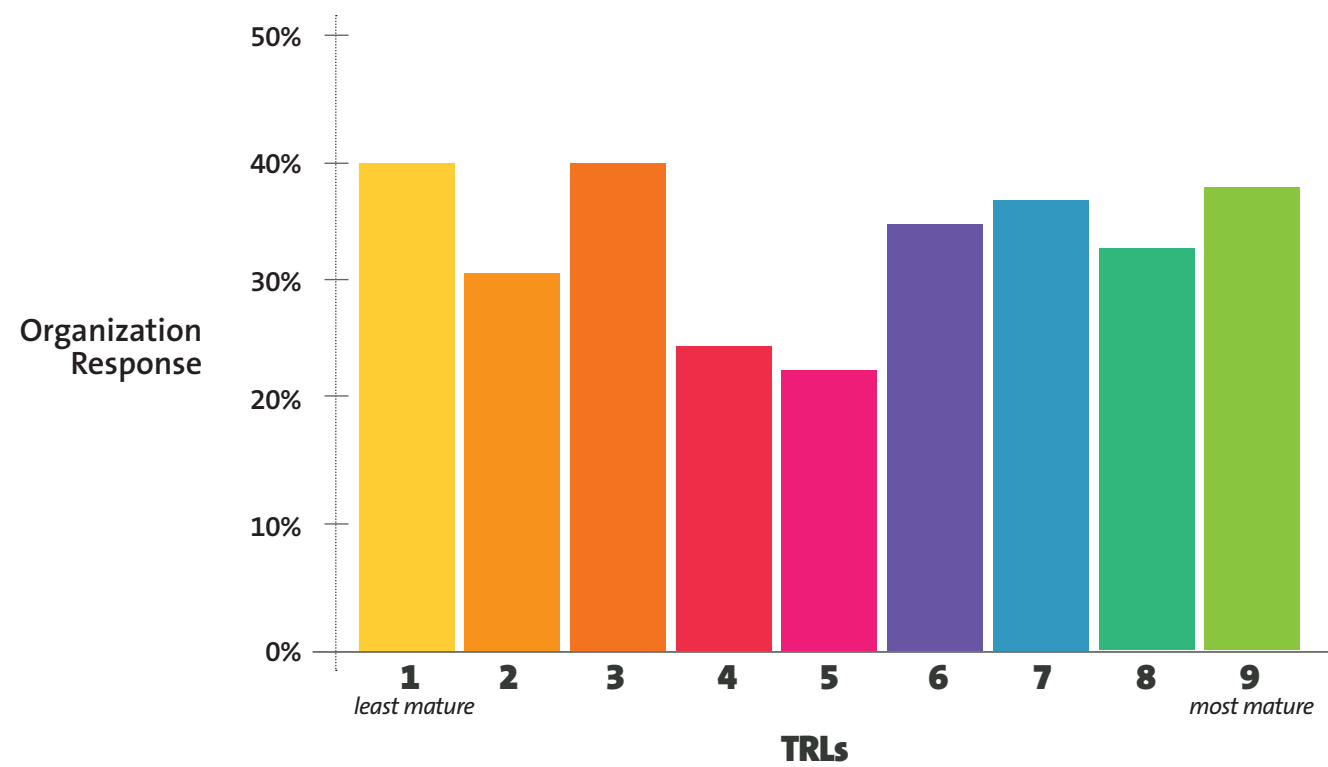
20% of respondents stated that they were currently startup/pre-revenue. In 2020, 4% projected that they would remain startup/pre-revenue in 2022, compared to 2% when asked two years before. Significantly more companies are currently in the early growth stage and anticipated to remain in early growth in two years, than when surveyed in 2018. In 2020, 5% more companies report being in product expansion than 2 years ago, but with roughly the same proportion anticipating they will be in product expansion in two-years (27% in 2022 compared to 28% in 2019). There are significantly fewer companies reporting mature stage, or, anticipating they will be in the mature stage in two-years, than reported in the 2018 survey.

8.1 Technology Readiness Levels (TRLs)

Technology readiness levels measures a project’s stage of development using nine (9) different categories. Projects eventually lead to product development, and subsequently products reaching markets. TRLs are defined in the Appendix E.

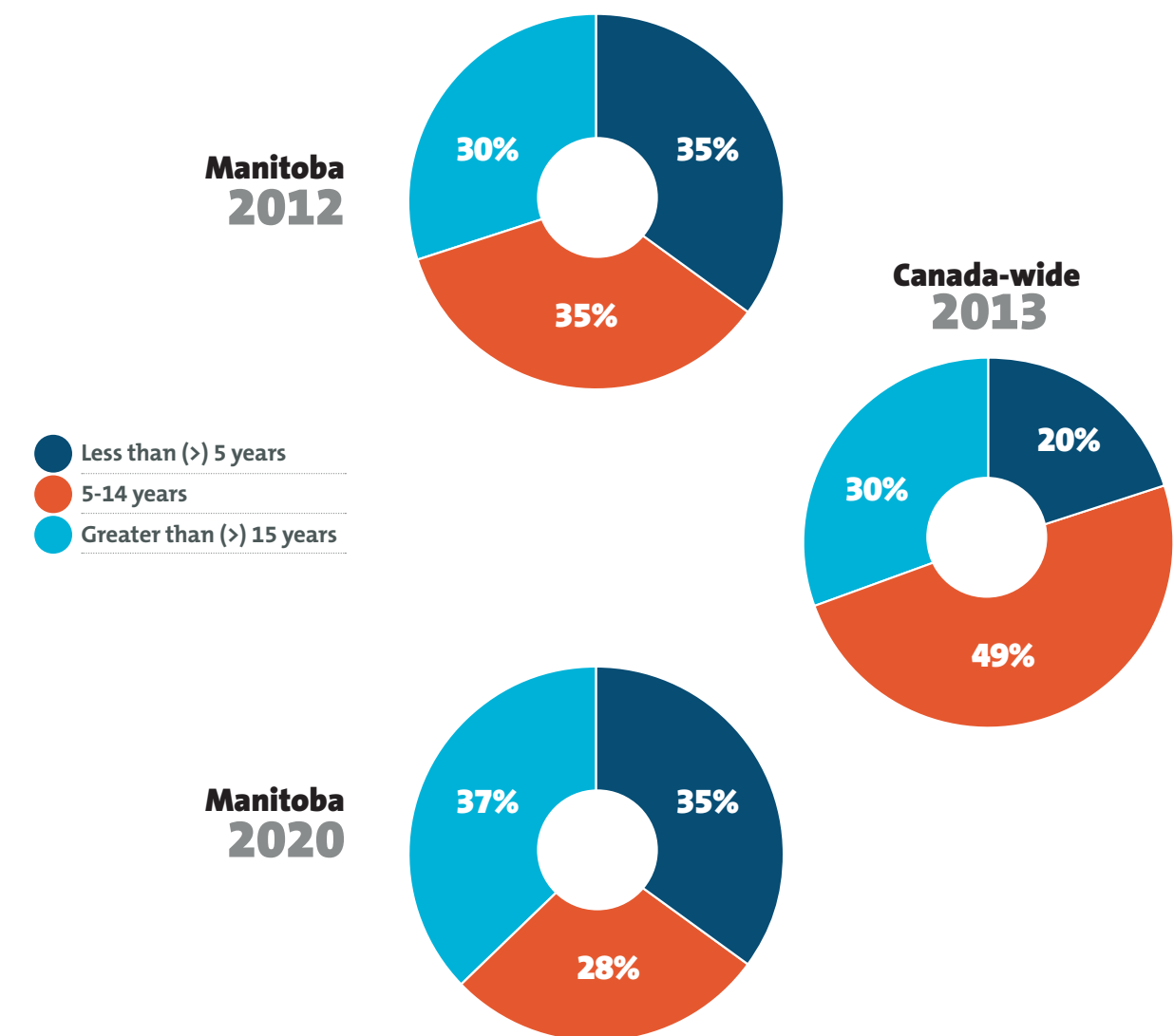
Manitoba bioscience organizations reported a wide-range of projects at various TRLs. In total, 322 different projects were reported; 40% of organizations reported projects in Level 1, 31% in Level 2, and 38% in level 9 (as shown in the table below), demonstrating that Manitoba bioscience companies are engaged in a wide range of innovation.

RESPONSE TO PRODUCT DEVELOPMENT



Bioscience companies in Manitoba tend to be older and more mature than the Canadian average. In fact, over one third of the companies sampled were greater than 15 years of age. The general increase in average age is indicative of industry success, maturity, established product, and product expansion. This is also confirmed by increasing sales/revenue, employment, EBITDA, and other industry key performance indicators.

BUSINESS AGE



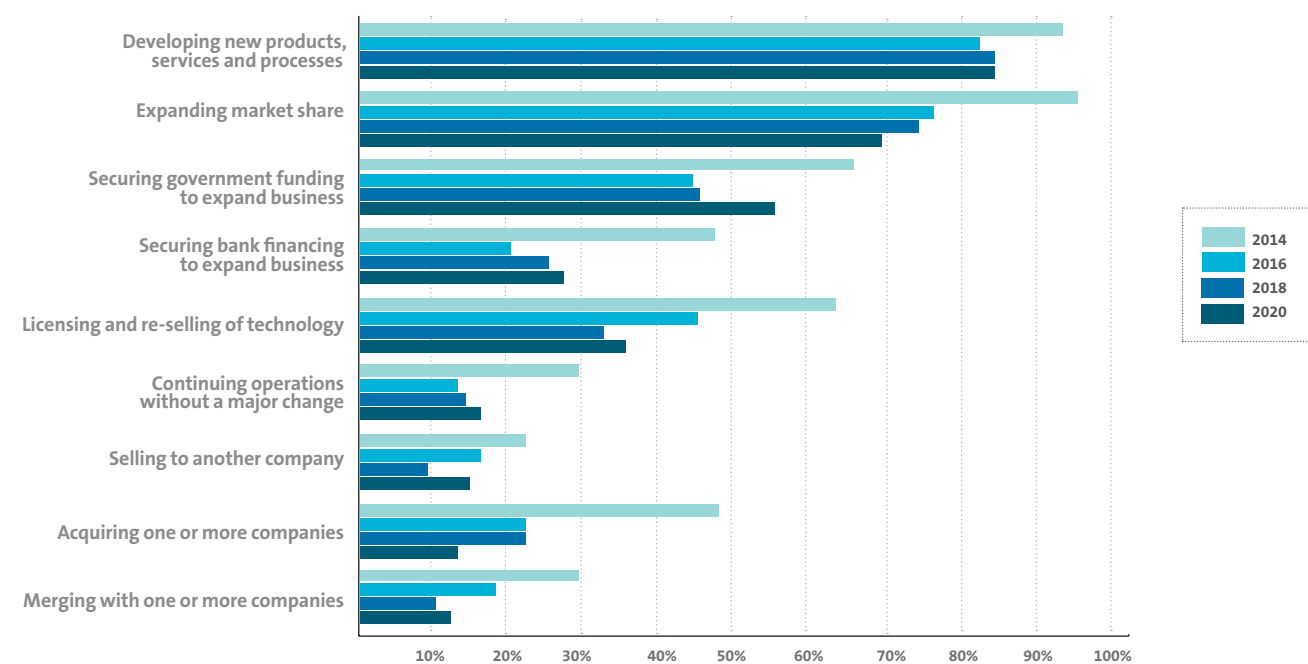
8.2 Further Information on Sector Outlook

The below table suggests that compared to bioscience companies Canada-wide (2013), developing new products, services and processes is even more of a key growth strategy in Manitoba. Similarly, expanding market share remains well above the 2013 Canada Wide result, but has decreased in Manitoba from 2014 to 2020 (95% to 69%).

THE TOP THREE FUTURE GROWTH STRATEGIES IN ALL FOUR STUDY PERIODS ARE:

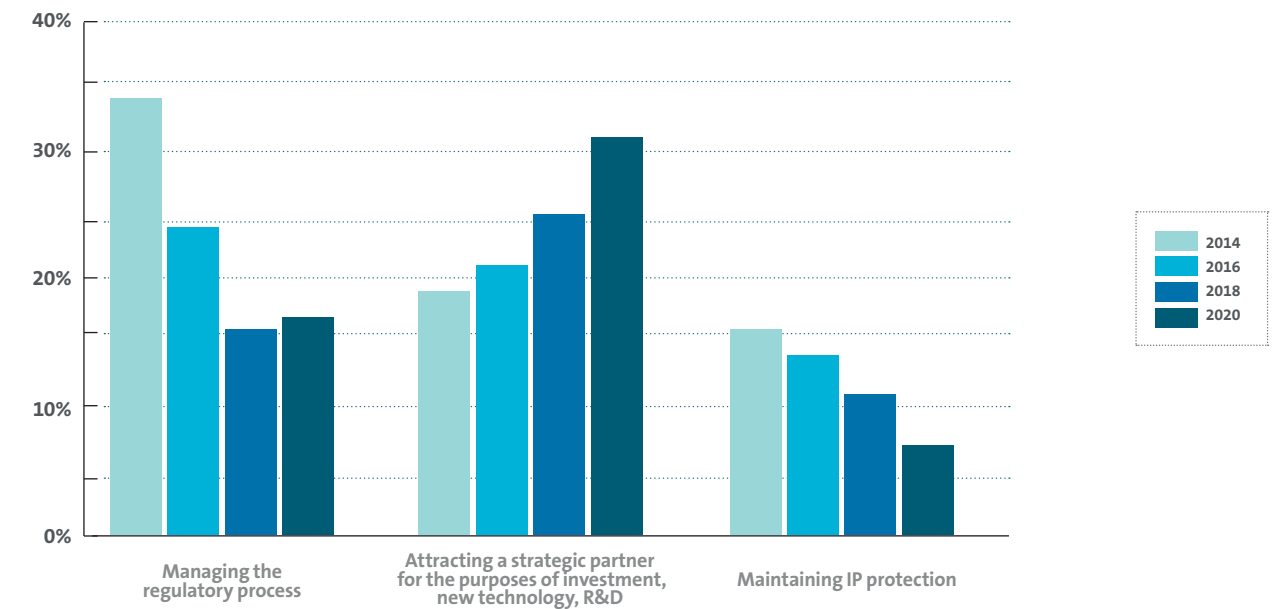
- developing new products, services and processes
- expanding market share
- securing government funding to expand business. Notably, 19% of organizations reported that they anticipate securing funding to maintain, rather than expand their business.

FUTURE GROWTH STRATEGIES Proportion of Companies



Strategies which include change of ownership (e.g. merging, acquiring, selling organization) are significantly lower than reported in 2014 with only 2/15 organizations reporting a strategy involving a change in ownership.

MAJOR OBSTACLES Proportion of Companies



Manitoba bioscience companies are reporting a wide variety of challenges. Since 2016, attracting a strategic partner for the purposes of investment, new technology, R&D and as a licensing partner has become a greater challenge, while the remaining obstacles have become less of a challenge or are relatively unchanged.

Attracting a strategic partner for the purposes of investment, new technology, R&D and raising capital are the most significant major obstacles reported by organizations in 2020. The difficulty of attracting a strategic partner has grown significantly as an ongoing challenge between 2014 and 2020.

The following table presents the proportion of companies reporting an obstacle as major, by company size:

**MAJOR OBSTACLES BY COMPANY SIZE
2018 and 2020**

MAJOR OBSTACLES	Year	5 or fewer FTE	6 to 20 FTE	21 to 50 FTE	> 50 FTE
ATTRACTING A TECHNOLOGY LICENSING PARTNER	2018	14%	12%	0%	5%
	2020	18%	12%	0%	0%
ATTRACTING A STRATEGIC PARTNER FOR THE PURPOSES OF INVESTMENT, NEW TECHNOLOGY, R&D	2018	48%	28%	0%	10%
	2020	46%	24%	13%	23%
MANAGING THE REGULATORY PROCESS	2018	14%	24%	0%	10%
	2020	14%	12%	25%	31%
ACCESSING CANADIAN MARKETS	2018	29%	28%	0%	0%
	2020	14%	28%	0%	8%
MAINTAINING IP PROTECTION	2018	24%	16%	0%	0%
	2020	4%	4%	13%	15%
MAINTAINING A CANADIAN PRESENCE	2018	10%	8%	0%	0%
	2020	7%	4%	0%	0%
RAISING CAPITAL OUTSIDE MANITOBA	2018	33%	8%	13%	0%
	2020	43%	16%	13%	15%
RAISING CAPITAL WITHIN MANITOBA	2018	48%	28%	25%	10%
	2020	50%	20%	13%	8%
ACCESSING MANITOBA'S MARKET	2018	24%	24%	0%	10%
	2020	21%	16%	0%	0%

Smaller size companies (20 or less FTEs) are reporting many challenges. For larger companies, managing the regulatory process is the most significant major obstacle; attracting a strategic partner for the purposes of investment, new technology and R&D is the second most significant obstacle.

9.1 Are Manitoba & Canada Conducive to Growing a Bioscience Business?

This year, respondents were asked to assess the Manitoba and Canadian operating environments with respect to their conduciveness to growing a bioscience business. Overall, responding organizations slightly favour the Canadian operating environment to Manitoba's, 31% compared to 29% think that the operating environment is conducive to growing a bioscience business. Conversely, 22% of responding organizations think that Manitoba's environment is working against the growth of bioscience businesses compared to 16% for Canada. The following tables present these results by number of employees:

Canada

CHARACTERIZATION OF OPERATING ENVIRONMENT <i>(economic conditions and public policy)</i>	5 or fewer FTE	6 to 20 FTE	21 to 50 FTE	> 50 FTE	All Sizes
Conducive to growing a bioscience business	36%	28%	29%	31%	31%
Working against the growth of bioscience businesses	14%	24%	0%	8%	16%
Neutral	39%	40%	71%	38%	42%

Manitoba

CHARACTERIZATION OF OPERATING ENVIRONMENT <i>(economic conditions and public policy)</i>	5 or fewer FTE	6 to 20 FTE	21 to 50 FTE	> 50 FTE	All Sizes
Conducive to growing a bioscience business	39%	12%	57%	31%	30%
Working against the growth of bioscience businesses	18%	36%	0%	8%	22%
Neutral	32%	48%	43%	54%	42%

The overall difference appears to result from companies with 6 to 20 FTE employees; 36% of these companies report that Manitoba's operating environment is working against the growth of bioscience businesses compared to a maximum of 18% for the other employment ranges (5 or fewer FTE).

In 2019, the Manitoba bioscience industry raised an estimated \$356 million in capital.

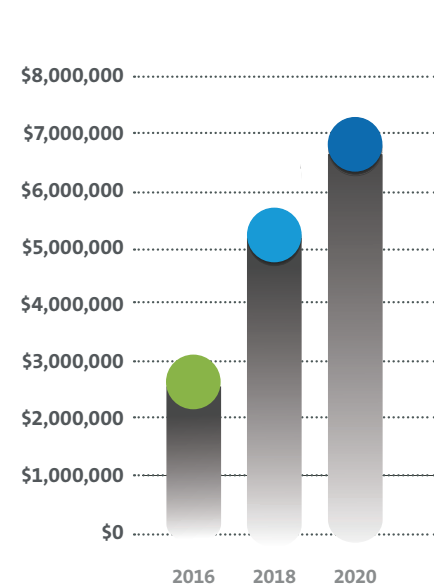
In 2019, total industry R&D expenditures is estimated at \$78,996,570. Between 2018 and 2020, average capital raised by survey respondents grew by 29%. Average R&D expenditures per company decreased by 5%.

As reported in Section 8.o, 2020 survey respondents indicate that raising capital was more of a challenge or obstacle than in 2018.

SOURCE OF CAPITAL
Comparison of Three Study Periods

Capital Sources	2016 Proportions	2018 Proportions	2020 Proportions
Government programs	43%	44%	58%
Founder equity	34%	28%	45%
Outside investors or private (e.g. firm)	51%	52%	24%
Friends and family	29%	24%	15%
Debt Financing	29%	32%	15%
Stock Exchange (e.g. TSX, Nasdaq)	11%	8%	6%
Other	6%	8%	6%

Average Capital Raised

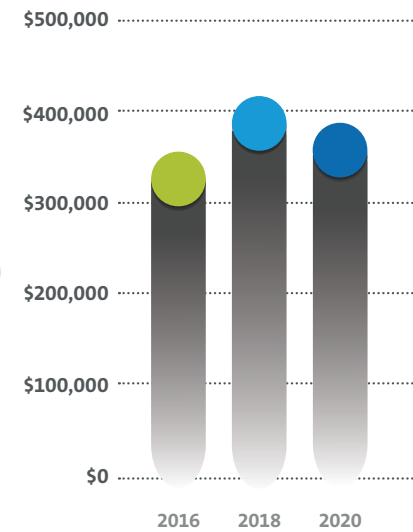


24%
4 year growth

2%
4 year growth

Total Capital Raised (2019)
\$356,302,619
Total Capital Raised (2017)
\$376,533,333

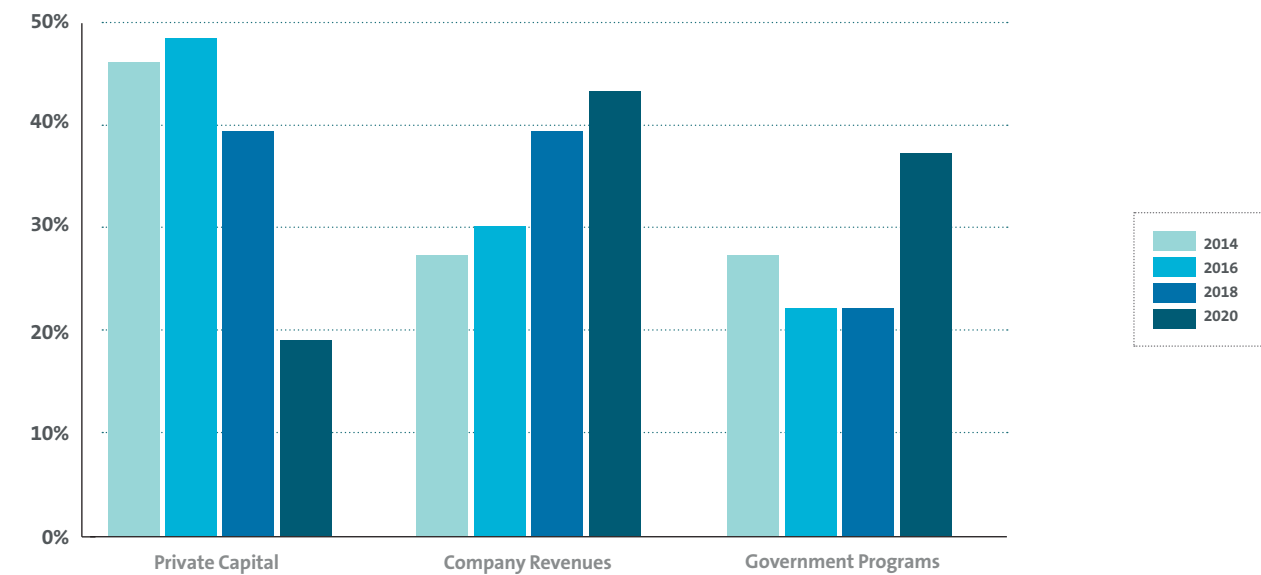
Average R&D Investment



Total R&D Investment (2019)
\$78,996,570
Total R&D Investment (2017)
\$73,944,052

Between 2016 and 2018, sources of capital were largely unchanged. However, between 2018 and 2020, government programs and founder equity have become a larger source of capital. This is likely reflected in the larger proportion of start-ups sampled in 2020, and the reported difficulty in raising capital.

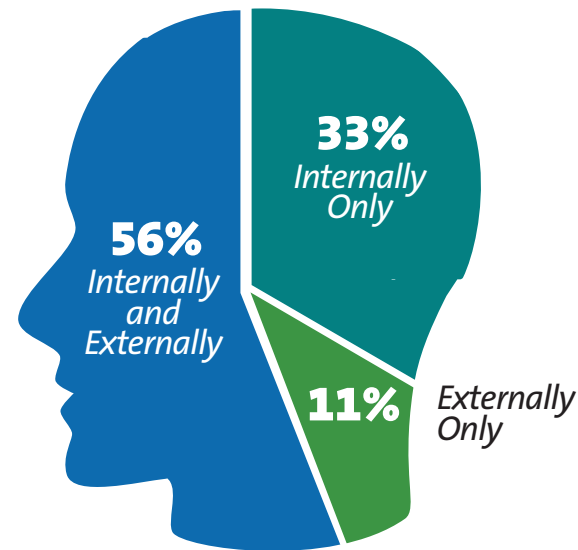
SOURCES OF R&D FUNDING
Comparison of Four Study Periods



Since 2014, there has been a significant increase in the proportion of R&D expenditures sourced from company revenues and government programs with less use of private capital. This could be due to the following reasons:

- (1) Since EBITDA has been generally increasing for respondent organizations, less external private capital is required (less demand for private capital).
- (2) Rates of return required by private investors to compensate for risk are not optimal for bioscience organizations wishing to borrow funds for R&D projects.

HOW R&D IS CONDUCTED WITHIN ORGANIZATIONS
Internally, externally or both



In 2020, organizations were asked to report whether their R&D was conducted internally, externally, or both. 56% of organizations conduct R&D both internally and externally with 33% conducting R&D internally only.

10.1 Government Programs

The below table presents various government programs, their usage rate, and whether or not they met company expectations. SRED and NRC-IRAP are the top-rated government programs. There are a significant number of programs with low usage rates and poor ratings.

PROVINCIAL AND FEDERAL PROGRAMS

Federal Programs

Federal Programs	Exceeded or met expectations	Did not meet expectations	Did not use	Did not know about the initiative	Usage Rate
National Research Council - Industrial Research Assistance Program (NRC - IRAP)	31	7	35	1	42%
Scientific Research & Experimental Development tax credit program (SRED)	28	4	41	1	38%
Canadian Trade Commissioner Service/CanExport	21	4	42	7	28%
Western Economic Diversification (WD)	17	5	47	5	23%
Canadian Agricultural Partnership Program	15	5	48	6	20%
MITACS	15	4	50	3	21%
Natural Science and Engineering Research Council (NSERC)	14	3	56	1	19%
Protein Industries Canada (PIC)	12	3	54	5	16%
BioTalent	11	2	55	5	15%
Prairie Biosciences Canada (PBC)	9	0	56	9	12%
Strategic Innovation Fund (SIF)	6	6	52	10	8%

PROVINCIAL AND FEDERAL PROGRAMS Cont'd

Provincial Programs

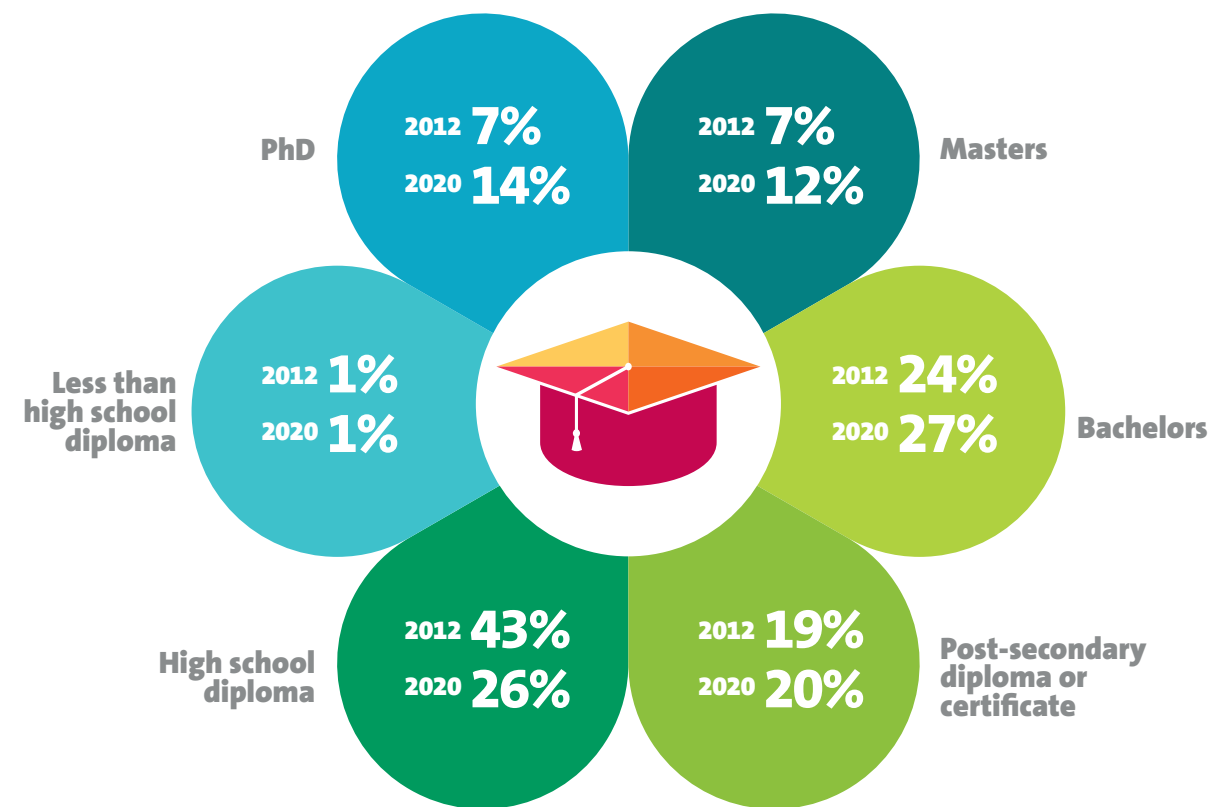
Provincial Programs	Exceeded or met expectations	Did not meet expectations	Did not use	Did not know about the initiative	Usage Rate
Scientific Research & Experimental Development tax credit program (SRED)	29	2	43	1	39%
Canada - Manitoba Jobs Grant	20	2	48	5	27%
Ag Action Manitoba	14	2	53	6	19%
Small Business Venture Capital Tax Credit	12	0	56	7	16%
Workforce Development Program	10	1	56	8	13%
Manitoba Manufacturing Investment Tax Credit	9	0	58	8	12%
Innovation Growth Fund (formerly Commercialization Support for Business Program CSBP)	6	2	56	11	8%
Manitoba Works Capital Incentive Tax Credit	6	1	59	9	8%
Industry Expansion Training Program	6	1	59	9	8%

THE MANITOBA BIOSCIENCE INDUSTRY EMPLOYS
16,330 individuals.
 IT IS A HIGH VALUE-ADDED INDUSTRY WITH A DIRECT
GDP/worker of \$344,562.

The following table provides a list of the top 13 occupations employed by the Manitoba bioscience industry in terms of industry concentration:

Title	Total Manitoba Job Openings 2018-2024	Total employed in Manitoba (2016)	2016 MB Average Salary Worked Full-time/year
Managers in agriculture, horticulture and aquaculture	1,911	13,470	\$34,856
Biologists and related scientists	131	865	\$89,191
Chemical technologists and technicians	104	700	\$58,300
Agricultural representatives, consultants and specialists	104	665	\$78,115
Biological technologists and technicians	70	565	\$65,967
Landscape and horticulture technicians and specialists	24	460	\$50,292
Agricultural and fish products inspectors	40	295	\$70,959
Chemists	52	270	\$81,500
Conservation and fishery officers	18	200	\$79,890
Forestry technologists and technicians	8	105	\$71,729
Forestry professionals	10	55	\$126,592

MANITOBA BIOSCIENCE FULL TIME EQUIVALENT (FTE) BY EDUCATION LEVEL
Degrees/Educational Qualifications



The Manitoba bioscience workforce is highly educated with 53% possessing at least a Bachelor's degree, compared to 25% of the total Manitoba population aged 25 and older. The proportion of the bioscience workforce possessing Ph. D. and Masters degrees has increased significantly between 2012 and 2020.

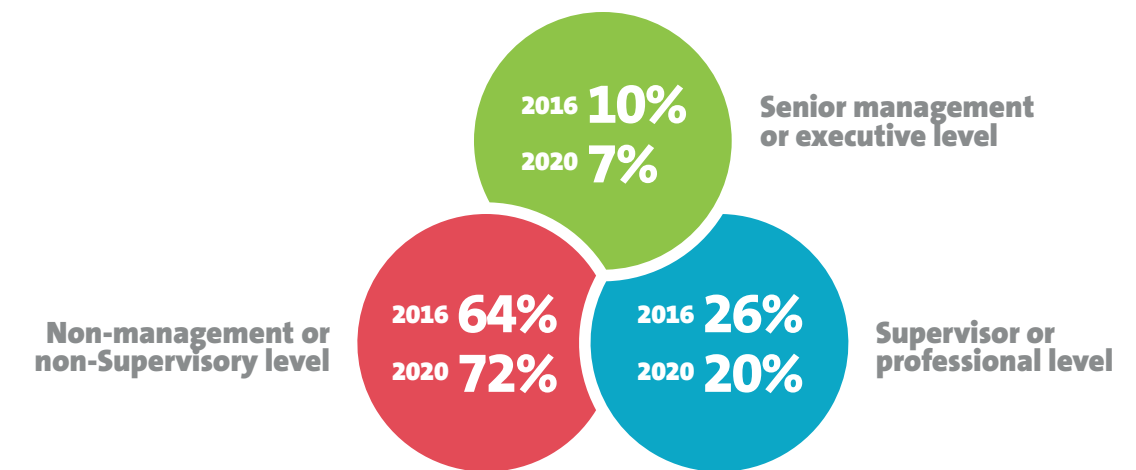
The proportion of the workforce possessing only high school diplomas has decreased significantly from 43% to 26% between 2012 to 2020. This shows that the workforce in the Manitoba bioscience industry is becoming increasingly educated and demonstrates the need for BAM to continue working with government and industry stakeholders, together with various educational institutions to help students to adapt quickly to employment upon graduation.

PROPORTIONS OF FULL-TIME EQUIVALENT (FTE) EMPLOYEES IN MANITOBA'S BIOSCIENCE INDUSTRY - 2020
By subsector and highest education level

Subsector Classification of BAM	PhD	Master's	Bachelor's	Post Secondary diploma or certificate	High school diploma	Less than high school diploma
CLEAN BIOTECH	0%	6%	10%	4%	74%	6%
HEALTH BIOTECH	4%	7%	30%	23%	36%	0%
AG BIOTECH	7%	7%	42%	15%	26%	2%
SUPPORT ORGANIZATIONS/OTHERS	28%	19%	22%	20%	10%	0%

WORKFORCE BY POSITION (LEVEL)

Proportions of Full-Time Equivalent (FTE) Employees in Manitoba's Bioscience Industry by Position



There has been growth in the non-management or non-supervisory level category between 2016 and 2020 and decline in the management and supervisor categories employed in bioscience organizations.

INDUSTRY WORKFORCE EXPANSION DEMAND

Manitoba’s bioscience industry workforce expansion demand by industry category

Employee Job Position	2014	2016	2018	2020
Manufacturing/Production	29%	18%	48%	46%
R&D/Design/Innovation	25%	23%	10%	15%
Sales & Marketing	11%	11%	15%	13%
Quality Assurance/Control	5%	17%	10%	8%
Senior Management	15%	7%	7%	7%

Expansion demand refers to hiring individuals as a result of business growth or new businesses being established.

The above table provides the proportion of workforce expansion demand by bioscience job categories. For example, the workforce expansion demand for manufacturing/production occupations contributed to 46% of the new jobs in 2020.

Expansion demand comprised of manufacturing/production occupations has increased since 2014 while the other categories have increased slightly or declined.

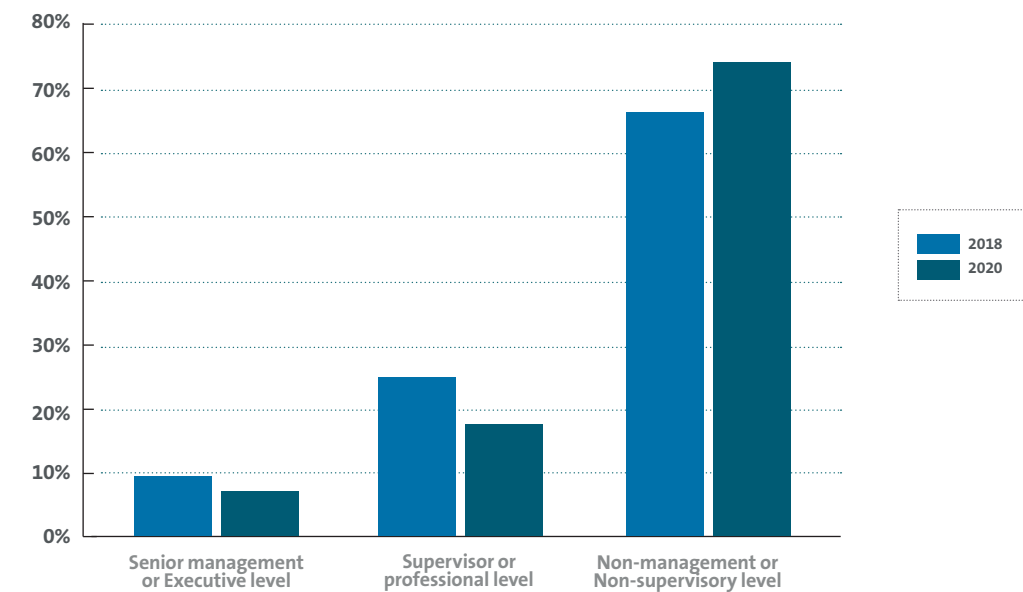
REPLACEMENT DEMAND

Employee Job Position	2014	2016	2018	2020
Senior management or executive level	6%	10%	6%	8%
Supervisor or professional Level	21%	16%	21%	31%
Non-management or non- Supervisory level	73%	74%	73%	61%

Replacement demand refers to the hiring of individuals to replace the retiring workforce. 61% of replacement demand was for non-management or non-supervisory level positions, less than the other three study periods. Similar to findings from previous years, replacement demand for supervisory level positions is increasing over time.

INDUSTRY WORKFORCE - UNFILLED POSITIONS (EXPANSION AND/OR REPLACEMENT DEMAND)

By employee job position from 2018

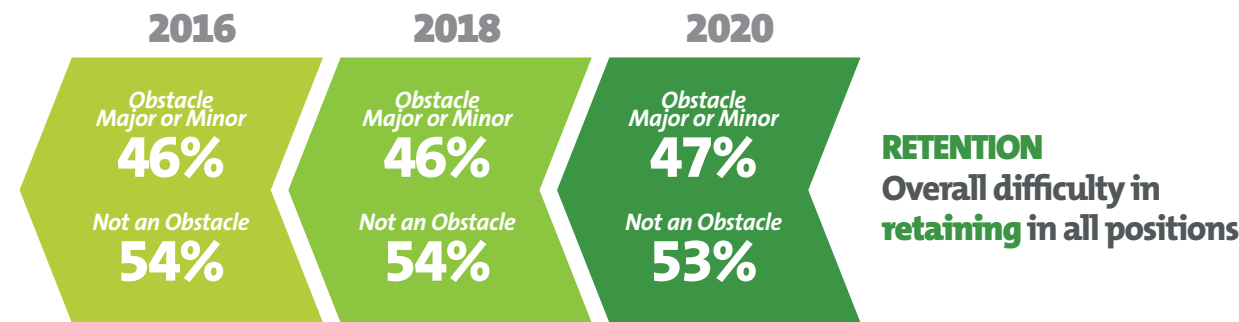
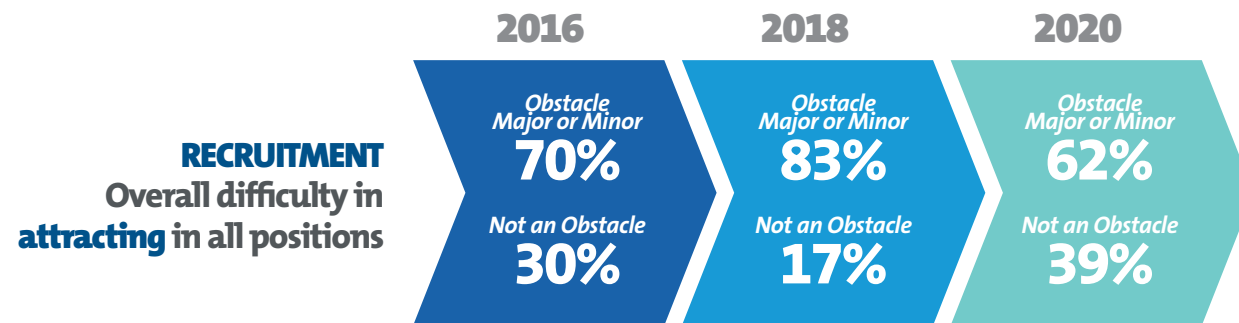


74% of unfilled positions are non-management or non-supervisory, an increase from 66% in 2018. It is important to note that Supervisor or professional level occupations account for 18% of unfilled positions, a decrease from 25% in 2018.

11.1 Recruitment and Retention

The 2016 and 2018 BAM Industry Surveys found that recruitment is a much greater challenge than retention; this is also demonstrated in this year's study.

WORKFORCE CHALLENGES



RECRUITMENT

Year	Workforce Challenge	Obstacle Major or Minor	Not an Obstacle
2016 2018 2020	Attracting senior management at an executive level	61% 71% 56%	38% 29% 44%
2016 2018 2020	Attracting employees at a Supervisor or professional level	77% 95% 76%	23% 5% 24%
2016 2018 2020	Attracting employees at a non-management or non-supervisory level	72% 81% 52%	28% 19% 48%
2016 2018 2020	Overall difficulty in attracting the above broad positions	70% 83% 61%	30% 17% 39%

Although the level of difficulty with retention is the same in 2016, 2018 and 2020, challenges with recruitment have improved significantly between 2018 and 2020, with only 61% of organizations reporting recruitment as at least a minor obstacle compared to 83% in 2018.

RETENTION

Year	Workforce Challenge	Obstacle Major or Minor	Not an Obstacle
2016 2018 2020	Retaining employees at a senior Management or executive level	43% 38% 38%	56% 62% 63%
2016 2018 2020	Retaining employees at a Supervisor or professional level	52% 48% 52%	49% 52% 48%
2016 2018 2020	Retaining employees at a non-management or non-supervisory level	44% 52% 50%	56% 48% 50%
2016 2018 2020	Overall difficulty in retaining the above broad positions	46% 46% 47%	54% 54% 53%

For all categories, recruitment of the workforce is less of a challenge than reported in 2018 and 2016.

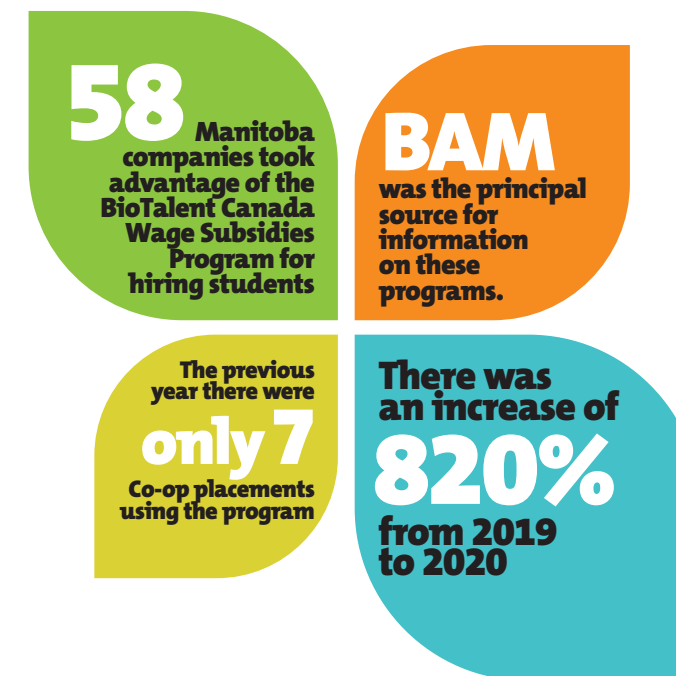
Recruitment is consistently more of a challenge than retention (although this gap is narrowing). The fact that recruitment is becoming less of a challenge is positive for industry labour market outlook.

In 2020, organizations are recruiting significantly more from Manitoba universities and colleges than reported in 2018. This year, organizations were asked to report on the number of co-op placements and staff training.

EDUCATIONAL INSTITUTIONS FROM WHICH EMPLOYEES ARE CURRENTLY BEING HIRED IN 2020

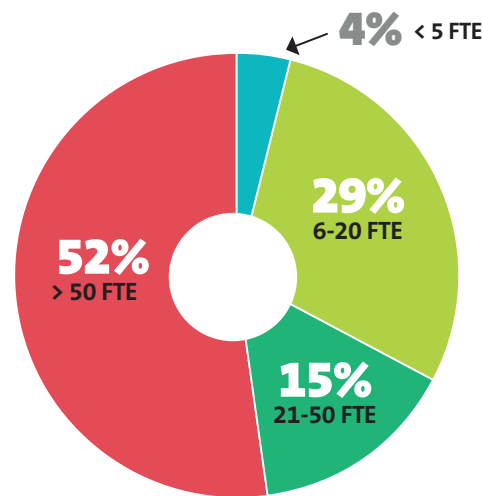
Institutions	# of Businesses Recruiting	% of Total Businesses Recruiting
University of Manitoba	41	55%
University of Winnipeg	15	20%
Red River College	23	31%
Assiniboine Community College	8	11%
Brandon University	6	8%
Other Universities or Colleges in Manitoba	5	7%
Other Universities or Colleges in Canada	25	32%

In total, there were 93 co-op students reported as being placed with the responding organizations. 52% of those (48/93) were placed in larger organizations (50 or more FTEs) while only 4% were placed with organizations having 5 or fewer FTEs. 11% of surveyed organizations with 5 or fewer FTEs saw at least one co-op student placed, 6 to 20 FTE, 38% of the largest organizations hired co-op students. Despite the fairly even distribution of organizations involved in the co-op program, as expected, the majority of students overall were placed with the larger organizations.



CO-OP STUDENTS PLACED

The following chart presents co-op student placement by organization size:



WORKFORCE CHALLENGE

Skills Gaps

Critical thinking, project management and writing are skills gaps reported by at least 20% of responding organizations. Leadership and sales and business development are next on the list of reported skills gaps with 19% and 17% respectively.

TOP 5 SKILLS GAPS

- Critical thinking
- Project management
- Writing
- Leadership
- Sales and business development

CURRENT SKILLS SHORTAGES NEGATIVELY IMPACTING THE OPERATIONS
Of sampled bioscience businesses

In 2020, organizations are reporting that these skills gaps are negatively impacting business operations to a greater extent than in 2018. In 2020, 67% of companies reported that the skills gaps had a major impact, compared to only 47% reporting a major impact in 2018. Although recruitment is being stated as less of a challenge than in previous years, gaps in skills are being reported as more of a negative issue.

TRAINING NEEDS
By company size

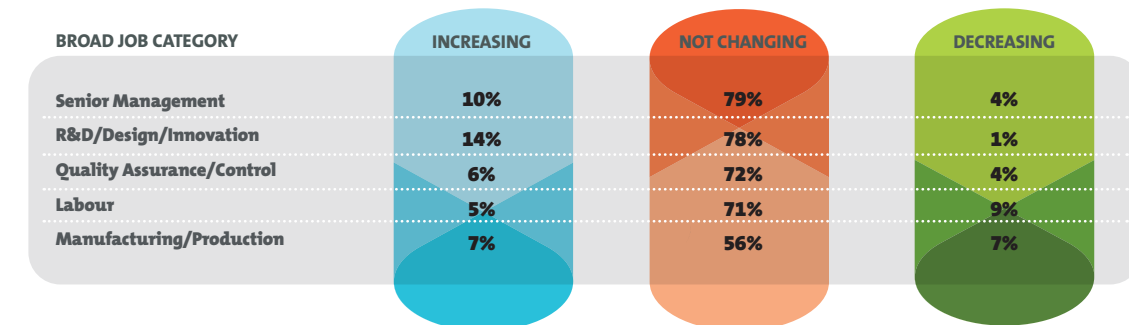
MAJOR OBSTACLES	Comparison Years	5 or fewer FTE	6 - 20 FTE	21 - 50 FTE	> 50 FTE	All Sizes
REGULATORY	2018	27%	48%	13%	30%	33%
	2020	36%	48%	13%	31%	36%
PROFESSIONAL DEVELOPMENT: Leadership, Management, Communication, Human Resource	2018	36%	60%	50%	40%	47%
	2020	43%	72%	50%	38%	53%
MANAGEMENT BUSINESS FUNCTIONS: Sales, Marketing, Production, Product/Service Development,	2018	36%	60%	63%	30%	45%
	2020	54%	48%	25%	46%	47%
BUSINESS OPERATIONS: GMP, Lean	2018	36%	48%	38%	40%	41%
	2020	39%	36%	13%	38%	35%

Respondents were asked to identify where BAM could fill training needs that exist within organizations. The results suggest that respondents see BAM filling a variety of training needs for all company sizes. Within the categories, regulatory and business development ranks last across company sizes compared to professional development and management. All areas are still reported as important for BAM to be involved in.

TECHNOLOGY AND AUTOMATION

This year, organizations were asked to report whether or not technology and automation is increasing or decreasing the number of people employed in various types of occupations. The following table presents the results of this analysis:

Effect of Technology and/or Automation on the Number of People Employed in the following Bioscience occupations in Manitoba, Response from the 2020 Survey of Manitoba Bioscience Companies



Technology and automation is tending to slightly decrease labour related occupations while increasing the number of people employed in senior management, sales and marketing, and R&D/Design/innovation occupations. From the above table of results, it does not appear that technology and automation is significantly decreasing the number of people employed in any occupational categories. This is also reflected in the overall 14% industry workforce growth between 2017 and 2019.

green

(verb)

gr·ee·n

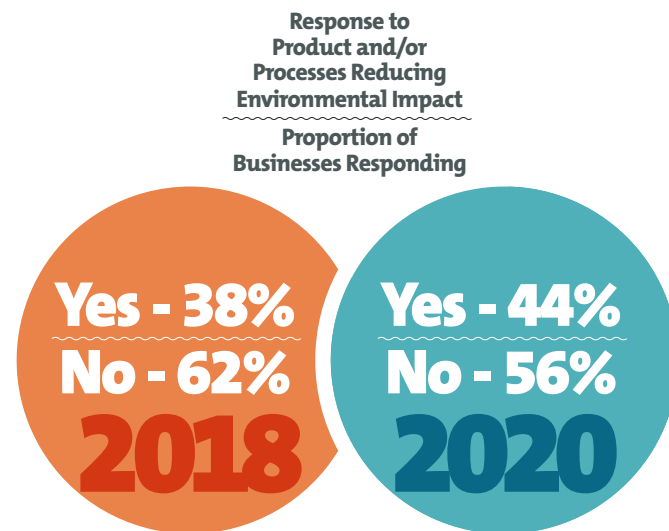
Definition of green

make less harmful or more sensitive to the environment.

44% of survey respondents indicate that they are producing products and/or processes which reduce environmental impacts beyond those produced by the common technology currently used. This is greater than 38% reported in 2018.

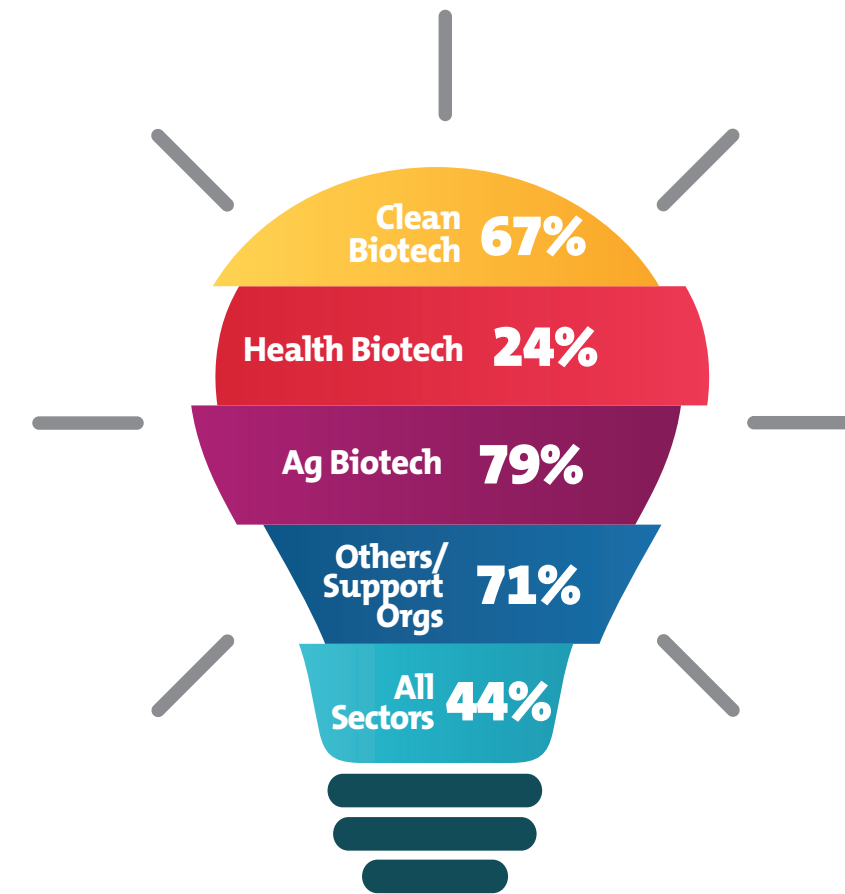
ENVIRONMENTAL IMPACT REDUCTION - 2020

Proportion of Bioscience Businesses Creating Products and/or Processes that Reduce Environmental Impact



ENVIRONMENTAL IMPACT REDUCTION - 2020

Proportion of Surveyed Bioscience Businesses Creating Products and/or Processes that Reduce Environmental Impacts by subsector



Clean Biotech and Ag Biotech companies contribute the “greenest” activity with 67% and 79% reporting respectively. In 2018, a greater proportion of Clean Biotech companies than Ag Biotech companies reported as “green”. In 2020, this reversed. This is likely due to the fact that the Clean Biotech and Ag Biotech often overlap in terms of the sector definitions with both operating in similar realms. Health Biotech companies also contribute to green activity with 24% of survey respondents indicating that they are creating green products and processes. This is an increase from 20% in 2018. This suggests that all subsectors are to some extent “green”.

STEPS FOR GOVERNMENT TO ASSIST MANITOBA'S BIOSCIENCE INDUSTRY
In Competing Globally

PERCEIVED APPROPRIATE GOVERNMENT INTERVENTION	Comparison Years	5 or fewer FTE	6 - 20 FTE	21 - 50 FTE	> 50 FTE	All Sizes
PROVIDE RESEARCH GRANTS	2018	76%	68%	25%	50%	58%
	2020	75%	76%	38%	15%	61%
CREATE INCENTIVES FOR RISK CAPITAL	2018	71%	52%	25%	50%	52%
	2020	71%	52%	50%	54%	60%
CREATE MORE FAVOURABLE TAX INCENTIVES	2018	48%	64%	50%	50%	53%
	2020	57%	52%	50%	62%	56%
IMPROVE THE SPEED OF THE REGULATORY PROCESS	2018	38%	64%	38%	65%	53%
	2020	39%	60%	38%	62%	51%
OTHER	2018	14%	8%	25%	5%	14%
	2020	7%	20%	25%	8%	13%
NONE OF THE ABOVE	2018	5%	8%	13%	0%	6%
	2020	4%	0%	13%	0%	3%

The above results suggest that survey respondents want the government involved with the industry in the form of research grants, creating more favourable tax incentives, improving the speed of the regulatory process, and creating incentives for risk capital. Provision of research grant ranks the highest with about 61% of the total sampled businesses reporting as an important government intervention. Consistent with other findings in this report, provision of research grants is an important area for government intervention for both the smaller (5 or fewer FTEs) and moderate (6 to 20 FTEs) sized businesses. The larger businesses with employee sizes in excess of 50 FTEs are not requiring government support with research grants but are requiring government intervention for the other categories.

Creation of a favorable tax incentive is perceived as an area for government to support by all sampled businesses irrespective of their size.

While improving the speed of the regulatory process is more of an issue for moderate and larger sized bioscience businesses, it is still a moderate concern for smaller business.

Other mentioned areas perceived to be appropriate for government intervention include:

- Act as an early first customer
- Reward risk-taking through tax credits
- Reduction of provincial and federal taxes
- Provide incentive for product testing
- Clarify funding program requirements

THE REGULATORY BODY ISSUING CLEARANCE/APPROVAL FOR NEW PRODUCTS

ISSUING REGULATORY BODY	5 or fewer FTE	6 - 20 FTE	21 - 50 FTE	> 50 FTE	All Sizes
HEALTH CANADA	61%	64%	50%	62%	60%
US FOOD AND DRUG ADMINISTRATION	50%	44%	25%	31%	41%
CANADIAN FOOD INSPECTION AGENCY	36%	32%	63%	31%	36%
MUNICIPAL GOVERNMENTS	11%	24%	38%	15%	19%
OTHER	21%	12%	13%	23%	19%
PROVINCIAL ENVIRONMENTAL STATUTES (THE ENVIRONMENT ACT)	11%	12%	38%	23%	16%
THE CE MARK	11%	16%	0%	8%	11%
FEDERAL ENVIRONMENTAL STATUTES (CEPA)	7%	4%	25%	0%	7%

Health Canada, US Food and Drug Administration and the Canadian Food Inspection Agency are the major regulators of the industry as reported by survey respondents.

External regulators like US Food and Drug Administration and The CE Mark may regulate the products of Manitoba bioscience businesses as they are responsible for standards in the United States and Europe respectively. The majority of revenue of the sampled bioscience businesses is from foreign markets, primarily the United States and Europe (apart from the rest of Canada).

This report is Bioscience Association Manitoba’s (BAM) bi-annual Industry Profile Study. It involves a detailed analysis of the bioscience industry in Manitoba using data obtained from the 2020 BAM Industry Survey to Businesses, as well as Statistics Canada Datasets. Out of an estimated total of 700 bioscience organizations in Manitoba, a sample of 84 organizations was obtained as part of the 2020 Bioscience Industry Survey to Businesses. The survey forms the basis of this report; Statistics Canada data was used to enhance the sample and overall estimation process.

This study corresponds to the 2019 calendar year and is based on the 2020 BAM Industry Survey. However, some questions are related to the 2020 calendar year. It is structured using a NAICS classification method similar to recent studies conducted by Battelle, Life Sciences Ontario (LSO) and Life Sciences BC (LSBC).

The 2018 Industry Profile Study and 2016 Industry Profile Study correspond to the 2017 and 2015 calendar years respectively for financial related questions, and to the 2018 and 2016 years for non-financial related questions.

Questions contained in the 2020 BAM Industry Survey were similar to questions asked in previous surveys and therefore comparisons are made with results from previous studies and with results from LSO and LSBC studies. Other questions were also asked of respondents including topics such as COVID-19. Statistics Canada datasets (see Appendix C: Data Sources) were used to enhance the accuracy of results and reduce reliance on sample data. Since this study uses detailed data obtained from the Business Register including business counts by detailed subsector NAICS, Manitoba bioscience industry population statistics are inferred from the sample as well as secondary data including Statistics Canada data. This differs from studies conducted in previous years, prior to 2018, which relied primarily on sample statistics thereby underestimating the size of the Manitoba Bioscience Industry. This study herein is able to make direct comparisons between population statistics (e.g., revenue, employment, capital, R&D) between 2017 and 2019 study periods.

The 2020 and 2018 industry profile studies both follow approaches and industry definitions consistent with other bioscience studies including those by Battelle, Life Sciences Ontario (LSO), and Life Sciences BC (LSBC). Since LSBC excludes Ag Biotech, the 2020 BAM Industry Profile Study primarily follows the methodologies and definitions adopted by Battelle and LSO, with even further focus on LSO which both include Ag Biotech.

A total of 84 responses were recorded. To calculate estimates of totals for the entire industry consisting of 700 companies, Business Register data was used to determine business count totals by each NAICS. Business Register data also provides details as to company size (employees). Once the total number of companies by each NAICS was compiled, averages obtained from the sample for revenue, employees, R&D, and capital were computed and applied to the population totals for each NAICS. In the event only a subset of the six-digit NAICS category was considered biosciences, the size of the bioscience workforce contained within the NAICS was used to estimate employment and business totals. For example, NAICS 5417 Research and development services was evaluated as follows:

Manitoba - NAICS 5417 - Scientific research and development services	
All occupations	970
031 Managers in health care	0
082 Managers in ag	10
2112 Chemists	40
212 Life sciences professionals	145
2211 Chemical technologists	30
222 Technical occupations in Life Sciences	20
311 Physicians, dentists	0
313 Pharmacists, dieticians	0
321 Medical technologists	25
Biosciences/Life Sciences Sub-Total	270
Weighting factor	0.278

The workforce concentration indicates that 27.8% of NAICS 5417 is bioscience related and therefore, business count data was adjusted such that 27.8% of the business counts for NAICS 5417 were counted as bioscience. This method is identical to the method used by LSO 2015. Since this report uses Census 2016 data compared to LSO 2015 which uses National Household Survey (NHS) data, this report herein is likely to be more accurate.

With respect to key performance indicators such as revenue and employees, if the survey sample was too small to compute estimates for the population, the manufacturer’s and wholesaler’s revenue database was obtained and weighted by employee counts for each 6-digit NAICS. If this data was unavailable, GDP estimates were converted to revenue/sales using the Statistics Canada supply and use tables and subsequently weighted by employee counts (business register). With respect to capital and R&D, using the sample, capital and R&D per worker was estimated and then applied to the employment population totals to compute total industry capital and R&D. Direct, indirect, and induced GDP were calculated using the market prices multipliers contained in the Statistics Canada supply and use tables (SUTs).

For a full detailed discussion of the methods and data used in this study, please contact BAM.

Based on a full-review of NAICS codes and studies previously conducted by LSO and Life Sciences BC, the following NAICS definitions were used in this report, to quantify the Manitoba Bioscience Industry:

Agricultural Feedstock & Chemicals (Ag Biotech)	311111	Dog and cat food manufacturing
	311119	Other animal food manufacturing
	311221	Wet corn milling
	311224	Oilseed processing
	325190	Other basic organic chemical manufacturing
	325313	Chemical fertilizer (except potash) manufacturing
	325314	Mixed fertilizer manufacturing
	325320	Pesticide and other agricultural chemical manufacturing
	418310	Agricultural feed merchant wholesalers
	418320	Seed merchant wholesalers
Drugs & Pharmaceuticals (Health Biotech)	418390	Agricultural chemical and other farm supplies merchant wholesalers
	325410	Pharmaceutical and medicine manufacturing
Medical Devices & Equipment (Health Biotech)	414510	Pharmaceuticals and pharmacy supplies merchant wholesalers
	334512	Measuring, medical and controlling devices manufacturing
Research, Testing & Medical Laboratories	339110	Medical equipment and supplies manufacturing
	417930*	Professional machinery, equipment and supplies merchant wholesalers
	541380*	Testing laboratories
Additional industries included in the expanded definition	541710*	Research and development in the physical, engineering and life sciences
	621510	Medical and diagnostic laboratories
	311211	Flour milling
	311420	Fruit and vegetable canning, pickling and drying
	413190	Other specialty-line food merchant wholesalers
	446191	Food (health) supplement stores
	541514	Computer system design and related services (except video game design and development)
Renewable Energy (Clean Biotech)	541690	Other scientific and technical consulting services
	541940	Veterinary services
	221119	Other electric power generation
	321111	Sawmills (except shingle and shake mills)
Bio-Industrial (Clean Biotech)	221122	Electric power distribution
	313110	Fiber, yarn and thread mills - manufacturing
	314990	All other textile product mills
	322110	Pulp mills
	322121	Paper, except newsprint, mills
	322122	Newsprint mills
	322130	Paperboard mills
	325610	Soap and cleaning compound manufacturing
	325991	Custom compounding of purchased resins
	325999	Other miscellaneous chemical product manufacturing
	326290	All other rubber product manufacturing
	333416	Heating equipment & commercial refrigeration equipment manufacturing
	Environmental Safety/ Energy Conservation Services (Clean Biotech)	541619
541620		Environmental consulting services
562210		Waste treatment and disposal
562910		Remediation services

The NAICS review conducted in preparation for this study examined a variety of factors including the nature of the goods and services provided by each subsector, the labour force concentration (proportion of the NAICS consisting of life science related occupations), and the nature of businesses actually contained in each NAICS (obtained from external sources).

2020 BIOSCIENCE ASSOCIATION MANITOBA INDUSTRY SURVEY

Statistics Canada - Table 16-10-0117-01 Principal statistics for manufacturing industries, by North American Industry Classification System (NAICS) (x 1,000)

Statistics Canada. Table 14-10-0201-01 Employment by industry, monthly, unadjusted for seasonality

Statistics Canada. Table 552-0006 - Canadian business counts, location counts with employees, by employment size and North American Industry Classification System (NAICS), Canada and provinces, June 2017, semi-annual (number)

Statistics Canada. CRO0165342_DM.2: Sex (3), Age (5), Industry - North American Industry Classification System (NAICS) 2012 (426) and Occupation - National Occupational Classification (NOC) 2016 (692) for the Employed Labour Force Aged 15 Years and Over, in Private Households of Manitoba, 2016 Census - 25% Sample Data

Statistics Canada. Table 36-10-0402-01 Gross domestic product (GDP) at basic prices, by industry, provinces and territories (x 1,000,000)

Statistics Canada. 2016 Census

This year's Industry Profile Study relies on data obtained from various sources and a comprehensive methodology to provide a robust, accurate presentation of the industry, its composition, and various challenges facing companies. This year to compute population totals, the Statistics Canada Business Register Data was used along with the results of the survey. To fill gaps in data, specifically when the survey sample was too small to estimate various categories, Statistics Canada GDP, wholesale, and manufacturing data was instrumented. The following table provides a breakdown of the survey sample by sector and subsector:

Industry Subsector	Manitoba Responses	% of Total	Industry Segment	Manitoba Responses	% of Total
Clean Biotech	9	10.71%	Biochemicals	3	3.70%
Bio-Health	53	63.10%	Bioenergy	3	3.70%
Ag Biotech	15	17.86%	Biomass Fuels	1	1.23%
Support Organization/ Other	7	8.33%	Biomaterials	3	3.70%
Total	84	100.00%	Digital Health	9	11.11%
			Medical Technology	18	22.22%
			Therapeutics	9	11.11%
			Health Food & Ingredients	8	9.88%
			Animal Health	2	2.47%
			Agricultural Inputs	5	6.17%
			Precision Agriculture	5	6.17%
			Plant Genomics	3	3.70%
			Support Organization/ Other	12	14.81%
			Total	81	100.00%

Level 1: Basic principles of concept are observed and reported

Scientific research begins to be translated into applied research and development. Activities might include paper studies of a technology's basic properties.

Level 2: Technology concept and/or application formulated

Invention begins. Once basic principles are observed, practical applications can be invented. Activities are limited to analytic studies.

Level 3: Analytical and experimental critical function and/or proof of concept

Active research and development is initiated. This includes analytical studies and/or laboratory studies. Activities might include components that are not yet integrated or representative.

Level 4: Component and/or validation in a laboratory environment

Basic technological components are integrated to establish that they will work together. Activities include integration of "ad hoc" hardware in the laboratory.

Level 5: Component and/or validation in a simulated environment

The basic technological components are integrated for testing in a simulated environment. Activities include laboratory integration of components.

Level 6: System/subsystem model or prototype demonstration in a simulated environment

A model or prototype that represents a near desired configuration. Activities include testing in a simulated operational environment or laboratory.

Level 7: Prototype ready for demonstration in an appropriate operational environment

Prototype at planned operational level and is ready for demonstration in an operational environment. Activities include prototype field testing.

Level 8: Actual technology completed and qualified through tests and demonstrations

Technology has been proven to work in its final form and under expected conditions. Activities include developmental testing and evaluation of whether it will meet operational requirements.

Level 9: Actual technology proven through successful deployment in an operational setting

Actual application of the technology in its final form and under real-life conditions, such as those encountered in operational tests and evaluations. Activities include using the innovation under operational conditions.

2021 INDUSTRY PROFILE STUDY

