A graphic consisting of four overlapping hexagons in shades of green and blue, positioned to the left of the main title.

BioScience

HUMAN RESOURCE STRATEGY
for Prince Edward Island





**BIOSCIENCE HUMAN RESOURCE STRATEGY
FOR PRINCE EDWARD ISLAND**



TABLE OF CONTENTS

	PAGE(S)
EXECUTIVE SUMMARY	1-4
1.0 INTRODUCTION	5-11
1.1 BACKGROUND	
1.2 OBJECTIVES	
1.3 METHODOLOGY	
1.3.1 Literature Review	
1.3.2 Primary Research	
1.3.3 Follow-up Procedures	
1.4 CHALLENGES	
1.5 DATA ANALYSIS	
2.0 PROFILE OF THE PEI BIOSCIENCE SECTOR	12-34
2.1 BIOSCIENCE DEFINED	
2.2 PROFILE OF EMPLOYER GROUP	
2.3 PROFILE OF EMPLOYEE GROUP	
2.4 INVENTORY OF WORKERS	
2.5 ANALYSIS OF STRENGTHS, WEAKNESSES, OPPORTUNITIES AND THREATS	
2.5.1 Strengths	
2.5.2 Weaknesses	
2.5.3 Opportunities	
2.5.4 Threats	
2.6 FACTORS FOR LOCATING A BIOSCIENCE COMPANY ON PEI	
2.7 CHOOSING PEI AS A WORK LOCALE	
2.8 GROWING THE PEI BIOSCIENCE SECTOR	
2.8.1 The Role Of Government	
2.8.2 The Role Of Educational Institutions And Department of Education	
2.8.3 The Role Of Industry	
2.8.4 The Role Of A Sector Representative Organization	
2.8.5 Other Collaborative Efforts Required For Sector Growth And Development	
3.0 ANALYSIS OF SKILL REQUIREMENTS BY OCCUPATIONAL AREA	35-52
3.1 RESEARCH	
3.2 PRODUCT/PROCESS DEVELOPMENT	
3.3 QUALITY CONTROL & QUALITY ASSURANCE	
3.4 MANUFACTURING & PRODUCTION	

	PAGE(S)	
3.5	PRODUCT & CUSTOMER SUPPORT	
3.6	REGULATORY AFFAIRS	
3.7	INTELLECTUAL PROPERTY	
3.8	BUSINESS DEVELOPMENT / INVESTOR RELATIONS	
3.9	CHIEF EXECUTIVE OFFICER (CEO)/PRESIDENT	
3.10	EXECUTIVE MANAGEMENT (VP'S)	
3.11	FINANCE	
3.12	MARKETING & SALES	
3.13	HUMAN RESOURCES	
3.14	MANAGEMENT INFORMATION SYSTEMS/ INFORMATION TECHNOLOGY	
3.15	ADMINISTRATION	
4.0	TRAINING ANALYSIS	53-71
4.1	NEW ENTRANTS	
	4.1.1 Availability And Quality Of Existing Regional Training	
	4.1.2 Training Needs For New Entrants	
4.2	CONTINUING EDUCATION AND CUSTOMIZED TRAINING	
	4.2.1 Availability And Quality Of Existing Regional Training	
	4.2.2 Ongoing Training Needs For Existing Workers	
4.3	FORECASTED FUTURE TRAINING NEEDS	
5.0	SUPPLY AND DEMAND ANALYSIS/FORECASTING	72-85
5.1	LABOUR SUPPLY	
	5.1.1 Capability Of Regional Training To Meet Future Demand	
	5.1.2 New Graduates	
5.2	LABOUR DEMAND	
	5.2.1 Current Unfilled Positions	
	5.2.2 Expected Increase In Employment	
	5.2.3 Retention	
	5.2.4 Recruitment	
6.0	KEY FINDINGS AND RECOMMENDATIONS	86-88

	PAGE(S)
7.0 ONGOING PROCESS FOR UPDATING HR INVENTORY	89-93
7.1 PROPOSED PEI BIOSCIENCE CAREERSOURCE	
7.1.1 Supply of Human Resources	
7.1.2 Demand for Human Resources	
7.1.3 Functionality and Access	
7.2 PROPOSED ONLINE PEI BIOSCIENCE PORTAL	
7.3 SUMMARY OF BENEFITS OF PROPOSED PEI BIOSCIENCE ONLINE PORTAL AND CAREERSOURCE	
7.4 MAINTENANCE AND MONITORING	
7.5 OTHER COMMENTS	

APPENDICES

APPENDIX 1.	ADVISORY COMMITTEE MEMBERS
APPENDIX 2.	BIBLIOGRAPHY
APPENDIX 3.	KEY INFORMANT INTERVIEWS
APPENDIX 4.	GRADUATE INFORMATION – MARITIME PROVINCES BIOSCIENCE RELATED PROGRAMS
APPENDIX 5.	INVENTORY OF WORKERS
APPENDIX 6	SKILLS RANKING BY OCCUPATIONAL AREA AND EDUCATIONAL LEVEL

EXECUTIVE SUMMARY

The Innovation and Technology Association of PEI, commissioned this study on behalf of BioScience industry stakeholders to obtain reliable information on current and anticipated labour market supply and demand issues within the industry. It is intended that the study data provide the basis for the development of a BioScience Human Resource Strategy which will be used by employers, educational institutions, and sector and government organizations to set policy, assist in decision-making and plan for the future.

The particular objectives of this study included:

- § Compilation of a comprehensive profile of the PEI BioScience Sector
- § Description of skill requirements, training and job roles for occupations and positions within the sector
- § Analysis of the current and future supply and demand for BioScience employees
- § Analysis of the availability and quality of existing and future training programs
- § Development of procedures to maintain and update a BioScience human resource supply and demand inventory

For purposes of this study the definition of BioScience is adapted from the Organization for Economic Co-operation and Development's (OECD's) definition for biotechnology, Statistics Canada's breakdown into sub sectors and a definition used by Technology PEI.

BioSciences encompass the full range of biological and life sciences and associated technologies. It involves the application of science and technology to living organisms, as well as parts, products and models thereof to alter living or non-living materials for the production of knowledge, goods or services and is further divided into eight sub-sectors:

- § Human Health: diagnostics, therapeutics;
- § Agriculture Biotechnology: plant biotechnology, animal biotechnology, non-food agriculture;
- § Natural Resources: energy, mining, forest products;
- § Environment: air, water, soil;
- § Aquaculture: fish health, brood stock genetics, bioextraction;
- § Bioinformatics: genomics and nuclear modeling, gene therapy;
- § Food Processing: bioprocessing, functional foods/nutraceuticals; and
- § Medical devices.

The BioScience cluster in Prince Edward Island consists of private sector companies, research institutions, academic institutions, and federal and provincial government agencies, all with a vested interest in growing the sector. Each of these stakeholder groups were interviewed or

surveyed in order to collect information to prepare this strategy. The information collected provides a comprehensive profile of the PEI BioScience Sector.

Based on the response from employers the number of employees by occupational area is as shown in the following table.

PEI BioScience Sector - Inventory of Workers	
Occupational Area	Number of Employees
Research	94.5
Product/Process Development	23.0
Quality Control/Quality Assurance	29.0
Manufacturing & Production	199.5
Product & Customer Support	4.0
Regulatory Affairs	1.5
Intellectual Property	0.0
Business Development/Investor Relations	6.3
CEO/President	7.4
Executive Management (VPs)	12.0
Finance	9.5
Marketing & Sales	18.5
Human Resources	3.4
Management Information Systems/Information Technology	5.5
Administration	21.6
Other	16.0
Total	451.7

Employers were asked to identify the number of new positions that would be created in their operations over the next three-year period. Following is a breakdown of the projected increases by educational level and by occupational area.

PEI BioScience Sector - Expected Increase In Employment by Educational Level				
Educational Level	Current Unfilled Positions @ 05/31/05	Next 12 Months	Next 13 to 24 Months	Next 25 to 36 Months
Grade 12 or Less	18	24	19	17
Certificate	-	-	-	-
Diploma	2	8	3	1
Bachelor	9	12	6	3
Masters	2	5	1	0
Doctoral	2	10	11	1
Education not specified	-	1	3	1
Total	33	60	43	23

PEI BioScience Sector - Expected Increase In Employment by Occupational Area				
Occupational Area	Current Unfilled Positions @ 05/31/05	Next 12 Months	Next 13 to 24 Months	Next 25 to 36 Months
Research	7	18	15	2
Product/Process Development	1	2	-	1
Quality Control & Quality Assurance	1	2	1	1
Manufacturing & Production	19	29	21	17
Product & Customer Support	1	-	-	-
Regulatory Affairs	-	-	-	-
Intellectual Property	-	-	-	-
Business Development/Investor Relations	1	-	1	-
CEO/President	-	-	-	-
Executive Management (VP's)	-	-	-	-
Finance	-	-	1	0
Marketing & Sales	2	2	3	1
Human Resources	-	1	-	-
MIS/IT	-	1	-	-
Administration	1	4	1	1
Other -Program Development Manager	-	1	-	0
Total	33	60	43	23

Given the extensiveness of the data collected and analyzed in this report, the following section summarizes some of the most significant findings only:

- § Sixty-three percent (63%) of private sector companies responding were at the commercial production stage of company development.
- § The largest percentage (27%) of employers indicated bioactives as their major activity.
- § Larger growth in employment was experienced from 2003 to 2004 than was experienced from 2004 to 2005.
- § The age of employees in the BioScience sector is fairly evenly distributed over 25 to 64 years of age.
- § Forty-seven percent (47%) of employees were male and fifty-three percent (53%) were female.
- § Fifty-five percent (55%) of employees were not originally from PEI.
- § The largest percentage (44%) of workers is in the occupational area of manufacturing & processing.
- § The most important factors to current employees for remaining in the BioScience Sector on PEI were interesting work, work/family balance and salary, benefits and perks.
- § The most important factors for new graduates accepting a position in the BioScience Sector are interesting work and training and development opportunities.
- § A need for twenty-four new employees at the doctorate level and eight new employees at the masters level over the next three years has been identified in the BioScience Sector.
- § Employers and employees have both indicated a willingness for continuing education and customized training to occur with all employers indicating they provided training during

the past twelve months and over fifty percent (50%) of employees, indicating they had participated in work-related training during the past twelve months.

- § The most preferred method of training by employees was in the classroom at forty-four percent (44%).
- § Sixty-eight percent (68%) of employers indicated that they have experienced challenges in hiring qualified employees.
- § Difficulty of recruiting employees depends on the level of qualifications of the employee being recruited. As the education level and experience level increase so does the difficulty of recruiting.
- § Forty-five percent (45%) of employers indicated they have problems with retention.
- § Based on information obtained from the employee survey, twenty percent (20%) of current employees expect to leave the BioScience Sector in the next five years.
- § Ninety-one percent (91%) of employers indicated that they recruit from a variety of places with recruitment from University postgraduate and undergraduate programs being the most common place of recruitment.
- § Ninety-five percent (95%) of employers indicated that they use more than one type of recruitment technique. The most popular recruitment technique is contacting educational institutions closely followed by newspaper advertisements.
- § According to the employees who responded to the survey newspaper/journal ads and the Internet were the most common ways they found out about their current positions.
- § New graduates used the Internet most commonly to search for employment followed by newspaper ads and networking.
- § Ninety-one percent (91%) of employers used more than one type of recruitment incentive with the fact that their organization provides more interesting work being the most common closely followed by training and development opportunities and work/family balance.
- § Employers most commonly recruit within Atlantic Canada.

The BioScience Sector is an evolving sector and as such changes are constantly occurring and as a result human resource requirements change as well. This report captures the current and projected human resources needs for the sector at a particular point in time. It is essential for growth of the sector that stakeholders have the most up to date information to allow for a proactive approach to labour market development. As part of this engagement we have recommended the development of a *PEI BioScience CareerSource* database, which would contain information on the supply and the demand of human resources within the PEI BioScience Sector. This tool is more fully explained in section 7.0 of this report.

1.0 INTRODUCTION

1.1 BACKGROUND

Over the last five years, educational institutions, the provincial and federal governments and other private and public sector stakeholders have worked together to establish a BioScience cluster in Prince Edward Island. There have been significant achievements during this period including the growth of revenues to fifty-six million dollars and over five hundred individuals employed in the sector (according to information supplied by employers during the conducting of this engagement). The University of Prince Edward Island has seen a four hundred and twenty-five percent increase in the value of research and development conducted at the institution. Ten BioScience projects on PEI have received approval and funding through the Atlantic Canada Opportunities Agency Atlantic Innovation Fund. The PEI Food Technology Centre has expanded its expertise and capacity for extraction technologies. The National Research Council's new Institute for Nutrisciences and Health significantly strengthens the research base of the cluster and provides a flagship research entity that will undoubtedly lead to new economic opportunities and spin-offs. Most recently, the Prince Edward Island BioAlliance Inc.(BIOPEI) was created to be the lead coordinator for the growth and development of the BioScience Sector in Prince Edward Island.

As noted in the 2003 report entitled "Nova Scotia BioScience Industry Skills Assessment" prepared by Gardner Pinfold, there are three major factors to ensuring growth in the industry, 1) adequate R & D funding, 2) an innovation environment and 3) sufficient numbers of highly educated people with the right mix of skills. The Innovation and Technology Association of PEI, commissioned this study on behalf of BioScience industry stakeholders to obtain reliable information on current and anticipated labour market supply and demand issues within the industry. It is intended that the study data provide the basis for the development of a BioScience Human Resource Strategy. The study was guided by an Advisory Committee composed of representatives from business, government and education. A complete list of Advisory Committee members is contained in Appendix 1 of this report. The strategy will be used by employers, educational institutions, and sector and government organizations to set policy, assist in decision-making and plan for the future.

1.2 OBJECTIVES

It is expected that the competition for qualified BioScience professionals will continue to increase as Nova Scotia, the Ottawa area, and other BioScience clusters implement human resource strategies to recruit, train and retain talent to their areas. A BioScience Human Resource Strategy developed specifically for PEI is essential to developing appropriate responses to supply and demand issues and to capitalizing on market opportunities. The particular objectives of this study included:

- § Compilation of a comprehensive profile of the PEI BioScience Sector
- § Description of skill requirements, training and job roles for occupations and positions within the sector

- § Analysis of the current and future supply and demand for BioScience employees
- § Analysis of the availability and quality of existing and future training programs
- § Development of procedures to maintain and update a BioScience human resource supply and demand inventory

1.3 METHODOLOGY

This study was conducted over a five-month period from late April 2005 to early September 2005. The main components of the research methodology were literature review, primary research and secondary data analysis.

1.3.1 Literature Review

A detailed literature review was conducted of studies and reports on other BioScience clusters in Canada and the United States. This review included documents and publications found through independent Internet research and from suggestions by the Advisory Committee (a complete bibliography is included in Appendix 2). Human resources for the BioScience industry are recruited from around the globe, thus it was important to use terms and definitions that would be recognized industry wide. The literature review was very important to assist in defining the scope of the BioScience Sector on PEI and the occupational and skill categories within the industry. It was also important to identify common labour market supply and demand issues in other jurisdictions to assist in the development of the survey instruments.

1.3.2 Primary Research

Primary research was based on interviews and surveys with six sample groups, including federal and provincial government organizations, industry organizations, BioScience employers, BioScience employees, recent graduates of BioScience related fields of study, and education and training providers. The members and key contacts for each of the sample groups were developed in close consultation with the Advisory Committee. A different survey instrument was developed for each group based on each group's characteristics and the information they would be able to provide. Each survey instrument collected relevant demographic data as well as group specific information. The list of survey instruments developed is as follows:

1. *Federal and Provincial Governments Interview Questionnaire* – Questions for this sample group were directed towards identifying industry trends, obtaining data for an analysis of the strengths, weaknesses, opportunities and threats for the PEI sector, identifying the organization's current and anticipated role(s) in labour market development and determining key next steps for ensuring PEI's labour market has the capacity to support continued growth in the industry.
2. *BioScience/Life Sciences Industry Associations Interview Questionnaire* – Questions for this sample group were directed towards gathering an understanding of each organization's particular role in labour market development, an overview of the BioScience Sector in other provinces as to the number and types of companies and their

employees, methods used for capturing and maintaining labour market information, and identifying industry trends and other anticipated supply and demand issues.

3. *BioScience Employers Interview Questionnaire* – Questions for this sample group were directed toward obtaining information to build a profile of the sector on PEI, to identify recruitment and retention issues and to determine the major concerns and challenges from the private sector perspective.
4. *Employee Education, Experience and Skills Profile* – This document was designed to capture detailed information on current employees in the sector. It was not a questionnaire but a series of tables that when completed by an employer provided information on their employees by job titles, occupational areas, education levels, fields of study, disciplines/specializations, years of experience and skill sets. The tables also captured information on current unfilled positions and expected increase in employment for the next three years.
5. *PEI BioScience Sector Employees On-Line Survey* – This survey was designed to capture considerable demographic data, information on the BioScience work experience of the respondents, and factors affecting their recruitment to and retention in the BioScience Sector.
6. *2004 Graduates of BioScience Related Programs Survey* – This survey was designed to capture information on the intentions of recent graduates to seek employment in the BioScience Sector, their success in finding employment in the sector and the type of employment they have obtained.
7. *Education and Training Providers Interview Questionnaire* – This questionnaire was designed to capture information on the institution’s awareness of the BioScience Sector in their province, their expectations regarding the future demand for BioScience training and the institution’s level of involvement in the sector. Attached to the survey were three schedules to be completed regarding academic programs and courses, the delivery of customized training and student enrolments.

The methodology used for collecting information from each of the sample groups is detailed below. A listing of all individuals contacted for this study is included in Appendix 3.

Federal and Provincial Government Organizations

Technology PEI, the Atlantic Canada Opportunities Agency, the NRC Institute of Nutrisciences and Health, the PEI Food Technology Centre, Agriculture and Agri-Food Canada and Human Resources Skills Development Canada were identified as key stakeholders in PEI’s BioScience industry. Representatives of this group were viewed as having a broad base of knowledge and experience of the industry.

A representative, and in some cases more than one representative, from each of the above noted organizations was interviewed in person using the Federal and Provincial Governments Interview Questionnaire. Prior to the interviews, an introductory phone call was made to each of the organizations to explain the purpose of the study, to request their participation and schedule a time for the interview. The survey instruments were also forwarded to the representatives prior to the interview for their review and preparation.

Industry Associations

Representatives of industry associations from each of the four Atlantic Provinces, including PEI BioAlliance, BioNova, BioAtlantech, the Newfoundland and Labrador Association of Technology Industries (NATI) and the Innovation and Technology Association of PEI (ITAP) as well as a national association, the Biotech Human Resource Council, were interviewed using the BioScience/Life Sciences Industry Associations Interview Questionnaire. The ITAP and PEI BioAlliance interviews were conducted in person and the other association representatives were interviewed by telephone. All interviews were preceded by an introductory phone call to explain the purpose of the study, request participation, schedule a time for the interview and arrange for sending of the survey instrument prior to the interview.

BioScience Employers

In consultation with the Advisory Committee and based on the definition of BioScience adopted for this study (please see Section 2.1 of this report) BioScience employers were classified as core, non-core and secondary. The core employers included private sector companies on PEI and the non-core employers included government organizations, education and training providers and the various centres and research groups operating within the framework of the University of Prince Edward Island (UPEI) and the Atlantic Veterinary College (AVC). The secondary employers included large BioScience employers located in Nova Scotia. The following chart provides a breakdown of the core, non-core and secondary employers contacted.

Core Employers	Non-Core Employers	Secondary Employers
Aqua Bounty Farms	PEI Food Technology Centre	Acadian Seaplants
ARK Biomedical Canada	Technology PEI	Ocean Nutrition
Atlantis BioActives Inc.	ACOA	
Diagnostic Chemicals/BioVectra dcl	NRC-Institute for Nutrisciences and Health	
Fortius Nutrition Inc.	Canadian Food Inspection Agency	
Novartis-Aqua Health Ltd.	Agriculture and Agri-Food Canada	
OvaPharm Limited	Institute of Human Health Research	
Progressive Bioactives Inc.	UPEI/AVC	
Active Botanicals Inc.	Atlantic Centre for Comparative Biomedical Research	
Agra Genesis	Lobster Science Centre	
Atlantic Agritech Inc.	Bioresource Innovation Project	
ChitoZanSys Limited	Centre for Aquatic Health Sciences	
Tube-Fab Inc.	AVC Diagnostic Services	
Viro Technologies	Atlantic Canada Network for Bioactive Compounds	
	Atlantic Swine Partnerships	
	Companion Animals	
	Dept of Health Management	
	Shellfish Research Group	
	PEI Health Research Institute	
	Holland College	

Seven core employers were interviewed in-person using the BioScience Employers Interview Questionnaire. These companies were also asked to complete the Employee Education,



Experience and Skills Profile. All interviews were preceded by an introductory phone call to explain the purpose of the study, request participation, schedule a time for the interview and arrange for receipt of the survey instruments prior to the interview.

The remaining core employers were contacted by telephone to explain the purpose of the study, request their participation and to arrange for an appropriate delivery method (mail, email or fax) of the BioScience Employers Interview Questionnaire and the Employee Education, Experience and Skills Profile. The non-core employers were asked to complete selected questions from the BioScience Employers Interview Questionnaire and the entire Employee Education, Experience and Skills Profile. When the survey instruments were completed they could be returned by mail, email, fax or pick-up.

Nineteen Employee Education, Experience and Skills Profiles and seventeen BioScience Employers Interview Questionnaires were completed by core and non core employers. Five respondents completed selected questions from the BioScience Employers Interview Questionnaires as requested.

The secondary employers were interviewed by telephone to discuss their experience with growth of the sector and human resource challenges in their province.

BioScience Employees

This was the largest sample group and encompassed employees of core and non-core employers. For the purposes of this study the following parameters were applied - all employees of core employers and employees of non-core companies who were classified as spending a minimum of fifty percent of their time on BioScience-related activities. It was not feasible to obtain individual contact information for employees from the employers, therefore it was decided that an on-line survey was the best method for reaching this sample group.

The introductory telephone call to the core and non-core employers included an explanation of the on-line survey for employees and the definition being used to determine a BioScience employee. The employers were asked for their cooperation in notifying employees of the on-line survey and of providing employees with the direct web link to the survey. For tracking purposes they were also asked to confirm the number of employees who would be notified of the survey. Some employers requested hard copies of the survey to distribute to their employees directly where they would not have access to the Internet at their worksite. These surveys were delivered to the employer and employees could return them directly to the consultant in the stamped self-addressed envelope provided.

Five-hundred and thirty seven employees were identified by the core and non-core employers. One hundred and ten employees completed on-line surveys and seven employees completed hard copy surveys for a total of one hundred and seventeen. Of this number, thirty-nine percent (39%) were employed by the private sector, thirty-seven percent (37%) by federal or provincial government agencies or departments, twenty-one percent (21%) were employed at UPEI or AVC and three percent (3%) of employees did not identify their place of employment.

2004 Graduates of BioScience Related Streams

With the cooperation and assistance of Kevin Lewis of Advancement Services at UPEI, surveys were prepared and distributed to UPEI graduates of the 2003/2004 school year. Due to timing, contact information was not available from UPEI for graduates of the 2004/2005 school year. Surveys were mailed to two hundred and seventeen graduates from the Faculty of Science (including Family and Nutritional Sciences, Biology, Veterinary Science, Chemistry, Computer Science, Engineering, and Physics) and the School of Business. Thirty-three completed surveys were returned.

Holland College does not currently offer any BioScience programs but the College will be offering a new diploma program in BioScience Technology commencing in the fall of 2006. The College provided graduate information for two programs considered related to the BioScience Sector, Environmental Technology and Renewable Resources, in the form of information collected from a follow-up survey that the Holland College Research Analyst conducts on an annual basis.

The Maritime Provinces Higher Education Commission (MPHEC) was contacted and asked for a count of graduates from BioScience related programs over the past three to five years from universities in the Maritimes. The available information covers the years 1999 to 2003 sorted by major field of study and degree level and is contained in Appendix 4.

Education and Training Providers

Representatives of educational institutions from the three Maritime Provinces, including UPEI, AVC, Holland College, Dalhousie University, the Nova Scotia Agricultural College, New Brunswick Community College, Edmunston and the University of New Brunswick and the PEI Department of Education were interviewed using the Education and Training Providers Interview Questionnaire. The UPEI, AVC, Holland College and PEI Department of Education interviews were conducted in person and the representatives of the Nova Scotia and New Brunswick training institutions were interviewed by telephone. The interviews were preceded by an introductory phone call to explain the purpose of the study, request participation, and schedule a time for the interview.

1.3.3 Follow-up Procedures

The collection of data from the various survey instruments was tracked on a regular basis in an Excel spreadsheet. Initial contact for participation in the study was made during the period May 16 to May 27, 2005. Follow-up contact with those individuals who had not yet returned completed survey instruments began with an email reminder sent on June 13, 2005 and followed by a telephone call on June 21, 2005. On June 27, 2005 employers were requested to notify employees of the on-line survey for a second time. On June 29, 2005 a final reminder email was sent to all individuals who had received survey instruments but had not returned them.

1.4 CHALLENGES

It was recognized that the amount of information being requested from study participants was considerable, but necessary due to the level of detail required to develop a comprehensive Human Resource Strategy for PEI's BioScience Sector. Although the majority of individuals contacted expressed an interest in the study and its results, a number stated that they were very busy at the time and could not participate. Some of the potential participants stated they had been contacted frequently in the last year on behalf of other studies related to the sector and did not want to go through the process again. There were also difficulties in reaching some of the key contacts during the follow-up process with the most common reasons being travel, work or vacation commitments. Other potential participants felt their company/organization did not fit within the study parameters and thus completed only those survey instruments they felt applied.

It was expected that achieving a high response rate from the graduate sample group would be challenging. Contact information for UPEI graduates was the information given to the university at the time a student enrolled at the institution. Given the time from enrolment to graduation and the frequently mobile nature of recent graduates it is difficult to know how many of the mailed surveys were successful in reaching the intended recipients.

1.5 DATA ANALYSIS

The data collected from each survey instrument, with the exception of the on-line survey, was entered in its own Excel database. The on-line surveys were captured in an Access database. The majority of data that was suitable for quantitative analysis has been presented throughout this report. Due to the large volume of possible tables, only those that displayed significant results or were meaningful within the context of the analysis have been included in the report. ***Note that the total percentages in the graphs and charts may not equal one hundred percent due to rounding.***

2.0 PROFILE OF THE PEI BIOSCIENCE SECTOR

2.1 BIOSCIENCE DEFINED

For purposes of this study the definition of BioScience is adapted from the Organization for Economic Co-operation and Development’s (OECD’s) definition for biotechnology, Statistics Canada’s breakdown into sub sectors and a definition used by Technology PEI.

BioSciences encompass the full range of biological and life sciences and associated technologies. It involves the application of science and technology to living organisms, as well as parts, products and models thereof to alter living or non-living materials for the production of knowledge, goods or services and is further divided into eight sub-sectors:

- § Human Health: diagnostics, therapeutics;
- § Agriculture Biotechnology: plant biotechnology, animal biotechnology, non-food agriculture;
- § Natural Resources: energy, mining, forest products;
- § Environment: air, water, soil;
- § Aquaculture: fish health, brood stock genetics, bioextraction;
- § Bioinformatics: genomics and nuclear modeling, gene therapy;
- § Food Processing: bioprocessing, functional foods/nutraceuticals; and
- § Medical devices.

2.2 PROFILE OF EMPLOYER GROUP

The BioScience cluster in Prince Edward Island consists of private sector companies, research institutions, academic institutions, and federal and provincial government agencies, all with a vested interest in growing the sector. Individuals from all of these groups were interviewed or surveyed during this engagement.

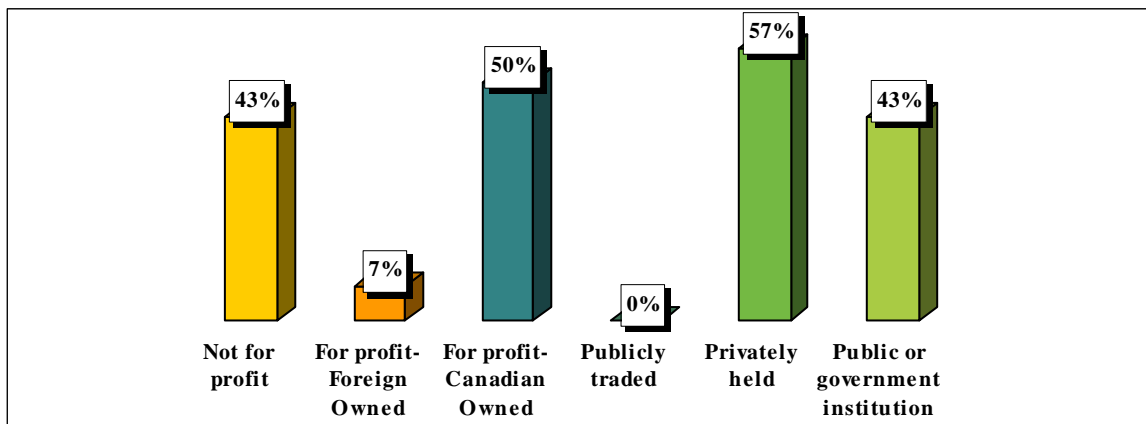


Figure 1 - Type of Ownership

Forty-three percent (43%) of the organizations that were interviewed as part of the employer group were public or government institutions and fifty-seven percent (57%) were privately held.

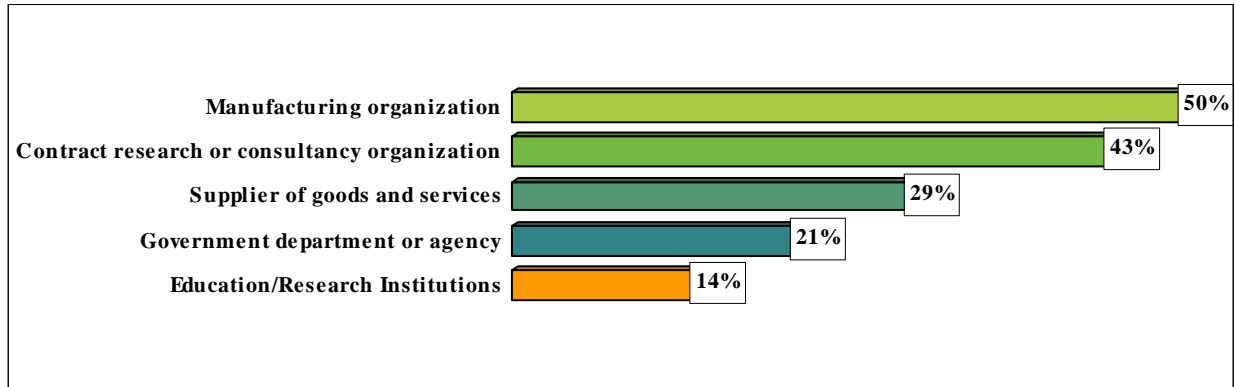


Figure 2 - Type of Organization

Employer organizations were asked to select from a predefined listing of the types of organization that best described them. Employers were allowed to select all that applied. Fifty percent (50%) indicated they were a manufacturing organization while forty-three percent (43%) indicated they were involved in contract research or consultancy.

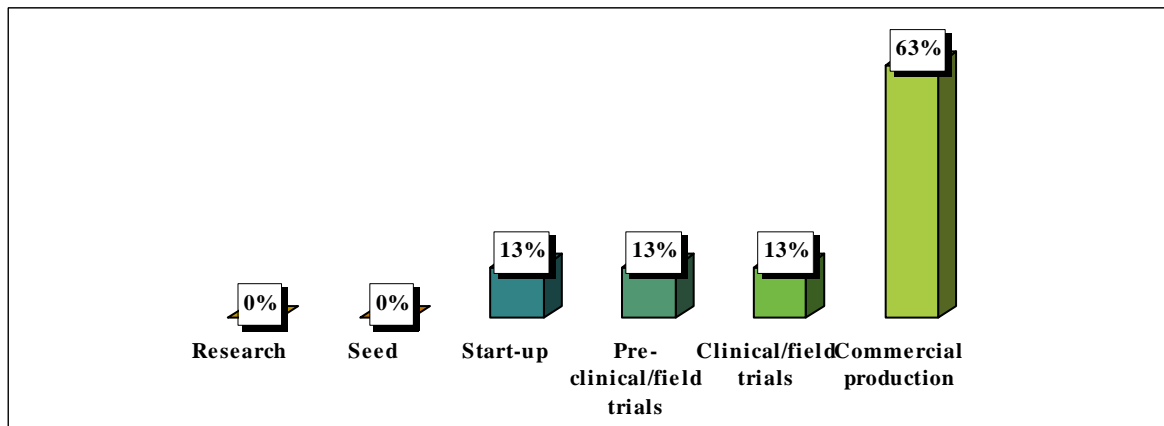


Figure 3 - Stage of Company Development

Employers were asked to indicate their stage of company development. The results are presented for core companies only. Sixty-three percent (63%) of employers indicated they were in commercial production while thirteen percent (13%) indicated they were in the stage of start-up, pre-clinical field trials or clinical/field trials.

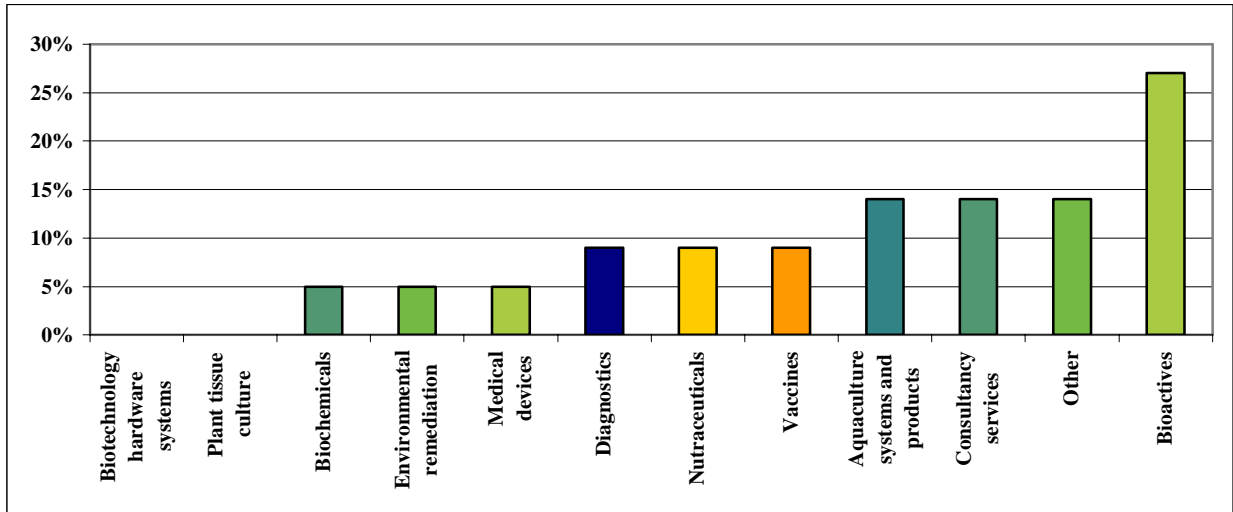


Figure 4 - Organization's BioScience Activities

Employers were asked to select from a pre-defined list the BioScience category that best describes their organizations activities. An other category was utilized by fourteen percent of the respondents and contained such responses as provider of clinical services, diagnostic and therapeutic services to pet owners, lobster health research, contract research for industry, discovery research, and training of highly qualified people. The largest percentage, twenty-seven percent (27%) indicated bioactives as their major activity.

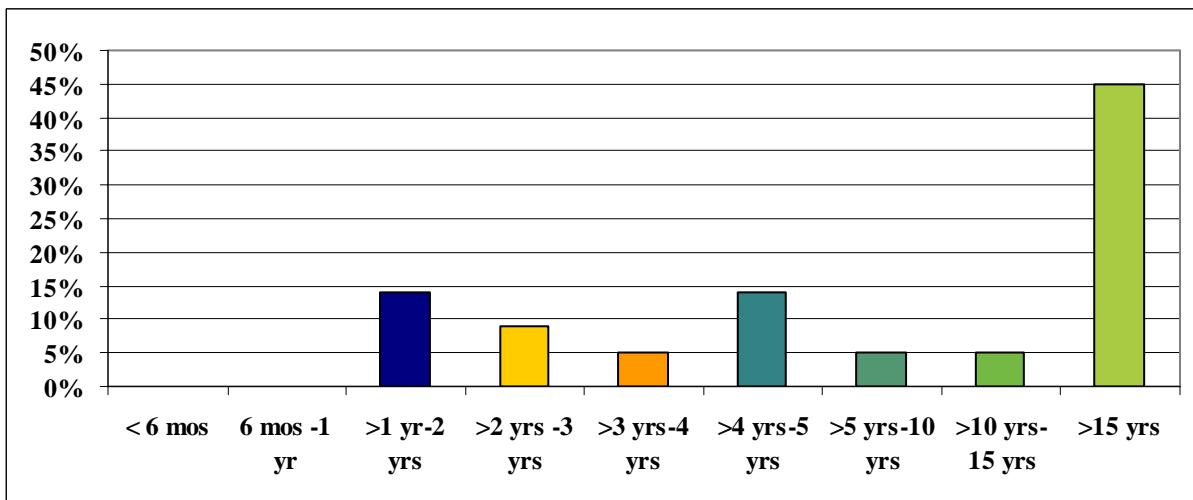


Figure 5 - Length of Time in Operation

Forty-five percent (45%) of the organizations that responded to the survey indicated they had been in operation for over fifteen years. This included educational and research institutions, government agencies as well as two private sector companies. The nine centres and departments from UPEI/AVC have been reflected individually in Figure 5 as they have been in existence for various lengths of time.

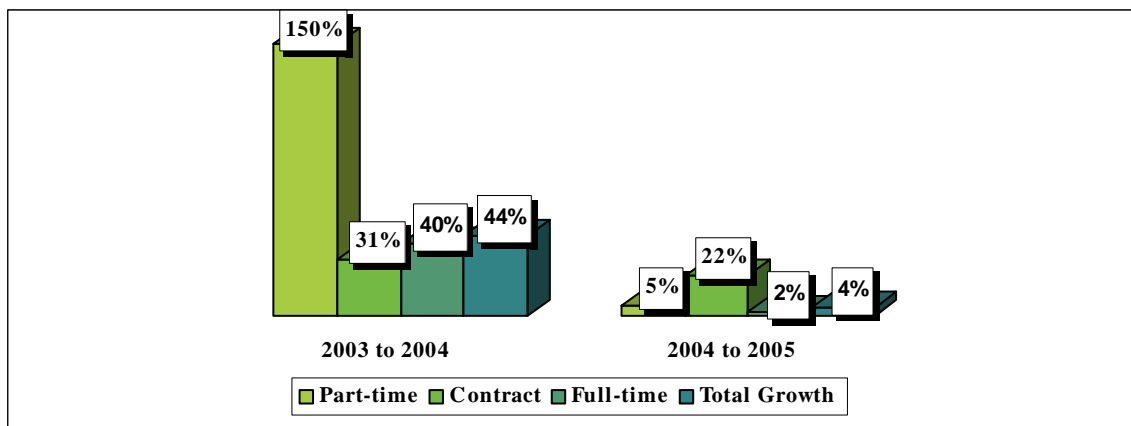


Figure 6 - Employment Growth

Larger growth in employment for part-time, contract, and full-time positions was experienced from 2003 to 2004 than was experienced from 2004 to 2005.

2.3 PROFILE OF EMPLOYEE GROUP

Demographic Profile

The profile for the employee group is based on demographic characteristics of the current employees as determined by the responses received to the online employee survey.

Table 1 – Employee Profile by Type of Employment	
Employment Type	Percentage
Full-time	75%
Contract	14%
Part-time	8%
Did not specify	3%

Table 2 – Employee Profile by Length of Employment	
Length of Employment	Percentage
<6 mos.	13%
6 mos – 1 yr	9%
>1 yr – 2 yrs	11%
>2 yrs – 3 yrs	12%
>3 yrs – 5 yrs	6%
>5 yrs – 10 yrs	19%
>10 yrs – 15 yrs	7%
>15 yrs	20%
Did not specify	3%

Fifty-two percent (52%) of survey respondents have been employed in their company for greater than three years.

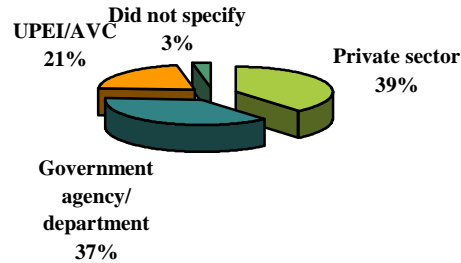


Figure 7 – Employee Profile by Place of Employment

The largest percentage (39%) of employees were employed by the private sector, thirty-seven percent (37%) were employed by federal or provincial government agencies or departments, and twenty-one percent (21%) were employed at the University or Atlantic Veterinary College. Three percent (3%) of respondents did not disclose their place of employment.

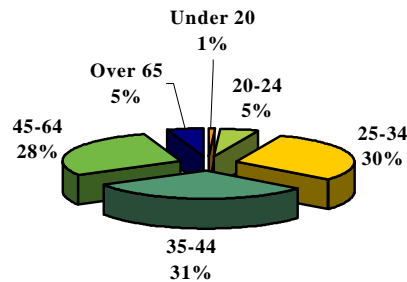


Figure 8 - Employee Age Profile

The age of employees in the BioScience Sector is evenly distributed over 25 to 64 years of age with only slightly less falling into the 45 to 64 age category. A large portion of the work force (manufacturing & production employees) require a Grade 12 or less education, however it would appear that most of these individuals have several years of experience as only six percent (6%) of the employee group was 24 or under.



Figure 9 - Employee Gender

There is not a large gender difference in employees within the BioScience Sector based on the respondents to the employee survey; forty-seven percent (47%) were male and fifty-three percent (53%) were female.

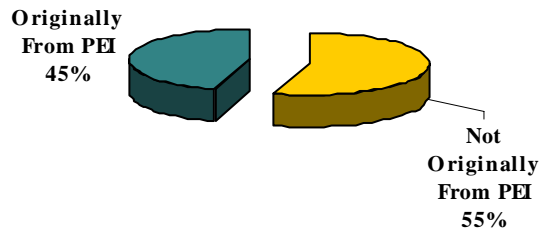


Figure 10 - Original Residency of Employees

Fifty-five percent (55%) of employees indicated they were from originally from outside of PEI. Thirty-seven percent (37%) of employees indicated that prior to moving to PEI to attend an educational institute or to accept employment in the BioScience Sector they resided in other Canadian provinces and three percent (3%) indicated they had resided in the United States.

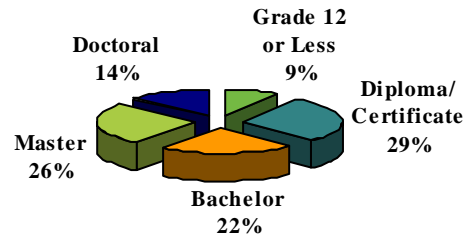


Figure 11 – Education Level Profile – Based on Employee Survey

Figure 11 depicts the educational profile of the employees who responded to the on-line survey.

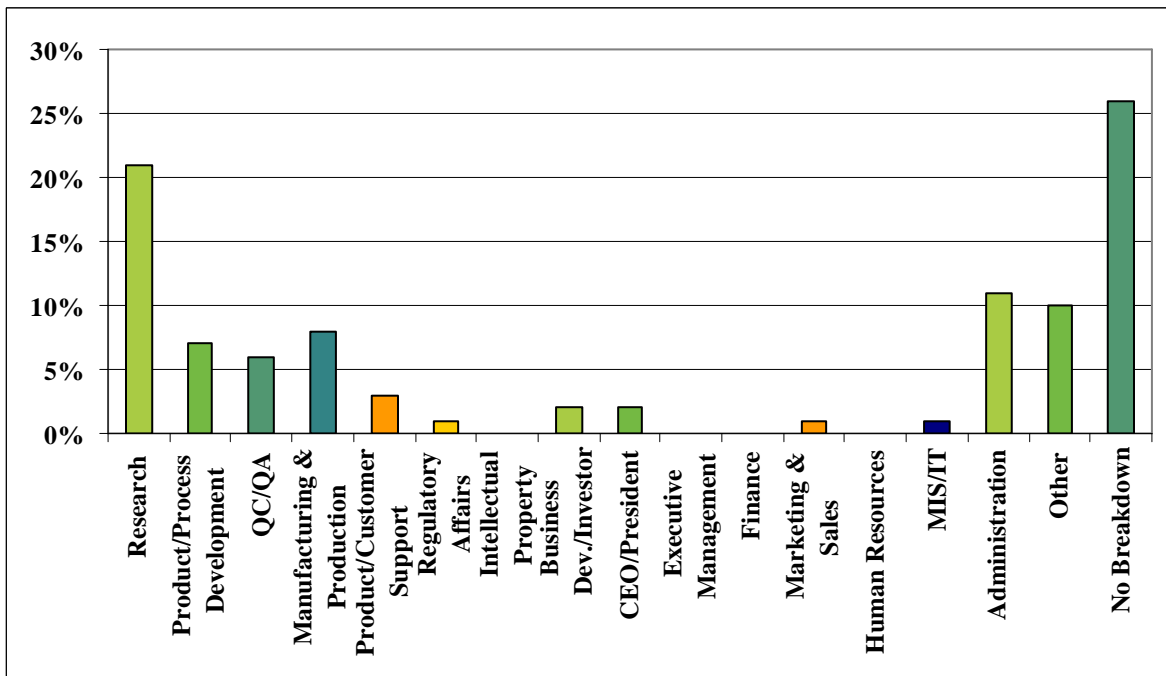


Figure 12 – Percentage of Workers in each Occupational Area – Based on Employee Surveys

Figure 12 depicts the occupational areas of employees who responded to the on-line survey.

2.4 INVENTORY OF WORKERS

All employers interviewed and surveyed were asked to complete an employee education, experience and skills profile for all current employees. The profile of workers by education level based on employer information is shown in Figure 13.

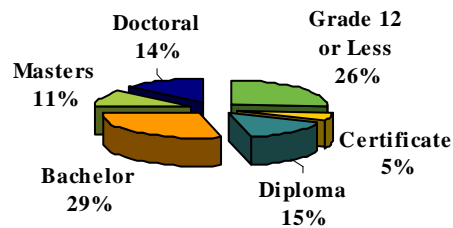


Figure 13 - Education Level Profile - Based on Employer Information

The breakdown of workers based on employer information by occupational area is shown in Figure 14.

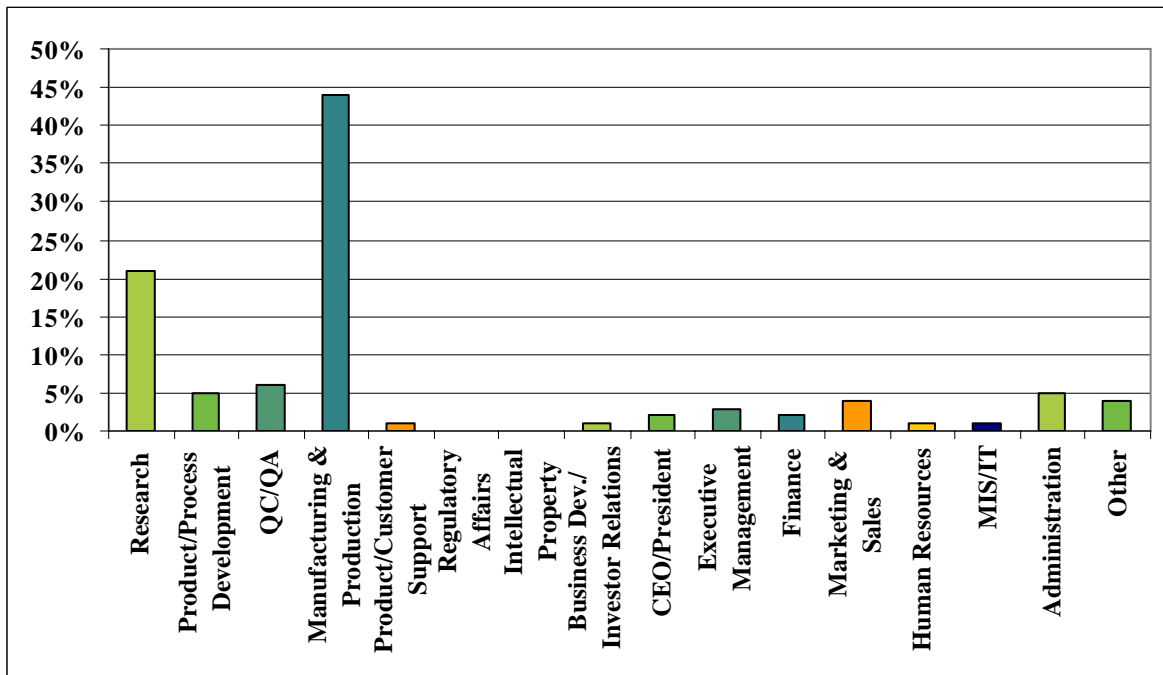


Figure 14 - Percentage of Workers in each Occupational Area – Based on Employer Information

The largest percentage (44%) of workers is in the occupational area of manufacturing & processing. The next largest occupational area is research with twenty-one percent (21%) of workers. The other category at four percent (4%) includes workers whose occupational category was listed as “teaching and clinical services” and workers who indicated they were involved in more than ten occupational areas. The major difference in percentages by occupational areas by employer and employee information shown in section 2.3 is in the area of manufacturing & production with employer information indicating forty-four percent (44%) of workers were in this occupational area and employee survey results indicating eight percent (8%) employed in the manufacturing & production occupational area. This difference may be a result of a number of factors:

- § The survey was online and many of the employees in the manufacturing and production occupational area may not have had access to the Internet while on-the-job. *It should be noted that employers were provided the option of receiving paper-based surveys for employees who would not have access to the Internet. Two companies chose to exercise this option.*
- § Employees in this occupational area may not have had the same level of interest in the sector and its human resource issues as their skills are transferable to other industries and they do not have to deal with the challenges of recruiting and hiring employees.

A complete inventory of employees based on information received from employees is included as Appendix 5.

2.5 ANALYSIS OF STRENGTHS, WEAKNESSES, OPPORTUNITIES AND THREATS

Employers, government, industry associations and educational institutions were asked to identify key labour market strengths, weaknesses, opportunities and threats faced by the BioScience Sector on Prince Edward Island.

2.5.1 Strengths

Several strengths were identified by various parties and included:

- § Brain power – Prince Edward Island has high quality personnel and a number of smart young individuals who want to remain in the area.
- § A quality of life and opportunity for a balanced lifestyle is available in PEI that is not available in other large centers. The cost of living is lower on PEI relative to other large centers.
- § Prince Edward Island is one of the most cost-competitive areas in the industrialized world in which to do business.
- § There is a good working relationship among various levels of government, academia and the private sector, which provides opportunities for networking, cooperation and collaboration. The formation of the BioAlliance to facilitate collaboration and growth within the BioScience Sector will assist in further enhancing and developing this relationship.

- § The establishment of the NRC-Institute for Nutrisciences and Health is laying the ground floor for new ventures with state of the art equipment and industrial partnership space.
- § PEI has an abundance of natural resources.
- § Public sector support of R&D.
- § The existence of two to three key successful companies that act as anchors for industry and sector growth.
- § Close proximity to research institutions and UPEI/AVC.
- § A good small university and technical college.
- § At the research level, the regional educational institutes do a good job of teaching basic skills for BioScience.

2.5.2 Weaknesses

The weaknesses identified by those interviewed and surveyed included:

- § Lack of management skills in some BioScience companies and lack of marketing and sales expertise.
- § The small size of PEI and the fact that no critical mass exists hurts our recruitment efforts because of limited opportunities for transferring to another local company if a job opportunity and the lack of advancement opportunities available.
- § Lack of capital and investment sources including seed funding, angel funding and venture capital.
- § Confusion in objectives, goals and direction at the government level.
- § Market disadvantage – transportation – no large regional receptor capacity.
- § PEI does not sufficiently promote its strengths.
- § Province needs to get act together on issues of controversial science, e.g. genetically modified organisms (GMO's)
- § Not a lot of graduate programs on PEI therefore students go off-island for education and then difficult to get them back
- § Have ability within Atlantic Canada to meet needs but educational and awareness of sector needs to be promoted to people going into university.
- § Difficulty of integrating visible minorities within work environment
- § Jobs and people are too narrow in areas of specialization and this does not work for small companies.
- § Lack of established reputation/track record to attract highly trained individuals.

2.5.3 Opportunities

Opportunities identified by employers, government, industry associations and educational institutions included:

- § Because of infrastructure and newness of sector, we are better situated to grow – lots of unused capacity versus other regions. The infrastructure is here therefore we only need to bring in human resources.

- § Niche / advantage – vet or agriculture health, lots of volume and great viability. Human health is not the only area for growth, especially if environmental sustainability, e.g., nutraceuticals. Animals are models for human health.
- § Need to focus for critical mass, so only develop sub-sectors that support the existing focus. For example, support training within a particular area that supports PEI’s focus.
- § Nutraceuticals – as the population ages and is more affluent, they are interested in health and proper eating and nutrition.
- § Pharmaceuticals – bioactive compounds as active ingredients vs. chemicals.
- § Focus on best utilization of natural resources, in terms of what we can grow on PEI.
- § Bring in companies that can benefit from technological development that do not compete with others.
- § Develop better uses for PEI’s natural resources which will lead to extraction of high value bioactives.
- § Pursuit of bioproducts / biofuels.
- § Pursuit of bioactives from bioresource base. Another opportunity may lie in identification of bioactives and licensing the commercialization elsewhere.
- § Molecular farming using GMO units to diversify agri-food sector to pharmaceutical delivery. Agri-energy crop production. Need to change agri-food sector to include agri-health, agri-energy, and agri-diversity.
- § Very strategically placed to deliver food safety; food quality – sub sectors -animal health pharmaceuticals and nutraceuticals; human health pharma and neutral, etc.
- § Environmental field is growing.
- § New product development – biological treatment of waster water (remediation of contaminated rivers) due to liability issues.
- § Nutrisciences – NRC; UPEI (Chairs).
- § Support services.
- § PEI and Atlantic Canada have the potential to let employees “shine”, which is a great marketing tool, as their people are not just a number.
- § Renewable energy / BioScience Sector combination (biodegraded fuel)
- § Custom manufacturing.
- § Companies outside of Canada are interested in setting up Canadian branch or R & D projects (small satellite) in PEI because of NRC and ACOA presence.
- § Extracts from marine products.

2.5.4 Threats

Factors identified by key informants as threats to the BioScience Sector on PEI were:

- § Government deciding “Yes” on Prince Edward Island becoming a GMO free province.
- § Negative public perception of genetically modified products.
- § Competition for human resources from large corporations, which are able to attract the best talent because of compensation and the opportunity for employee advancement.
- § Age of current skilled workforce will lead to shortages.
- § Potential of government not sustaining involvement and interest in the BioScience Sector for the long term. If the sector is to be successful, the government and industry have to be

married for the long term to reap the benefits as the sector has a longer development period up front.

- § Impact of below average rating of PEI K-12 students in science, on future labour market.
- § Lack of available funding at critical points between the research and development phase and eventual sale of a commercial product or service.

2.6 FACTORS FOR LOCATING A BIOSCIENCE COMPANY ON PEI

Research indicates that economic, financial, business and quality of life factors are the key areas corporations consider when locating a new branch, division or project. Economic factors affect a company's ability to make a profit and include the availability of raw materials, the capacity of the local labour market, transportation infrastructure, cost of doing business relative to other locations and communications services. Financial factors assist a company to reduce the cost of the goods and processes they require for production and include the minimization and/or elimination of taxes, training grants, and transportation subsidies. These incentives are often bundled as a package to make a location more attractive to businesses. Business factors include a wide range of criteria such as a large local market, conducive regulatory climate, availability of local suppliers and partners, access to research entities and local technical and scientific talent, intellectual property protection and availability of patent attorneys, and access to incubation, commercialization and funding services. Quality of life is affected by the cost of living, climate, crime rate, quality and affordability of health care services, arts and entertainment, and sports and recreation opportunities.

PEI can be assessed positively on many of the factors discussed above. The province received a top four ranking from KPMG when the consulting firm compared the cost of doing business in forty-two locations throughout North America and Europe. The PEI workforce is small but generally well educated with access to post-secondary educational institutions that are well qualified to address training and skills gaps. Communications and transportation services are adequate. PEI offers a number of tax relief programs that assist companies involved in research and development. The province has demonstrated through the efforts of Technology PEI and PEI Business Development that it wants to create an excellent business climate for attracting BioScience companies. The highly focused approach needed for successful cluster development will be enhanced by the mandate of PEI BioAlliance Inc. to create the right conditions for job creation, retention and economic growth in the sector. Finally, PEI has an enviable reputation as a great place to live with affordable housing, a temperate climate, low crime rate, access to a wide variety of entertainment and recreational activities, and a public health care system. While no one factor alone will attract a large BioScience company, PEI's strengths combined with leadership, strategic planning and targeted sector specific actions should produce results.

2.7 CHOOSING PEI AS A WORK LOCALE

Current employees in the PEI BioScience Sector, as part of the on-line survey, were asked to indicate their primary reason for obtaining employment within the BioScience Sector on PEI. The primary reason indicated was the fact that there was availability of employment within the

sector. Other reasons included spouse having business or working on PEI, opportunity for advancement and challenging work opportunities.

Table 3 - Primary Reason for Obtaining Employment within BioScience Sector on PEI	
Reason	% of Respondents
Availability of employment	59%
Quality of life on PEI	12%
Post-secondary education in BioScience	10%
Research opportunities	3%
Salary range	3%
Other	14%

A survey of students who graduated in 2004 from BioScience related programs of the University of Prince Edward Island and Atlantic Veterinary College was conducted to determine their level of interest in employment in the BioScience Sector within Prince Edward Island.

2004 graduates from Holland College’s BioScience-related programs (Environmental Technology and Renewable Resources) were not surveyed directly however the Research Analyst at Holland College did provide information they had gathered from their graduate survey. This information is shown in Table 4.

Table 4 – Holland College 2004 Graduates of BioScience Related Programs			
Program	No. of Graduates	% Employed in Work Directly Related to Training	% Employed in Work indirectly related to Training
Environmental Technology	11	57%	14%
Renewable Resources	16	9%	27%

Figures 15 and 16 and Table 6 are based on the thirty-three responses received from the 2004 graduates of BioScience related programs at UPEI and AVC. The graduate survey respondents consisted of fifty-eight percent (58%) Bachelor of Science graduates, thirty-two percent (32%) Bachelor of Business Administration graduates, and ten percent (10%) Engineering Diploma graduates.

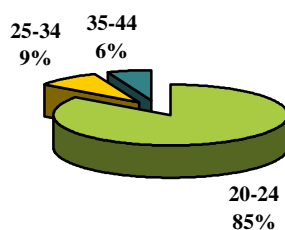


Figure 15 – 2004 Graduates Age Category

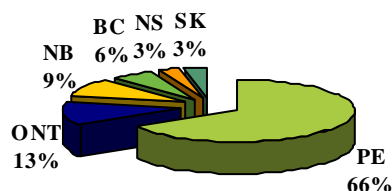


Figure 16 – Current Residence of 2004 Graduates

Thirty-three percent (33%) of the 2004 graduates who responded to the survey resided outside of PEI and sixty-seven percent (67%) of the respondents were female. Sixteen percent (16%) of the respondents had worked in the BioScience Sector prior to graduating in 2004. Seventy-six percent (76%) of the respondents plan to pursue additional education opportunities.

Employees were also asked to indicate from a provided listing whether or not a particular factor was of importance to them in their decision to remain in the BioScience Sector on PEI. Factors such as being provided with interesting work and the opportunity to have a balance of work and family life were the top rated factors.

Table 5 Importance of Factors to Remaining Employed in the BioScience Sector on PEI – Current Employees	
Factor	% of Respondents
Interesting work	97%
Work/family balance	97%
Salary, benefits, perks	94%
Location	93%
Organizational management/culture	87%
Training and development opportunities	86%
Quality of facilities and equipment	85%
Location in a dynamic BioScience region	67%
Facilitating spousal employment	60%

New graduates were asked as part of their survey to indicate the importance of various factors in accepting a position in the BioScience Sector on PEI. New graduates, similar to the current employees ranked interesting work the highest.

Table 6 Importance of Factors in Accepting a Position in the BioScience Sector on PEI – New Graduates	
Factor	% of Respondents
Interesting work	55%
Training and development opportunities	52%
Salary, benefits, perks	48%
Quality of facilities and equipment	48%
Work/family balance	42%
Organizational management/culture	42%
Location	30%
Location in a dynamic BioScience region	24%
Facilitating spousal employment	6%

Seventy percent (70%) of respondents to the employee survey indicated they would consider leaving employment in the BioScience Sector and identified the reasons shown in Table 7 for potentially leaving the sector. Career advancement was the top ranked reason. Other reasons included Atlantic Innovation Funding (AIF) only for set term and a job may not be available at end of funding term and PEI moving away from BioScience Sector development.

Table 7 - Primary Reasons for Potentially Leaving the BioScience Sector	
Reason	% of Respondents
Career advancement	36%
Retirement	18%
Dissatisfaction with organizational/management culture	11%
To obtain employment outside of PEI	10%
Dissatisfaction with salary levels	7%
Spousal relocation	7%
To obtain employment in another sector	6%
To return to school	4%
Other	2%

Eighty-eight percent (88%) of the graduate respondents indicated that they intended to make or would consider making PEI their permanent place of residency. The factors they indicated that were important to this decision were:

- § Close to family and friends
- § Available employment
- § Lifestyle factors mentioned included cost of living, size, cleanliness, safety, low crime rate, and a great place to raise a family.
- § Cultural diversification

2.8 GROWING THE PEI BIOSCIENCE SECTOR

The interviewees were asked what their organizations and other stakeholders could do in order to grow the PEI BioScience Sector by attracting both highly qualified professionals and new and/or relocated companies. Continual collaboration and strong, ongoing communications among all key stakeholders have been consistent themes discussed during the interviews.

2.8.1 The Role Of Government

Government is seen as supporting the growth of the PEI BioScience Sector. However, in order to continue to grow and develop this sector, interviewees suggested the need for more government funding for sector-related research, education and training at the University of Prince Edward Island and Holland College. This funding will support the development of new research projects that will expose students to the experience and education they require for this knowledge-intensive sector. These recommendations are also related to the students' involvement in research that can take place at government labs, such as National Research Council – Institute for Nutrisciences and Health, and at Agriculture and Agri-Food Canada in order to better train the future workforce.

Interviewees have commented that government must establish a public policy and commitment to the growth and development of the PEI BioScience Sector. This “prosperity plan” is required because of issues and debate concerning “a Genetically Modified Organism (GMO)” free zone for PEI. Negative publicity and uncertainty about PEI’s position with regard to GMOs create uncertainty as to the future of the BioScience Sector, which can negatively impact efforts to recruit highly qualified professionals.

Another discussion point that relates to the government’s role in growing the sector on PEI is the need for infrastructure. Interviewees have discussed the need for incubator facilities for business mentoring support and federal labs for increased research activity.

A focused-approach to developing and growing the sector and greater incentives by government are required in order to attract a critical mass to PEI. A larger number of BioScience-based businesses, with a focus on a particular niche for the sector as a whole, are needed to attract highly talented individuals. Some respondents located on both PEI and off-Island have commented that while seeking employment, highly qualified professionals will look at the sector as a whole for career advancement opportunities.

The stakeholders interviewed for the purpose of the development of this strategy commented that **the sector development requires the long-term commitment and investment by both the provincial and federal government.**

2.8.1.1 Prince Edward Island Business Development Inc./Technology PEI

Interviewees see the provincial government as supporting the growth of the PEI BioScience Sector through:

- § Establishment of the Research and Development (R&D) fund.
- § Establishment of the *Progressive Tax Rebate Program* that provides tax incentives to companies and individuals who invest in innovation, growth and development of BioScience and other targeted sectors across the province.
- § Prospecting activities that led to the successful attraction of new BioScience-based organizations to PEI.
- § Hosting of the *Premier's Roundtable on BioScience*.
- § Organization of short courses of interest to BioScience-based business, such as intellectual property.

BioScience-based businesses and organizations must often recruit highly qualified professionals from outside of Canada given the knowledge requirements for the specific employment. Interviewees feel that a more efficient immigration process, with improved turnaround times, by the provincial government, would support sector growth. **Tax incentives** for employees relocating to Prince Edward Island to work within the BioScience Sector are also considered a very important role of the provincial government, according to the interviewees.

Other areas in need of support or additional support by the provincial government, as discussed by the interviewees, are as follows:

- § Continue to organize and subsidize short sector-related courses made available to industry.
- § Further develop prospecting activities. One interviewee commented that prospecting activities should focus on large, established BioScience-based businesses. Another interviewee stated that the companies must be committed to grow, develop and stay on PEI.
- § Provide funding support for the costs of PEI-based BioScience companies to recruit new employees.
- § Host the *Premier's Roundtable on BioScience* annually in order to identify sector needs and to keep all levels of the provincial government apprised of the sector development given the uniqueness of BioSciences.
- § Assist new or relocated companies with their human resources needs. For example, interviewees suggested that the provincial government could provide a list of potential employees, and advertise employment opportunities throughout the region on behalf of the organizations.

2.8.1.2 Prince Edward Island Food Technology Centre (PEI FTC)

The PEI Food Technology Centre provides technical support to the food processing industry. Over the years, the organization has expanded its services within the area of food product and process development and laboratory services, and now has expertise and infrastructure in place for bioresource upgrading. The Centre will develop intellectual property in collaboration with BioScience-based companies and organizations, and will fund development projects on behalf of the private sector. PEI FTC had the official opening of its Natural Products Extraction on April 1, 2005.



PEI FTC has been referenced as an ideal location for a BioScience Accelerator on PEI given its current role in supporting the development of intellectual property. Other industry stakeholders interviewed during this process commented that PEI FTC must better:

- § Define its role in the PEI BioScience Sector, and educate other cluster stakeholders of this role.
- § Further promote its capabilities to existing and prospective BioScience-based organizations.

2.8.1.3 Atlantic Canada Opportunities Agency (ACOA)

Interviewees commented that the federal government has demonstrated its support for the growth of the PEI BioScience Sector through the Atlantic Canada Opportunities Agency (ACOA).

Examples cited during interviews include the following:

- § Creation and continuation of Atlantic Innovation Fund (AIF) Rounds I, II and III for funding research and assisting PEI BioScience-based organizations in their innovation efforts.
- § Support for the establishment of the Centre for Enterprise and Entrepreneurship (CEE) through the University of Prince Edward Island and the Centre for Labour Force Innovation (CLFI) through Holland College.

ACOA intends to take a more active role in immigration that compliments existing programs and services. ACOA is also looking to play a greater role in supporting human resources development, offering financial and support services throughout the recruitment and hiring processes. ACOA's Innovation Skills Development Initiative (ISDI) helps small and medium-sized enterprises (SMEs) acquire or enhance innovation management and technical skills in order to make them more productive and globally competitive. This initiative also provides funding to support the recruitment of innovative, skilled individuals.

Other areas in need of additional or new support by ACOA, as discussed by the interviewees, are as follows:

- § Further build on prospecting activities.
- § Focus more on BioScience-based businesses and industry growth through ACOA's Innovative Skills Development Initiative (ISDI).
- § Offer more funding support on workplace skills development.
- § Become more actively involved in immigration activities.
- § Support apprenticeship programs for recent graduates.
- § Assist BioScience-based businesses in sourcing risk capital.

2.8.1.4 National Research Council (NRC)

Interviewees commented that the National Research Council (NRC):

- § Plays an important role in linking industry and the academic community.
- § Supports the establishment of new companies on PEI and plays a proactive business development role.

The National Research Council, and in particular, the new Institute for Nutrisciences and Health (NRC–INH), is seen as instrumental in the development and attraction of new BioScience organizations to PEI. Several interviewees have commented that the activities of this new centre should be a priority focus for the sector on PEI. NRC-INH also demonstrates the federal government’s financial and research commitment to the growth of the PEI BioScience Sector.

NRC-INH will support UPEI’s and Holland College’s efforts to educate and train individuals within the BioScience Sector, according to interviewees. For example, NRC faculty will teach and train graduate students in cooperation with UPEI.

2.8.1.5 Agriculture and Agri-Food Canada (AAFC)

Agriculture and Agri-Food Canada (AAFC) conducts research of benefit to Atlantic Canada, and brings new product discoveries to the private sector. AAFC provides consulting advice to the agriculture community and the BioScience Sector. AAFC currently provides research to the private sector by matching the dollars invested by the company; however, the funds available for this program are diminishing.

AAFC believes that it can play a more active role in BioScience by gradually shifting to bio-based products, with specific emphasis on extraction of bioactives. The agency can also support UPEI’s and Holland College’s efforts to educate and train highly qualified individuals by:

- § Taking part in lectures and labs for focusing on specific skills.
- § Co-supervising graduate students at UPEI.
- § Participating in advisory committees at the educational institutions.

2.8.2 The Role Of Educational Institutions And Department Of Education

In terms of the role of the educational institutions, interviewees commented that:

- § UPEI and Holland College must collaborate and continue to partner with and maintain strong communications with the private sector.
- § Strong technical training programs and customized industry training should be introduced at Holland College. Interviewees recognized the College’s intention to introduce a BioScience program through its new Centre for Labour Force Innovation.
- § UPEI must continue to offer and develop strong research and graduate student programs.
- § The educational institutions must ensure that key skills, such as quality assurance, quality control, and good manufacturing practices, are incorporated in BioScience-related programs and training.
- § Educational institutions should focus on multidisciplinary education. One interviewee referred to the need for combination degrees, with particular emphasis on a background in business/management and sciences. UPEI’s new Centre for Enterprises and Entrepreneurship has been recognized as heading in the right direction.
- § Establishment of co-op programs for students related to bioscience has also been recognized as an area of interest during the interviews. Interviewees generally spoke very highly of the coop programs available through UPEI. Any opportunity for building on the coop programs that currently exist in the areas of business, physics and computer

- sciences, as they relate to BioSciences, would be seen as favourable. As noted by an interviewee, industry must be willing and able to financially compensate these students.
- § The educational institutions should pursue funding opportunities for establishing a research chair through National Sciences and Engineering Research Council (NSERC). Industry must be willing to commit financially to half of the cost of this position, as required by the program, in order for this recommendation to be fulfilled.
 - § Interviewees recognized that the educational institutions cannot offer all types of training and education required by the industry, and that educational institutions throughout Atlantic Canada must specialize in a particular area of education, training and research. This would result in educational institutions indirectly working toward a training continuum for BioScience employees throughout the region.
 - § Holland College and the University of Prince Edward Island should expand on their role during the prospecting activities for the PEI BioScience Sector as applicable. They should assist other stakeholders in identifying and attracting new companies to establish or relocate to PEI. This would require a lead organization preparing a prospecting strategy for the PEI BioScience Sector, in cooperation with stakeholders, such as UPEI and Holland College, that would identify their respective roles throughout the prospecting process. The role of the College and UPEI would capitalize on each of their respective strengths. As noted by an interviewee, these activities would require significant resources on behalf of the University and College that would need to be financed by an outside organization.

University of Prince Edward Island's efforts to conduct early stage research and development was seen as necessary to drive the innovation chain and as integral to the growth and development of the PEI BioScience Sector. It was recommended that the University continue to partner with industry on research projects provided that industry is committed financially. UPEI has been recognized as "on the leading edge" of the BioScience development on PEI.

Interviewees recognized the need for and the importance of Holland College's agenda to develop new BioScience-related programs. They see a need for strong technical training programs at Holland College.

From the PEI Department of Education's perspective their role in supporting the BioScience sector includes 1) partnering with provincial educational institutions to ensure high quality educational opportunities are available on Prince Edward island; 2) partnering with other departments and levels of government to help create an environment that supports research and development and entrepreneurship; 3) ensuring that Islanders are well prepared to participate in the social and economic growth of the province; and 4) partnering with other provinces to ensure there are networks of education and business opportunities for individuals and organizations across the Atlantic region.

2.8.3 The Role Of Industry

In order to grow the BioScience Sector on Prince Edward Island, interviewees suggested that industry:

- § Invest in the education and training of their current and future employees.
- § Participate in co-op programs as a means for students and prospective employees to receive valuable sector experience.
- § Communicate with government and educational institutions on an ongoing basis.
- § Participate in mentorship programs for Biotechnology management.

Industry can also play a role in supporting prospecting activities by sharing their leads for both employees and new or established businesses with the appropriate government agencies and other stakeholders responsible for these activities.

It was suggested that in order to better attract talented individuals to work in the Prince Edward Island BioScience Sector, the BioScience company or organization should assist in finding employment for the individual's spouse. The difficulty a spouse has in seeking employment is evident throughout Atlantic Canada and not just PEI, according to discussions held with BioScience stakeholders located off-Island.

2.8.4 The Role Of A Sector Representative Organization

Interviewees discussed the need for an organization to act on behalf of industry, research organizations, educational institutions, and government. Some interviewees as well as members of the Advisory Committee suggested that the newly formed Prince Edward Island BioAlliance Inc. should be the coordinating organization that will assist stakeholders in collectively growing the sector.

Interviewees see this organization as critical for bringing together stakeholders from industry, research and educational communities, and government. This organization will assist in maintaining open communications among these stakeholders and within the sector.

Interviewees felt that the PEI Innovation and Technology Sector Council may play a supporting role for the growth and development of the sector by focusing on workplace issues and challenges in cooperation with PEI BioAlliance Inc.

The roles of the BioScience Sector associations and organizations in other Atlantic Canadian provinces vary from province-to-province. Examples of these activities include the following:

- § Advertise employment opportunities.
- § Host networking events and conferences.
- § Identify industry's HR needs and gaps through private and public sector networks.
- § Support the enhancement of research and development infrastructure.
- § Collaborate with community colleges to identify training needs.

- § Offer short courses (e.g., intellectual property, patents, introduction to BioScience, and regulatory issues).
- § Support business plan development and searches for sources of investment capital from angel and venture capitalists as well as government departments and agencies.
- § Participate in Aventis Bio challenges.
- § Enhances public awareness among the people of the region on the increasing role of the sector in today's economy and society.

The BioScience and life science's association of Nova Scotia, BioNova, released its sector growth strategy in 2004, which identified the following four-point plan:

- § Creation of a life science's secretariat at the provincial cabinet level to champion development of the industry.
- § Business environment support, with specific emphasis on changes to Nova Scotia's tax structure.
- § Financial support in the form of an independent, comprehensive, dedicated life sciences development fund.
- § Research and commercialization support.

2.8.5 Other Collaborative Efforts Required For Sector Growth And Development

Interviewees also made recommendations that will require collective effort on behalf of several stakeholders of the PEI BioScience Sector. These recommendations are as follows:

- § Further enhance **linkages** between industry, government, research and education and identify collaborative means of growing the sector. One of the most consistent themes with regard to collaboration is the need to identify a focus for the sector that will support sector development through partnerships and prospecting.
- § Establish a **mentorship program** to assist BioScience employees in developing their management skills. The new Centre for Enterprises and Entrepreneurship through UPEI will address the need for a mentorship program.
- § Focus on **infrastructure needs** and become better connected with markets, innovation, knowledge and suppliers.
- § **Share the marketing services provided by a highly qualified professional** for all PEI-based BioScience organizations. Island companies are small and have limited resources available to access highly qualified marketing services. By sharing marketing resources, these services will be more feasible.
- § Create an **incubation facility**, which is critical in order to be able to attract new and/or relocated companies to the province, and to support commercialization. The presence of this facility will promote the low-risk growth of companies located on PEI. One interviewee suggested that the "shared" marketing consultant could operate at this proposed incubator. The successful establishment of the "shared" marketing and/or incubation services will require a highly coordinated approach by industry, government and the Prince Edward Island BioScience Alliance Inc.. A few interviewees identified the need for more BioScience employers and employees to receive an education and work experience in both management and biotechnology. Based on discussions with

other provincial and national organizations, this is not unique to Prince Edward Island. UPEI's new Centre for Enterprises and Entrepreneurship has identified the need for cross disciplinary education as one of its goals. Some interviewees commented that in addition to the new programs to be provided through CEE, an incubation facility is also required to support these needs.

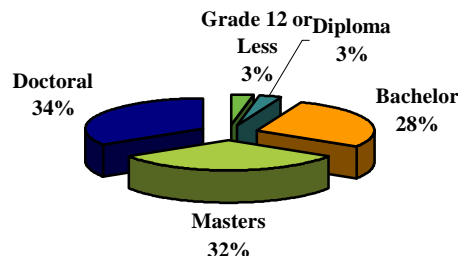
- § Create a process that facilitates the **sharing of contacts and information** by all stakeholders. Interviewees have specifically identified the need for sharing contacts that could support the recruitment of highly qualified personnel and the prospecting of new companies to the province.
- § Collaborate with stakeholders of other BioScience and life sciences sectors through the **Maritime Provinces** in order to create critical mass and successfully attract highly qualified professionals to the region.
- § Create **career advancement opportunities** and promote the PEI BioScience Sector and PEI-based organizations based on these opportunities.
- § Create a support network to access to **venture capital**.

3.0 ANALYSIS OF SKILL REQUIREMENTS BY OCCUPATIONAL AREA

Employers were provided a list of skills consisting of technical, complimentary and non-technical skill sets which were identified by the Biotechnology Human Resources Council of Canada and on Industry Canada’s Strategis website for the Biotechnology sector. Employers were asked to indicate whether the listed skill was important to the occupational area for employees at various levels of education. This employee skill profile table was completed by nineteen different employers, including private sector, university research organizations, federal and provincial government organizations and educational institutes. A complete listing of the rankings by skill by education level for each occupational area is provided in Appendix 6. The percentage is based on the number of employers who responded to the survey and who indicated the skill was important to the occupational area and the specific education level. An analysis of the most important technical, complementary and non-technical skills by occupational area is included in the following sub-sections of this report. Employees were also asked as part of the employee survey to indicate whether the same set of skills were important to them in their position. An analysis of the most important skills from their point of view is provided at the end of each section.

3.1 RESEARCH

The occupational area of research includes position titles such as researcher, extraction technologist, R&D technician, lab technician, field workers, grad students, student technicians, applications development, research scientists, technical officers, chemist, technical managers, research officers, professors, lead researchers, directors, food scientists, product managers, and chemical engineers. The largest percentage (34%) of employees in this category has a doctoral degree.



Technical Skills

- § Clinical research skills are the most important technical skills for employees at the doctorate level.
- § Laboratory and instrumentation techniques and good laboratory practices are equally ranked as the most important technical skills for Researchers with all other post-secondary education.

Complementary Skills

- § Intellectual property protection and management is the most important complementary skill for Research doctorates.

- § Across all other levels of education, quality assurance and quality control is ranked as one of the most important complementary skills.
 - For Research doctorates it placed a second.
 - Quality assurance and quality control is ranked as the most important skill for Bachelor's degrees and Diploma/Certificates.
 - This skill, along with intellectual property protection and management, product development process and project management skills, are equally the most important skills for individuals in the Research area with master's degrees.

Non-Technical Skills

- § BioScience employers ranked leadership and creative thinking as the most important non-technical skills for Researchers at the doctorate level.
- § Critical thinking and attention to detail were placed as most important for master's degrees.
- § The most important non-technical skill for Researchers with a bachelor's degree is teamwork followed by verbal and written communication skills and flexibility and adaptability, ranked equally important.

Overall Skills

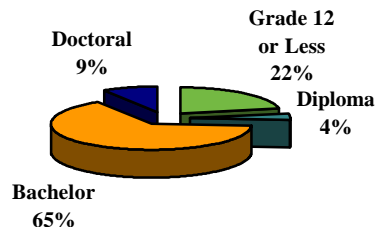
- § Based on the overall responses provided by PEI BioScience employers, regardless of level of education, *teamwork, a non-technical skill, is considered the most important skill for a Researcher.*
- § As a percentage of the PEI BioScience organizations that responded to the survey, non-technical skills have the highest percentage of rankings indicating that these skills are important. In fact, the rankings for teamwork, attention to detail, flexibility/adaptability, results-oriented, verbal and written communications and problem solving are higher than that of any technical or complementary skill for the Researcher occupational area.

From the Employees Point of View

- § Laboratory and instrumentation techniques and good laboratory practices were equally ranked by employees as the most important technical skills in this occupational area.
- § Intellectual property protection and quality assurance/quality control were the most highly ranked complementary skills.
- § All employees in this occupational area ranked the following non-technical skills as important:
 - Verbal and written communication skills in English
 - Problem solving
 - Creative thinking
 - Critical thinking
 - Attention to detail

3.2 PRODUCT/PROCESS DEVELOPMENT

The occupational area of product and process development includes positions titles such as agriculture bio project officer, technicians, product development co-ordinator, virologist, project quality coordinator, and project technologist. The highest percentage (65%) of employees in this category possesses a bachelor degree.



Technical Skills

- § According to a majority of the nineteen companies that responded, the three most important technical skills for the Product/Product Development occupational area are laboratory and instrumentation techniques, good manufacturing practices, and development process.
- § Skills in good laboratory practices are also important to this occupational area.

Complementary Skills

- § Quality assurance/quality control, product development process and project management skills are the three most important complementary skills for all levels of education.

Non-Technical Skills

- § Overall non-technical skills are relatively important to employees across all education levels. Leadership and client-focused skills are important but less important than the other non-technical skills except for communication skills in languages other than English, which is of minor importance to this occupational area.
- § Relative to the importance of other non-technical skills, the importance of leaderships skills tends to be related to the level of education; Leadership skills are more important than all other non-technical skills for Ph.Ds and are not considered important for employees with diplomas and/or certificates.

Overall Skills

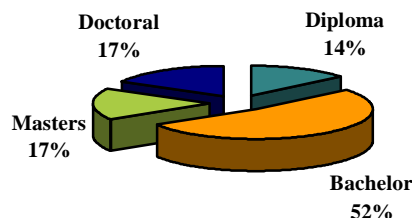
- § Non-technical skills overall tend to be more important in this occupational area.

From the Employees Point of View

- § Laboratory and instrumentation techniques, development process, good manufacturing practice and good laboratory practices were equally ranked by employees as the most important technical skills in this occupational area.
- § Intellectual property protection and quality assurance/quality control were the most highly ranked complementary skills.
- § All employees in this occupational area ranked the following non-technical skills as important:
 - Results oriented
 - Flexibility and adaptability

3.3 QUALITY CONTROL & QUALITY ASSURANCE

The occupational area of quality control/quality assurance includes position titles such as QC supervisor, QC technician, QA coordinator, QC manager, regulatory affairs coordinator, environment and regulatory coordinator, QA operations manager, QA validations manager, QC chemists, and QA document coordinator. The highest percentage (52%) of employees in this category has a bachelor degree.



Technical Skills

- § Technical skills in laboratory and instrumentation techniques, good laboratory practices and good manufacturing practices are considered to be equally the most important skills for the QA/QC occupational area.

Complementary Skills

- § Intellectual property protection and management is the most important complementary skills for Ph.Ds, while quality assurance/quality control was rated as the most important skill for all other levels of education. Project management skills are also important at the bachelor level.

Non-Technical Skills

- § Teamwork, problem solving, critical thinking, attention to detail and results-oriented skills are equally the most important non-technical skills for the quality assurance/quality control occupational area regardless of level of education.
- § Attention to detail is the most important non-technical skill for individuals with a master’s degree, while teamwork, problem solving and results oriented were cited as the most important of these skills for employees with bachelor’s degrees.
- § Leadership skills are most important of all non-technical skills for employees with doctorate education.

Overall Skills

- § Overall more non-technical skills are considered important to this occupational area compared to technical and complementary skills.
- § Several skills classified as technical, complementary and non-technical are considered equally the most important skill for Quality Assurance/Quality Control occupational area within the PEI BioScience Sector. These skills are as follows:
 - Good laboratory practices (*technical skill*)
 - Good manufacturing practices (*technical skill*)
 - Quality control, quality assurance (*complementary skill*)

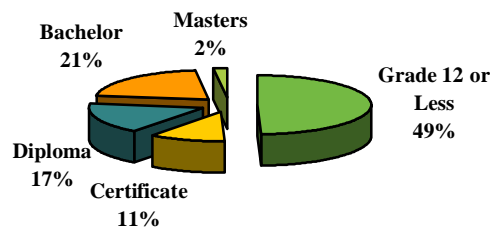
- Teamwork (*non-technical skill*)
- Problem solving (*non-technical skill*)
- Critical thinking (*non-technical skill*)
- Attention to detail (*non-technical skill*)
- Results-oriented (*non-technical skill*)

From the Employees Point of View

- § Good laboratory practices were ranked by all employees as the most important technical skills in this occupational area.
- § Quality assurance/quality control was ranked by all employees as the most important complementary skill.
- § All employees in this occupational area ranked the following non-technical skills as important:
 - Verbal and written communication skills in English
 - Attention to detail
 - Results oriented
 - Flexibility and adaptability

3.4 MANUFACTURING & PRODUCTION

The occupational area of manufacturing and production includes position titles such as production supervisors, managers, engineers, workers, cleaners and technicians, engineering assistants, project managers, resource managers, team leaders, chemical operators, building plant coordinators, maintenance technicians, inventory coordinators, formulation blenders, warehouse managers, equipment managers, manufacturing technicians, primary encapsulator operator, shift supervisors, shippers, receivers, directors, managers of operations, and trainers. Education levels in this occupation category range from grade 12 or less to masters degrees with the largest percentage (49%) possessing a grade 12 or less education.



Technical Skills

- § Good manufacturing practices is by far the most important technical skill for the Manufacturing and Production occupational area.
- § Laboratory and instrumentation techniques, development process and good laboratory practices are also of significant importance to this occupational area.

Complementary Skills

- § Quality assurance/quality control (QA/QC) and project management skills are the most important skills for the occupational area, regardless of education.
- § Project management skills are most important at the bachelor level.
- § Product development process is also of significant importance.

Non-Technical Skills

- § Relative to all other non-technical skills, leadership skills are very important for the master's level of education and have little relative importance for all other levels of education.
- § Problem solving, teamwork, written and verbal communication skills and critical thinking are among the most important non-technical skills for employees with bachelor's degrees.
- § Attention to detail, results-oriented and flexibility/adaptability skills are of slightly more importance to employees with an undergraduate degree or a diploma/certificate.

Overall Skills

- § Not surprisingly, the category *good manufacturing practices is considered the most important skill set for manufacturing and production occupational area.*
- § Forty-nine percent of employees in this occupational area have grade 12 or less. The only technical or complimentary skill to be ranked of any importance was product development process. Several non-technical skills (verbal and written communication skills, creative thinking, critical thinking, attention to detail results oriented and flexibility, adaptability) were ranked equally as important.
- § Almost as important as good manufacturing practices in all education levels are non-technical skills, as follows:
 - Problem solving
 - Verbal and written communication skills
 - Critical thinking
 - Attention to detail
 - Results-oriented
 - Flexibility and Adaptability

From the Employees Point of View

- § Good manufacturing practices was ranked by all employees as the most important technical skills in this occupational area.
- § Quality assurance/quality control was ranked by all employees as the most important complementary skill.
- § All employees in this occupational area ranked the following non-technical skills as important:
 - Verbal and written communication skills in English
 - Problem solving
 - Creative thinking
 - Critical thinking
 - Attention to detail

- Results oriented
- Flexibility and adaptability

3.5 PRODUCT & CUSTOMER SUPPORT

The occupational area of product and customer supports included the position title of administrative support. This was identified as a separate occupational area by only one organization. The individual's level of education was grade 12 or less.

Technical Skills

- § Good manufacturing processes, followed by development process, are ranked as the most important technical skills.
- § Based on level of education, skills related to laboratory and instrumentation techniques are ranked as the most important for master's degrees, while good manufacturing practices is ranked most important for diploma/certificate levels.

Complementary Skills

- § Project management is the most important complementary skill.

Non-Technical Skills

- § Teamwork, critical thinking, attention to detail, results-oriented and flexibility, adaptability skills are equally considered important non-technical skills for the Product and Customer Support occupational area. Overall these skills are ranked second most important, behind only verbal and written communications in English.

Overall Skills

- § Skill sets classified as non-technical are more heavily weighted for this occupational category.
- § Skills classified as complimentary, and in particular, those related to project management, quality assurance/quality control, and product development process, are more important relative to any technical skill.
- § The most important skill set overall for Product and Customer Support occupational area is *verbal and written communications*.

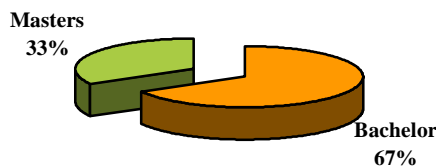
From the Employees Point of View

- § Clinical research, laboratory and instrumentation techniques, and good laboratory practices were ranked by all employees as the most important technical skills in this occupational area.
- § Quality assurance/quality control was ranked by all employees as the most important complementary skill.
- § All employees in this occupational area ranked the following non-technical skills as important:
 - Verbal and written communication skills in English
 - Team work

- Problem solving
- Creative thinking
- Critical thinking
- Attention to detail
- Results oriented
- Client focused
- Flexibility and adaptability

3.6 REGULATORY AFFAIRS

The occupational area of regulatory affairs includes position titles such as research associate and strategic advisor. This occupational area was identified by only two organizations.



Technical Skills

- § Good manufacturing practices and laboratory and instrumentation techniques are ranked the most important technical skills for positions in the Regulatory Affairs occupational area.

Complementary Skills

- § National and international regulatory acumen and product management skills are equally ranked as the most important complementary skills for this occupational category.

Non-Technical Skills

- § Problem solving, critical thinking, attention to detail, verbal and written communication and results-oriented are the most important skills in the non-technical category.

Overall Skills

- § BioScience companies tend to focus on skills categorized as complementary when employing individuals within the occupational area of Regulatory Affairs. The least emphasis is placed on technical skills.
- § *National and international regulatory acumen* and *project management skills* are equally ranked as the most important skills overall for the Regulatory Affairs occupational area.

From the Employees Point of View

- § Laboratory and instrumentation techniques, good manufacturing practices and good laboratory practices were ranked by all employees as the most important technical skills in this occupational area.
- § Quality assurance/quality control, national and international regulatory acumen and project management were ranked by all employees as the most important complementary skills.

- § All employees in this occupational area ranked the following non-technical skills as important:
- Leadership
 - Verbal and written communication skills in English
 - Attention to detail
 - Results oriented
 - Client focused
 - Flexibility and adaptability

3.7 INTELLECTUAL PROPERTY

None of the organizations identified any current employees working in the occupational area of intellectual property.

Technical Skills

- § Information technology management and development process skills are considered the most important technical skills for the Intellectual Property occupational area.
- § It is interesting to note that while these skills are ranked as the most important to the higher levels of education, another, yet different, skill is of equal importance for each of the degrees.
- In addition to these two skill sets, clinical research is of equal importance to doctorate degrees.
 - On the other hand, informatics is equally ranked with these two skills for master's degrees.
 - Laboratory and instrumentation techniques are of equal importance to IT management and development process for bachelor's degrees.

Complementary Skills

- § The highest ranked complementary skill is marketing strategies at a master's level.
- § Intellectual property management, business promotion, market research, financial management and product development process are ranked equally overall for this occupational area.

Non-Technical Skills

- § All non-technical skills are relatively of equal importance with the exception of communications in a language other than English.

Overall Skills

- § The emphasis is on non-technical skills for Intellectual Property occupational area.
- § ***Verbal and written communications in English is ranked as the most important skill,*** across all three categories and regardless of level of education, for Intellectual Property occupational area.

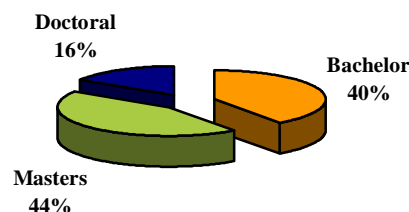
§ *It should be noted that the importance of skills identified in Intellectual Property occupational area are not based on existing employee skill levels as none of the responding employers had anyone employed in this area.*

From the Employees Point of View

§ None of the employees who responded to the survey worked in the occupational area of intellectual property.

3.8 BUSINESS DEVELOPMENT/INVESTOR RELATIONS

The occupational area of business development/investor relations includes position titles such as manager, policy and innovation, AIF coordinator, director general, economic development officer, project officer, director of business development, director of research support opportunities development, and account executive. The highest percentage (44%) of employees in this category has a master’s degree.



Technical Skills

§ BioScience companies find that Business Development/Investor Relations officers must have development process technical skills. All other technical skills are ranked less important when compared to complementary and non-technical skills.

Complementary Skills

§ Skills related to marketing strategies and business promotion are the most important complementary skills required by this occupational area. Strategic alliance development and management followed by project management skills, financial management, business affairs, and business software are also important complementary skills.

Non-Technical Skills

§ Non-technical skills are of a high importance to BioScience employees in Business Development and Investor Relations occupations.

Overall Skills

§ *The highest ranking for the importance of skills are marketing strategies, strategic alliance development and management, and business promotion* which are categorized as complementary skills, for the Business Development/Investor Relations occupational area.

§ The Business Development/Investor Relations relies little on technical skills, with the acceptance of development process, which is still ranked behind all but three

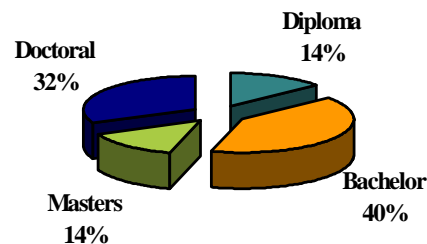
complementary and non-technical skills (QA/QC, relations with investors and communications in a language other than English).

From the Employees Point of View

- § None of the technical skills were ranked by employees as being important in this occupational area.
- § All employees in this occupational area ranked the following complimentary skills as important:
 - Marketing strategies
 - Financial management
 - Strategic alliance development and management
 - Business Affairs
 - Relations with investors
 - Business promotions
 - Market research
 - Project management
- § All employees in this occupational area all of the non-technical skills as important:
 - Verbal and written communication skills in English and other languages
 - Team work
 - Problem solving
 - Creative thinking
 - Critical thinking
 - Attention to detail
 - Results oriented
 - Client focused
 - Flexibility and adaptability

3.9 CHIEF EXECUTIVE OFFICER (CEO)/PRESIDENT

The education level of individuals in this position ranged from diplomas to doctoral degrees with the largest percentage (40%) possessing a bachelor degree.



Technical Skills

- § The most important technical skill for a Chief Executive Officer (CEO) and/or President is clinical research followed closely by development process.
- § All other technical skills are ranked as less important when compared to all other skills.

Complementary Skills

- § Strategic alliance development and management is the most important complementary skill.

§ Skills related to business affairs and promotion are ranked the second most important complementary skills required by a CEO and/or President of a BioScience organization.

Non-Technical Skills

§ Other than communication in a language other than English, all non-technical skills are ranked as important skills for a CEO and/or President.

§ Leadership, verbal and written communication skills in English, and team work ranked slightly higher than the other non-technical skills.

Overall Skills

§ Skills categorized as technical are ranked less important compared to non-technical and complementary skills with non-technical skills ranked the highest overall.

From the Employees Point of View

§ Development process and good manufacturing practices were ranked by all employees as the most important technical skills in this occupational area.

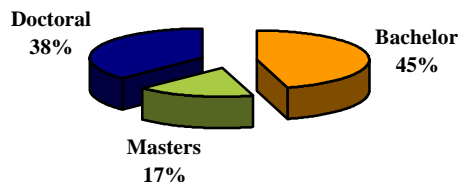
§ All of the complimentary skills except for business software were ranked as equally important by all the employees.

§ All employees in this occupational area ranked the following non-technical skills as important:

- Team work
- Problem solving
- Creative thinking
- Critical thinking
- Results oriented
- Client focused
- Flexibility and adaptability

3.10 EXECUTIVE MANAGEMENT (VP’S)

Employers were instructed to include directors and managers in the specific occupational areas in which they worked and to only include executives above this level and below the president or CEO in this occupational area. Position titles in the executive management occupational area include vice-president, executive director, chief operating officer and project manager. The highest percentage (45%) of employees in this category have a bachelor degree.



Technical Skills

§ Good manufacturing practices is an important technical skill for Executive Management occupational area, and is more important than clinical research, which is the most important technical skill required by Presidents and CEOs.

Complementary Skills

§ Strategic alliance development and management coupled with business affairs, are considered the most important complementary skill of Executive Management occupational area.

Non-Technical Skills

§ Leadership, verbal and written communication in English, teamwork, problem solving, critical thinking, results-oriented and client focused are the non-technical skills ranked most important.

Overall Skills

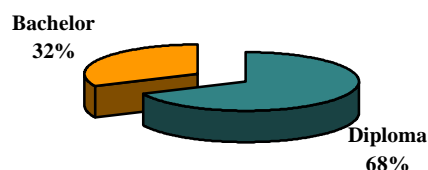
§ Non-technical skills are the most important skills for Executive Management, and overall out-rank all of the technical skills and a majority of complementary skills (with the exception of communications in a language other than English).

From the Employees Point of View

§ None of the employees who responded to the survey worked in this occupational area.

3.11 FINANCE

The occupational area of finance includes position titles such as accounting technician, secretary, accountants, manager of finance and administration, office and accounts division manager. The highest percentage (68%) of employees in this category have a diploma.



Technical Skills

§ Little emphasis is placed on technical skills for Finance-related occupations.

Complementary Skills

§ Not surprisingly, financial management is considered the most important complementary skill.

§ Business software is the second most important complementary skill.

Non-Technical Skills

§ Leadership is considered the least important non-technical skill. All other non-technical skills are relatively important (with the exception of communications in a language other than English).

Overall Skills

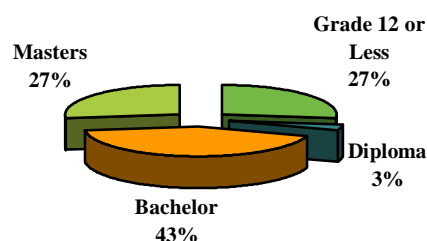
§ *Non-technical skills, written and verbal communication in English, problem solving and attention to detail, along with financial management categorized as a complementary skill, are considered equally as the most important skills for Finance occupational area.* This is not surprising given the relevance of these skills to the financial area.

From the Employees Point of View

§ None of the employees who responded to the survey worked in this occupational area.

3.12 MARKETING & SALES

The occupational area of marketing and sales includes position titles such as communications officer, marketing and sales, international marketing intern, sales & marketing manager, manager customer services and business development. The highest percentage (43%) of employees in this category possess a bachelor degree.



Technical Skills

§ Technical skills are of little importance with clinical research being the most important technical skill for the Marketing and Sales occupational area as a whole.

Complementary Skills

- § Marketing strategies and market research are ranked as the most important complementary skills for the Marketing and Sales occupational area.
- § Also significant for this occupational area are skills in business affairs and strategic alliance development and management. These skills are especially important for employees with master’s degrees.
- § The third most important complementary skills are project management skills and business software, ranked equally.

Non-Technical Skills

- § Verbal and written communications, creative thinking, attention to detail, results-oriented and flexibility/adaptability are the most important non-technical skills for the Marketing and Sales occupational area.
- § Leadership is not seen as very important relative to other non-technical and complementary skills.
- § Communications in a language other than English has limited importance.

Overall Skills

- § *Complementary skills – marketing strategies and market research – are considered the most important skills*, regardless of level of education, for the Marketing and Sales occupational area.
- § Other important complementary skills are equally ranked with the most important non-technical skills.

From the Employees Point of View

- § Good laboratory practices and development process were ranked by all employees as the most important technical skills in this occupational area.
- § All employees in this occupational area ranked the following complimentary skills as important:
 - Marketing strategies
 - Financial management
 - Business affairs
 - Strategic alliance development and management
 - Business promotion
 - Market research
 - Project management
 - Business software
- § All employees in this occupational area ranked all of the non-technical skills except for leadership as important.

3.13 HUMAN RESOURCES

The occupational area of human resources includes position titles such as HR generalist, staffing and HR planning specialists and HR co-ordinators. All of the employees in this occupational area of the respondent organizations possess a bachelor degree.

Technical Skills

- § Overall the ranking of importance for technical skills is relatively low compared to complementary and non-technical skills. However, within this skills category, clinical research is considered the most important skill for the Human Resources occupational area. This is true for the individual levels of education at the doctorate, master's and bachelor's degree levels.

Complementary Skills

- § Human Resources occupational area requires business software skills according to the rankings of importance of skills by the PEI BioScience organizations that responded to the survey.
- § Business affairs and project management skills are considered the second and third most important complementary skills for this occupational area, respectively.

Non-Technical Skills

§ Several non-technical skills are ranked as most important of all skills for the Human Resources occupational area. These skills are communications, teamwork, problem solving, critical thinking, attention to detail, results-oriented, and flexibility/adaptability.

Overall Skills

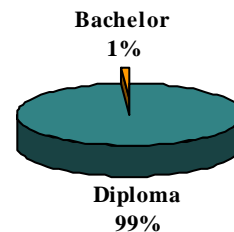
§ Non-technical skills are the most important skills required by Human Resources occupational area. Other than communications in a language other than English non-technical skills are ranked as more important than any technical or complementary skills.

From the Employees Point of View

§ None of the employees who responded to the survey worked in this occupational area.

3.14 MANAGEMENT INFORMATION SYSTEMS / INFORMATION TECHNOLOGY

The occupational area of MIS/IT includes position titles such as IT supervisor, analyst programmer, systems administer manager, computer support and IT support. The highest percentage (99%) of employees in this category possess a diploma.



Technical Skills

§ Information technology management is considered the most important technical skill across educational levels for the MIS/IT occupational area.

Complementary Skills

§ The most important complementary skill is business software.

Non-Technical Skills

§ Teamwork, problem solving and client focused are the most important non-technical skills for MIS/IT occupational area.

§ Critical thinking, communications, attention to detail, results-oriented and flexibility/adaptability are ranked as second most important non-technical skills.

Overall Skills

§ A majority of the *non-technical skills* out-rank technical and complementary skills in terms of importance.

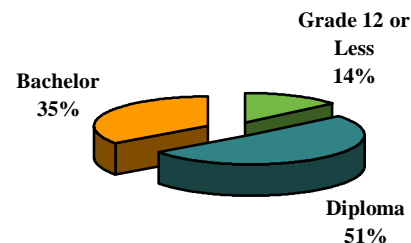
From the Employees Point of View

§ Information technology management and development process were ranked by all employees as the most important technical skills in this occupational area.

- § All employees in this occupational area ranked the following complimentary skills as important:
- Marketing strategies
 - Quality assurance/quality control
 - Business affairs
 - Product development process
 - Project management
 - Business software
- § All employees in this occupational area ranked all of the non-technical skills except as important.

3.15 ADMINISTRATION

The occupational area of administration includes position titles such as project manager, associate director, purchasing, supply chain coordinator, materials planning clerk, accounts payable and inventory clerk, office administrator, data entry clerk, administrative support and assistants, program coordinator, and building cleaners. The largest percentage (51%) of employees in this category has a diploma.



Technical Skills

- § Overall technical skills are of little importance relative to all other skills for Administration occupational area.
- § Clinical research, followed by information technology management, is ranked as the first and second most important technical skills, respectively.

Complementary Skills

- § Business software is the most important complementary skill, followed by business affairs and financial management for Administration occupational area.
- § Business affairs skills are considered most important for Administration employees with a bachelor's degree.

Non-Technical Skills

- § The most important non-technical skills are verbal and written communications, teamwork, results-oriented and flexibility/adaptability for this occupational area.
- Attention to detail and client-focused are also of significance, followed closely by problem solving and critical thinking.

Overall Skills

- § *The most important skills are non-technical – verbal and written communications, teamwork, results-oriented and flexibility/adaptability* – for Administration occupational areas.
- § The ranking of importance for each non-technical skill (other than communications in a language other than English) out-rank all technical and complimentary skills.

From the Employees Point of View

- § Information technology management was ranked by all employees in this occupational area as the most important technical skill.
- § Project management was ranked by all employees in this occupational area as the most important complimentary skill.
- § All employees in this occupational area ranked the following non-technical skills as important:
 - Verbal and written communication in English
 - Team work
 - Problem solving
 - Attention to detail
 - Results oriented
 - Client focused
 - Flexibility and adaptability

4.0 TRAINING ANALYSIS

A key component of developing a future labour market for the BioScience sector is the availability of good quality educational and training programs, which adequately prepare individuals to work in this sector. As part of this engagement, interviews were held with selected educational institutions throughout the Maritime Provinces to determine what programs were available to new entrants interested in pursuing employment in the BioScience sector, and to existing employees in upgrading their current level of skills. Section 4.1 of the report includes an overview of all BioScience-related programs in the region based on information obtained from the Maritime Provinces Higher Education Commission. This section also takes a more detailed look at individual program offerings and enrolment levels from selected educational institutions obtained through in-person and telephone interviews, and the training need for new entrants. Section 4.2 focuses on continuing education and customized training in terms of availability and training needs.

4.1 NEW ENTRANTS

4.1.1 Availability And Quality Of Existing Regional Training

Internet research was carried out on educational institutions delivering programs, which would equip individuals to work in the BioScience Sector at various levels. A listing of relevant programs is provided in Table 8. In addition, a combination of in-person and telephone interviews, were held with selected educational institutions throughout the Maritimes. The selected institutions were identified through discussion with employers, government, and local education institutes and included:

- § University of Prince Edward Island
 - Atlantic Veterinary College
 - Faculty of Science
 - School of Business
- § Holland College
- § University of New Brunswick
- § New Brunswick Community College – Centre of Excellence in Agriculture and Biotechnological Sciences (Edmunston)
- § Dalhousie University
- § Nova Scotia Agriculture College

Table 8 - Existing Regional Training		
Name of Institution	Level	Discipline / Specialization
University of Prince Edward Island	Minor in Environmental Studies	Interdisciplinary – Science, Arts, Education, Business
	Bachelor of Science	Biology
		Chemistry
		Computer Science and Information Technology
		Engineering
		Family and Nutritional Science
		Mathematics and Statistics
	Masters of Science	Biology
Chemistry		
Bachelor	Business Administration	
Atlantic Veterinary College	Masters in Science	Biomedical Science
		Companion Animals
		Health Management
		Pathology & Microbiology
	Masters in Veterinary Sciences	Health Management
		Pathology & Microbiology
	PhD	Biomedical Science
		Companion Animals
		Health Management
Pathology & Microbiology		
Mount Allison University	Bachelor of Science	Biology
		Chemistry
		Mathematics & Computer Science
		Physics
		Biochemistry
		Environmental Sciences
	Bachelor	Commerce
	Bachelor	Environmental Studies
	Master of Science	Biology
	Chemistry	
Mount Saint Vincent	Bachelor	Business Administration
	Bachelor of Science	Biology
		Chemistry
		Mathematics & Statistics
		Applied Human Nutrition
	Masters of Science	Applied Human Nutrition

Table 8 - Existing Regional Training (continued)		
Name of Institution	Level	Discipline / Specialization
University of New Brunswick – (Fredericton/Saint John)	Bachelor of Science	Biology
		Computer Science & Applied Statistics
		Environmental Biology
		Engineering
		Health Sciences
		Mathematical Science
		Nursing
		Physical Sciences (Chemistry, Geology, Physics)
	Bachelor of Science in Engineering	Chemical Engineering
		Electrical & Computer Engineering
		Mechanical Engineering
	Bachelor	Business Administration
	Masters of Science	Biology
		Chemistry
		Physics
		Mathematics & Statistics
	Masters of Science in Engineering	Chemical Engineering
		Electrical & Computer Engineering
		Mechanical Engineering
	Masters	Business Administration
Masters of Science in Forestry & Environment	Forestry & Environmental Management	
PhD	Biology	
	Chemical Engineering	
	Chemistry	
	Computer Science	
	Electrical & Computer Engineering	
	Forestry & Environmental Management	
	Mathematics & Statistics	
	Mechanical Engineering	
	Physics	
	Acadia University	Bachelor of Science
Biochemistry		
Chemistry		
Computer Science		
Engineering		
Environmental Science		
Nutrition & Dietetics		
Mathematics & Statistics		
Physics		
Bachelor		
Masters of Science		Biology
		Biochemistry
		Chemistry
		Computer Science
		Engineering

Table 8 - Existing Regional Training (continued)		
Name of Institution	Level	Discipline / Specialization
Memorial University	Bachelor	Business Administration
	Bachelor	Engineering & Applied Science
	Bachelor of Science	Biochemistry
		Biology
		Chemistry
		Mathematics & Statistics
		Physics & Physical Oceanography
		Environmental Science
		Environmental Studies
	Bachelor of Arts	Environmental Studies
	Masters of Science	Biochemistry
		Food Science
		Aquaculture
		Biology
		Marine Biology
		Chemistry
		Computational Science
		Computer Science
		Environmental Science
		Mathematics & Statistics
		Physics
	Masters of Engineering	Environmental Engineering
		Computer Engineering
Masters	Business Administration	
PhD	Biochemistry	
	Food Science	
	Biology	
	Marine Biology	
	Chemistry	
	Computer Science	
	Environmental Science	
	Mathematics & Statistics	
	Physics and Physical Oceanography	
	Engineering	
Nova Scotia Community College	Diploma	General Arts & Science
		Water Resources Technology
		Business Administration
		International Business
		Human Resources Management

Table 8 - Existing Regional Training (continued)		
Name of Institution	Level	Discipline / Specialization
Dalhousie University	Bachelor of Science	Biochemistry & Molecular Biology
		Biology
		Chemistry
		Environmental Studies
		Microbiology & Immunology
		Mathematics & Statistics
	Bachelor of Engineering	Biological Engineering
		Chemical Engineering
		Environmental Engineering
		Food Science & Technology
	Bachelor	Management
		Business Administration
	Masters of Science	Biochemistry & Molecular Biology
		Biology
		Chemistry
		Environmental Studies
		Microbiology & Immunology
		Mathematics & Statistics
	Masters of Engineering	Biological Engineering
		Chemical Engineering
		Environmental Engineering
Food Science & Technology		
Masters	Business Administration	
PhD	Biochemistry & Molecular Biology	
	Biology	
	Chemistry	
	Microbiology & Immunology	
	Mathematics & Statistics	
	Biological Engineering	
	Chemical Engineering	
	Food Science & Technology	
St. Mary's University	Bachelor of Science	Biology
		Chemistry
		Engineering
		Environmental Studies
		Math & Computing Science
	Bachelor	Commerce
	Masters	Applied Science
		Business Administration
	PhD	Management

Table 8 - Existing Regional Training (continued)		
Name of Institution	Level	Discipline / Specialization
St. Francis Xavier University	Bachelor of Science	Biology
		Chemistry
		Engineering
		Human Nutrition
		Math & Statistics
		Physics
	Bachelor	Business Administration
	Masters of Science	Biology
		Chemistry
Physics		
Cape Breton University	Bachelor	Chemical Science
		Biology
		Biology/Biodiversity
		Chemistry
		Integrative Science
		Engineering
		Human Nutrition
		Business Administration
		Marketing
		Manufacturing
New Brunswick Community Colleges	Diploma	Business Administration
		Chemical Technology
		Environment Technology
		International Business
		Medical Lab Technology
		Pre-Technology
		Biotechnology (co-op)
Nova Scotia Agricultural College	Diploma	Engineering
		Animal Health Technology
		Plant Science Technician
		Animal Science Technician
	Bachelor of Science	Agricultural Environmental Studies
		Animal Science
		Aquaculture
		Plant Science
	Masters of Science	Pre-Veterinary Medicine
		Plant Science
Holland College	Diploma	Environmental Applied Science Technology
		Wildlife Conservation Technology
		Business Administration
		Business Information Technology Program

4.1.1.1 University of Prince Edward Island

Atlantic Veterinary College

The Atlantic Veterinary College (AVC) plays an important role in the BioScience Sector providing highly qualified people for the sector as well as conducting applied research. Sixty-two percent (62%) of the students who graduated or were enrolled at AVC over the past four years were residents of Canada with approximately thirty-five percent (35%) of these students having residency in Prince Edward Island prior to enrolling.

AVC's Biomedical Science Program at the Masters and PhD level involves a variety of graduate courses:

- § Electron Microscopy
- § Stereological Theory and Practice
- § Principles of Biomedical Research
- § Image Analysis
- § Animal Welfare
- § Domestic Animal Ethology
- § Animal Experimentation
- § Developmental Biology
- Endocrinology and Metabolism
- § Mammalian Physiology
- § Autonomic Cardiovascular Physiology
- § Neuroscience
- § Cell Physiology and Pharmacology
- § Systems Pharmacology
- § Clinical Pharmacology/Toxicology
- § Biochemical Toxicology
- § Fish Physiology
- § Cell and Molecular Biology
- § Ecology and Environmental Sciences
- § Plant Science
- § Biology
- § Chemistry
- § Computational Chemistry
- § Spectroscopic Structure Elucidation

AVC's Companion Animal Program at the Masters and PhD level involves a variety of graduate courses:

- § Advanced Medicine of the Renal, Genitourinary and Endocrine Systems
- § Advanced Medicine of the Cardiac, Pulmonary and Neuromuscular Systems
- § Advanced Medicine of the Gastrointestinal, Hemolymphatic, and Immunologic Systems

AVC's Health Management Program at the Masters and PhD level involves a variety of graduate courses:

- § Veterinary Biostatistics
- § Epidemiology
- § Population Medicine in Aquaculture
- § Health and Production Management in Shellfish and Crustacean Aquaculture
- § Bovine Theriogenology
- § Equine Theriogenology
- § Equine Breeding Farm Theriogenology
- § Large Animal Surgery
- § Equine Surgery and Lameness
- § Large Animal Internal Medicine
- § Animal Nutrition
- § Nutrition and Digestive Processes in Swine
- § Herd Health and Production Management of Dairy Cattle

AVC's Pathology & Microbiology Program at the Masters and PhD level involves a variety of graduate courses:

- § Diseases of Cultured Fish
- § Immunology
- § Viral Pathogenesis
- § Bacteriology
- § Diagnostic Anatomic Pathology
- § Diagnostic Clinical Pathology
- § Surgical Pathology
- § Diagnostic Bacteriology
- § Diagnostic Veterinary Virology
- § Diagnostic Immunology
- § Cellular Pathology
- § Molecular Biology Techniques
- § Helminthology

Table 9 - University Of Prince Edward Island – Atlantic Veterinary College

Program/Course Related To BioScience Sector	Graduates			Current Enrolment 2004/05					Future Enrolment			
	2002	2003	2004	1 st yr	2 nd yr	3 rd yr	4 th yr	5 th yr	Sept. 2005 - Aug. 2006	Sept. 2006 - Aug. 2007	Sept. 2007 - Aug. 2008	Sept. 2008 - Aug. 2009
Masters in Biomedical Sciences	4	1	2	6	1	-	1	1	60	60	60	70
PhD in Biomedical Sciences	1	2	-	1	1	2	2	-				
Masters in Companion Animals	-	1	-	1	-	-	1	-				
PhD in Companion Animals	-	-	-	-	-	-	-	-				
Masters in Health Management	4	2	1	5	4	3	3	3				
PhD in Health Management	-	1	2	1	1	3	3	3				
Masters in Veterinary Science in Health Management	-	-	-	1	-	-	-	-				
Masters in Pathology & Microbiology	1	3	2	4	3	1	1	2				
PhD in Pathology & Microbiology	-	3	-	-	-	1	1	1				
Masters in Veterinary Science in Pathology & Microbiology	-	-	-	1	-	2	-	-				

Faculty of Science

UPEI’s Faculty of Science plays a significant role in PEI’s BioScience Sector. The Faculty of Science not only plays a role in educating future employees but also is involved in a number of research projects with industry and place a number of undergraduate and graduate students with local companies. As part of the expansion of the School of Business planning was underway to offer a multidisciplinary undergraduate degree in Business and Science, however there have been some administrative difficulties in packaging this joint degree. The University is now discussing focusing on a marketing effort on the opportunity for a student to complete either a Major in Science with a Minor in Business or a Major in Business with a Minor in Science. The Faculty of Science is also planning to add a course in Bioinformatics in 2005 with potential for the addition of future courses. The Family & Nutritional Sciences program is also looking at the option of expanding offerings to include a Masters. Other concepts being explored by the Faculty of Science are the possibility of a Life Sciences Degree (including Biology, Chemistry and Family & Nutritional Sciences) and a PhD in this area as well.

Table 10 - University Of Prince Edward Island – Faculty Of Science

Program/Course Related To BioScience Sector	Graduates			Future Enrolment			
	2002	2003	2004	Sept. 2005 - Aug. 2006	Sept. 2006 - Aug. 2007	Sept. 2007 - Aug. 2008	Sept. 2008 - Aug. 2009
Bachelor of Science-Biology	75	75	75	75	75	75	75
Honors -Biology	17	17	17	17	17	17	17
Masters of Science -Biology	5	5	5	5	5	5	5
Bachelor of Science-Chemistry	12	12	12	12	12	13	13
Honors -Chemistry	6	6	6	6	7	7	7
Masters of Science -Chemistry	4	4	4	4	4	5	5
Bachelor of Science-Family & Nutritional Sciences	15	15	15	16	17	18	18
Honors -Family & Nutritional Sciences	-	-	-	2	3	4	5
Family & Nutritional Sciences-Internship	6	6	6	6	6	7	7
Bachelor of Science-Physics	5	5	5	5	5	6	6
Bachelor of Science-Physics (Co-op)	2	2	2	3	3	3	3
Honors -Physics	5	5	5	6	6	6	6

School of Business

The University of Prince Edward Island is expanding the School of Business into a Centre for Enterprise and Entrepreneurship. In conjunction with this expansion the School of Business is planning to add a Masters of Business Administration with a speciality in science. It is expected that the program would be offered in the fall of 2006. UPEI is still working on the packaging of the program and will require approval from the University Senate and Maritime Provinces Higher Education Committee. The MBA program will include a number of science and business courses focused on biotechnology and entrepreneurship. It is likely that the MBA would also be offered on a part-time basis and as well an opportunity for a graduate diploma after a completion of a specified number of courses would be provided. Approximately eighty percent of students enrolled in the School of Business are from Prince Edward Island.

Table 11 - University Of Prince Edward Island – School Of Business

Program/Course Related To BioScience Sector	Graduates	Current Enrolment 2004/2005				Future Enrolment			
	2004	1 st year	2 nd year	3 rd year	4 th year	Sept. 2005 - Aug. 2006	Sept. 2006 - Aug. 2007	Sept. 2007 - Aug. 2008	Sept. 2008 - Aug. 2009
BBA	95	254	294	118	121				
MBA						-	15	15	15

4.1.1.2 Holland College

In May 2005 Holland College announced the creation of the Centre for Labour Force Innovation, which has a BioScience Training Institute as one of its four areas of strategic focus. Holland College has undergone a review of its existing postsecondary programs related to environmental technology and renewable resources to identify learning modules relevant and adaptable to the BioScience Sector. New program development activity is also being undertaken to design new postsecondary program offerings specifically focused on the BioScience Sector. Holland College is planning to offer a new diploma program in BioScience Technology commencing in the fall of 2006 and are currently in the process of hiring a program development manager for this area.

Some areas that are being considered for inclusion in this two year program are:

- § Microbiology
- § Biochemistry
- § Organic chemistry
- § Inorganic chemistry
- § Cell biology
- § Histology
- § Tissue cultures
- § Molecular genetics
- § Virology
- § Immunology
- § Biotechniques (laboratory techniques)
- § Food microbiology
- § Analytical methods and lab instrumentation
- § Lab/food safety
- § Research techniques
- § Technical writing
- § Bioinformatics
- § Statistical methods
- § Processing techniques for pharmaceuticals and nutraceuticals
- § Patent protection issues in the Biotechnology industry

Holland College has identified a need for establishing a BioScience industry advisory group that is willing to share information about the industry to ensure any programs developed are practical and relevant for the industry.

Table 12 - Holland College

Program/Course	Graduates			Current Enrolment 2004/05		Future Enrolment			
	2002	2003	2004	1 st year	2 nd year	Sept. 2005 - Aug. 2006	Sept. 2006 - Aug. 2007	Sept. 2007 - Aug. 2008	Sept. 2008 - Aug. 2009
Diploma in Environmental Applied Science Technology	13	N/A	11	N/A	18	18	18	18	18
Diploma in Wildlife Conservation Technology	14	N/A	16	N/A	18	18	18	18	18
Diploma in BioScience Technology	N/A	N/A	N/A	N/A	N/A	N/A	16	16	16
Percentage of PEI students	78%	-	69%	-	-	-	-	-	-

4.1.1.3 University of New Brunswick

In UNB’s opinion New Brunswick produces more graduates than the market demands in the areas of chemistry, biology, chemical engineering and chemical technologists given the small BioScience presence in the province. They have targeted some PEI companies for their co-op science program. Their students are generally interested in going to PEI for work experience. UNB has a new program (Medicinal Chemistry) currently before the Maritime Provinces Higher Education Committee for approval to be offered in the fall of 2006. The objective of this program is to provide chemists for the pharmaceutical industry with a specific theoretical and practical background distinct from chemistry graduates.

4.1.1.4 New Brunswick Community College – Centre of Excellence in Agriculture and Biotechnological Sciences – Grand Falls

The Centre of Excellence opened its doors in 1998 with a mandate to increase the competitiveness, diversity and productivity of New Brunswick companies involved in agriculture and biotechnology. They offer highly specialized training in biotechnology with a 81-week co-op diploma program. The biotechnology program provides students with the fundamentals of knowledge in biology and chemistry as they apply to biotechnology. The first year of the program provides a solid base in core sciences with the second year providing specialization in biotechnology methods related to molecular biology, instrumental analyses, biofermentation, microbiology, immunology and applied biotechnology. The program includes a 17 week paid practicum. The program is offered in English and French with ten students in each language being the average for the last number of years. The majority of the students enrolled in this program are from New Brunswick with a few from Quebec. There have never been any Prince Edward Island students in this program. They have had students from their program obtain employment in PEI, however some have returned to New Brunswick because they felt PEI was too far away from their home. They do provide some contract training for companies in the summer months when students are not enrolled. Their experience with employment in the BioScience Sector in New Brunswick is that there are not a lot of new jobs, mainly just turnover

in existing jobs, however there is some demand for graduated students in Montreal. The Centre of Excellence has an Industry Advisory Committee, which they meet with on a regular basis to review the program and keep it up to date.

4.1.1.5 Dalhousie University

In fall of 2005 Dalhousie University will be offering a Masters in Computational Biology & Bioinformatics, which is an area of increasing demand worldwide. They hope to have twenty graduates per year. They were not able to provide any information on how many of their graduates would be employed in PEI. More than fifty percent (50%) of their student base is from outside Nova Scotia with approximately thirty percent (30%) of students coming from Ontario. In their experience Ontario students tend to be more mobile while Nova Scotia students tend to want to stay in Halifax. They estimated that they have approximately twenty graduates each year from PEI.

4.1.1.6 Nova Scotia Agriculture College

From the perspective of the Nova Scotia Agriculture College (NSAC) the programs, which fall within the BioScience Sector are:

- § Plant Science
- § Environmental Sciences
- § Animal Sciences
- § Plant Technologist

They offer both a Bachelor of Science and a Masters of Science in the first three areas. The Plant Technologist is a diploma program. In terms of initiating new courses or programs they have an established curriculum committee, which brings forward the new ideas. A new course, which they started two years ago was Speciality Crops – Nutraceutical Crops under the Plant Science degree program. They also offer a course in Plant Biotechnology and Molecular Biology, which can be taken in the fourth year or at the graduate level. They do offer a Bachelor of Science in Business (Agriculture Economics), which has about twelve students per year. They are trying to find ways to increase the awareness of the Plant Science degree and attract students. They do have a new series of technical programs commencing in 2006 with one being retail food which contains a focus on food safety and quality which is related to biotechnology. NSAC feels the BioScience Sector needs to be developed and coordinated within Atlantic Canada with more communication among the industry associations and the educational institutions. They indicated that they do find it a challenge to attract PEI students as PEI students seem to want to stay on PEI.

Programs	Number of Graduates		
	2005	2004	2003
Masters of Science	20	7	11
Bachelor of Science – Plant Science	5	7	6
Bachelor of Science – Animal Science	37	26	27
Bachelor of Science – Environmental Sciences	9	9	13
Diploma – Plant Science Technology	0	5	6
Percentage of PEI students (based on total grads)	7%	4%	6%

4.1.2 Training Needs For New Entrants

Employers were asked to identify the number of new positions that would be created in their operations over the next three-year period. Following is a breakdown of the projected increases by educational level and occupational area.

Table 14 - Expected Increase In Employment				
Educational Level	Current Unfilled Positions @ 05/31/05	Next 12 Months	Next 13 to 24 Months	Next 25 to 36 Months
Grade 12 or Less	18	24	19	17
Certificate	-	-	-	-
Diploma	2	8	3	1
Bachelor	9	12	6	3
Masters	2	5	1	-
Doctoral	2	10	11	1
Education not specified	-	1	3	1
Total	33	60	43	23

New positions at the Masters level included Masters of Science with specializations in the following areas:

- § Microbiology/immunology
- § Biochemistry
- § Aquaculture
- § Micro/Chemistry/Process Engineering
- § Masters in Business with a specialization in accounting

New positions at the Doctorate level included Phd's in:

- § Business with a BioManagement focus
- § Epidemeology-Aquaculture
- § Molecular biology/Nutrition/Food Science
- § General Science
- § Tissue Culture
- § Biochemistry/Molecular biology
- § Chemistry/Biochemistry/Analytical Chemistry

Table 15 - Expected Increase In Employment

Occupational Area	Current Unfilled Positions @ 05/31/05	Next 12 Months	Next 13 to 24 Months	Next 25 to 36 Months
Research	7	18	15	2
Product/Process Development	1	2	-	1
Quality Control & Quality Assurance	1	2	1	1
Manufacturing & Production	19	29	21	17
Product & Customer Support	1	-	-	-
Regulatory Affairs	-	-	-	-
Intellectual Property	-	-	-	-
Business Development/Investor Relations	1	-	1	-
CEO/President	-	-	-	-
Executive Management (VP's)	-	-	-	-
Finance	-	-	1	-
Marketing & Sales	2	2	3	1
Human Resources	-	1	-	-
MIS/IT	-	1	-	-
Administration	1	4	1	1
Other -Program Development Manager	-	1	-	-
Total	33	60	43	23

4.2 CONTINUING EDUCATION AND CUSTOMIZED TRAINING

Fifteen companies completed the table in the Employee Skill Profile identifying continuing education and customized training provided to current employees. All of these companies provided some form of training to at least some of their employees. The skills that training has been provided in most frequently were provided by over fifty percent (50%) of the employers and were in the areas of:

- § Laboratory and instrumentation techniques
- § Good laboratory practices
- § Intellectual property protection and management

Fifty-three percent (53%) of the training was provided by the employer on-the-job and sixty-seven percent (67%) of any training provided was paid for by the Employer. Twenty-five percent (25%) of training was paid for by the employee.

Fifty-two percent (52%) of employee online survey respondents indicated that they had received work-related training and ninety-six percent (96%), of those receiving training indicated that it was paid for by the employer. Training received in the 2004 and 2005 years covered such topics as:

- § Animal use and care
- § Introduction to biotechnology
- § Biotechnology management
- § Competitive intelligence

- § Computer software usage
- § First aid
- § Transporting dangerous goods
- § GMP training
- § Food plant sanitation
- § HACCP training
- § Laboratory biosafety
- § Patent protection in biotechnology
- § Project management
- § Risk management for devices and IVDs
- § Safety training
- § Sales training
- § WHMIS

Training has been provided by a number of training providers including educational institutes, industry associations and training associations. The most common providers were:

Biotechnology Human Resource Council (BHRC)

- § Sandler Sales Institute
- § UPEI
- § AVC
- § Atlas Compliance Packaging Co. Ltd.
- § Employers
- § Red Cross

4.2.1 Availability And Quality Of Existing Regional Training

4.2.1.1 University of Prince Edward Island

UPEI provides continuing education to already existing employees through the Centre for Lifelong Learning but have also provided some courses specific to the BioScience Sector through individual departments. The School of Business offered a course “Biotech Management in a Global Economy” in 2004, which had twelve participants from the private sector, provincial and federal government and UPEI. The School of Business would like to offer additional courses in the BioScience area in the future and have plans to offer their MBA on a part-time basis, which will allow existing employees to enrol. A major factor in offering continuing education is having a champion or leader in the University who has identified the need and has the desire to see it happen. Available resources to develop and deliver the program are also a large factor in the course being offered. Several years ago an extension course on DNA sequencing was offered, however no additional continuing education courses have been offered in recent years. There maybe some interest in offering continuing education courses through the Family & Nutritional Sciences in areas such as Genomics, Molecular Biology or Food Security. The Atlantic Veterinary College does not currently offer any continuing education or customize training courses targeted towards existing employees however they would be interested in partnering with industry in this area as long as there was a benefit for both the students and the AVC researchers in the offering.

4.2.1.2 Holland College

Holland College has offered customized training in the BioScience related area in the past and have current plans for additional offerings. Training offered included a course on wastewater treatment operations for the Department of National Defence in 2001/02, a laboratory techniques related to biological water quality indicators for the Atlantic Wastewater Association in 2003 and a wastewater treatment operator course for PEI Departments of Environment & Energy and Community & Cultural Affairs in 2004. There are plans to offer the wastewater treatment operator course to the Department of National Defence in 2006 and to develop and deliver a customized training course in Chemical Process Operator Training for three private sector companies in 2005/06. Holland College indicated that the challenge of meeting the technology requirements and the continuous updating for instrumentation, processes and health & safety regulations are significant factors for offering customized training.

4.2.2 Ongoing Training Needs For Existing Workers

Employers indicated that local education providers were not adequately addressing the following skills:

- § Good laboratory practices
- § Good manufacturing practices
- § Clinical research
- § Informatics (bio-informatics and molecular modeling)
- § Information technology management
- § Development process
- § Intellectual property protection and management
- § Quality assurance, quality control
- § National and international regulatory acumen

Employees who responded to the online survey were asked to indicate what areas they would like to receive additional training in to enable them to perform more effectively in their jobs and/or to increase their opportunity for advancement with their company. Employees identified a number of areas where they would like to receive additional training. The most frequently mentioned training areas are summarized below:

- § Computer applications
- § Biotechnology and business management
- § MBA
- § Bioinformatics
- § Bioactives
- § Project management
- § Molecular biology techniques
- § Regulatory affairs
- § Statistical analysis

4.3 FORECASTED FUTURE TRAINING NEEDS

A need for twenty-four new employees at the doctorate level and eight new employees at the Masters level over the next three years has been identified in the BioScience Sector.

Employers and employees have also identified a need for continuing education and customized training for existing employees. Employers and employees have both indicated a willingness for continuing education and customized training to occur with all employers indicating they provided training during the past twelve months and over fifty percent (50%) of employees indicating they had participated in work related training during the past twelve months.

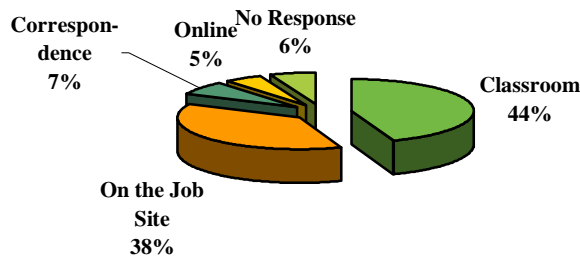


Figure 17 - Preferred Method of Training - Indicated by Employee

The most preferred method of training by employees was in the classroom at forty-four percent (44%) followed by on the job site with thirty-eight percent (38%). Seven percent (7%) preferred correspondence and while only five percent (5%) preferred online.

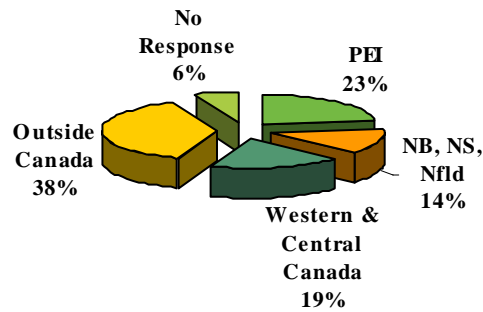


Figure 18 – Farthest Distance Willing to Travel for Training - Indicated by Employees

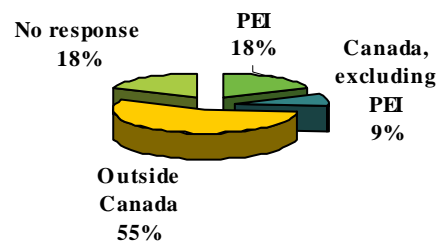


Figure 19 – Farthest Distance Employers Willing to Send Employees for Training

Seventy-one percent (71%) of employees indicated a willingness to travel outside of PEI to take advantage of training opportunities. Sixty-four percent (64%) of employers indicated a willingness to send employees outside of PEI for training if the training was not available locally and would be more likely to send more senior employees the greater distance for relevant training. Eighty-four percent (84%) of employees indicated a willingness to attend training in the evening and seventy-four percent (74%) indicated a willingness to attend training on the weekends.

5.0 SUPPLY AND DEMAND ANALYSIS/FORECASTING

This section examines the labour market supply based on the ability of regional education and training institutions to provide skilled and knowledgeable employees for the BioScience sector and the interest of 2004 graduates of UPEI/AVC in employment in the sector. Labour demand is based on the forecasted human resource needs provided by employers during this process.

5.1 LABOUR SUPPLY

5.1.1 Capability Of Regional Training To Meet Future Demand

Considering the fact that UPEI and AVC only produce on average fourteen Masters graduates and three PhDs per year and the challenges that employers have in attracting employees from outside the province there is a projected shortfall for this area. This will be mitigated somewhat by the fact that some Islanders do leave PEI to obtain their Masters and PhDs in other locations, however consideration must be given to the difficulty of attracting these individuals back to PEI after graduation.

Holland College has expressed an interest in working with the BioScience Sector to develop and deliver training to meet the needs of employees and in fact is already working with at least three private sector BioScience companies to develop and deliver Chemical Process Operator training. With the establishment of the new Centre for Labour Force Innovation and BioScience related diploma programs Holland College will be well positioned to deliver some of the training to meet the continuing education needs of the sector.

UPEI's School of Business, Faculty of Science and Atlantic Veterinary College have also expressed an interest in working with the BioScience Sector to meet some of their continuing education needs.

It will be necessary that a strong communication link be established with local educational institutions and the BioScience Sector to clearly communicate industry training needs and provide an opportunity for local education providers to respond.

5.1.2 New Graduates

Twenty-seven percent (27%) of the graduate survey respondents indicated that they are currently employed in the BioScience Sector with fifteen percent (15%) being employed outside of PEI. A further thirty-six percent (36%) not currently employed in the BioScience Sector are interested in employment in the sector with twenty-four percent (24%) interested in employment on PEI. A further eighteen percent (18%) did not indicate a current interest in the BioScience Sector (*most likely due to current pursuit of further education*) but did indicate an interest in future employment in the sector on PEI. Factors given for having an interest in the sector on PEI were:

- § Interesting field
- § Love for the sector

- § Want to be part of an expanding industry
- § Exciting opportunities
- § Future with endless possibilities and outcomes to be achieved
- § Putting education to better use
- § Challenging and fulfilling work

Forty-five percent (45%) of graduates indicated no interest in working in the BioScience Sector either on PEI or outside of the province. Reasons given were:

- § No interest in the sector
- § Don't know enough about the sector
- § Do not have qualifications or courses
- § Lack of opportunities with competitive compensation
- § Have not seen any interesting opportunities in the sector
- § Pursuing additional education

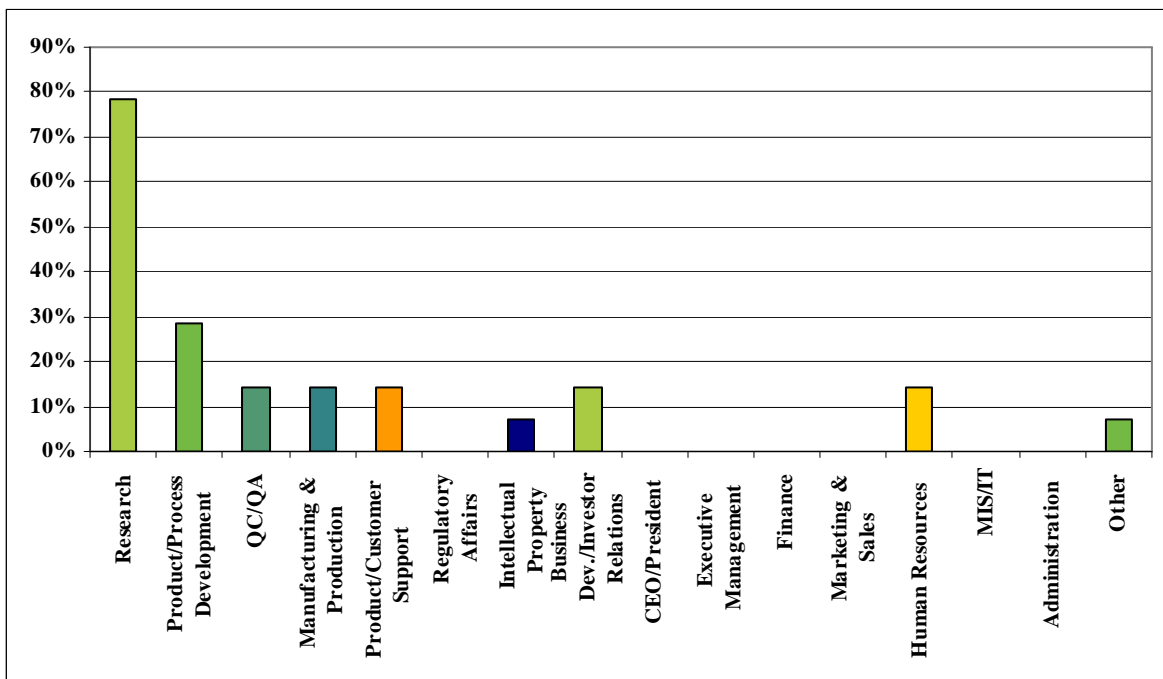


Figure 20- Areas of Interest in the BioScience Sector - 2004 Graduates

BioScience-related programs graduates employed in or seeking employment in the BioScience Sector were asked which occupational area would best describe their area of interest. The highest percentage seventy-nine (79%) were interested in employment in the research area followed by twenty-nine percent (29%) with an interest in product/process development area.

5.2 LABOUR DEMAND

Sixty-eight percent (68%) of employers indicated that they have experienced challenges in hiring qualified employees. Some of the challenges identified by employers were:

- § Difficulty of matching salary levels when trying to attract senior people from outside Atlantic Canada
- § Lack of spousal opportunities
- § Ability to pay signing bonus and provide research funding
- § Very few qualified people in the area of life sciences, especially with skills in molecular biology and animal handling
- § Small start-ups need multi-skills as money is tight
- § Difficult to get sales people with right qualifications and background in Maritimes
- § Availability of people with training in natural products
- § Limited pool of skilled individuals

Difficulty of recruiting employees depends on the level of employee being recruited. As the education level and experience level increase so does the difficulty of recruiting. An employer assessment of difficulty recruiting employees required over the next three years follows:

- § Recruiting for career entry-level positions, which are the majority of recruits is not difficult. Where experience is required, there is more difficulty.
- § In general it is very difficult to hire a clinical specialist position, especially in areas such as ophthalmology and radiology. It may take one to four years to hire somebody, if you can hire anyone at all.
- § There will be some difficulty in hiring at the operator level. Hiring about every six months with growth and some people not satisfactorily completing probationary period.
- § Higher tech employees may be difficult to recruit. Not sure of skills available locally and may be difficult to get people to relocate. Don't anticipate any problem hiring basic production staff, as resources should be available locally.
- § If recruitment is well planned and managed it should not be a problem.
- § Difficult – small budget for recruitment efforts
- § On a scale of one to ten, a six.
- § Extremely.
- § Very difficult. Decreasing pool of trained medical technologists. More jobs and fewer qualified technologists.
- § Very difficult – require combination of biotech management skills and science background.
- § Not difficult at processing stage.
- § Do not foresee problems. Highly qualified applicant rate on recent hires.

5.2.1 Current Unfilled Positions

Employers were asked to identify any current unfilled positions in their company or organization, the reason why the position is not filled and how long they have been trying to fill the position. Thirty-three vacant positions were identified, as of May 31, 2005, by seven

companies and organizations. Sixty-three percent (63%) of these positions were vacant for less than a month. For fifteen percent (15%) of the vacant positions the reason given for the positions not being filled was that no one qualified could be found. The length of time the positions have been outstanding ranged from over one month to over one year. The position unfilled the longest required education at the masters or doctorate level and was in the Research occupational area.

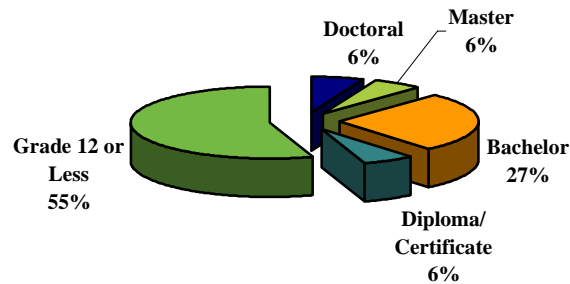


Figure 21 - Current Unfilled Positions by Education Level

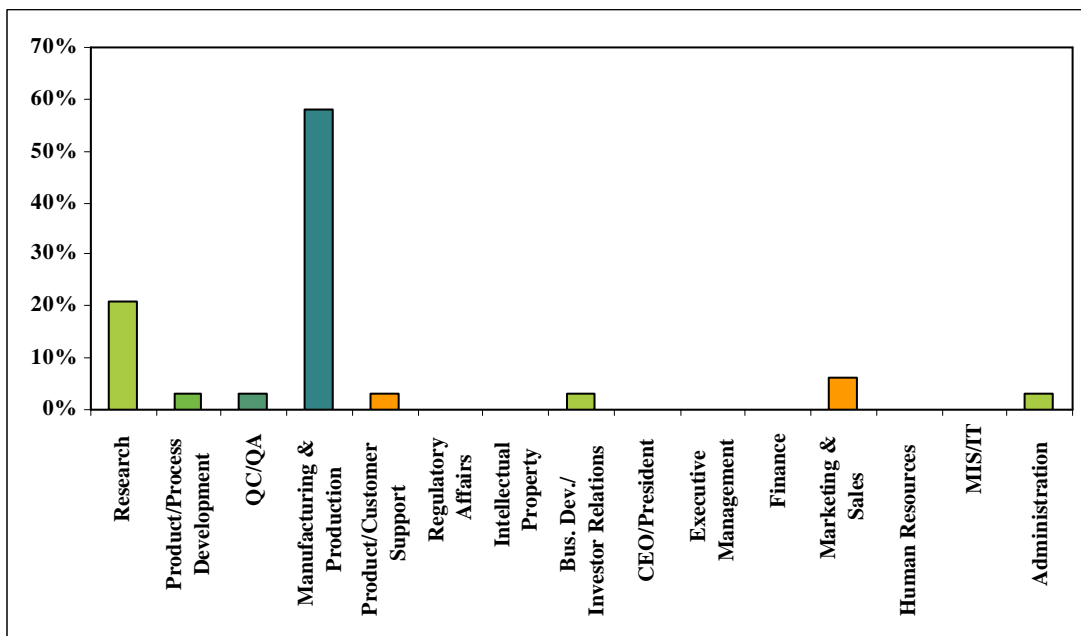


Figure 22 - Current Unfilled Positions by Occupational Area

Fifty-five percent (55%) of the identified positions did not require an education level higher than Grade 12 with experience requirements ranging from none up to three years experience. The

majority of these positions were unfilled for less than one month and were as a result of growth of the company. All of these positions were in the occupational area of Manufacturing & Production.

5.2.2 Expected Increase In Employment

Employers were asked to identify by education level and occupational area the number of full-time equivalent positions they expected to require over the next three years broken down by the next twelve months, the next thirteen to twenty-four months, and the next twenty-five to thirty-six months. Sixty positions were identified over the next twelve months, forty-three positions over the next thirteen to twenty-four months, and twenty-nine over the next thirty-six months. These positions do not include the current unfilled positions identified in the previous section. These expected increases in positions are based on the responses of nineteen BioScience employers including four of the larger private sector companies and the new NRC – Institute for Nutrisciences and Health. No information was available from key informant interviews as to any new companies, which were being prospected for establishment or relocation to PEI. Taking into consideration the above factors a projection of additional increases in employment was not made.

5.2.2.1 Expected Increase In Employment Over The Next 12 Months

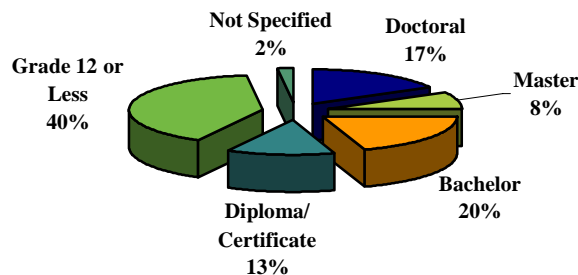


Figure 23 - Expected Increase in Employment by Education Level Over the Next 12 Months

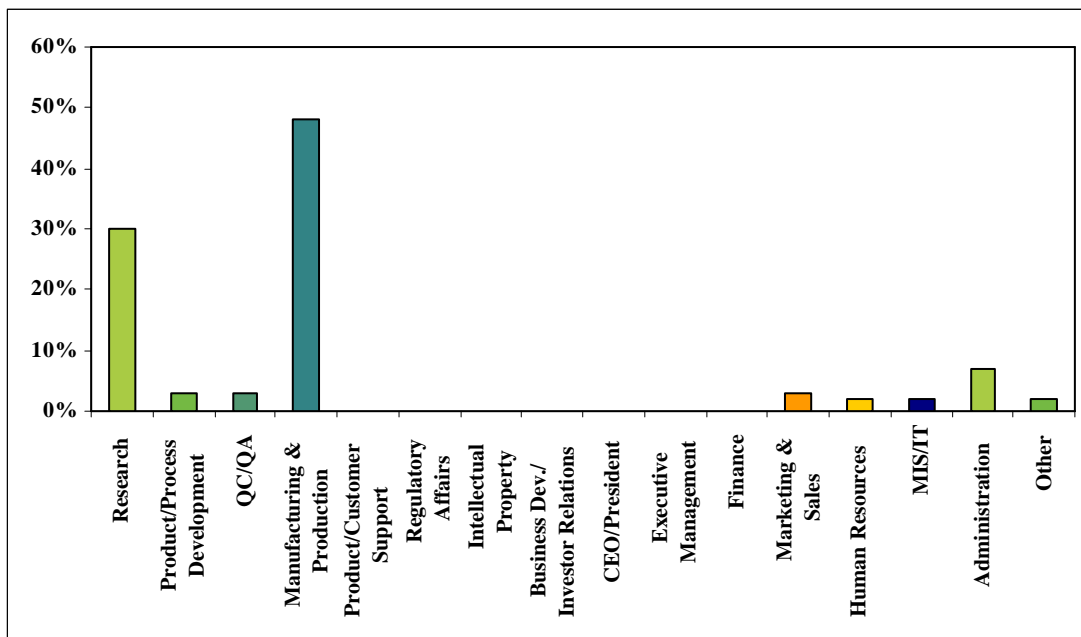


Figure 24 - Expected Increase in Employment by Occupational Area Over the Next 12 Months

Forty percent (40%) of the identified positions did not require an education level higher than Grade 12. Experience requirements for these positions ranged from none to four years experience. All of these positions were in the occupational area of Manufacturing & Production. Overall there was an expected increase of sixty positions over the next twelve months. Thirty percent (30%) of the expected increase in positions over the next twelve months is in the occupational area of Research with experience requirements ranging from one to six years. The education level required for these positions ranged from a bachelor’s degree to doctorate levels in the field of science with a third of these being at the doctorate level. Four of the positions indicated they would be open to individuals with a bachelor’s, masters, or doctorate. Disciplines mentioned for the positions were:

- § Biology
- § Nursing
- § Molecular biology
- § Nutrition
- § Biochemistry
- § Chemistry
- § Aquaculture
- § Tissue culture

5.2.2.2 Expected Increase In Employment Over The Next 13 To 24 Months

Employers were asked to identify by education level and occupational area the number of full-time equivalent positions they expected to require over the next 13 to 24 month period.

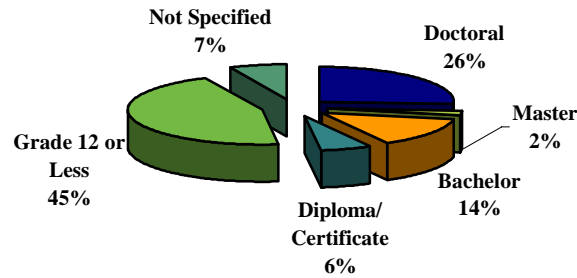


Figure 25 - Expected Increase in Employment by Education Level Over the Next 13 to 24 Months

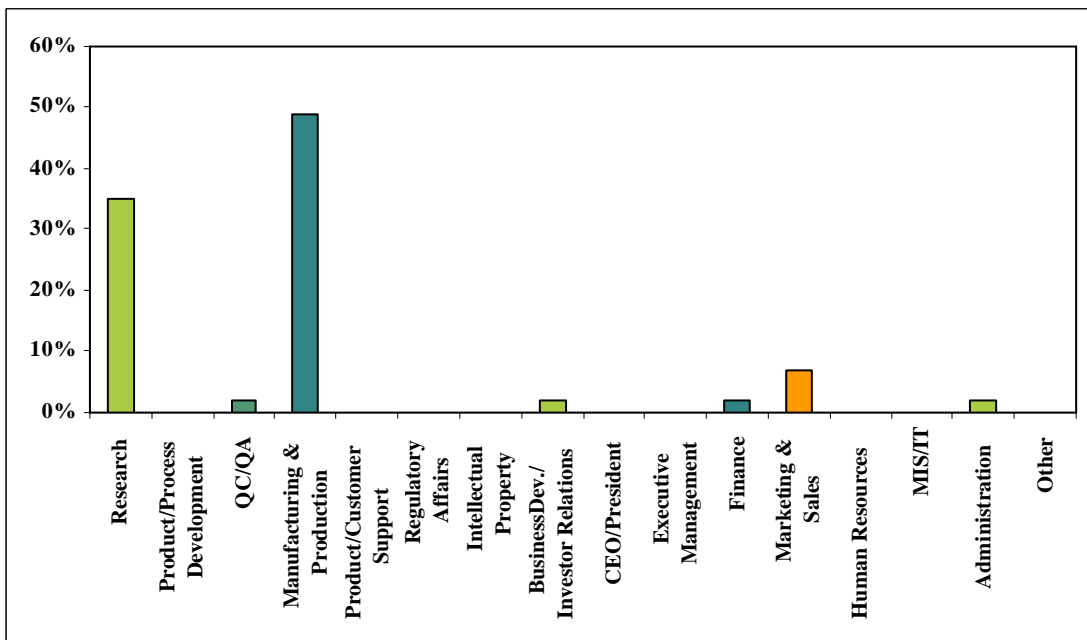


Figure 26 - Expected Increase in Employment by Occupational Area over the Next 13 to 24 Months

Forty-five percent (45%) of the identified positions did not require an education level higher than Grade 12. Experience requirements ranged from none to four years experience. All of these positions were in the occupational area of Manufacturing & Production. Overall there was an expected increase of forty-three positions over the next thirteen to twenty-four months. Thirty-five percent (35%) of the expected increases in positions over the next thirteen to twenty-four months are in the occupational area of Research with experience requirements ranging from one to six years. The education level required for these positions ranged from a bachelor’s degree to

doctorate levels in the field of science with two-thirds of these being at the doctorate level. Disciplines mentioned for the positions were:

- § Biology
- § Nursing
- § General science
- § Molecular biology
- § Biochemistry
- § Chemistry
- § Biotechnology management

5.2.2.3 Expected Increase In Employment Over The Next 25 To 36 Months

Employers were asked to identify by education level and occupational area the number of full-time equivalent positions they expected to require over the next 25 to 36 month period.

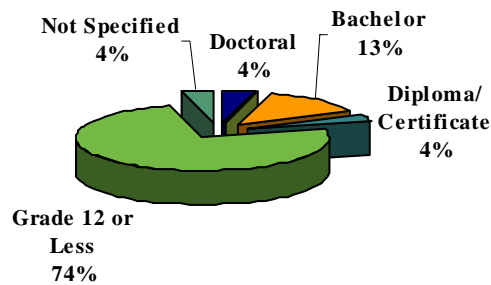


Figure 27 - Expected Increase in Employment by Education Level Over the Next 25 to 36 Months

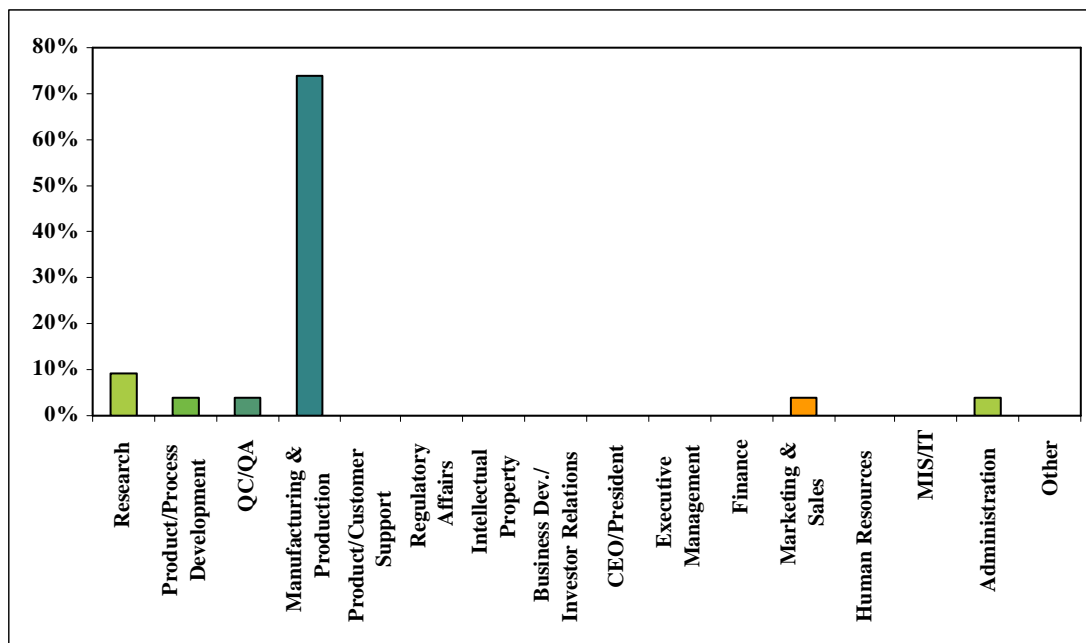


Figure 28 - Expected Increase in Employment by Occupational Area Over the Next 25 to 36 Months

Seventy-four percent (74%) of the identified positions did not require an education level higher than Grade 12. Experience requirements ranged from none to four years experience. All of these positions were in the occupational area of Manufacturing & Production. Overall there was an expected increase of twenty-three positions over the next twenty-five to thirty-six months. Nine (9%) percent of the expected increase in positions over the next twenty-five to thirty-six months is in the occupational area of Research with experience requirements ranging from one to six years. The education level required for these Research positions ranged from a bachelor’s degree to doctorate levels in the field of science with fifty percent (50%) at each of the bachelor and doctorate level. Disciplines mentioned for the positions were:

- § Biology
- § Molecular biology
- § Biochemistry

5.2.3 Retention

Forty-five percent (45%) of employers indicated they have problems with retention and provided the following reasons:

- § The major issues are the levels of remuneration available in the academic setting.
- § Spousal opportunities. Need spousal programs. One BioScience company does HR consulting for spouse and has also considered term contract positions for spouses to help them acquire local work experience.
- § Remote geographic location
- § Difficulty in securing long-term funding and the instability that creates.

- § Unable to match the permanence and salary offered by federal government organizations such as AAFC and NRC.
- § Right opportunity but timing not right because of stage of development and cash flow therefore, contract basis but no full time employment.
- § Company does not want to retain because there were problems with expectation that they can multi-task and be independent thinkers versus what they are getting – narrow thinkers and specialization. The company is not large enough for this.
- § Other career opportunities.
- § Some people have opportunity to consider all of Canada as their place of looking for work. Also competition on salary as job market is Canadian. Need to be able to assess the position and compete salary wise with national market.
- § Cultural difficulties.

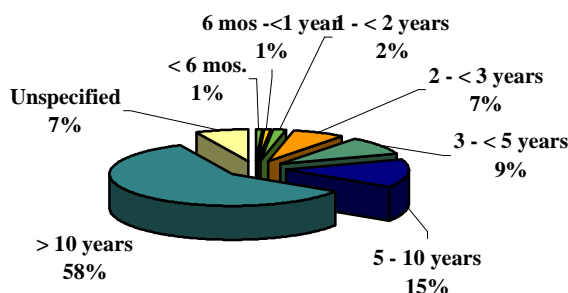


Figure 29 - Length of Time Employees Expect to Remain in BioScience Sector

Based on information obtained from the employee survey twenty percent (20%) of current employees expect to leave the BioScience Sector in the next five years therefore there will also be a need to fill these positions. As indicated earlier in this report in Table 7 the main reason current employees would consider leaving employment in the BioScience Sector is for career advancement.

5.2.4 Recruitment

Employers were asked to provide various information about employee recruitment, where they recruit from, techniques used, types of incentives provided, and primary geographic area for recruitment.

Table 16 - Recruitment of Scientific and BioScience Related Employees From:	
University (postgraduate programs)	64%
University (undergraduate programs)	59%
Academia	45%
College	41%
Other BioScience operations in Canada	41%
Other BioScience operations in PEI	36%
On-the-job Training	32%
Unsolicited resumes	32%
Immigration	23%
Co-op placements	18%
Other BioScience operations in US	18%
Other BioScience operations outside Canada and US	9%
Public Sector	5%

Ninety-one percent (91%) of employers indicated that they recruit from a variety of places with recruitment from University postgraduate and undergraduate programs being the most common place of recruitment.

Table 17 - Type of Recruitment Techniques Used	
Educational Institutions	55%
Newspaper Ads	49%
Internal Postings	45%
Networking	45%
Employee Referrals	41%
Internet	41%
Industry Publications	38%
On-campus Recruitment	32%
Co-op Programs	27%
On-the-Job Training	23%
Executive Search Firms	9%
Employment Agencies	5%

Ninety-five percent (95%) of employers indicated that they use more than one type of recruitment technique. The most popular recruitment technique is contacting educational institutions closely followed by newspaper advertisements.

Employees were asked in their online survey how they had found their current employment and what method they would use to find future employment if they left their current position.

Table 18 - How Employees Found Out About Their Current Positions	
Newspaper / journal ads	23%
Internet	15%
Internal posting	12%
Other employee referral	11%
Submission of unsolicited resume	9%
On-the-job training	7%
Recruited from another company	6%
Networking	6%
Co-op program	3%
On campus recruitment	3%
Recruited from public sector	3%
Recruited from outside Canada	2%
Employment agency	1%

According to the employees who responded to the survey newspaper/journal ads and the Internet were the most common ways they found out about their current positions.

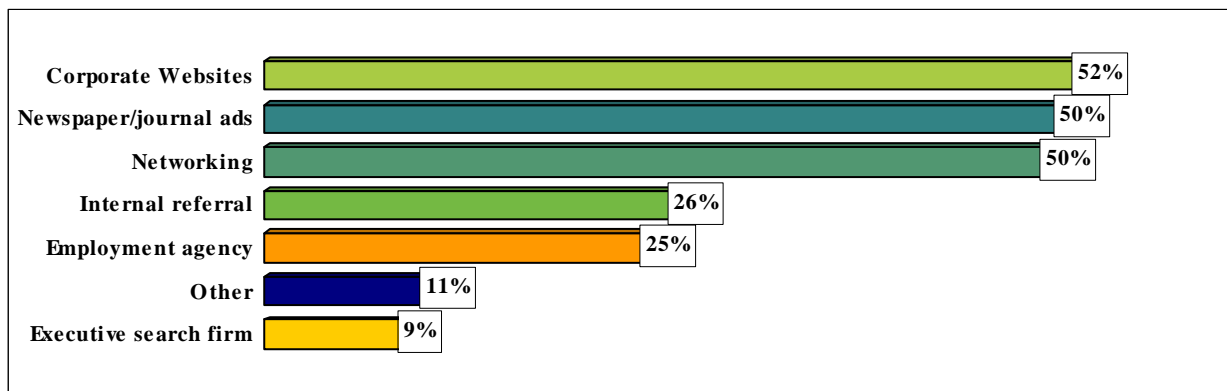


Figure 30 - Methods of Finding Future Employment (Indicated by Current Employees)

The Internet and more specifically corporate websites has become a more popular job search tool with the largest percentage (52%) of employees indicating this method for searching for future jobs in the sector. Networking ranked high which would be reflective of the fact that the employee already working in the industry would have established a number of contacts in the industry. Networking is also a common technique used by employers during the recruitment process. Newspaper/journal ads are still a very common method.

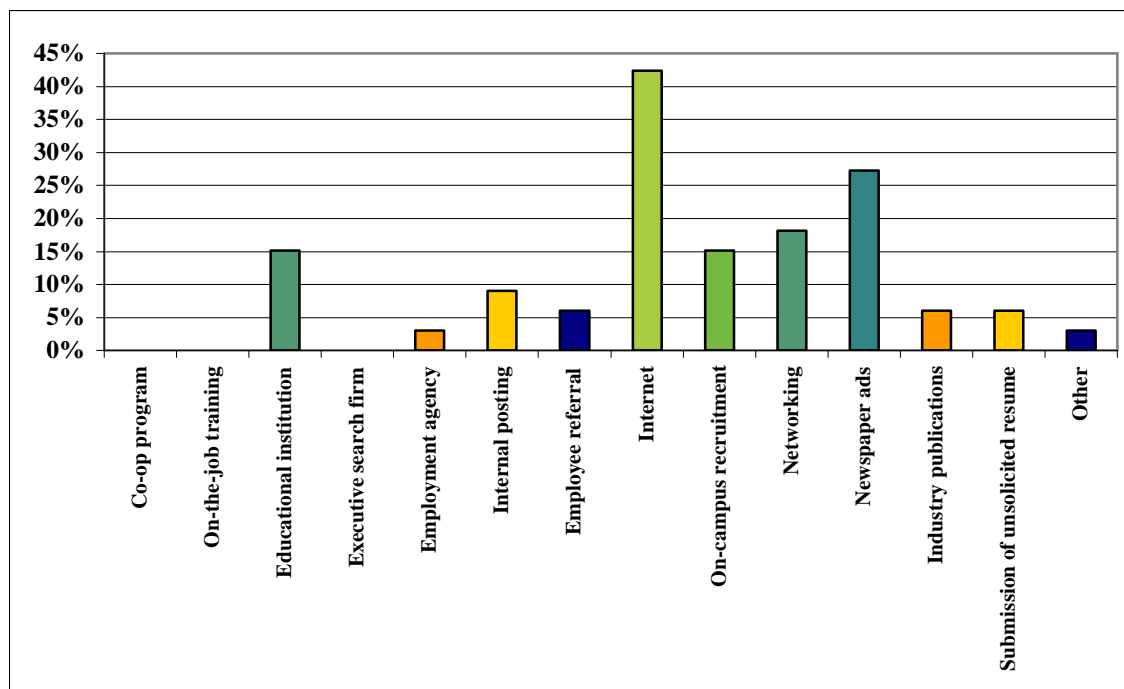


Figure 31 - Methods by which New Graduates Expect to Become Aware of Employment Opportunities

New graduates similar to the employee group used the Internet most commonly to search for employment followed by newspaper ads and networking. Very few employers had any formalized co-op education agreements or on-the-job training agreements with any of the educational institutions, which is reflected in the fact that this is not a method by which graduates become aware of employment opportunities in the sector.

Table 19 - Types of Recruitment Incentives	
More Interesting Work	64%
Training and Development Opportunities	59%
Work/family Balance	59%
Location	50%
Salary, Benefits, Perks	45%
Organizational Management/Culture	41%
Signing Bonuses	0%

Ninety-one percent (91%) of employers used more than one type of recruitment incentive with the fact that their organization provides more interesting work being the most common closely followed by training and development opportunities and work/family balance. As shown in Table 6, section 2.7 interesting work and training and development opportunities were the most important factors for a new graduate accepting employment in the sector, however both salary, benefits, and perks and quality of facilities and equipment were ranked higher than work/family balance. The lower ranking of work/family balance is most likely a reflection of age. With existing employees, as shown in Table 5, section 2.7 interesting work and work/family balance

were the two most important factors to remaining employed in the BioScience Sector, while salary, benefits and perks, location, and organizational management/culture ranked higher than training and development opportunities.

Table 20 - Primary Geographic Area for Recruitment	
Prince Edward Island	45%
Atlantic Canada	68%
Other parts of Canada	27%
United States	9%
Outside Canada and United States	9%

Employers most commonly recruit within Atlantic Canada.

6.0 KEY FINDINGS AND RECOMMENDATIONS

HR Needs of Young and Emerging Companies

Young and emerging companies require individuals with a multitude of skills. They are not yet at the stage of growth where they can hire staff for individual positions within occupational areas but rather need individuals who possess skill sets from a number of occupational areas.

Industry associations should look at facilitating an industry mentorship program which pairs leadership of young and emerging companies with experienced senior management.

Increasing Awareness of Career Opportunities in the BioScience Sector

Several of the graduate survey respondents indicated a lack of awareness of the sector and what it has to offer for employment.

More co-op education experiences in the BioScience Sector need to be provided to students enrolled in Science and Business programs so that these individuals can gain an awareness of what career opportunities the sector has to offer.

BioScience Sector representatives should participate in high school career days, visit high school science classes to talk about opportunities in the sector and/or provide awards at annual school science fairs. Today's high school students are the sector's future employees.

All high schools should be encouraged to participate in initiatives such as the Aventis Biotech Challenge.

Individuals looking at career options need to be made aware of the demand for employees with a combination of skill sets and in particular a combination of business and science skills. **UPEI plans to more actively promote the options of a Major in either Science or Business with a Minor in the other discipline and should execute this plan.**

Attracting Highly Qualified People to PEI

The BioScience Sector on PEI competes not only with the Atlantic Region but also the rest of Canada and internationally for highly qualified people.

Government should look at immigration policies regarding the entry of highly skilled people into the province to ensure that this is accomplished on a timely basis and that PEI is competitive with the procedures for the other provinces.

Highly qualified individuals tend more often than not to also have a highly qualified spouse and the ability to attract the individual to PEI is quite often dependent on the employment opportunities for the spouse. Some companies have found the need to develop HR programs to assist the spouse in finding employment in order to attract the resources they need. This was also noted as a concern within other Atlantic Canadian provinces.

The sector as a whole should look at establishing a program to assist with identifying spousal employment opportunities.

The ability to attract highly qualified people is linked to a critical mass existing in the sector. Highly qualified people want to have other job opportunities in the area should the current one does not work out and are also attracted by the opportunity for future advancement within the sector.

More emphasis needs to be placed on recruiting an anchor company for the sector.

Strengthening the Communication Between Educational Institutions and Industry

Employee training programs can assist in improving and updating overall skills and knowledge levels, and the ability to provide training can be a significant factor in attracting and retaining employees. In-house training programs are expensive and time-consuming for employers.

Industry and educational institutions should explore the opportunity for co-operative training on areas of common interest leaving only the individual company differences to be dealt with in an in-house training format.

Educational institutions should establish active BioScience Industry Advisory Boards to examine on an ongoing basis the changing skill requirements, gaps, and leading practices to ensure that programs being offered are current in for a rapidly changing industry.

PEI BioAlliance Inc. may consider establishing a skills and investment fund with the support of the provincial and federal governments. Private sector companies could apply to PEI BioAlliance Inc. for financial support under this fund to complement their own investment.

Establish a Mechanism for Distributing Human Resource Information to Industry

The Biotechnology Human Resource Council undertakes a number of human resource research initiatives. Recommendations in the 2004 Canadian Biotechnology Human Resources Study include conducting further research on HR related issues such as:

- § Steps in developing an effective HR strategy;

- § Strategies for attracting and retaining top-notch employees, including facilitating the employment process for spouses;
- § Compensation surveys that differentiate by position, region, stage of a company's development, its size and sub-sector;
- § Best practices report on benefits of multi-disciplinary leadership teams; and
- § Generic competency profiles for key leadership and management positions.

A central repository for research conducted on HR issues within the sector should be established along with a process for distributing information to industry.

7.0 ONGOING PROCESS FOR UPDATING HR INVENTORY

For the development of this strategy, information on the skills, education and experience of the PEI BioScience employees was collected. In order to achieve a higher response rate and to collect accurate information, individuals responded unanimously. This information is extremely valuable in order to capture a snapshot of the current inventory of human resources and to identify the gaps based on the future needs of the sector. This information has been very useful in preparing this *BioScience Human Resource Strategy for Prince Edward Island*.

7.1 PROPOSED PEI BIOSCIENCE CAREERSOURCE

In terms of moving forward and identifying the most useful HR tool for maintaining an inventory of skills and other human resource information for future use, after careful consideration, it is recommended that a *PEI BioScience CareerSource* database be created. This database should contain information based on the supply and the demand of human resources within the PEI BioScience Sector.

7.1.1 Supply Of Human Resources

It is recommended that the PEI BioScience Sector **create a database of skills, education and experience** collected from unsolicited and solicited curriculum vitae for individuals interested in employment in the BioScience Sector on PEI.

- § Unsolicited curriculum vitae: develop a **central repository of skills**, whereby the prospective employee creates a profile of themselves based on a list of pre-selected categories and open-ended questions that would include contact information, skill sets, level of education and work experience. This section should also require the individual to indicate the type of BioScience-related employment they would be interested in pursuing (e.g., occupational area, public vs. private sector organizations and so on).
- § Solicited curriculum vitae: create a **centralized recruitment process**, whereby prospective employees create a profile in response to an employment opportunity posted on the PEI BioScience CareerSource by a BioScience employer located on PEI.

The database should also have a section for current high school, post secondary, graduate and doctoral students to post their curriculum vitae. These profiles should specify the students' interest in employment within the PEI BioScience Sector and the time frame for which they would be able to commence employment. The students should also be asked to indicate if they are interested in on-the-job training, co-op work placements or graduate student placements. An option should be available to "submit" a profile to the searchable database of prospective employees, which would indicate that the student is currently in the process of seeking employment. Holland College and the University of Prince Edward Island should be asked to encourage students to complete an online profile.

7.1.2 Demand For Human Resources

This database would be an invaluable tool for BioScience employers to search for prospective employees who have particular qualifications and have an interest in becoming employed within the sector. The database should also enable the BioScience employers to advertise employment opportunities.

7.1.3 Functionality And Access

The *PEI BioScience CareerSource* database should have specific functionality and clear guidelines around the accessibility of data input and information collected. The recommendations are as follows:

- § **Ease of use** is an important feature of the online database for both entering and retrieving the data. Prospective BioScience employees (and current students) would enter and submit information to create a profile. This profile should include, at a minimum, contact information, level and discipline of education, skill sets, and work experience within the field of BioScience.
- § **Access to the data entry** would be available to any individual who wishes to create a profile based on their curriculum vitae and is interested in seeking employment within the BioScience Sector on PEI. It is recommended that quality controls over the data to be submitted be put into place. Specifically, once completed and submitted by a prospective employee, a profile should be automatically emailed to an administrator who would review and post the information on the searchable database. This functionality will ensure the accuracy of the information provided, and eliminate any duplication. Prospective employees should be able to set up an account with a username and password that would enable them to create and update their profiles.
- § **Access to the data entered** should be available to BioScience-based companies, research institutions, educational institutions and government located on PEI *only*. This database could have search capabilities based on an individual's name, specific skill set, education and/or experience, occupational area or type of area.
- § The BioScience employers on PEI would also have **access to data entry for advertising their respective job postings**. These postings should be automatically deleted from the online database after a pre-specified period (e.g., two months). The employer should receive an automatic email notification prior to the deletion of the job posting.



7.2 PROPOSED ONLINE PEI BIOSCIENCE PORTAL

It is recommended that the *PEI BioScience CareerSource* database be displayed on an online portal available on a web site through PEI BioAlliance Inc. This portal would post the employment opportunities available at local BioScience-related organizations.

The online portal should also include a **BioScience Highlights Section** that would help to promote the growth of the PEI BioScience Sector to prospective employees, companies looking to establish a presence on PEI, and other BioScience cluster stakeholders. This section would highlight the number of private sector and of public sector BioScience employers, and the number of employees based on occupational profiles, which has been collected as part of this strategy. The BioScience Highlight would also include the projected number of employees required by occupational area and by private and public sectors for the upcoming year. This information has already been collected for the year beginning on June 1, 2005, and should be updated on an annual basis.

Other recommendations for the online portal are as follows:

- § Identification of BioScience-related programs through Holland College and undergraduate, graduate and doctoral degrees available through the University of Prince Edward Island. BioScience-related programs and degrees available at other community colleges and universities throughout Canada could also be included.
- § Postings of BioScience-related job opportunities within the co-op and on-the-job training programs and other research positions available through the educational institutions located on PEI.
- § Availability of information on scholarships and sponsorships for students studying in BioSciences including qualifications and application requirements.
- § Description of human resource funding programs available through government, along with contact information, which would include, but not be limited to, the following:
 - ACOA's Innovation Skills Development Initiative (ISDI);
 - Human Resources Skills Development Canada's Targeted Wage Subsidies and other applicable programs;
 - BioScience Human Resources Council (BHRC)'s "Career Focus" wage subsidy funded by the Government of Canada, if available.

7.3 SUMMARY OF BENEFITS OF PROPOSED PEI BIOSCIENCE ONLINE PORTAL AND CAREERSOURCE

The PEI BioScience Online Portal and CareerSource would offer numerous benefits to the sector on PEI, some of which are highlighted below.

- § Demonstration of the significance and growth of the PEI BioScience Sector to prospective employees, cluster stakeholders, the general public and BioScience prospective companies looking to relocate or expand to PEI.

- § A one-stop source for prospective employees regionally, nationally and internationally to become aware of the employment opportunities throughout the sector on PEI.
- § A database of prospective employees interested in employment within the BioScience Sector on PEI readily available to local employers.
- § Support for prospecting activities, as companies can post employment opportunities prior to establishing a presence on PEI.
- § Promotion of the opportunities for receiving training and education and for career advancements within the PEI BioScience Sector to high school, post graduate, graduate and doctorate students.

7.4 MAINTENANCE AND MONITORING

It is recommended that PEI BioAlliance Inc. be responsible for the overall maintenance and monitoring of the PEI BioScience Online Portal and CareerSource. Ease of use and other features that allow the users to enter the information themselves would reduce the amount of time and resources spent on maintaining and monitoring the portal. However, as the administrator, PEI BioAlliance Inc. would be responsible for the following:

- § Promoting the availability and use of the portal.
- § Monitoring content posted on the portal and/or the database.
- § Overseeing that PEI BioScience-based organizations automatically receive usernames and passwords to access the searchable online database.
- § Contracting and managing relationship with a web developer, and
- § Responding to inquiries of a non-technical nature.

7.5 OTHER COMMENTS

In addition to, or as an alternative to, the *PEI BioScience CareerSource* database, the PEI BioScience Sector may utilize the **Biotechnology Human Resources Council (BHRC)**'s **PetriDish Career Portal**. This portal offers BioScience employers a recruitment tool and access to employment data and trends. According to BHRC's web site, the portal generates over 20,000 hits per day and allows career seekers from Canada and the world over to post their résumés and identify career opportunities within Canada's Biotech industry. Among the services this portal provides, employers can purchase, post, modify and remove career postings anytime and view candidate CVs via a key word search. Based on interviews conducted for this strategy it appears as though PEI's involvement with the Council is focused primarily on partnering for the offering of short courses on BioScience related topics. Other Atlantic Canadian BioScience and/or life sciences associations seem to be uncertain at this time as to their involvement with, and the future sustainability of, the Council.

However, utilizing BHRC's portal alone would not provide the PEI BioScience Sector with the valuable information on the local market.

Other recommendations for becoming aware of the supply of human resources identified through primary and secondary research are as follows:

- § **Share contacts and utilize networks at organizations located in other provinces and countries.** During the interviews, some stakeholders discussed the importance of establishing and maintaining relationships with researchers at institutions and organizations off Island.
- § **Establish a central database of regional, national and international key contacts** maintained by PEI BioAlliance Inc. that is made available to the sector stakeholders on PEI. Given the background of BioScience employers and employees and the international scope of this sector, establishing this database of contacts can be easily accomplished.
- § Utilize **networking sessions** to further develop relationships among the key stakeholders of the PEI BioScience Sector, and to discuss HR needs.



APPENDIX 1 – ADVISORY COMMITTEE MEMBERS

Innovation and Technology Association of Prince Edward Island (ITAP), Sandy Peardon, Executive Director (Advisory Committee Chairperson)

Atlantic Canada Opportunities Agency, Juanita Diamond, Economic Development Officer, Life Sciences

BioVectra dcl, Gary Reid, Vice President, Research & Applications Development

Fortius Canada Inc., Alan Andreasen, Chief Executive Officer

Holland College, Kim Horreht, Program Manager, Applied Sciences and Technology

Prince Edward Island BioAlliance, Rory Francis, Executive Director

Prince Edward Island Department of Education, Susan Graham, Manager, Student Financial Services

Progressive BioActives Inc (PBI), Shane Patelakis, Chief Executive Officer

Technology PEI, Gailene Murphy, Research Secretariat

University of Prince Edward Island, Katherine Schultz, Vice President, Research and Development



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APPENDIX 2 – BIBLIOGRAPHY (CONTINUED)

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APPENDIX 3 – KEY INFORMANT INTERVIEWS

Technology PEI, Gailene Murphy, Research Secretariat

Technology PEI, Richard Ablett, Account Executive BioScience

Atlantic Canada Opportunities Agency, Juanita Diamond, Economic Development Officer, Life Sciences

Atlantic Canada Opportunities Agency, Brian Thompson, Director General Policy and Planning

NRC Institute for Nutrisciences and Health, Dr. Michael Mayne, Lead Scientist

PEI Food Technology Centre, Jim Smith, Executive Director

Agriculture and Agri-Food Canada, Christiane DesLauriers, Assistant Director General

Agriculture and Agri-Food Canada, Dr. Ted Van Lunen, Special Advisor to the Assistant Deputy Minister-Research

Human Resources Skills Development Canada, Diane Robertson, Manager, Information and Economic Services

PEI BioAlliance, Rory Francis, Executive Director

Biotech Human Resource Council, Paul Fortin, Acting Executive Director

BioNova, Marli MacNeil, Chief Executive Officer

BioAtlantech, John Argall, Executive Director

Newfoundland and Labrador Association of Technology Industries, Barbara Girard, Life Sciences

Innovation and Technology Association of PEI, Sandy Peardon, Executive Director

Aqua Bounty Farms, Roddie Milton, Hatchery Manager

ARK Biomedical Canada, Wendell E. Dawson, President and CEO

Atlantis BioActives Inc., Colin Marr, Director Business Development

BioVectra dcl, Diagnostic Chemicals, Dr. Gary Reid, Vice President, Research Operations and Development



APPENDIX 3 – KEY INFORMANT INTERVIEWS (CONTINUED)

Novartis –Aqua Health Inc., Kira Salenius, Head of Research & Development

OvaPharm Limited, Paul Neima, CEO & Technical Innovation Manager

Progressive BioActives Inc., Shane Patelakis, Chief Executive Officer

Ocean Nutrition, Colin Barrow, Executive Director of Research and Development

Atlantic Veterinary College, Dr. Tim Ogilvie, Dean Veterinary Medicine

University of Prince Edward Island, Dr. Roger Gordon, Dean of Science

University of Prince Edward Island, Dr. Roberta MacDonald, Dean, School of Business

Holland College, Brian O’Neill, Learning Manager, Trades Strategy Project

Dalhousie University, Keith Taylor, Dean, Faculty of Science

Nova Scotia Agricultural College, Sharon Kilyanek, Plant Technologist Program

Nova Scotia Agricultural College, Brian Craise, Recruitment, Career Services

University of New Brunswick, Dave MaGee, Acting Dean of Science

New Brunswick Community College, Edmunston, Janique O’Brien, Director, Centre of Excellence in Agriculture and Biotechnology

Prince Edward Island Department of Education, Susan Graham, Manager, Student Financial Services



**APPENDIX 4 - GRADUATE INFORMATION – MARITIME PROVINCES
BIOSCIENCE RELATED PROGRAMS**

APPENDIX 4 - GRADUATE INFORMATION – MARITIME PROVINCES BIOSCIENCE RELATED PROGRAMS (CONTINUED)

Data set not finalized

Credentials Awarded by Province, Institution, Major Field of Study and Level - 1999 to 2003

Source: USIS and ESIS.

Data is not final. Preliminary numbers only.

Sum of Credentials Awarded					Grad Year						
Province	Institution	MFOS Group	MFOS Desc	Level	1999	2000	2001	2002	2003		
NB	Campus universitaire de Moncton	Agricultural and Biological Sciences	Biochemistry	B	14	19	10	13	21		
				M	2	1			2		
			Family Studies	B	5	5	7	7	8		
				M					1		
			Food & Nutrition	B	17	28	23	10	13		
				M		6	4	2			
			Food Science	B			3	4	1		
			Other Biology	B	40	27	17	17	17		
				M	5	3	4	4	5		
			Agricultural and Biological Sciences Total					83	89	68	57
		Commerce and Administration	Accounting	Accounting & Finance	B	39	23	29	35	27	
					UC/UD	1		1	1		
				Business Administration - Law Commerce, Management, Business Administration, Administrative Studies/Sciences - other	UC/UD			2			
					M		2		2	1	
				Finance	B	29	39	23	20	16	
					M	34	59	64	65	58	
				Financial Services	UC/UD			1			
					B	24	24	24	25	23	
				Hospitality/Tourism	UC/UD			1		3	
					B					2	
				Industrial Relations and Personnel Management	UC/UD		2		2	2	
					B	27	21	18	21	38	
				Marketing - Retailing	UC/UD	1	1	3		2	
					B	25	24	22	27	24	
				Operations Management	UC/UD	2		1	1		
					B	9	14	19	16	13	
				Public Administration	UC/UD	1					
					GC/GD	1	2	7	5	2	
				Public Administration - Law	M	7	8	7	13	14	
					M			1	3		
		Commerce and Administration Total					200	219	223	236	225
		Engineering and Applied Sciences	Civil Engineering	Electrical Engineering	B	15	11	7	4	8	
					B	13	15	13	14	11	
				Forestry - Other	M					3	
					B	3	6	2	4	3	
				Industry Technology	B		4	3		2	
					B	12	6	6	21	8	
				Other Engineering	M	3	3	2	1	7	
					Engineering and Applied Sciences Total					46	45
		Humanities and Related	French Language and/or Literature	B	8	7	8	9	5		
				D			1	1	1		
				M	4	3	2	5	3		
History - Other	B		10	4	8	6	5				
	M		1	4		2	1				
Other English Language and/or Literature	B		2		2	2	5				

APPENDIX 4 - GRADUATE INFORMATION – MARITIME PROVINCES BIOSCIENCE RELATED PROGRAMS (CONTINUED)

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Credentials Awarded by Province, Institution, Major Field of Study and Level - 1999 to 2003

Source: USIS and ESIS.

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Sum of Credentials Awarded				Grad Year					
Province	Institution	MFOS Group	MFOS Desc	Level	1999	2000	2001	2002	2003
NB	Campus universitaire de Moncton	Humanities and Related	Other Mass Communications Studies	B	22	11	14	11	13
			Philosophy - Other	B			1	4	4
			Religious Studies	UC/UD	3	4	26	1	25
			Translation and Interpretation	B	4	4	9	12	4
			Humanities and Related Total		54	37	71	53	66
		Mathematics and Physical Sciences	Chemistry - Other	B	6	2	7	4	
				M	2		2	2	
			Computer Science	B	12	9	2	4	
				B	13	9	20	25	21
			Computer Science - Applied	GC/GD	25				
				UC/UD	1		1		2
			Information Technology	GC/GD		16	15	24	15
	B			4			1	2	
	Other Mathematics	M				1			
		M				1			
	Other Physics	B	5	3	1	4	4		
		M				4	1		
	Mathematics and Physical Sciences Total		68	39	52	66	44		
	Campus universitaire de Moncton Total		451	429	447	456	445		
	Campus universitaire de Shippagan	Agricultural and Biological Sciences	Fisheries	UC/UD	1				
			Agricultural and Biological Sciences Total		1				
		Commerce and Administration	Accounting	UC/UD	5	3	7	1	3
				B	1	3	4	3	2
Commerce, Management, Business Administration, Administrative Studies/Sciences - other			UC/UD	9	13	5	6	4	
			UC/UD					2	
Financial Services			UC/UD					1	
			UC/UD					1	
Human Resources Management			UC/UD	5	2	1	4		
			B	1					
Industrial Relations and Personnel Management	UC/UD	2				1			
	UC/UD	11	10	16	17	3			
Commerce and Administration Total		34	31	33	33	16			
Campus universitaire de Shippagan Total		35	31	33	33	16			
Campus universitaire d'Edmundston	Commerce and Administration	Accounting	B	1					
			Other UG					1	
		Accounting & Finance	UC/UD	3	1	6	1	1	
			UC/UD		1			2	
		Commerce, Management, Business Administration, Administrative Studies/Sciences - other	B	7	6	8	7	8	
			UC/UD					2	
		Finance	UC/UD					2	
			UC/UD					2	
		Human Resources Management	UC/UD	4	6	7	4		
			UC/UD	3	2	10	4	5	
Industrial Relations and Personnel Management	UC/UD	4	1	1	8	2			
	UC/UD					2			
Commerce and Administration Total		22	17	32	25	22			
Engineering and Applied Sciences	Forestry - Other	B	15	16	25	32	29		
Engineering and Applied Sciences Total		15	16	25	32	29			
Campus universitaire d'Edmundston Total		37	33	57	57	51			
Mount Allison University	Agricultural and Biological Sciences	Biochemistry	B	14	15	16	18	12	

APPENDIX 4 - GRADUATE INFORMATION – MARITIME PROVINCES BIOSCIENCE RELATED PROGRAMS (CONTINUED)

Data set not finalized

Credentials Awarded by Province, Institution, Major Field of Study and Level - 1999 to 2003

Source: USIS and ESIS.

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Sum of Credentials Awarded				Grad Year					
Province	Institution	MFOS Group	MFOS Desc	Level	1999	2000	2001	2002	2003
NB	Mount Allison University	Agricultural and Biological Sciences	Environmental Science Other Biology	B				12	7
				B	55	56	55	60	51
				M	2	1	2	2	1
				UC/UD					1
				Agricultural and Biological Sciences Total	71	72	73	92	72
		Commerce and Administration	Commerce, Management, Business Administration, Administrative Studies/Sciences - other	B	73	78	77	109	81
				Commerce and Administration Total	73	78	77	109	81
				Engineering and Applied Sciences	Engineering General	UC/UD	12	7	3
		Engineering and Applied Sciences Total	12	7	3				
		Humanities and Related	Classics French Language and/or Literature German History - Other Other English Language and/or Literature Other languages and literatures Philosophy - Other Religious Studies Spanish	B	4	2	1	5	1
				B	11	15	9	5	7
				B		1	2	2	
				B	41	27	33	36	30
				UC/UD	1				
				B	34	32	33	37	36
				UC/UD		6			
				B	1		2	5	4
				B	4	2	6	8	7
				B	5	4	6	8	1
				B		1		2	1
		Humanities and Related Total	101	90	92	108	87		
		Mathematics and Physical Sciences	Chemistry - Other Computer Science Other Mathematics Other Physics	B	32	14	18	13	17
				M			1		
				B	3	10	7	11	7
				B	4	6	10	7	10
				B	13	7	8	10	5
				UC/UD	2				1
Mathematics and Physical Sciences Total	54	37	44	41	40				
Mount Allison University Total				311	284	289	350	280	
St. Thomas University	Humanities and Related	French Language and/or Literature History - Other Journalism (Languages and/or Literatures, Other) Other English Language and/or Literature Other languages and literatures Philosophy - Other Religious Studies Spanish	B	9	10	7	12	13	
			B	28	27	32	27	42	
			B	2	4	4	7	5	
			B	38	34	35	55	66	
			B		1				
			B	4	1	3	4	6	
			UC/UD	1					
			B	6	5	5	6	5	
			B		2	6	1	6	
			Humanities and Related Total	88	84	92	112	143	
			Mathematics and Physical Sciences	Other Mathematics	B			1	
Mathematics and Physical Sciences Total	1	1	1	1	1				
St. Thomas University Total				88	84	93	112	144	
University of New Brunswick-Fredericton	Agricultural and Biological Sciences	Biochemistry Biology-Mathematics-Statistics Biology-Physics	B	21	24	27	20	29	
			B			1		2	
			B		1	1			

APPENDIX 4 - GRADUATE INFORMATION – MARITIME PROVINCES BIOSCIENCE RELATED PROGRAMS (CONTINUED)

Data set not finalized

Credentials Awarded by Province, Institution, Major Field of Study and Level - 1999 to 2003

Source: USIS and ESIS.

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Sum of Credentials Awarded				Grad Year									
Province	Institution	MFOS Group	MFOS Desc	Level	1999	2000	2001	2002	2003				
NB	University of New Brunswick-Fredericton	Agricultural and Biological Sciences	Marine Biology Other Biology	B				1					
				B	110	70	62	51	62				
				D	4	4	2	2	3				
				M	9	11	6	6	8				
				Agricultural and Biological Sciences Total					144	110	100	79	104
		Commerce and Administration	Accounting Commerce, Management, Business Administration, Administrative Studies/Sciences - other	B				2	14	11	9		
				B	223	225	270	265	214				
				M	37	43	39	30	49				
				UC/UD	12	15	14	14	18				
				B					4	7			
				UC/UD						1			
				B						1			
				B			6	7	1	13			
				B	9	12	6	7	2				
				B							1		
				UC/UD	2	16	27	23	16				
				Commerce and Administration Total					283	319	377	357	328
		Engineering and Applied Sciences	Chemical Engineering	B		24	27	27	22	24			
				D	3	3	1	2	1				
				M	9	14	12	3	5				
				B	56	60	42	32	34				
				D	2	1	2	3	2				
				M	8	9	6	12	13				
				UC/UD			3	2		1			
				B	44	69	47	46	58				
				D	4	1	2	1	5				
				M	4	10	5	2	16				
				B	31	20	31	13	13				
				M	3	1	1						
				B	1								
				B	70	80	60	40	52				
				D	2	5	5						
				M	9	2	8	3	8				
				B	10	13	6	6	6				
				B	46	33	41	36	46				
				D	3	1	3	1					
				M	4	3	3	5	5				
				B	13	17	14	20	12				
				D	1	5	1	3					
				GC/GD					2				
				M	7	5	8	9	4				
				UC/UD	3	4	5	6	1				
				Engineering and Applied Sciences Total					357	386	332	265	308
				Humanities and Related	Classics Film French Language and/or Literature German	B		6	2	6	7	8	
		UC/UD							17	9			
		B	7			16	7	6	9				
		UC/UD							2	1			
B		2	1			1	1						

APPENDIX 4 - GRADUATE INFORMATION – MARITIME PROVINCES BIOSCIENCE RELATED PROGRAMS (CONTINUED)

Data set not finalized

Credentials Awarded by Province, Institution, Major Field of Study and Level - 1999 to 2003

Source: USIS and ESIS.

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Sum of Credentials Awarded				Grad Year								
Province	Institution	MFOS Group	MFOS Desc	Level	1999	2000	2001	2002	2003			
NB	University of New Brunswick-Fredericton	Humanities and Related	History - Other	B	19	28	36	39	57			
			History - Other	D		2	2		1			
			Leadership Studies (Interdisciplinary)	M	14	4	6	7	13			
			Literature of the West	B					17			
			Other English Language and/or Literature	B		1		1	3			
				B	29	33	37	22	34			
				D	1	1	2	1				
				M	7	10	6	16	14			
			Other Mass Communications Studies	B	2	15	8	9	9			
			Philosophy - Other	B	1	8	4	4	8			
				M		1	1					
			Russian	B		1			1			
			Spanish	B		1						
			Humanities and Related Total					87	126	117	130	185
			Mathematics and Physical Sciences		Applied Physics	Chemistry - Other	B	1	3	2		
						D	4	1	4	3	5	
						M	1	4	5	3	4	
		Computer Science			B	97	86	122	106	121		
					D	1	1		1	4		
					M	5	11	10	14	18		
					UC/UD		8	5	2	2		
		Environmental Geochemistry			B	5	1	1	2	4		
		Geology - Other			B	2	7	8	7	6		
					D	1	1	2	2	3		
					M	1	1	3	1	1		
		Geology - Physics			B					1		
		Mathematical Statistics			B				1			
					M					1		
		Mathematics - Physics			B	2	1	1	2	1		
		Multimedia			B			1	10	6		
		Other Mathematics			B	6	2	8	3	8		
					M	1		1		1		
		Other Physics			B			1	3	1		
					D		2	1				
					M	2	2	1		1		
		Physics - Chemistry	B			2		1				
		Software Development	UC/UD	3	6	7	7	9				
		Mathematics and Physical Sciences Total					140	149	195	176	208	
		University of New Brunswick - Fredericton Total					1011	1090	1121	1007	1133	
		University of New Brunswick-Saint John	Agricultural and Biological Sciences	Environmental Biology	Marine Biology	B					1	
						B	12	6	13	10	11	
					Other Biology	B	31	40	22	18	25	
						D	1		3		1	
	M				4	5	5	6				
Agricultural and Biological Sciences Total					48	51	43	34	38			

APPENDIX 4 - GRADUATE INFORMATION – MARITIME PROVINCES BIOSCIENCE RELATED PROGRAMS (CONTINUED)

Data set not finalized

Credentials Awarded by Province, Institution, Major Field of Study and Level - 1999 to 2003

Source: USIS and ESIS.

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Sum of Credentials Awarded					Grad Year						
Province	Institution	MFOS Group	MFOS Desc	Level	1999	2000	2001	2002	2003		
NB	University of New Brunswick-Saint John	Commerce and Administration	Accounting Commerce, Management, Business Administration, Administrative Studies/Sciences - other	B				10	12		
				B	94	75	80	57	67		
				M	21	48	47	33	34		
				UC/UD	7	7	6	7	17		
				Electronic Commerce	B		25	34	38	35	
					UC/UD	2	3	2	11	1	
				Hospitality/Tourism	B		2	4	9	23	
					B	10	12	11	6	8	
				Human Resources Management	UC/UD	3	1	3	4	3	
					UC/UD					1	
		Commerce and Administration Total					137	173	187	176	200
		Engineering and Applied Sciences	Electrical Engineering Mechanical Engineering Surveying Engineering	B		1					
				M				1			
				B					3		
		Engineering and Applied Sciences Total						1		4	
		Humanities and Related	French Language and/or Literature History - Other Multimedia Other English Language and/or Literature Other Mass Communications Studies Philosophy - Other	B	4	2	2	2	3		
				UC/UD		2	2	6	4		
				B	7	12	7	18	14		
				B			1	4	3		
				B	23	14	13	12	16		
				B				1			
		B	1	1	2	1	1				
		Humanities and Related Total					35	31	27	44	41
		Mathematics and Physical Sciences	Chemistry - Other Computer Science Data Analysis Mathematical Statistics Other Mathematics Other Physics	D	1						
				B			2	9	7		
				D					1		
				M	2		1	2	1		
B	1			5	5	5	2				
UC/UD				2		2	4				
B	1										
B	2				2	1	2				
D					1						
M							2				
Mathematics and Physical Sciences Total					7	7	11	19	19		
University of New Brunswick - Saint John Total					227	263	268	277	298		
NB Total					2160	2214	2308	2292	2367		
NS	Acadia University	Agricultural and Biological Sciences	Environmental Science Food & Nutrition Food Science Other Agriculture Other Biology	B		15	16	13	11		
				B	41	21	27	21	20		
				B	7	3	6		2		
				B	3						
				B	86	60	49	55	71		
				M	12	6	6	8	1		

APPENDIX 4 - GRADUATE INFORMATION – MARITIME PROVINCES BIOSCIENCE RELATED PROGRAMS (CONTINUED)

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Credentials Awarded by Province, Institution, Major Field of Study and Level - 1999 to 2003

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Sum of Credentials Awarded				Grad Year							
Province	Institution	MFOS Group	MFOS Desc	Level	1999	2000	2001	2002	2003		
NS	Acadia University	Agricultural and Biological Sciences Total			149	105	104	97	105		
		Commerce and Administration	Business Administration (Spanish, French and German)	B				1		2	
			Commerce, Management, Business Administration, Administrative Studies/Sciences - other	B	125	104	100		108	146	
				UC/UD	5	4		4		3	
			Secretarial Science	UC/UD	1						
		Commerce and Administration Total			131	108	105	112	151		
		Engineering and Applied Sciences	Engineering General	UC/UD	30	26	26		36	35	
		Engineering and Applied Sciences Total			30	26	26	36	35		
		Humanities and Related	Classics	B	1					1	
			French Language and/or Literature	B	12	9	8		8	8	
			German	B					2	2	
			History - Other	B	24	24	22		27	39	
			Other Classics, Classical and Dead Languages	B	1						
			Other English Language and/or Literature	B	29	27	43		31	26	
				M	7	6			1	1	
			Other languages and literatures	B	1						
			Philosophy - Other	B	6	7	6		3	5	
			Religious Studies	B		1					
			Spanish	B	1	1				1	
			Theological Studies (Professional programme, preparation for the ministry) - Other	1st Prof.	20	7	9		11	12	
				B	2					2	
				D	1	5		1			
				M	5	1				1	
		Humanities and Related Total			110	88	91	84	100		
		Mathematics and Physical Sciences	Chemistry - Other	B	9	10	6		12	9	
				M	1					1	
			Computer Science	B	39	47	43		53	54	
				M	3	9			3	2	
				UC/UD	5					1	
			Geology - Other	B	13	7	9		11	11	
				M		3		1		2	
			Other Mathematics	B	14	15	11		19	14	
			Other Physics	B	6	8	7		5	2	
		Mathematics and Physical Sciences Total			90	99	78	106	95		
		Acadia University Total					510	426	404	435	486
		Atlantic School of Theology	Humanities and Related	Theological Studies (Professional programme, preparation for the ministry) - Other	1st Prof.	18	18	19		20	16
					M	3	2	2		1	3
					Humanities and Related Total		21	20	21	21	19
		Atlantic School of Theology Total				21	20	21	21	19	
		Dalhousie University	Agricultural and Biological Sciences	Biochemistry	B	17	11	23		12	35
D	3				2	5		1	3		
M					3	4		4	1		
D	1										

APPENDIX 4 - GRADUATE INFORMATION – MARITIME PROVINCES BIOSCIENCE RELATED PROGRAMS (CONTINUED)

Data set not finalized

Credentials Awarded by Province, Institution, Major Field of Study and Level - 1999 to 2003

Source: USIS and ESIS.

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Sum of Credentials Awarded				Grad Year								
Province	Institution	MFOS Group	MFOS Desc	Level	1999	2000	2001	2002	2003			
NS	Dalhousie University	Agricultural and Biological Sciences	Food & Nutrition	M	2							
			Food Science	B					2			
				D			1	1				
				M		3	6	2	1			
			Marine Biology	B	28	31	27	27	45			
			Microbiology	B	17	19	29	34	24			
				D	2	3	2	3	4			
			Microbiology	M		4	3	3	3			
			Other Biology	B	161	135	129	112	109			
				D	10	7	3	7	10			
				M	8	11	12	11	15			
			Other Household Sciences and Related	B					2			
			Zoology - Other	B		3						
			Agricultural and Biological Sciences Total					252	229	244	219	252
			Commerce and Administration			Accounting	B				32	29
		Commerce, Management, Business Administration, Administrative Studies/Sciences - other				B	176	167	94	74	35	
						M	76	73	71	79	95	
		Electronic Commerce				M		1	8	25	39	
		Entrepreneurship				B				1	3	
		Finance				B				26	29	25
		Financial Services				M	68	32	60	67	83	
		Health Administration				M	13	10	19	16	14	
						UC/UD	8	16	33	18	20	
		Human Resources Management				B					4	
		Information Management				M				7	13	
		International Business Management				B				4	4	
						B				4	24	
						M				1		
		Marine Management				M			16	21	16	16
		Marketing - Retailing				B				21	33	39
		Public Administration				GC/GD			3	2		3
						M	27	31	42	49	51	
						UC/UD	2					
		Commerce and Administration Total					370	349	429	452	504	
		Engineering and Applied Sciences			Agricultural/Biological Engineering	B	16	16	32	24	35	
						D			1	1		
						M		1	2	1	1	
					Architecture	1st Prof.			23	44	41	32
						B	41	49	47	47	60	
						M	35	13		3		
					Biomedical Engineering	M			2	4	4	
Chemical Engineering	B				26	21	23	13	31			
	D					2	1	1	2			
	M				1	7	4	4	5			
Civil Engineering	B				35	28	31	26	27			

APPENDIX 4 - GRADUATE INFORMATION – MARITIME PROVINCES BIOSCIENCE RELATED PROGRAMS (CONTINUED)

Data set not finalized

Credentials Awarded by Province, Institution, Major Field of Study and Level - 1999 to 2003

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Sum of Credentials Awarded					Grad Year							
Province	Institution	MFOS Group	MFOS Desc	Level	1999	2000	2001	2002	2003			
NS	Dalhousie University	Engineering and Applied Sciences	Civil Engineering	D	1			1	2			
				M	9	7	2	16	13			
			Computer Engineering	M		14	20	21	23			
				B	33	62	47	52	56			
			Electrical Engineering	D	2	2	3	1	1			
				M	11	5	5	6	10			
				UC/UD				13				
			Engineering	B	1							
				M	2							
			Engineering General	UC/UD	1	1	61	66	91			
				D		1						
			Engineering Mathematics	M		2		1	6			
				D		2	1					
			Industrial Engineering	B	36	33	18	26	20			
				D		2	1					
				M	2	3	4	4	5			
			Mechanical Engineering	B	36	55	48	48	72			
				D	2	3	5	3	1			
				M	7	7	3	2	6			
				UC/UD			1					
			Metallurgical Engineering	B	8	8	12	6	7			
				D				1				
				M	1			1				
			Mining Engineering	B	23	21	15	7	2			
				M		2	1	1				
			Naval Architecture and Marine Engineering	M					1			
				M					2			
			Petroleum Engineering	M					2			
				M					2			
			Engineering and Applied Sciences Total					329	389	433	442	513
					Humanities and Related	Classics	B	2	5		1	5
							M	3	2	5	2	4
						French Language and/or Literature	B	16	16	17	23	13
							D	2				
						German	M	3	5	1	4	2
							B	3	4	2	1	2
						History - Other	M	7	6	5	5	6
							B	80	69	62	56	52
							D	2	2	2	1	4
						History of Science and Technology	M	4	5	3	5	3
							B					1
							M	31	19	29	26	40
						Linguistics	B		3	4	1	1
						Other Classics, Classical and Dead Languages	B	6				
							D	1				
Other English Language and/or Literature	B	58				49	43	35	57			
	D	1				1	4	3	4			
	M	14				5	16	4	12			
	M											

APPENDIX 4 - GRADUATE INFORMATION – MARITIME PROVINCES BIOSCIENCE RELATED PROGRAMS (CONTINUED)

Data set not finalized

Credentials Awarded by Province, Institution, Major Field of Study and Level - 1999 to 2003

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Sum of Credentials Awarded					Grad Year								
Province	Institution	MFOS Group	MFOS Desc	Level	1999	2000	2001	2002	2003				
NS	Dalhousie University	Humanities and Related	Other languages and literatures	B	7								
			Philosophy - Other	B	20	12	11	21	18				
				D	1		1						
				M	4	8	8	6	12				
			Religious Studies	B	4	5	2	6	2				
			Russian	B		3	3	1	4				
			Spanish	B	13	12	9	9	9				
			Humanities and Related Total					282	231	227	210	251	
			Mathematics and Physical Sciences	Chemistry - Other	B	26	33	34	32	30			
				Chemistry - Other	D	8	3	13	5	5			
		Chemistry - Other		M	3	6	4	4	7				
		Computer Science		B	104	98	87	75	107				
				D	2		1	1	2				
				M	122	59	26	32	32				
		Computer Science - Applied		M				1	10				
		Geology - Other		B	16	17	25	14	15				
				D	3	1	2	2	6				
				M	5	1	2	3	2				
		Mathematical Statistics		B		3	7	2	3				
				D		3							
				M		3	3	2	2				
		Other Mathematics		B	25	31	24	31	32				
				D	2		1	6					
				M	10	7	5	3	4				
		Other meteorology		UC/UD	1	8	6	4	9				
		Other Oceanography and Water Studies		D	5	5	1	3	1				
				M	5	5	2	5	5				
		Other Physics		B	8	8	9	18	19				
				D	3		1	2	3				
				M	1	3	5	3	4				
		Mathematics and Physical Sciences Total					349	294	258	248	298		
		Dalhousie University Total					1582	1492	1591	1571	1818		
		Mount Saint Vincent University		Agricultural and Biological Sciences	Consumer Studies	B	1						
					Family Studies	B	9	8	6	3	4		
					M				1	2			
			Food & Nutrition		B	35	21	28	26	37			
					M			4	2	4			
			Other Biology		B	9	10	9	5	11			
			Other Household Sciences and Related		B	2		2		1			
			Agricultural and Biological Sciences Total					56	39	49	37	59	
			Commerce and Administration		Commerce, Management, Business Administration, Administrative Studies/Sciences - other	B	71	74	51	77	81		
						UC/UD	68	64	53	68	63		
					Hospitality/Tourism	B	30	24	24	19	28		
						UC/UD		5	6	9	8		
					Information Technologies/Computer Studies	B	10	28	14	8	9		

APPENDIX 4 - GRADUATE INFORMATION – MARITIME PROVINCES BIOSCIENCE RELATED PROGRAMS (CONTINUED)

Data set not finalized

Credentials Awarded by Province, Institution, Major Field of Study and Level - 1999 to 2003

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Sum of Credentials Awarded					Grad Year						
Province	Institution	MFOS Group	MFOS Desc	Level	1999	2000	2001	2002	2003		
NS	Mount Saint Vincent University	Commerce and Administration	Information Technologies/Computer Studies	UC/UD			4	6	9	11	
		Commerce and Administration Total				179	199	154	190	200	
		Humanities and Related	French Language and/or Literature	B		11	2	7	2	4	
				UC/UD		2		5		3	
			History - Other	B		12	13	17	24	23	
				UC/UD			1		1		
			Other English Language and/or Literature	B		13	15	8	10	17	
				Philosophy - Other	B		1		1	1	3
			Public Relations Management	B		67	55	54	52	54	
			Religious Studies	B		3	1	1	4	2	
		Spanish	B						1		
		Humanities and Related Total				109	87	93	95	106	
		Mathematics and Physical Sciences	Chemistry - Other	B		4	5	3	2	1	
				UC/UD				1			
			Other Mathematics	B		7	8	3	5	10	
				UC/UD					1		
		Mathematics and Physical Sciences Total				11	14	7	7	11	
		Mount Saint Vincent University Total					355	339	303	329	376
		Nova Scotia Agricultural College	Agricultural and Biological Sciences	Agribiology: Environmental	B		23	17	12	8	14
					M			1	4	4	6
Agricultural Business	B				3	1	5	2	6		
	Agricultural Chemistry			B		3	1	5	3	2	
Agricultural Mechanization	M					1	2	1			
	B				6	5	4	3	3		
Agricultural Science	B					1	2				
	Animal Science			B		53	39	42	37	27	
Aquaculture	M				8	1	1	6	3		
	B				16	16	7	5	3		
Other Agriculture	M				1						
	M				1						
Other Biology	B					3	1	2			
	Pest Management			B		10	10	10	7	6	
Plant Science	M				2	1	1	5	2		
	B				2						
Agricultural and Biological Sciences Total						128	97	96	83	72	
Engineering and Applied Sciences	Agricultural/Biological Engineering			B		10	11	8	12	2	
				UC/UD		1	1				
	Landscape Horticulture			B		2	1	5	6	8	
Engineering and Applied Sciences Total				13	13	13	18	10			
Nova Scotia Agricultural College Total					141	110	109	101	82		
Saint Mary's University	Agricultural and Biological Sciences	Forensic Science	UC/UD					7	8		
			B		59	73	53	46	50		
		Other Biology	UC/UD		2		2	1			
			B								
Agricultural and Biological Sciences Total				61	73	55	54	58			
Commerce and Administration	Accounting	B		12	33	64	67	81			

APPENDIX 4 - GRADUATE INFORMATION – MARITIME PROVINCES BIOSCIENCE RELATED PROGRAMS (CONTINUED)

Data set not finalized

Credentials Awarded by Province, Institution, Major Field of Study and Level - 1999 to 2003

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Sum of Credentials Awarded				Grad Year									
Province	Institution	MFOS Group	MFOS Desc	Level	1999	2000	2001	2002	2003				
NS	Saint Mary's University	Commerce and Administration	Commerce, Management, Business Administration, Administrative Studies/Sciences - other	B	351	254	290	290	297				
				M	116	120	109	98	111				
				UC/UD		2							
				UC/UD	26	151	121	142	158				
		Commerce and Administration Total					505	560	584	597	647		
		Engineering and Applied Sciences		Engineering General	UC/UD	27	15	20	26	30			
		Engineering and Applied Sciences Total					27	15	20	26	30		
		Humanities and Related		Classics	B	2	3	1	1	1			
				French Language and/or Literature	B	12	10	11	17	18			
				German	UC/UD			1	1	1			
				History - Other	B	27	22	27	29	31			
					M	2	2	2		2			
					UC/UD	1	1	1					
				Linguistics	B		1		3	1			
				Other Classics, Classical and Dead Languages	B		2						
				Other English Language and/or Literature	B	78	67	83	74	81			
					UC/UD	1	1	2	1	1			
				Other languages and literatures	B		2						
				Philosophy - Other	B	10	10	15	8	10			
					M					1			
				Religious Studies	B	2	8	1	5	5			
				Spanish	UC/UD				1	3			
		Humanities and Related Total					135	129	144	140	155		
		Mathematics and Physical Sciences		Astrophysics and Astronomy	M	2	1	1		1			
				Chemistry - Other	B	14	10	12	12	6			
				Computer Science	B	19	9	4	7	17			
				Computer Science and Business Administration	B	1	8	6	6	16			
				Geology - Other	B	5	21	7	13	9			
					UC/UD	2							
				Other Mathematics	B	27	5	5	8	7			
					UC/UD		9						
				Other Physics	B	9	8	4	2	6			
		Mathematics and Physical Sciences Total					79	71	39	48	62		
		Saint Mary's University Total					807	848	842	865	952		
		St. Francis Xavier University		Agricultural and Biological Sciences	Aquaculture and Fisheries	B		3	9	2	1		
					Food & Nutrition	B	29	27	27	16	11		
						UC/UD					2		
						Other Biology	B	50	41	35	58	48	
							M			2	1		
				Agricultural and Biological Sciences Total					79	71	73	77	62
				Commerce and Administration		Accounting	B	3	25	15	14	19	
						Commerce, Management, Business Administration, Administrative Studies/Sciences - other	B	146	70	69	56	83	
						Information Management	B	5	80	78	58	52	
						Management	B	1	18	8	21	18	
		Commerce and Administration Total					155	193	170	149	172		

APPENDIX 4 - GRADUATE INFORMATION – MARITIME PROVINCES BIOSCIENCE RELATED PROGRAMS (CONTINUED)

Data set not finalized

Credentials Awarded by Province, Institution, Major Field of Study and Level - 1999 to 2003

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Sum of Credentials Awarded				Grad Year							
Province	Institution	MFOS Group	MFOS Desc	Level	1999	2000	2001	2002	2003		
NS	St. Francis Xavier University	Engineering and Applied Sciences	Engineering General	UC/UD	39	20	30	20	20		
		Engineering and Applied Sciences Total				39	20	30	20	20	
		Humanities and Related	French Language and/or Literature	History - Other	Other English Language and/or Literature	B	9	6	7	10	13
						B	36	27	19	33	36
						B	54	64	47	63	62
						B	2	1	5	1	8
						B	3	5	1	4	8
						UC/UD	6	24	49	45	56
		Humanities and Related Total				110	127	128	156	183	
		Mathematics and Physical Sciences	Chemistry - Other			B	26	13	26	20	15
						M	1	1			
		Mathematics and Physical Sciences	Computer Science	Geology - Other	Other Mathematics	B		8		11	12
						B	9	7	12	7	12
						M			1	1	
						B	24	13	20	9	10
	B					5	5	3	3	4	
	Mathematics and Physical Sciences Total				65	47	62	51	53		
	St. Francis Xavier University Total				448	458	463	453	490		
	Université Sainte-Anne	Commerce and Administration	Business Computing	Commerce, Management, Business Administration, Administrative Studies/Sciences - other	B					1	
					B	12	7	11	5	10	
					UC/UD	1			1	1	
		Commerce and Administration Total				13	7	11	6	12	
		Humanities and Related	French Language and/or Literature	History - Other	Other English Language and/or Literature	B	6	3	7	6	2
B						1	1	3	1		
B						4	1		1	1	
Humanities and Related Total				11	5	10	8	3			
Université Sainte-Anne Total				24	12	21	14	15			
University College of Cape Breton	Agricultural and Biological Sciences	Other Biology		B	29				24		
	Agricultural and Biological Sciences Total				29				24		
	Commerce and Administration	Commerce, Management, Business Administration, Administrative Studies/Sciences - other	Community Economic Development		B	89	97	94	72	80	
					UC/UD	20					
					M		7	3	4	3	
	Commerce and Administration Total				109	104	97	76	83		
	Engineering and Applied Sciences	Chemical Technology	Engineering General	Environmental Health Technology	B					2	
					UC/UD	12	6	17	17	4	
					B	15	11	17	14	20	
					B	34	17	25	18	25	
B									12		
B					2	1	2		30		
B					5						
Engineering and Applied Sciences Total				63	35	61	49	98			

APPENDIX 4 - GRADUATE INFORMATION – MARITIME PROVINCES BIOSCIENCE RELATED PROGRAMS (CONTINUED)

Data set not finalized

Credentials Awarded by Province, Institution, Major Field of Study and Level - 1999 to 2003

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Sum of Credentials Awarded					Grad Year						
Province	Institution	MFOS Group	MFOS Desc	Level	1999	2000	2001	2002	2003		
NS	University of King's College	Humanities and Related	History - Other	B		6				9	
			Other English Language and/or Literature	B		8				8	
			Other Mass Communications Studies	B							2
			Philosophy - Other	B		1					
		Humanities and Related Total					15				19
		Mathematics and Physical Sciences	Chemistry - Other	B		1					
			Computer Science	B		2					
			Computer System Development	B					1		1
			Geographical Information Systems	B							1
			Information Management	B		2	3	14	14	15	
	Networking Systems		B					5		2	
	Other Mathematics	B		1							
	Mathematics and Physical Sciences Total					6	3	20	18	18	
	University College of Cape Breton Total					222	142	178	143	242	
	University of King's College	Agricultural and Biological Sciences	Biochemistry	B			1		2		
			Marine Biology	B			3		1	2	
			Microbiology	B					1		1
			Other Biology	B		7	10	7	7	3	
		Agricultural and Biological Sciences Total					7	14	11	9	6
		Humanities and Related	Classics	B		7	13	11	4	5	
French Language and/or Literature			B		7	2	6	2	2		
German			B		1	2	1		1		
History - Other			B		32	26	37	16	11		
History of Science and Technology			B						4		
Journalism (Languages and/or Literatures, Other)			B		47	55	61	55	57		
Linguistics			B				1		1		
Other English Language and/or Literature			B		14	27	16	20	28		
Philosophy - Other			B		4	2	5	4	2		
Religious Studies			B		1	1		1	2		
Russian			B		1	1		1			
Spanish			B		2	4	2		2		
Humanities and Related Total					116	134	141	104	112		
Mathematics and Physical Sciences		Chemistry - Other	B		1		1		2	1	
		Computer Science	B		1			1			
	Geology - Other	B		1		2			2		
	Other Mathematics	B		2	3		1		2		
	Other Physics	B						1	3		
Mathematics and Physical Sciences Total					5	6	5	3	8		
University of King's College Total					128	154	157	116	126		
NS Total					4238	4001	4089	4048	4606		
PEI	University of Prince Edward Island	Agricultural and Biological Sciences	Family Studies	B		1		1	3	5	
			Food & Nutrition	B		2	8	5	11	6	
			Other Biology	B		61	65	71	41	52	
			Other Household Sciences and Related	B		10	3			1	
			Veterinary Medicine	1st Prof.		50	52	60	59	59	

APPENDIX 4 - GRADUATE INFORMATION – MARITIME PROVINCES BIOSCIENCE RELATED PROGRAMS (CONTINUED)

Data set not finalized

Credentials Awarded by Province, Institution, Major Field of Study and Level - 1999 to 2003

Source: USIS and ESIS.

Data is not final. Preliminary numbers only.

Sum of Credentials Awarded					Grad Year					
Province	Institution	MFOS Group	MFOS Desc	Level	1999	2000	2001	2002	2003	
PEI	University of Prince Edward Island	Agricultural and Biological Sciences	Veterinary Sciences	D	1	4	1	1	6	
				M	10	10	4	12	11	
		Agricultural and Biological Sciences Total			134	143	142	127	140	
		Commerce and Administration	Commerce, Management, Business Administration, Administrative Studies/Sciences - other	B	60	79	91	78	90	
				B	3	3	4	6		
				Hospitality/Tourism	16	12	25	17	12	
				Public Administration	16	12	25	17	12	
		Commerce and Administration Total			76	94	116	99	108	
		Engineering and Applied Sciences	Engineering General	UC/UD	13	25	28	15	19	
		Engineering and Applied Sciences Total			13	25	28	15	19	
		Humanities and Related	French Language and/or Literature	B	5	3	6	3	10	
				History - Other	B	33	27	17	28	44
					Other English Language and/or Literature	B	15	27	24	37
				Philosophy - Other	B	1	4	6	5	1
				Religious Studies	B	3	1	3	3	4
		Humanities and Related Total			57	62	56	73	86	
		Mathematics and Physical Sciences	Chemistry - Other	B	17	8	11	10	18	
				Computer Science	B	5	3	6	11	8
				Other Mathematics	B	3	3	1	3	3
				Other Physics	B	5	2	3	3	1
Mathematics and Physical Sciences Total			30	16	21	27	30			
University of Prince Edward Island Total					310	340	363	341	383	
PEI Total					310	340	363	341	383	
Grand Total					6708	6555	6760	6681	7356	

APPENDIX 5 – INVENTORY OF WORKERS

RESEARCH					
Positions by Job Title	Education Level	Field of Study	Discipline/ Specialization	Years of Experience	Number of FTE's as of 05/31/05
Researcher	Bachelor's Level	Science	N/A	12	1
Extraction Technologist	Bachelor's	Chemistry	Biochemistry	1	1
Extraction Technologist	Bachelor's	Chemistry	Biochemistry	7	1
R&D Technician	BSc	Chemistry	Biochemistry	2	1
MTS-5 Lab Technician	BSc	Science	Molecular Biology/Nutrition	10	0.75
Field Workers	BSc	Science	Biology	0 to 1	4
Technician	BSc	Science	Forestry	20	1
Technician	BSc	Science	Home Economics	13	1
Technician	BSc	Science	Biology	26	1
Grad student	BSc		Aquaculture	4	1
Grad student	BSc		Aquaculture	2	1
Technician	BSc				1
Student	BSc				0.25
Student Technician	BSc				0.25
Student Technician	BSc				0.25
Student Technician	BSc				0.25
Applications Development	BSc, RT	Science	Clinical chemistry	16 to 18	2
Technician	Diploma	Science	Horticulture	25	1
Technician	Diploma		Aquaculture	15	1
Field Technician	Grade 12		Aquaculture	5	1
Technician	H.S.		various	8	1
Laboratory Technician	Masters	Science	Biochemistry	1	1
Laboratory Technician	Masters	Science	Biochemistry	1	1
Research Scientist	Masters	Veterinary medicine	Epidemiology	6	1
Research Scientist	Masters	Veterinary medicine	Immunology	15	1
Sr. Extraction Tech.	Master's	Chemistry	Biochemistry	18	1
Technical Officers	Masters, Bachelors, Diploma	Science	Molecular Biology, Nutrition	3 to 5	3
Research Tech	MSc	Science	Biology.	1 to 3	6
Chemist.	MSc	Science	Natural Products Chemistry	6	1
Technical Manager	MSc				1
Technician	MSc				1
Postdoctoral Fellow	PhD	Science	N/A	1	1
Group Leader	PhD	Science	Chemistry	7	1
Senior Chemist, Production	PhD	Science	Chemistry	23	1
PDF	PhD	Science	Food Chemistry	2 to 4	0.5
Research Scientist	PhD	Science	Parasitology	26	1
Research Scientist	PhD	Science	Plant Pathology	30	1
Research Scientist	PhD	Science	Plant Pathology	38	1
Research Scientist	PhD	Science	Weeds	40	1
			Biology, NeuroScience, NutriScience		
Research Officers	PhD	Science		5 to 10	4
Research Scientist	PhD	Veterinary medicine	Clinical pathology	2	1
Research Scientist	PhD	Veterinary medicine	Molecular biology.	5	1
Research Scientist	PhD				0.75
Lead Researcher	PhD, DVM				1
Research Scientist	PhD, DVM				0.5
Professors	PhD, Masters	Business		20	1
Research Scientists	PhD, MSc, Bsc	Science	Chemistry, Biology, Biochemistry	1 to 27	19
Director of Research	PhD, MSc	Science	Chemistry	12 to 32	5
Food Technologist	Bachelor's	Food Science	Food Science	2	1
Chemical Engineer	Master's	Chemical Engineering	Process & Environmental	16	1

APPENDIX 5 – INVENTORY OF WORKERS (CONTINUED)

RESEARCH					
Positions by Job Title	Education Level	Field of Study	Discipline/ Specialization	Years of Experience	Number of FTE's as of 05/31/05
Project Manager Natural Products Extraction	Master's	Chemistry.	Biochemistry	25	1
Food Scientist	Master's	Food Science	Food Science	18	1
Food Scientist	Master's	Food Science	Chemical Engineering Biosystems Engineering	21	1
Natural Products Biochemist	PhD	Chemistry	Biochemistry	9	1
Ultrasonics Chemist	PhD	chemistry	Sonochemistry	35	1
Food Science Mgr	PhD	Chemistry, Engineering	Biochemical Engineering Food Scienc	12	1
Food Scientist / Engineer	PhD	Food Science	Bioprocessing Nutritional Sciences	22	1
Manager R&D / QC	MSc	Chemistry	Biochemistry	5	1
Sr. Microbiologist / Laboratory Mgr	Master's	Biology	Microbiology	16	1
Research Secretariat	Masters Degree	Science	Animal Science / Aquaculture / Pathology Micro	15	1
Director	DVM, MSc				1
Plant Manager	Grade 12			5	1
Manager	MSc	Science - Biology	Biochemistry lab	30	1
TOTAL RESEARCH POSITIONS					94.5
PRODUCT/PROCESS DEVELOPMENT					
Positions by Job Title	Education Level	Field of Study	Discipline/ Specialization	Years of Experience	Number of FTE's as of 05/31/05
Ag. / Bio Project Officer	Bachelor's Level	Business	Agriculture	15	1
Tech IV	BSc / RT	Bacteriology	Bacteriology lab	15	3
Tech IV	BSc / RT	Biology	Parasitology lab	15	1
Tech IV	BSc / RT	Chemistry	Chemistry lab	10	2
Tech IV	BSc / RT	Histology	Histology	15	3
Tech IV	BSc / RT	Science - Hematology	Hematology lab	20	2
Tech IV	BSc / RT	Virology	Virology lab	5	3
Product Development Coordinator	Diploma	Administration	N/A	2	1
Tech III	Grade 12	Post Mortem	Autopsy	15	2
ADS - Pathology	PhD	Aquatics	Aquatics	15	1
Virologist	PhD	Science	Virology.	25	1
Projects Quality Coordinator	Grade 12			14	1
Project Technologist	Grade 12			14	1
Project Technologist	Grade 12			15	1
TOTAL PRODUCT/PROCESS DEVELOPMENT POSITIONS					23
QUALITY CONTROL/QUALITY ASSURANCE					
Positions by Job Title	Education Level	Field of Study	Discipline/ Specialization	Years of Experience	Number of FTE's as of 05/31/05
QC Supervisor	BSc	Chemistry	Chemistry	2	1
QC Technician	BSc	Chemistry	Chemistry	2	3
QA Coordinator	BSc	Science	Chemistry	6	1
Coordinator	BSc / RT	Science - QC	Biochemistry / QC	6	1
QC Mgr, Asst. Mgr	BSc, RT	Science	Chemistry, Biology, Clinical Chemistry	20 to 25	2
Reg. Affairs Coord.	BSc, RT	Science	Biology, Clinical Chemistry	8 to 25	2
Analytical Coordinator	Chem Tech	Science	Chemistry	6	1
Env. & Reg. Coord.	Env. Tech	Science	Environmental	1	1
QA Operations Mgr	MSc	Science	Environment	12	1
QA Validations Mgr	PhD	Science / Chemistry	Chemistry	7	1
QC Chemists	PhD, MSc, BSc, Chem Tech	Science	Chemistry / Biology	1 to 16	12
QA Document Coord.	Secretarial Diploma	Science	Secretarial	4 to 20	2
QA / QC Coordinator	Bachelor's	Science	Chemistry	1	1
TOTAL QUALITY CONTROL/QUALITY ASSURANCE POSITIONS					29

APPENDIX 5 – INVENTORY OF WORKERS (CONTINUED)

MANUFACTURING & PRODUCTION					
Positions by Job Title	Education Level	Field of Study	Discipline/ Specialization	Years of Experience	Number of FTE's as of 05/31/05
Production Manager	Bachelor's	Strategic Mgmt		4	1
Production Manager	BEng, BSc, Diploma	Science	Chemical Engineering, Chemistry	8 to 29	3
SCM	BEng, H.S.	Industrial Engineering		1 to 21	33
Production Supervisor	BSc	Chemistry	Chemistry	5	1
Engineering Assistant	BSc	Engineering	Electrical	2	1
Resource Manager	BSc	Forestry	Forestry	3	1
Project Manager	BSc	Science	Chemistry	21	1
Production Techs	BSc, Diploma, H.S.	Science, H.S.	Chemistry, Biology, Biotech	1 to 20	46
Maintenance	Certificate	Machinery Repair		2	2
Team Leader	Certificate		Chem Manufacturing	2	4
Chem Operator	Certificate		Chem Manufacturing	0	16
Building / Plant Coord	Diploma	Electro / Mechanical		15	0.5
Maintenance Techs	Diploma	Technology	Power Eng., Elect. / Mech.	1 to 20	12
Inventory Coordinator	Diploma		Inventory Control	2	1
Formulation Blender	Diploma, Grade 12 or less	Carpentry	N/A	1 month to 2 years	4
Warehouse Manager	Grade 12			2	1
Equipment Manager & Manufacturing Technician	Grade 12 or less	N/A	N/A	6	1
Primary Encapsulator Operator	Grade 12 or less	N/A	N/A	3 months to 2 years	7
Production Worker	Grade 12 or less	N/A	N/A	1 month to 2.5 years	42
Production Cleaner	Grade 12 or less	N/A	N/A	1	1
Shift Supervisor	Grade 12 or less	N/A	N/A	1 to 4	4
Shipper / Receiver	Grade 12 or less	N/A	N/A	2	1
Warehouse Person	Grade 12 or less	N/A	N/A	3 months to 12 years	4
Janitor	H.S.			1 to 8	4
Director of Production	MSc	Chemistry	Biochemistry	5	1
Manager of Operations	MSc	Chemistry	Biochemistry	5	1
Dir of Manufacturing	MSc	Science	Biochemistry	8	1
Production Engineer	P. Eng	Engineering	Mechanical	3	1
Shift Supervisor				10 to 15	2
Trainer	Diploma	Hotel Mgmt	N/A	7	1
OH&S Manager					1
TOTAL MANUFACTURING & PROCESSING POSITIONS					199.5
PRODUCT & CUSTOMER SUPPORT					
Positions by Job Title	Education Level	Field of Study	Discipline/ Specialization	Years of Experience	Number of FTE's as of 05/31/05
Administrative Support	Grade 12	Secretarial	Secretarial & Customer Support	10	4
REGULATORY AFFAIRS					
Positions by Job Title	Education Level	Field of Study	Discipline/ Specialization	Years of Experience	Number of FTE's as of 05/31/05
Research Associate	Bachelor's	Science		9	1
Strategic Advisor	Master's	MBA		15	0.5
TOTAL REGULATORY AFFAIRS					1.5

APPENDIX 5 – INVENTORY OF WORKERS (CONTINUED)

BUSINESS DEVELOPMENT/INVESTOR RELATIONS					
Positions by Job Title	Education Level	Field of Study	Discipline/ Specialization	Years of Experience	Number of FTE's as of 05/31/05
Manager, Policy & Innovation	Bachelor's	Business		20	0.5
AIF Coordinator	Bachelor's	Business		21	1
Director General	Master's	Business		18	0.5
Economic Development Officer, Life Sciences	Master's	Science	Plant Science, Plant Protection	15	1
Project Officer	Bachelor's Level	Business / Marketing	N/A	7	1
Director of Business Development	MSc	Science	Physio / Pharm	5	1
Dir., Research Support Opportunities Development	Master's	MBA		10	0.3
Account Executive: Life Science	Doctoral Degree	Science	Food / Agriculture	25	1
TOTAL BUSINESS DEVELOPMENT/INVESTOR RELATIONS POSITIONS					6.3
CEO/PRESIDENT					
Positions by Job Title	Education Level	Field of Study	Discipline/ Specialization	Years of Experience	Number of FTE's as of 05/31/05
CEO	Bachelor's	Science	Microbiology & Immunology	7	1
President	Bachelor's	Science	Microbiology & Immunology	7	1
CEO	Diploma	Nursing		16	1
President	LLB	Law	Law / Accounting	25	1
Chairman	PhD	Science	Chemistry	50	1
CEO	PhD	Science	Chemistry	35	1
Director General	PhD	Science / Business	Oceanography / Biology	25	0.4
CEO	Masters	Business	International business	21	1
TOTAL CEO/PRESIDENT POSITIONS					7.4
EXECUTIVE MANAGEMENT (VP'S)					
Positions by Job Title	Education Level	Field of Study	Discipline/ Specialization	Years of Experience	Number of FTE's as of 05/31/05
Executive Director	Bachelor's	Science	Biology	21	1
VP, COO, Exec Mgmt	PhD to B.Eng, B.Sc	Science, Engineering & Business		15 to 30	7
Chief Operating Officer - Innovation Manager	Masters	Science	Food Science	7	1
Executive Director	PhD	Food Science	Enzymes, Microbiology	30	1
Project Manager	BA	Economics	Economics	25	1
Chairman of department	Master of Vet. Science, MBA, and DVM	Veterinary medicine	Small animal internal medicine	22	1
TOTAL EXECUTIVE MANAGEMENT (VP) POSITIONS					12
FINANCE					
Positions by Job Title	Education Level	Field of Study	Discipline/ Specialization	Years of Experience	Number of FTE's as of 05/31/05
Controllers	BBA, CA	Business	Accounting	1	2
Accounting Technician	Diploma	Accounting		1	1
Secretary	Diploma	Administration	Medical / Legal	16	0.5
Accountants	Diploma	Business	Accounting	1 to 27	4
Manager - Finance & Admin	Bachelor's	Business	Accounting	4	1
Office & Accounts Division Manager	Diploma & Certificate	Business - Accounting & Admin	Accounting & Bookkeeping (College / Compu College)	9	1
TOTAL FINANCE POSITIONS					9.5

APPENDIX 5 – INVENTORY OF WORKERS (CONTINUED)

MARKETING & SALES					
Positions by Job Title	Education Level	Field of Study	Discipline/ Specialization	Years of Experience	Number of FTE's as of 05/31/05
Communications Officer	Bachelor's	Public Relations		10	1
Marketing & Sales	BBA, MBS, MSc, RT, H.S.	Business	Marketing, Clinical Chemistry, High School, Sales	1 to 13	15
International Marketing Intern	BSc	Science, BA	Management major	<1	1
Sales & Marketing Manager	Diploma	Science	Vet Science	25 + (sales)	0.5
Manager - Customer Service & Business Development	Bachelor's	Science	Environmental	5	1
TOTAL MARKETING & SALES POSITIONS					18.5
HUMAN RESOURCES					
Positions by Job Title	Education Level	Field of Study	Discipline/ Specialization	Years of Experience	Number of FTE's as of 05/31/05
HR Generalist	Bachelor's	Business	HR	5 to 10	0.4
Staffing & HR Planning Specialist	Bachelor's	Business	HR	2	1
HR Coordinators	BBA, Bed	Business	HR	7 to 11	2
TOTAL HUMAN RESOURCE POSITIONS					3.4
MANAGEMENT INFORMATION SYSTEMS/INFORMATION TECHNOLOGY					
Positions by Job Title	Education Level	Field of Study	Discipline/ Specialization	Years of Experience	Number of FTE's as of 05/31/05
IT Supervisor	Bachelor's	IT		5	0.5
Analyst Programmer	Diploma	computers	Application programmer	10	1
Systems Admin Mgr	Diploma	CS	IT	3	1
Computer Support	Diploma	CS	IT	1 to 8	2
IT Support	Diploma	IT		2	1
TOTAL MIS/IT POSITIONS					5.5
ADMINISTRATION					
Positions by Job Title	Education Level	Field of Study	Discipline/ Specialization	Years of Experience	Number of FTE's as of 05/31/05
Accountant	BA	Business	Accounting	2	1
Project Manager	Bachelor's	Business / Public Admin	Project Management	10	1
Associate Director	Bachelor's	Science	Mathematics	31	0.6
Purchasing	BBA, BSc, Diploma	Business / Science		1 to 20	5
Supply Chain Coordinator	Diploma	Administration	N/A	2	1
Materials Planning Clerk	Diploma	Administration	N/A	0	1
A/P and Inventory Clerk	Diploma	Administration	N/A	6 months	1
Office Administrator	Diploma	Administration	N/A	2.5	1
Data Entry Clerk	Diploma	Administration	N/A	1.5	1
Admin Assistants	Diploma	Business	Office Admin	1 to 13	4
Administration Support	Diploma	N/A	N/A	20	1
Program Coordinator	Diploma				1
Administrative Assistant	Grade 12	High School		5	1
Administrative Assistant	Grade 12 or less	N/A	N/A	0	1
Building Cleaner	Grade 12 or less	N/A	N/A	0	1
TOTAL ADMINISTRATION POSITIONS					21.6

APPENDIX 5 – INVENTORY OF WORKERS (CONTINUED)

OTHER					
Positions by Job Title	Education Level	Field of Study	Discipline/ Specialization	Years of Experience	Number of FTE's as of 05/31/05
Teaching and Clinical Services					
Cardiologist	DVM	Veterinary medicine	Small and large animal cardiology	10	1
Small animal internist	Masters & DVM	Veterinary medicine	Small animal internal medicine	3 to 31	4
Small animal surgeon	Masters & DVM	Veterinary medicine	Small animal surgery	4 to 30	3
Radiologist	Masters & DVM	Veterinary medicine	Radiology	4 to 20	2
Ophthalmologist	Masters & DVM	Veterinary medicine	Small and large animal ophthalmology	10	1
Anesthesiologist	Masters & DVM	Veterinary medicine	Small and large animal anesthesiology	4 to 30	3
Indicated Involved in more than 10 Occupational Categories					
President & CEO	None	None	None	5	1
VP of Operations	Masters	English & Psychology		35 to 40	1
TOTAL OTHER POSITIONS					16
TOTAL NUMBER OF POSITIONS - ALL OCCUPATIONAL AREAS					451.7

APPENDIX 6 – SKILLS RANKING BY OCCUPATIONAL AREA AND EDUCATION LEVEL

APPENDIX 6 – SKILLS RANKING BY OCCUPATIONAL AREA AND EDUCATION LEVEL (CONTINUED)

	RESEARCH				
	Doctoral	Master's	Bachelor	Diploma/ Certificate	Grade 12 or less
Technical Skills					
Clinical research	47%	37%	21%	5%	0%
Informatics (bio-informatics and molecular modeling)	26%	32%	26%	0%	0%
Laboratory and instrumentation techniques	37%	47%	63%	32%	0%
Good laboratory practices	42%	47%	63%	32%	5%
Information technology management	32%	32%	37%	5%	0%
Development process	37%	42%	32%	5%	0%
Good manufacturing practices	16%	21%	32%	11%	0%
Complementary Skills					
Intellectual property protection and management	53%	47%	21%	5%	0%
Marketing strategies	16%	26%	26%	5%	0%
Financial management	26%	32%	26%	5%	0%
Quality assurance, quality control	47%	47%	47%	16%	5%
Business affairs	21%	37%	16%	0%	0%
Strategic alliance development and management	42%	32%	16%	0%	0%
National and international regulatory acumen	37%	26%	16%	5%	0%
Relations with investors	21%	21%	16%	0%	0%
Business promotion	26%	32%	21%	5%	0%
Market research	21%	26%	16%	5%	0%
Product development process	37%	47%	21%	11%	0%
Project management skills	42%	47%	32%	11%	0%
Business software	21%	26%	21%	5%	0%
Non-Technical Skills					
Leadership	58%	53%	16%	0%	0%
Verbal and written communication skills (English)	53%	58%	63%	21%	5%
Verbal and written communication skills (Other than English)	5%	5%	11%	0%	0%
Team work	53%	58%	68%	26%	16%
Problem solving	53%	63%	58%	21%	5%
Creative thinking	58%	63%	47%	11%	5%
Critical thinking	53%	68%	47%	16%	5%
Attention to detail	53%	68%	53%	26%	16%
Results oriented	53%	63%	58%	21%	11%
Client focused	37%	47%	37%	11%	0%
Flexibility, adaptability	53%	58%	63%	26%	16%

APPENDIX 6 – SKILLS RANKING BY OCCUPATIONAL AREA AND EDUCATION LEVEL (CONTINUED)

	PRODUCT/PROCESS DEVELOPMENT				
	Doctoral	Master's	Bachelor	Diploma/ Certificate	Grade 12 or less
Technical Skills					
Clinical research	0%	16%	0%	0%	0%
Informatics (bio-informatics and molecular modeling)	5%	11%	11%	0%	0%
Laboratory and instrumentation techniques	5%	16%	26%	16%	0%
Good laboratory practices	5%	11%	26%	16%	0%
Information technology management	5%	5%	16%	5%	0%
Development process	5%	21%	26%	11%	0%
Good manufacturing practices	5%	11%	32%	11%	5%
Complementary Skills					
Intellectual property protection and management	11%	16%	11%	0%	0%
Marketing strategies	5%	11%	11%	5%	0%
Financial management	5%	5%	16%	5%	0%
Quality assurance, quality control	5%	16%	32%	11%	0%
Business affairs	5%	11%	5%	0%	0%
Strategic alliance development and management	5%	11%	11%	0%	0%
National and international regulatory acumen	5%	11%	16%	5%	5%
Relations with investors	0%	0%	5%	0%	0%
Business promotion	5%	5%	11%	5%	0%
Market research	5%	5%	11%	5%	0%
Product development process	5%	21%	26%	11%	5%
Project management skills	5%	21%	21%	11%	5%
Business software	5%	5%	16%	5%	0%
Non-Technical Skills					
Leadership	11%	16%	11%	0%	5%
Verbal and written communication skills (English)	5%	21%	32%	5%	5%
Verbal and written communication skills (Other than English)	0%	0%	11%	0%	0%
Team work	5%	21%	32%	5%	5%
Problem solving	5%	21%	32%	5%	0%
Creative thinking	5%	21%	26%	0%	0%
Critical thinking	5%	21%	32%	5%	5%
Attention to detail	5%	21%	32%	5%	5%
Results oriented	5%	21%	32%	5%	5%
Client focused	5%	16%	21%	5%	0%
Flexibility, adaptability	5%	21%	32%	5%	5%

APPENDIX 6 – SKILLS RANKING BY OCCUPATIONAL AREA AND EDUCATION LEVEL (CONTINUED)

	QUALITY CONTROL & QUALITY ASSURANCE				
	Doctoral	Master's	Bachelor	Diploma/ Certificate	Grade 12 or less
Technical Skills					
Clinical research	0%	0%	5%	0%	0%
Informatics (bio-informatics and molecular modeling)	11%	5%	11%	0%	0%
Laboratory and instrumentation techniques	11%	16%	21%	16%	0%
Good laboratory practices	11%	16%	21%	11%	0%
Information technology management	5%	5%	5%	16%	0%
Development process	11%	16%	11%	16%	0%
Good manufacturing practices	11%	11%	26%	16%	0%
Complementary Skills					
Intellectual property protection and management	16%	5%	5%	0%	0%
Marketing strategies	5%	5%	11%	5%	0%
Financial management	5%	5%	11%	5%	0%
Quality assurance, quality control	11%	16%	26%	11%	0%
Business affairs	11%	5%	5%	0%	0%
Strategic alliance development and management	11%	5%	11%	0%	0%
National and international regulatory acumen	11%	11%	16%	5%	0%
Relations with investors	0%	0%	5%	0%	0%
Business promotion	11%	5%	11%	5%	0%
Market research	5%	5%	11%	5%	0%
Product development process	11%	11%	16%	11%	0%
Project management skills	11%	11%	21%	11%	0%
Business software	5%	5%	16%	5%	0%
Non-Technical Skills					
Leadership	16%	11%	11%	0%	0%
Verbal and written communication skills (English)	11%	16%	26%	5%	0%
Verbal and written communication skills (Other than English)	0%	0%	11%	0%	0%
Team work	11%	16%	32%	5%	0%
Problem solving	11%	16%	32%	5%	0%
Creative thinking	11%	16%	21%	0%	0%
Critical thinking	11%	16%	32%	5%	0%
Attention to detail	11%	21%	26%	5%	0%
Results oriented	11%	16%	32%	5%	0%
Client focused	11%	11%	26%	5%	0%
Flexibility, adaptability	11%	16%	26%	5%	0%

APPENDIX 6 – SKILLS RANKING BY OCCUPATIONAL AREA AND EDUCATION LEVEL (CONTINUED)

	MANUFACTURING & PRODUCTION				
	Doctoral	Master's	Bachelor	Diploma/ Certificate	Grade 12 or less
Technical Skills					
Clinical research	0%	5%	0%	0%	0%
Informatics (bio-informatics and molecular modeling)	5%	11%	5%	0%	0%
Laboratory and instrumentation techniques	5%	16%	21%	21%	5%
Good laboratory practices	5%	11%	16%	21%	0%
Information technology management	5%	5%	11%	5%	0%
Development process	5%	16%	26%	11%	0%
Good manufacturing practices	5%	16%	26%	37%	5%
Complementary Skills					
Intellectual property protection and management	5%	11%	5%	5%	0%
Marketing strategies	5%	5%	5%	11%	0%
Financial management	5%	5%	5%	11%	0%
Quality assurance, quality control	5%	16%	26%	26%	0%
Business affairs	5%	5%	0%	5%	0%
Strategic alliance development and management	5%	5%	0%	0%	5%
National and international regulatory acumen	5%	11%	11%	5%	0%
Relations with investors	0%	5%	0%	0%	5%
Business promotion	5%	5%	5%	5%	0%
Market research	5%	5%	11%	5%	0%
Product development process	5%	16%	21%	16%	11%
Project management skills	5%	21%	26%	21%	0%
Business software	5%	5%	11%	16%	0%
Non-Technical Skills					
Leadership	5%	21%	11%	16%	0%
Verbal and written communication skills (English)	5%	16%	32%	21%	11%
Verbal and written communication skills (Other than English)	0%	0%	5%	0%	0%
Team work	5%	16%	32%	21%	5%
Problem solving	5%	16%	37%	21%	5%
Creative thinking	5%	16%	26%	16%	11%
Critical thinking	5%	16%	32%	21%	11%
Attention to detail	5%	16%	26%	26%	11%
Results oriented	5%	16%	26%	26%	11%
Client focused	5%	16%	21%	21%	5%
Flexibility, adaptability	5%	16%	26%	26%	11%

APPENDIX 6 – SKILLS RANKING BY OCCUPATIONAL AREA AND EDUCATION LEVEL (CONTINUED)

	PRODUCT & CUSTOMER SUPPORT				
	Doctoral	Master's	Bachelor	Diploma/ Certificate	Grade 12 or less
Technical Skills					
Clinical research	0%	5%	5%	5%	0%
Informatics (bio-informatics and molecular modeling)	5%	11%	11%	5%	0%
Laboratory and instrumentation techniques	5%	16%	16%	16%	0%
Good laboratory practices	5%	5%	21%	16%	0%
Information technology management	5%	5%	16%	11%	0%
Development process	5%	11%	21%	16%	0%
Good manufacturing practices	5%	11%	21%	21%	5%
Complementary Skills					
Intellectual property protection and management	11%	16%	5%	11%	0%
Marketing strategies	5%	21%	11%	16%	5%
Financial management	5%	21%	11%	16%	0%
Quality assurance, quality control	5%	26%	21%	21%	0%
Business affairs	5%	16%	5%	11%	5%
Strategic alliance development and management	5%	26%	11%	11%	0%
National and international regulatory acumen	5%	26%	11%	16%	5%
Relations with investors	0%	11%	11%	11%	0%
Business promotion	5%	21%	16%	16%	0%
Market research	5%	21%	16%	11%	0%
Product development process	5%	21%	16%	16%	11%
Project management skills	5%	21%	26%	21%	5%
Business software	5%	16%	16%	21%	0%
Non-Technical Skills					
Leadership	5%	21%	21%	5%	11%
Verbal and written communication skills (English)	5%	26%	26%	26%	5%
Verbal and written communication skills (Other than English)	0%	5%	0%	5%	0%
Team work	5%	26%	26%	16%	11%
Problem solving	5%	26%	26%	16%	5%
Creative thinking	5%	26%	21%	11%	5%
Critical thinking	5%	26%	26%	16%	11%
Attention to detail	5%	26%	26%	16%	11%
Results oriented	5%	26%	26%	16%	11%
Client focused	5%	26%	26%	16%	5%
Flexibility, adaptability	5%	26%	26%	16%	11%

APPENDIX 6 – SKILLS RANKING BY OCCUPATIONAL AREA AND EDUCATION LEVEL (CONTINUED)

	REGULATORY AFFAIRS				
	Doctoral	Master's	Bachelor	Diploma/ Certificate	Grade 12 or less
Technical Skills					
Clinical research	11%	5%	5%	0%	0%
Informatics (bio-informatics and molecular modeling)	0%	5%	5%	0%	0%
Laboratory and instrumentation techniques	0%	5%	16%	5%	5%
Good laboratory practices	0%	5%	16%	5%	0%
Information technology management	0%	0%	5%	5%	0%
Development process	0%	5%	11%	11%	0%
Good manufacturing practices	0%	5%	21%	5%	0%
Complementary Skills					
Intellectual property protection and management	5%	5%	5%	0%	0%
Marketing strategies	5%	5%	16%	0%	0%
Financial management	5%	5%	5%	5%	0%
Quality assurance, quality control	0%	11%	16%	5%	0%
Business affairs	5%	11%	5%	0%	5%
Strategic alliance development and management	5%	5%	11%	0%	0%
National and international regulatory acumen	11%	16%	32%	5%	0%
Relations with investors	5%	16%	5%	0%	0%
Business promotion	5%	5%	5%	5%	0%
Market research	5%	5%	11%	5%	0%
Product development process	5%	16%	16%	11%	0%
Project management skills	11%	21%	26%	5%	0%
Business software	5%	5%	11%	5%	0%
Non-Technical Skills					
Leadership	0%	5%	5%	5%	0%
Verbal and written communication skills (English)	5%	16%	21%	11%	0%
Verbal and written communication skills (Other than English)	0%	0%	0%	5%	0%
Team work	5%	16%	16%	11%	0%
Problem solving	5%	16%	21%	11%	0%
Creative thinking	5%	16%	11%	5%	0%
Critical thinking	5%	16%	21%	11%	0%
Attention to detail	5%	16%	21%	11%	0%
Results oriented	5%	16%	21%	11%	0%
Client focused	5%	16%	11%	11%	0%
Flexibility, adaptability	5%	16%	16%	11%	0%

APPENDIX 6 – SKILLS RANKING BY OCCUPATIONAL AREA AND EDUCATION LEVEL (CONTINUED)

	INTELLECTUAL PROPERTY				
	Doctoral	Master's	Bachelor	Diploma/ Certificate	Grade 12 or less
Technical Skills					
Clinical research	11%	0%	0%	0%	0%
Informatics (bio-informatics and molecular modeling)	5%	16%	5%	0%	0%
Laboratory and instrumentation techniques	5%	5%	11%	5%	0%
Good laboratory practices	5%	11%	5%	5%	0%
Information technology management	11%	16%	11%	5%	0%
Development process	11%	16%	11%	5%	0%
Good manufacturing practices	5%	11%	5%	5%	0%
Complementary Skills					
Intellectual property protection and management	11%	16%	5%	0%	0%
Marketing strategies	5%	21%	5%	5%	0%
Financial management	5%	16%	5%	5%	0%
Quality assurance, quality control	5%	11%	5%	5%	0%
Business affairs	5%	16%	5%	0%	0%
Strategic alliance development and management	5%	16%	0%	0%	0%
National and international regulatory acumen	5%	16%	0%	5%	0%
Relations with investors	0%	11%	0%	5%	0%
Business promotion	5%	11%	11%	5%	0%
Market research	5%	16%	11%	0%	0%
Product development process	5%	16%	5%	0%	5%
Project management skills	5%	11%	11%	0%	0%
Business software	5%	5%	5%	11%	0%
Non-Technical Skills					
Leadership	16%	16%	11%	0%	0%
Verbal and written communication skills (English)	11%	21%	11%	5%	0%
Verbal and written communication skills (Other than English)	5%	11%	5%	0%	0%
Team work	11%	16%	11%	11%	0%
Problem solving	11%	16%	11%	11%	0%
Creative thinking	11%	16%	11%	11%	0%
Critical thinking	11%	16%	11%	11%	0%
Attention to detail	11%	16%	11%	11%	0%
Results oriented	11%	16%	11%	11%	0%
Client focused	11%	16%	11%	11%	0%
Flexibility, adaptability	11%	16%	11%	11%	0%

APPENDIX 6 – SKILLS RANKING BY OCCUPATIONAL AREA AND EDUCATION LEVEL (CONTINUED)

	BUSINESS DEVELOPMENT/INVESTOR RELATIONS				
	Doctoral	Master's	Bachelor	Diploma/ Certificate	Grade 12 or less
Technical Skills					
Clinical research	11%	5%	5%	0%	0%
Informatics (bio-informatics and molecular modeling)	11%	5%	11%	0%	0%
Laboratory and instrumentation techniques	11%	5%	11%	0%	0%
Good laboratory practices	11%	5%	5%	0%	0%
Information technology management	16%	11%	11%	0%	0%
Development process	16%	21%	21%	0%	0%
Good manufacturing practices	11%	11%	5%	0%	0%
Complementary Skills					
Intellectual property protection and management	11%	26%	21%	5%	0%
Marketing strategies	11%	32%	37%	5%	0%
Financial management	11%	26%	26%	11%	0%
Quality assurance, quality control	11%	21%	11%	0%	0%
Business affairs	11%	21%	37%	5%	0%
Strategic alliance development and management	11%	26%	42%	5%	0%
National and international regulatory acumen	11%	21%	32%	0%	0%
Relations with investors	11%	16%	16%	0%	0%
Business promotion	11%	32%	37%	5%	0%
Market research	11%	26%	32%	0%	0%
Product development process	11%	21%	37%	0%	0%
Project management skills	11%	26%	37%	5%	0%
Business software	11%	26%	26%	11%	0%
Non-Technical Skills					
Leadership	11%	26%	32%	5%	0%
Verbal and written communication skills (English)	11%	26%	32%	11%	0%
Verbal and written communication skills (Other than English)	5%	5%	5%	5%	0%
Team work	11%	26%	32%	11%	0%
Problem solving	11%	26%	32%	11%	0%
Creative thinking	11%	26%	26%	11%	0%
Critical thinking	11%	26%	26%	11%	0%
Attention to detail	11%	26%	32%	11%	0%
Results oriented	11%	26%	32%	11%	0%
Client focused	11%	26%	32%	11%	0%
Flexibility, adaptability	11%	26%	26%	11%	0%

APPENDIX 6 – SKILLS RANKING BY OCCUPATIONAL AREA AND EDUCATION LEVEL (CONTINUED)

	CEO/PRESIDENT				
	Doctoral	Master's	Bachelor	Diploma/ Certificate	Grade 12 or less
Technical Skills					
Clinical research	16%	21%	5%	0%	0%
Informatics (bio-informatics and molecular modeling)	5%	5%	0%	0%	0%
Laboratory and instrumentation techniques	5%	5%	0%	0%	0%
Good laboratory practices	5%	11%	0%	0%	0%
Information technology management	11%	11%	5%	0%	0%
Development process	16%	16%	5%	0%	0%
Good manufacturing practices	5%	11%	5%	0%	0%
Complementary Skills					
Intellectual property protection and management	16%	16%	21%	0%	0%
Marketing strategies	11%	26%	16%	0%	0%
Financial management	16%	21%	21%	0%	0%
Quality assurance, quality control	11%	21%	16%	0%	0%
Business affairs	16%	26%	21%	5%	0%
Strategic alliance development and management	21%	26%	26%	0%	0%
National and international regulatory acumen	5%	21%	11%	0%	0%
Relations with investors	11%	21%	21%	0%	0%
Business promotion	16%	26%	26%	0%	0%
Market research	5%	16%	16%	0%	0%
Product development process	11%	16%	16%	0%	0%
Project management skills	11%	16%	16%	0%	0%
Business software	5%	11%	11%	5%	0%
Non-Technical Skills					
Leadership	26%	26%	21%	0%	0%
Verbal and written communication skills (English)	26%	26%	21%	0%	0%
Verbal and written communication skills (Other than English)	11%	0%	5%	0%	0%
Team work	26%	26%	21%	0%	0%
Problem solving	26%	21%	21%	0%	0%
Creative thinking	26%	21%	21%	0%	0%
Critical thinking	26%	21%	21%	0%	0%
Attention to detail	26%	21%	21%	0%	0%
Results oriented	26%	21%	21%	0%	0%
Client focused	26%	21%	21%	0%	0%
Flexibility, adaptability	26%	21%	21%	0%	0%

APPENDIX 6 – SKILLS RANKING BY OCCUPATIONAL AREA AND EDUCATION LEVEL (CONTINUED)

	EXECUTIVE MANAGEMENT (VP'S)				
	Doctoral	Master's	Bachelor	Diploma/ Certificate	Grade 12 or less
Technical Skills					
Clinical research	5%	5%	5%	5%	0%
Informatics (bio-informatics and molecular modeling)	0%	0%	5%	0%	0%
Laboratory and instrumentation techniques	5%	5%	11%	0%	0%
Good laboratory practices	5%	5%	11%	0%	0%
Information technology management	0%	0%	5%	0%	0%
Development process	5%	5%	11%	0%	0%
Good manufacturing practices	11%	11%	16%	5%	5%
Complementary Skills					
Intellectual property protection and management	11%	16%	21%	11%	5%
Marketing strategies	5%	16%	16%	0%	0%
Financial management	11%	21%	21%	0%	0%
Quality assurance, quality control	11%	16%	26%	5%	5%
Business affairs	16%	26%	26%	5%	5%
Strategic alliance development and management	16%	26%	26%	5%	5%
National and international regulatory acumen	11%	21%	21%	0%	0%
Relations with investors	5%	16%	16%	5%	5%
Business promotion	11%	21%	21%	0%	0%
Market research	5%	16%	16%	0%	0%
Product development process	11%	21%	21%	5%	5%
Project management skills	11%	21%	21%	0%	0%
Business software	11%	16%	21%	0%	0%
Non-Technical Skills					
Leadership	16%	37%	21%	5%	5%
Verbal and written communication skills (English)	16%	37%	21%	5%	5%
Verbal and written communication skills (Other than English)	0%	11%	5%	0%	0%
Team work	16%	37%	21%	5%	5%
Problem solving	16%	37%	21%	5%	5%
Creative thinking	11%	32%	16%	0%	0%
Critical thinking	16%	37%	21%	5%	5%
Attention to detail	11%	32%	16%	0%	0%
Results oriented	16%	37%	21%	5%	5%
Client focused	16%	37%	21%	5%	5%
Flexibility, adaptability	11%	32%	16%	0%	0%

APPENDIX 6 – SKILLS RANKING BY OCCUPATIONAL AREA AND EDUCATION LEVEL (CONTINUED)

	FINANCE				
	Doctoral	Master's	Bachelor	Diploma/ Certificate	Grade 12 or less
Technical Skills					
Clinical research	0%	5%	0%	0%	0%
Informatics (bio-informatics and molecular modeling)	0%	5%	0%	0%	0%
Laboratory and instrumentation techniques	0%	0%	5%	0%	0%
Good laboratory practices	0%	0%	5%	0%	0%
Information technology management	0%	5%	5%	5%	0%
Development process	0%	5%	11%	0%	0%
Good manufacturing practices	0%	0%	0%	5%	0%
Complementary Skills					
Intellectual property protection and management	0%	5%	5%	0%	0%
Marketing strategies	0%	0%	11%	0%	0%
Financial management	11%	21%	37%	5%	0%
Quality assurance, quality control	0%	5%	16%	0%	0%
Business affairs	5%	11%	32%	0%	0%
Strategic alliance development and management	5%	11%	21%	0%	0%
National and international regulatory acumen	0%	16%	16%	0%	0%
Relations with investors	0%	11%	16%	0%	0%
Business promotion	0%	11%	21%	0%	0%
Market research	0%	5%	16%	0%	0%
Product development process	0%	5%	11%	0%	0%
Project management skills	11%	16%	21%	5%	0%
Business software	11%	21%	32%	5%	0%
Non-Technical Skills					
Leadership	5%	16%	21%	0%	0%
Verbal and written communication skills (English)	11%	21%	37%	5%	0%
Verbal and written communication skills (Other than English)	0%	5%	5%	0%	0%
Team work	11%	21%	32%	5%	0%
Problem solving	11%	21%	37%	5%	0%
Creative thinking	11%	21%	26%	5%	0%
Critical thinking	11%	21%	26%	5%	0%
Attention to detail	11%	21%	37%	5%	0%
Results oriented	11%	21%	26%	5%	0%
Client focused	11%	21%	32%	5%	0%
Flexibility, adaptability	11%	21%	32%	5%	0%

APPENDIX 6 – SKILLS RANKING BY OCCUPATIONAL AREA AND EDUCATION LEVEL (CONTINUED)

	MARKETING & SALES				
	Doctoral	Master's	Bachelor	Diploma/ Certificate	Grade 12 or less
Technical Skills					
Clinical research	11%	11%	5%	0%	0%
Informatics (bio-informatics and molecular modeling)	0%	5%	0%	0%	0%
Laboratory and instrumentation techniques	0%	5%	0%	0%	0%
Good laboratory practices	0%	5%	0%	0%	0%
Information technology management	5%	0%	0%	0%	0%
Development process	0%	5%	5%	0%	0%
Good manufacturing practices	5%	5%	0%	0%	0%
Complementary Skills					
Intellectual property protection and management	5%	16%	11%	0%	0%
Marketing strategies	11%	26%	26%	0%	0%
Financial management	0%	16%	16%	0%	0%
Quality assurance, quality control	5%	11%	5%	5%	0%
Business affairs	5%	32%	21%	0%	0%
Strategic alliance development and management	5%	32%	21%	0%	0%
National and international regulatory acumen	5%	21%	11%	0%	0%
Relations with investors	0%	21%	5%	0%	0%
Business promotion	0%	26%	21%	0%	0%
Market research	5%	32%	26%	0%	0%
Product development process	0%	16%	11%	0%	0%
Project management skills	5%	26%	21%	0%	0%
Business software	5%	21%	26%	0%	0%
Non-Technical Skills					
Leadership	5%	16%	16%	0%	0%
Verbal and written communication skills (English)	5%	26%	26%	0%	0%
Verbal and written communication skills (Other than English)	0%	5%	11%	0%	0%
Team work	11%	21%	21%	0%	0%
Problem solving	5%	26%	21%	0%	0%
Creative thinking	5%	26%	26%	0%	0%
Critical thinking	5%	26%	21%	0%	0%
Attention to detail	5%	21%	32%	0%	0%
Results oriented	5%	21%	32%	0%	0%
Client focused	5%	21%	26%	0%	0%
Flexibility, adaptability	5%	21%	26%	5%	0%

APPENDIX 6 – SKILLS RANKING BY OCCUPATIONAL AREA AND EDUCATION LEVEL (CONTINUED)

	HUMAN RESOURCES				
	Doctoral	Master's	Bachelor	Diploma/ Certificate	Grade 12 or less
Technical Skills					
Clinical research	5%	11%	5%	0%	0%
Informatics (bio-informatics and molecular modeling)	0%	5%	0%	0%	0%
Laboratory and instrumentation techniques	0%	5%	0%	0%	0%
Good laboratory practices	0%	5%	0%	0%	0%
Information technology management	0%	5%	0%	5%	0%
Development process	0%	5%	0%	0%	0%
Good manufacturing practices	0%	5%	0%	0%	0%
Complementary Skills					
Intellectual property protection and management	0%	0%	5%	11%	0%
Marketing strategies	0%	0%	5%	0%	0%
Financial management	0%	0%	5%	5%	0%
Quality assurance, quality control	0%	0%	5%	0%	0%
Business affairs	0%	0%	26%	11%	5%
Strategic alliance development and management	0%	0%	5%	0%	0%
National and international regulatory acumen	0%	0%	11%	5%	5%
Relations with investors	0%	0%	11%	0%	0%
Business promotion	0%	0%	11%	0%	0%
Market research	0%	0%	5%	0%	0%
Product development process	0%	0%	5%	0%	0%
Project management skills	5%	5%	21%	0%	0%
Business software	5%	5%	26%	11%	5%
Non-Technical Skills					
Leadership	5%	16%	32%	0%	0%
Verbal and written communication skills (English)	5%	11%	42%	5%	5%
Verbal and written communication skills (Other than English)	0%	0%	16%	0%	0%
Team work	5%	11%	42%	5%	5%
Problem solving	5%	11%	42%	5%	5%
Creative thinking	5%	11%	37%	0%	0%
Critical thinking	5%	11%	42%	5%	5%
Attention to detail	5%	11%	42%	5%	5%
Results oriented	5%	11%	42%	5%	5%
Client focused	5%	11%	37%	5%	5%
Flexibility, adaptability	5%	11%	42%	5%	5%

APPENDIX 6 – SKILLS RANKING BY OCCUPATIONAL AREA AND EDUCATION LEVEL (CONTINUED)

	MIS/IT				
	Doctoral	Master's	Bachelor	Diploma/ Certificate	Grade 12 or less
Technical Skills					
Clinical research	0%	0%	5%	0%	0%
Informatics (bio-informatics and molecular modeling)	0%	0%	5%	0%	0%
Laboratory and instrumentation techniques	0%	0%	5%	0%	0%
Good laboratory practices	0%	0%	5%	0%	0%
Information technology management	0%	0%	16%	11%	5%
Development process	0%	0%	5%	0%	0%
Good manufacturing practices	0%	0%	5%	0%	0%
Complementary Skills					
Intellectual property protection and management	0%	5%	0%	0%	0%
Marketing strategies	0%	5%	0%	0%	0%
Financial management	0%	5%	0%	0%	0%
Quality assurance, quality control	0%	5%	0%	0%	0%
Business affairs	0%	5%	5%	5%	5%
Strategic alliance development and management	0%	5%	0%	0%	0%
National and international regulatory acumen	0%	5%	5%	5%	5%
Relations with investors	0%	5%	0%	0%	0%
Business promotion	0%	5%	0%	0%	0%
Market research	0%	5%	0%	0%	0%
Product development process	0%	5%	0%	0%	0%
Project management skills	0%	5%	5%	0%	0%
Business software	0%	5%	11%	11%	5%
Non-Technical Skills					
Leadership	0%	5%	21%	0%	0%
Verbal and written communication skills (English)	0%	5%	21%	5%	5%
Verbal and written communication skills (Other than English)	0%	5%	5%	0%	0%
Team work	0%	5%	21%	11%	5%
Problem solving	0%	5%	21%	11%	5%
Creative thinking	0%	5%	16%	5%	0%
Critical thinking	0%	5%	21%	5%	5%
Attention to detail	0%	5%	21%	5%	5%
Results oriented	0%	5%	21%	5%	5%
Client focused	0%	5%	21%	11%	5%
Flexibility, adaptability	0%	5%	21%	5%	5%

APPENDIX 6 – SKILLS RANKING BY OCCUPATIONAL AREA AND EDUCATION LEVEL (CONTINUED)

	ADMINISTRATION				
	Doctoral	Master's	Bachelor	Diploma/ Certificate	Grade 12 or less
Technical Skills					
Clinical research	0%	11%	11%	5%	0%
Informatics (bio-informatics and molecular modeling)	0%	5%	0%	0%	0%
Laboratory and instrumentation techniques	0%	5%	0%	0%	0%
Good laboratory practices	0%	5%	0%	5%	0%
Information technology management	0%	11%	5%	5%	0%
Development process	0%	11%	5%	0%	0%
Good manufacturing practices	0%	11%	5%	0%	0%
Complementary Skills					
Intellectual property protection and management	0%	16%	5%	5%	0%
Marketing strategies	0%	16%	5%	0%	0%
Financial management	0%	16%	16%	16%	0%
Quality assurance, quality control	0%	11%	0%	0%	0%
Business affairs	0%	11%	21%	16%	0%
Strategic alliance development and management	5%	11%	5%	0%	0%
National and international regulatory acumen	0%	16%	11%	5%	0%
Relations with investors	0%	11%	11%	16%	0%
Business promotion	0%	11%	11%	5%	0%
Market research	0%	11%	11%	0%	0%
Product development process	5%	5%	0%	11%	0%
Project management skills	0%	11%	16%	5%	0%
Business software	0%	16%	16%	16%	5%
Non-Technical Skills					
Leadership	0%	16%	26%	16%	0%
Verbal and written communication skills (English)	5%	11%	37%	32%	11%
Verbal and written communication skills (Other than English)	0%	5%	11%	5%	0%
Team work	5%	11%	32%	32%	16%
Problem solving	5%	11%	37%	26%	5%
Creative thinking	5%	11%	26%	26%	5%
Critical thinking	5%	11%	32%	32%	5%
Attention to detail	5%	11%	32%	37%	5%
Results oriented	5%	11%	32%	37%	11%
Client focused	5%	11%	32%	32%	11%
Flexibility, adaptability	5%	11%	32%	37%	11%