

# Profile of the Greenhouse Industry in Alberta 2019



SEPTEMBER 2020

Alberta 

Alberta Agriculture and Forestry, Government of Alberta  
September 2020  
Profile of the Greenhouse Industry in Alberta 2019  
ISBN 978-1-4601-4827-3

Prepared By:  
Emmanuel Anum Laate and Dr. Mirza Consultants Inc.

Emmanuel Anum Laate  
Senior Crop Economist  
Economics Section  
Economics and Competitiveness Branch  
Phone: (780) 422-4054  
Fax: (780) 427-5220  
[emmanuel.laate@gov.ab.ca](mailto:emmanuel.laate@gov.ab.ca)

© 2020 Government of Alberta.

This document is made available under the Open Government Licence – Alberta (<http://open.alberta.ca/licence>). The contents of this document may not be used, or reproduced, without accrediting Alberta Agriculture and Forestry, Economics and Competitiveness Branch, Economics Section.

This document is available online at: <http://open.alberta.ca/publications/9781460148273>

# Acknowledgements

We acknowledge and appreciate the participation of all the greenhouse operators in Alberta who willingly provided detailed information and the contribution and support of the Alberta Greenhouse Growers Association for this study. Without their participation and support, the publication of this report would not have been possible.

This study was completed with funding from the Canadian Agricultural Partnership program, a five-year Federal-Provincial-Territorial initiative.

# Table of Contents

<b>EXECUTIVE SUMMARY</b> .....	<b>13</b>
<b>BACKGROUND</b> .....	<b>15</b>
Introduction .....	15
Objectives .....	15
Methodology and Survey Response .....	15
Alberta Greenhouse Industry Survey Regions .....	15
<b>Section 1: Greenhouse Information</b> .....	<b>17</b>
Number of Greenhouse Operations by Region in Alberta .....	17
Years of Experience of Greenhouse Operators in Alberta .....	17
Education Level of Greenhouse Operators in Alberta .....	18
Type of Greenhouse Businesses in Alberta .....	19
Total Land, Greenhouse Area and Number of Growers .....	19
Size of Greenhouse Operations in Alberta .....	20
Year Greenhouses were Constructed .....	21
Expansion of Greenhouse Facilities by Region .....	21
Greenhouse Structures and Area by Region .....	22
Greenhouse Crop Sector by Region .....	22
Operation of Greenhouses by Region .....	23
Financing of Greenhouse Operations .....	24
Source of Financing (Loans) .....	24
Greenhouse Production Certified as Organic by Region .....	25
Breakdown of Sales by Market Channel .....	25
Annual Gross Sales of Greenhouse Operations .....	26
<b>Section 2: Heating System / Efficiencies</b> .....	<b>27</b>
Type of Heating System .....	27
Type of Heating Fuel .....	27
Energy Saving Systems .....	28
Efficiency of Energy Curtains .....	28
Heating Cost of Greenhouse Operations in Alberta .....	29
Carbon Dioxide Recovery by Greenhouse Operations .....	29
<b>Section 3: Environmental Control</b> .....	<b>30</b>
Type of Environmental Control System .....	30

Summer and Winter Ventilation .....	30
Horizontal or Vertical Air Flow Fans .....	31
Cooling System .....	31
Curtains .....	32
Relative Humidity Control System .....	32
<b>Section 4: Computer Use.....</b>	<b>33</b>
Type of Computers used by Greenhouse Growers .....	33
Computer Use in Greenhouses .....	33
Crop Scheduling Programs.....	34
<b>Section 5: Lighting Systems .....</b>	<b>35</b>
Type of Lighting System in Greenhouses .....	35
Total Number of Lights in Greenhouses .....	35
Total Wattage in Greenhouses .....	36
<b>Section 6: Water Use.....</b>	<b>37</b>
Source of Water .....	37
Quantity of Water Used by Greenhouse Growers .....	37
Collection of Water from Greenhouse Roof .....	38
Water Quality .....	38
Analyses of Water of Used in Greenhouses .....	39
Sodium Level in Water Used .....	39
Water Treatment Used in Greenhouses .....	40
<b>Section 7: Irrigation Systems .....</b>	<b>41</b>
Type of Irrigation Systems .....	41
Water Recycling.....	41
Disposal of Waste Water .....	42
<b>Section 8: Fertilizer Use.....</b>	<b>43</b>
Fertilizer Injector Systems Used in Greenhouses .....	43
Type of Fertilizers Used in Greenhouses .....	43
Use of Calcium Nitrate in the Greenhouse Fertilizer Program .....	44
<b>Section 9: Plants Grown, Area and Retail.....</b>	<b>45</b>
Greenhouse Crop Area by Sector .....	45
Vegetables .....	45
Cucumber.....	45
Tomato .....	46

Pepper.....	47
Lettuce, Eggplant and Other Crops.....	48
Growing Systems used by Vegetable Growers .....	49
Bedding Plants / Ornamentals .....	50
Potted Flowers .....	50
Vegetables .....	51
Number of Cell Packs of Bedding Plants and Hanging Baskets.....	51
Cut Flowers .....	53
Vegetables Grown in Containers .....	53
Tree Seedlings.....	54
How Long Tree Seedling Stock are Kept.....	54
Culinary or Medicinal Herbs Grown in Alberta.....	55
Production Schedule.....	55
Growers Having Nursery Material.....	56
Comparison of 2019 Production to 2018 .....	56
Consideration of Cannabis as a Greenhouse Crop.....	57
Retail .....	57
Producers' Interest in Cost of Production Study .....	58
<b>Section 10: Crop Problems.....</b>	<b>59</b>
Insect Problems .....	59
Practice of Integrated Pest Management (IPM) .....	59
Use and Purchase of Biological Controls .....	60
Use of Pollinators (Bumble Bees).....	61
Source of Pesticide Recommendations.....	61
Disease Problems.....	62
Improvement of IPM Knowledge.....	62
<b>Section 11: Labour .....</b>	<b>63</b>
Number of People Employed in Greenhouses .....	63
Availability of Skilled Employees .....	63
Foreign Workers .....	64
<b>Section 12: Environmental Trends .....</b>	<b>65</b>
Environmentally Friendly Practices.....	65
Recycling of Plastics and Containers .....	65
Use of Landfill for Disposal .....	66
Composting of Waste Material.....	66



<b>Section 13: Food Safety</b> .....	<b>67</b>
<b>Section 14: Taxation and Other Issues</b> .....	<b>68</b>
Greenhouse Taxation and Classification .....	68
Greenhouse Insurance .....	68
Main Suppliers of Plant Material .....	69
Growers Who Raise Their Own Seedlings .....	70
Membership of Alberta Greenhouse Growers Association.....	70
Use of Greenhouse Consultants.....	71
Suggestions on How AGGA can improve its Usefulness .....	72
Attendance at Green Industry Show and Conference .....	72
Business Threats in the Next Three to Five Years .....	73
Business Opportunities in the Next Three to Five Years.....	74
<b>Section 15: Other Key Industry Highlights</b> .....	<b>75</b>
Comparison of Greenhouse Crop Area by Province .....	75
Other Alberta Highlights by Greenhouse Crop Sector.....	76
Vegetables .....	76
Floriculture.....	77
Tree Seedlings .....	77
Alberta’s Trade Balance for Greenhouse Crops.....	77
<b>Section 16: Future Sustainability of the Alberta Greenhouse Crops Industry</b> .....	<b>79</b>
Greenhouse Building/Structure Trends .....	79
Vertical farms and use of transport (intermodal) containers for commercial production .....	81
Future trends in vertical farming.....	82
Growing in transport containers .....	82
Crop Management Trends .....	83
Use of LED lights is increasing in year round production of vegetables.....	83
High wire training system for cucumbers .....	84
Better use of plant physiology knowledge, in terms of leaf volume to fruit .....	84
Choice of growing media is a constantly changing trend.....	84
Marketing and Business Trends .....	85
Workplace and Workforce Trends .....	86
Political/Regulatory and Legislative Trends.....	87
Bedding Plants and Ornamental Sector .....	88
Customers Are Becoming More Sophisticated.....	88
Fast Developing and Improving Communication Technologies .....	90

Increasing Concerns for the Environment .....91  
Regulatory concerns are increasing .....91  
Other concerns .....91  
How Innovations are going to drive the Alberta greenhouse industry? .....92  
Getting ready to handle pandemics like COVID-19.....93  
**APPENDICES .....94**



# List of Tables

Table 1. 1: Years of Experience of Greenhouse Operators in Alberta.....	18
Table 1. 2: Education Level of Greenhouse Operators in Alberta .....	18
Table 1. 3: Type of Business of Greenhouse Operations .....	19
Table 1. 4: Total Land Area, Greenhouse Area, and Number of Growers in Alberta .....	19
Table 1. 5: Size of Greenhouse Operations in Alberta.....	20
Table 1. 6: Year Greenhouses were Constructed .....	21
Table 1. 7: Expansion of Greenhouses by Region.....	21
Table 1. 8: Greenhouse Structures and Area.....	22
Table 1. 9: Number of Greenhouses by Sector in Alberta .....	22
Table 1. 10: Operation of Greenhouses by Region.....	23
Table 1. 11: Financing of Greenhouse Operations .....	24
Table 1. 12: Source of Financing (Loans) .....	24
Table 1. 13: Greenhouse Production Certified as Organic by Region .....	25
Table 1. 14: Breakdown of Sales by Market Channel .....	25
Table 1. 15: Annual Gross Sales of Greenhouse Operations .....	26
Table 2. 1: Types of Heating Systems Used in Greenhouses .....	27
Table 2. 2: Type of Heating Fuel .....	27
Table 2. 3: Energy Saving Systems Used in Greenhouses .....	28
Table 2. 4: Energy Efficient Systems Used in Greenhouses .....	28
Table 2. 5: Heating Costs per Year .....	29
Table 2. 6: Recovery of Carbon Dioxide from Greenhouses .....	29
Table 3. 1: Types of Environmental Control Systems .....	30
Table 3. 2: Summer and Winter Ventilation.....	30
Table 3. 3: Horizontal or Vertical Air Flow Fans .....	31
Table 3. 4: Cooling System .....	31
Table 3. 5: Use of Curtains.....	32
Table 3. 6: Relative Humidity Control System.....	32
Table 4. 1: Type of Computers Used in Greenhouses.....	33
Table 4. 2: Uses of Computers by Greenhouse Growers .....	33
Table 4. 3: Crop Scheduling Program Used by Greenhouse Growers .....	34
Table 5. 1: Lighting Systems in Greenhouses.....	35
Table 5. 2: Number of Lights in Greenhouses.....	35
Table 5. 3: Total Wattage in Greenhouses.....	36
Table 6. 1: Source of Water Used by Greenhouse Growers.....	37
Table 6. 2: Quantity of Water Used by Greenhouse Growers.....	37
Table 6. 3: Collection of Water from Greenhouse Roof .....	38

Table 6. 4: Quality of Water Used in Greenhouses.....	38
Table 6. 5: Analyses of Water Used.....	39
Table 6. 6: Sodium Level in Water Used.....	39
Table 6. 7: Type of Water Treatment Used in Greenhouses .....	40
Table 7. 1: Type of Irrigation Systems and Recycling Water .....	41
Table 7. 2: Water Recycling .....	41
Table 7. 3: Disposal of Waste Water.....	42
Table 8. 1: Type of Fertilizer Injection System Used in Greenhouses .....	43
Table 8. 2: Type and Amount of Fertilizers Used in Greenhouses .....	43
Table 8. 3: Use of Calcium Nitrate as Part of the Greenhouse Fertilizer Program .....	44
Table 9. 1: Greenhouse Crop Area by Region .....	45
Table 9. 2: Variety of Cucumber Grown by Region.....	46
Table 9. 3: Greenhouse Area under Cucumber .....	46
Table 9. 4: Variety of Tomatoes Grown by Region .....	47
Table 9. 5: Greenhouse Area under Tomatoes.....	47
Table 9. 6: Variety of Peppers Grown by Region.....	48
Table 9. 7: Greenhouse Area under Pepper .....	48
Table 9. 8: Lettuce, Eggplant and Other Crops Grown by Region.....	49
Table 9. 9: Greenhouse Area under Lettuce, Eggplant and Other Crops.....	49
Table 9. 10: Type of Growing Systems Used by Vegetable Growers .....	50
Table 9. 11: Type of Potted Flowers Grown.....	50
Table 9. 12: Type of Vegetables Grown.....	51
Table 9. 13: Total Cell Packs of Bedding Plants and Hanging Baskets Grown by Region.....	51
Table 9. 14: Top Ten Bedding Plants by Region Based on Number of Plants Grown.....	52
Table 9. 15: Top Ten Bedding Plants by Region Based on Number of Plants Grown.....	52
Table 9. 16: Cut Flowers Grown by Region in Alberta .....	53
Table 9. 17: Vegetables Grown in Containers in Alberta .....	53
Table 9. 18: Tree Seedlings Grown in Alberta .....	54
Table 9. 19: How Long Tree Seedling Stock are Kept .....	54
Table 9. 20: Culinary or Medicinal Herbs Grown in Alberta .....	55
Table 9. 21: Production Schedule .....	55
Table 9. 22: Growers having Nursery Material.....	56
Table 9. 23: Comparison of 2019 Production to 2018.....	56
Table 9. 24: Consideration of Cannabis as a Potential Greenhouse Crop .....	57
Table 9. 25: Growers involved in Retail.....	57
Table 9. 26: Participation in a Greenhouse Cost of Production Study .....	58
Table 10. 1: Insect Problems.....	59
Table 10. 2: Practice of Integrated Pest Management (IPM) by Greenhouse Growers.....	60
Table 10. 3: Purchase and Use of Biological Controls.....	60

Table 10. 4: Use of Pollinators .....	61
Table 10. 5: Source of Pesticide Recommendations .....	61
Table 10. 6: Disease Problems in Greenhouse Crops .....	62
Table 10. 7: Improvement of IPM Knowledge .....	62
Table 11. 1: Number of People Employed in Alberta Greenhouses .....	63
Table 11. 2: Concerns with Availability of Skilled Employees .....	63
Table 11. 3: Use of Foreign Workers .....	64
Table 12. 1: Environmentally Friendly Production Practices .....	65
Table 12. 2: Recycling of Plastics of Containers .....	65
Table 12. 3: Use of Landfill for Disposal.....	66
Table 12. 4: Composting of Waste Material .....	66
Table 13. 1: Food Safety Issues.....	67
Table 14. 1: Greenhouse Taxation and Classification Issues .....	68
Table 14. 2: Availability of Greenhouse Insurance in Alberta .....	68
Table 14. 3: Greenhouse Insurance Companies .....	69
Table 14. 4: Main Suppliers of Plant Material.....	69
Table 14. 5: Greenhouse Growers Who Raise Their Own Seedlings.....	70
Table 14. 6: Membership of Alberta Greenhouse Growers Association (AGGA) .....	71
Table 14. 7: Use of Greenhouse Consultants .....	71
Table 14. 8: Suggestions on How AGGA can improve its Usefulness to Growers .....	72
Table 14. 9: Attendance at the Green Industry Show and Conference in Last Five Years .....	73
Table 14. 10: Business Threats in the Next Three to Five Years.....	73
Table 14. 11: Business Opportunities in the Next Three to Five Years .....	74
Table 15. 1: Production and Value of Greenhouse Vegetables in Alberta.....	76
Table 15. 2: Alberta's Trade Balance for Food Crops Grown under Cover .....	78
Table 15. 3: Alberta's Trade Balance for Nursery and Floriculture Products .....	78

# LIST OF FIGURES

Figure 1: Map of Alberta Illustrating Regions and Major Centres .....	16
Figure 2: Number of Greenhouses by Region.....	17
Figure 3: Greenhouse Area by Region in Square Feet.....	20
Figure 4: Number of Greenhouses by Sector in Alberta .....	23
Figure 5: Crop Scheduling Programs Used by Growers .....	34
Figure 6: Total Greenhouse Area in Canada, 2019 .....	75

# APPENDICES

Appendix 1: Other Comments, Concerns and Issues .....	94
Appendix 2: Profile of the Greenhouse Industry in Alberta, 2019 Questionnaire.....	96

# EXECUTIVE SUMMARY

In winter 2019-2020, Alberta Agriculture and Forestry (AF) in collaboration with Alberta Greenhouse Growers Association (AGGA) conducted a survey to gather current benchmark data on greenhouse crop operations in Alberta. The results show that presently there are 195 greenhouse operations in Alberta. Of these, 184 greenhouses fully completed the survey questionnaire. Data from the remaining 11 operations were gathered through general business information and directories as well as through previous surveys. Institutional facilities of approximately 3.56 acres were not included in the total area. This is the most comprehensive survey of the greenhouse industry in Alberta.

Alberta's greenhouse industry is ranked fourth in the country after Ontario, British Columbia and Quebec. Based on the recent survey, the present size of Alberta's greenhouse crops industry is estimated to be 404 acres, 164 hectares (ha), 17.62 million square feet (ft<sup>2</sup>) or 1.64 million square metres (m<sup>2</sup>). Vegetable accounted for about 46 per cent of the total greenhouse area (187 acres), followed by floriculture at 42 per cent or 170 acres and tree seedlings at 12 per cent or 48 acres. Greenhouse institutional facilities of approximately 3.56 acres are not included in the total area. The total land associated with greenhouse farming in the province is estimated at 6,658 acres or 2,694 ha.

The greenhouse area in the province is divided into ten regions, ranging from Fort McMurray (Region 1) to Lethbridge (Region 10). Compared to the 2014 survey results, the Medicine Hat region which includes Redcliff (Region 9) continues to account for the largest percentage (41 per cent) of the total greenhouse area. Area under 10,000 ft<sup>2</sup> has decreased from 30 per cent in 2014 to 22 per cent in 2019, while area over 40,000 ft<sup>2</sup> has increased (from 32 per cent in 2014 to 35 per cent in 2019). Double poly greenhouses accounted for about 72 per cent of total area followed by glass at 23 per cent. Approximately 40 per cent of greenhouses are year-round and 60 per cent are seasonal in nature.

Based on the survey results, 41 per cent or 1,277 employees were employed as full time workers and the remaining 59 per cent or 1,851 were part time workers. Growers have used federal and provincial government programs to bring in foreign workers from Mexico, Thailand, Philippines, Caribbean, Chile, Spain, Belgium and Trinidad.

Natural gas continued to be the fuel of choice for heating greenhouses. No major shift has occurred in the use of alternate fuel like coal, wood or others. Based on survey responses, the average heating cost in 2019 was estimated at \$8.82 per sq. m. or 0.82 per sq. ft. This translates to total greenhouse industry heating expenditure of approximately \$14.44 million.

Compared to the 2014 survey, use of computers for environmental control increased from 15 per cent to 17 per cent. Other uses include book-keeping, crop scheduling, irrigation control, email and internet search. Ninety-six per cent of growers reported their production practices were environmentally friendly. Eighty-one per cent of growers recycle plastic materials and containers and about 85 per cent compost their plant material. About 31 per cent practise on-farm food safety and 33 per cent have Environmental Farm Plans.

The majority of growers are anticipating business threats such as higher energy costs, markets and prices, labour shortages, import competition, taxes and regulation and currency fluctuations in the next three to five years. Growers indicated that in the next three to five years non-traditional products, the buy local movement, export markets, organic or green products and would serve as opportunities for expansion. The majority of growers surveyed are members of AGGA and are aware of the services the Association provides. Other comments, issues and concerns provided by survey participants are listed in Appendix I and the survey questionnaire is presented in Appendix II.

# BACKGROUND

## Introduction

In winter 2019-2020, Alberta Agriculture and Forestry (AF), in collaboration with Alberta Greenhouse Growers Association (AGGA), conducted this survey to gather current benchmark data on greenhouse crop operations in Alberta. This includes size, distribution in different regions within the province, heating systems, water and energy use, labour, opportunities and issues related to financing, environment, business climate and regulation, competitiveness with imports, and other benchmarks and future trends.

This study was completed with funding from the Canadian Agricultural Partnership program, a five-year Federal-Provincial-Territorial initiative. The greenhouse industry has developed similar data every four to six years since 1980. The last survey completed in 2015 was based on 2014 data.

## Objectives

The main objectives of the study were to develop benchmark data on the state of greenhouse crop operations in Alberta. The profile report will provide Alberta greenhouse crop industry with an evidence-based decision-making tool. It will help industry to measure progress towards its strategic goals and provide key performance indicators to compare against competitors. It will improve the knowledge of growers to address the current issues/opportunities they are facing.

New producers can also use the information to increase their understanding of how to continue to provide local and freshly grown vegetables and ornamentals to Albertans. The report will serve as a guide to government when developing and evaluating programs and policies for industry.

## Methodology and Survey Response

A detailed survey questionnaire was prepared by AF and AGGA (Appendix II). The survey was originally mailed to 270 people (both members and non-members of AGGA). One field surveyor and Dr. Mirza Consultants Inc. were retained to work on the project. In total, 195 growers were identified as having active operations. Many growers on the mailing list indicated that they have closed down, sold the greenhouse, or the owner has retired or is deceased. In total, 184 surveys were completed and data on location and size from additional 11 growers were gathered through general business information and directories as well as from previous surveys. Thus, data from a total of 195 growers was collected.

## Alberta Greenhouse Industry Survey Regions

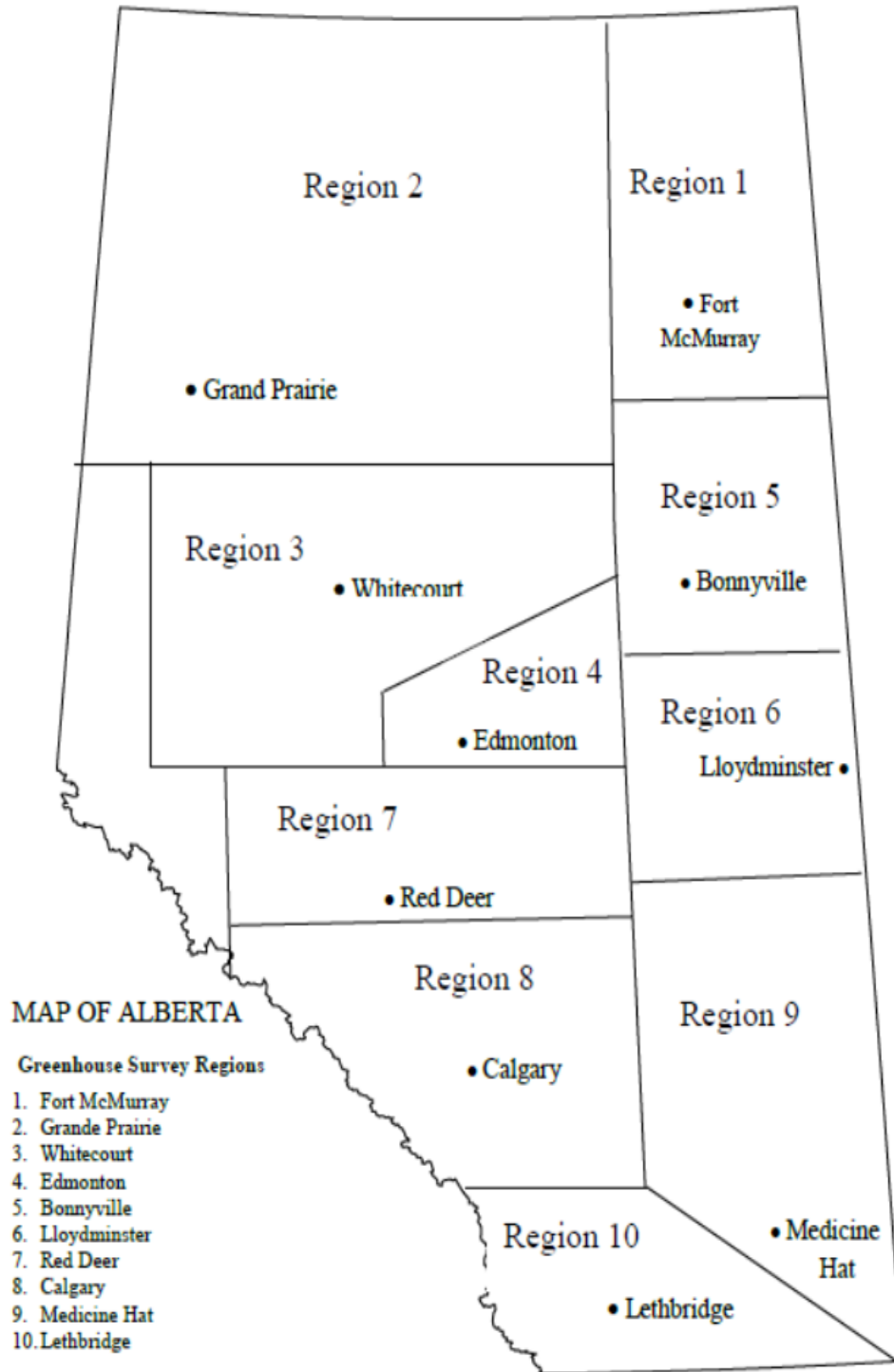
For comparison purposes, the province was divided into ten regions, which makes up the survey area. The city chosen to name the region was used for one or both of the following two reasons:

- 1) It is the dominant centre due to population.
- 2) It has a central position relative to the region.



The borderlines were drawn according to regional centres, individual greenhouse placements and also to encompass populated areas in a simple manner. Figure 1 shows a map of Alberta divided into the ten regions.

**Figure 1: Map of Alberta Illustrating Regions and Major Centres**

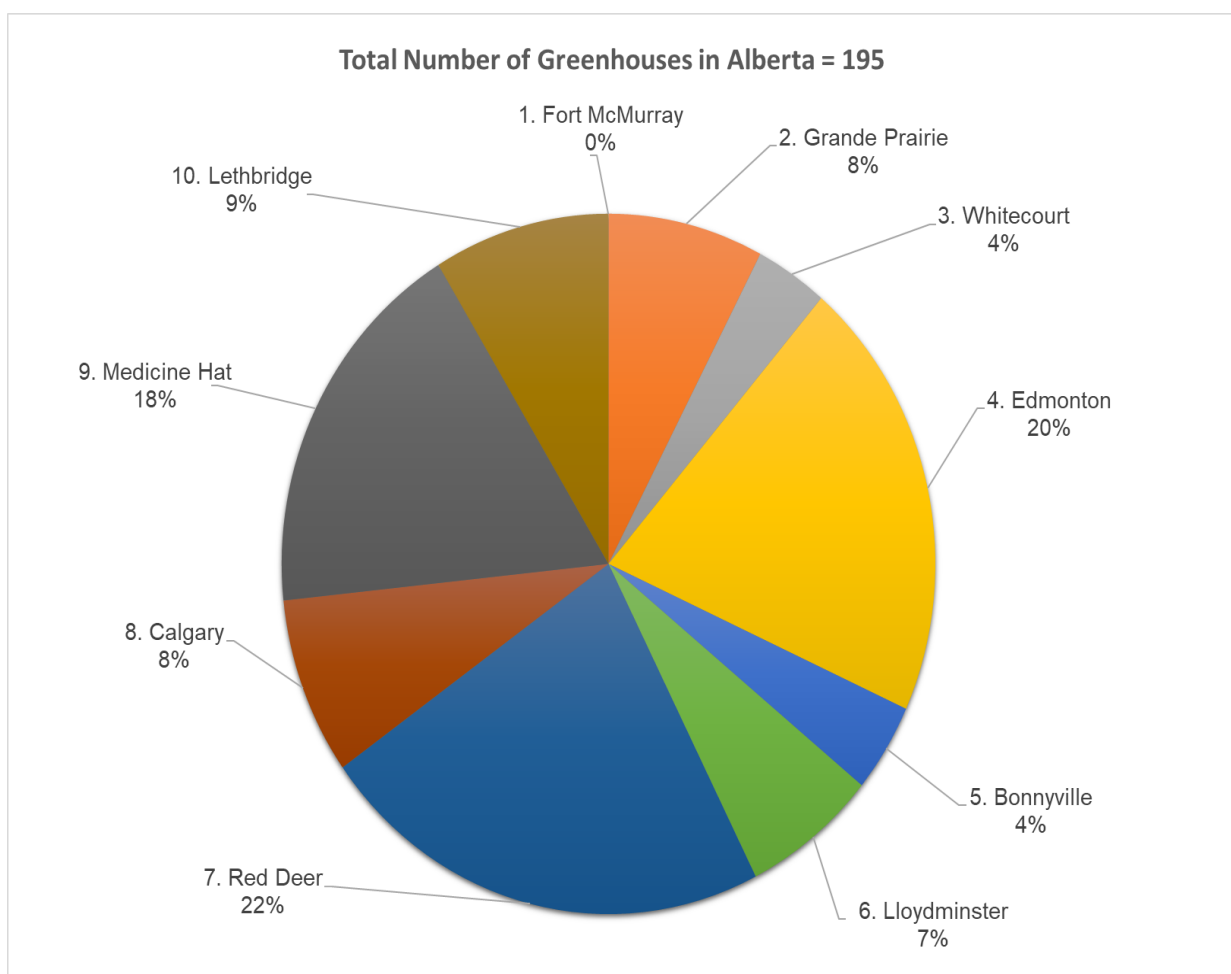


# Section 1: Greenhouse Information

## Number of Greenhouse Operations by Region in Alberta

Presently there are 195 greenhouse operations in Alberta. Based on the survey response, Red Deer has 22 per cent of the total followed by Edmonton with 20 per cent and Medicine Hat with 18 per cent. Figure 2 presents the number greenhouse operations located in each region of the province.

**Figure 2: Number of Greenhouses by Region**



## Years of Experience of Greenhouse Operators in Alberta

Of the 180 growers who answered this question (respondents), 94 operators or 52 per cent indicated they have more than 20 years' experience in the greenhouse crop industry. Thirty six operators or 20 per cent indicated they have 16 to 20 years' experience, eight per cent or 15 operators have 11 to 15 years' experience, 16 per cent or 29 operators have five to 10 years' experience while the remaining three per cent or six operators reported having less than five years' experience. Table 1.1 presents the range of experience from less than five years to more than 20 years.

**Table 1. 1: Years of Experience of Greenhouse Operators in Alberta**

Region	Operators Experience (Years)					Number of Growers by Region
	less than 5	5 to 10	11 to 15	16 to 20	Over 20	
1. Fort McMurray	0	0	0	0	0	0
2. Grande Prairie	1	3	2	3	5	14
3. Whitecourt	0	0	0	0	7	7
4. Edmonton	1	5	3	4	23	36
5. Bonnyville	1	1	1	1	4	8
6. Lloydminster	0	3	4	2	4	13
7. Red Deer	2	6	3	15	18	44
8. Calgary	0	1	0	4	9	14
9. Medicine Hat	1	6	1	4	16	28
10. Lethbridge	0	4	1	3	8	16
<b>Total</b>	<b>6</b>	<b>29</b>	<b>15</b>	<b>36</b>	<b>94</b>	<b>180</b>
<b>Per cent of Total</b>	<b>3.3%</b>	<b>16.1%</b>	<b>8.3%</b>	<b>20.0%</b>	<b>52.2%</b>	<b>100%</b>

## Education Level of Greenhouse Operators in Alberta

Table 1.2 lists the education level of greenhouse growers in Alberta. Of the 193 respondents, 67 growers or 35 per cent had grade 12 or less, 31 growers (16 per cent) were Olds College graduates, 52 growers (27 per cent) had other College degrees or had taken courses in horticulture, 33 growers (17 per cent) had completed their Bachelor of Science degree, and the remaining 10 growers (five per cent) had post-graduate education (M.Sc. or higher degree).

**Table 1. 2: Education Level of Greenhouse Operators in Alberta**

Region	Education Level of Greenhouse Operators					Number of Growers by Region
	Grade 12 or less	Olds College	Other College / Courses	B.Sc.	M.Sc. or higher	
1. Fort McMurray	0	0	0	0	0	0
2. Grande Prairie	5	1	8	3	0	17
3. Whitecourt	6	1	1	1	0	9
4. Edmonton	14	3	12	8	1	38
5. Bonnyville	2	2	0	3	1	8
6. Lloydminster	6	3	3	2	0	14
7. Red Deer	8	13	13	8	5	47
8. Calgary	3	1	5	5	0	14
9. Medicine Hat	20	4	5	0	1	30
10. Lethbridge	3	3	5	3	2	16
<b>Total</b>	<b>67</b>	<b>31</b>	<b>53</b>	<b>33</b>	<b>10</b>	<b>193</b>
<b>Per cent of Total</b>	<b>35%</b>	<b>16%</b>	<b>27%</b>	<b>17%</b>	<b>5%</b>	<b>100%</b>

## Type of Greenhouse Businesses in Alberta

Based on 181 survey responses, about 45 per cent of the greenhouse operations in Alberta are registered as family businesses or sole proprietorship (Table 1.3). This is followed by 26 per cent as incorporated and 24 per cent as limited type businesses.

**Table 1. 3: Type of Business of Greenhouse Operations**

Region	Type of Business				Number of Growers by Region
	Family	Incorporated	Limited	Non-Profit	
1. Fort McMurray	0	0	0	0	0
2. Grande Prairie	8	3	4	0	15
3. Whitecourt	3	1	3	0	7
4. Edmonton	13	10	12	0	35
5. Bonnyville	4	3	1	0	8
6. Lloydminster	12	1	0	0	13
7. Red Deer	25	12	7	0	44
8. Calgary	4	4	6	0	14
9. Medicine Hat	8	8	13	0	29
10. Lethbridge	4	6	5	1	16
<b>Total</b>	<b>81</b>	<b>48</b>	<b>51</b>	<b>1</b>	<b>181</b>
<b>Per cent of Total</b>	<b>45%</b>	<b>26%</b>	<b>29%</b>	<b>1%</b>	<b>100%</b>

## Total Land, Greenhouse Area and Number of Growers

Table 1.4 presents land area associated with greenhouses and total greenhouse area for each region. The data provided in this table is based on 195 greenhouse operations in Alberta.

**Table 1. 4: Total Land Area, Greenhouse Area, and Number of Growers in Alberta**

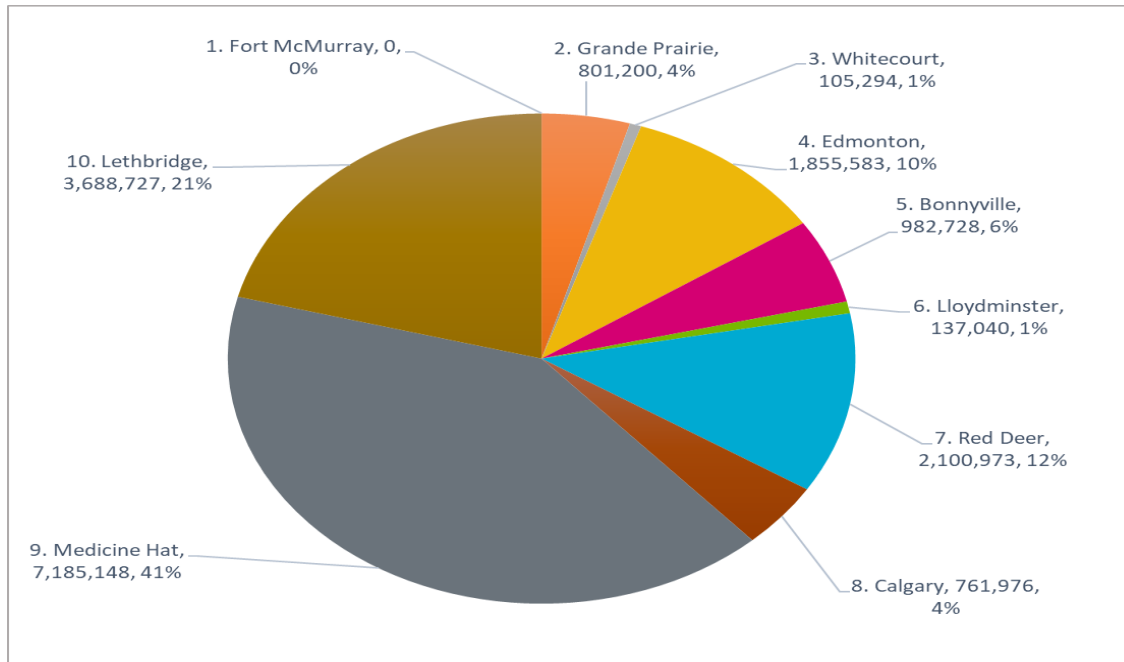
Region	Land Area		Greenhouse Area			Number of Growers by Region
	Acres	Hectares	(sq. ft)	(sq. m)	Per cent of Total	
1. Fort McMurray	0	0	0	0	0%	0
2. Grande Prairie	516	209	801,200	74,434	5%	15
3. Whitecourt	490	198	105,294	9,782	1%	7
4. Edmonton	983	398	1,855,583	172,389	11%	40
5. Bonnyville	201	81	982,728	91,298	6%	8
6. Lloydminster	257	104	137,040	12,731	1%	13
7. Red Deer	2,256	913	2,100,973	195,187	12%	44
8. Calgary	1,046	423	761,976	70,812	4%	16
9. Medicine Hat	506	205	7,185,148	667,522	41%	35
10. Lethbridge	404	163	3,688,727	342,694	21%	17
<b>Total</b>	<b>6,658</b>	<b>2,694</b>	<b>17,618,669</b>	<b>1,636,850</b>	<b>100%</b>	<b>195</b>

Total Greenhouse Area: 17,618,669 sq. ft. = 1,636,850 sq. m. = 404 acres = 164 hectares

Note: sq. ft. = square feet    sq. m. = square metre    1 sq. m. = 10.7639 sq. ft.    One Hectare = 2.4711 Acres

Figure 3 presents the percentage of greenhouse area in each region. The Medicine Hat region had 41 per cent of the total greenhouse area followed by Lethbridge at 21 per cent, Red Deer at 12 per cent and Edmonton at 11 per cent.

**Figure 3: Greenhouse Area by Region in Square Feet**



## Size of Greenhouse Operations in Alberta

Based on the survey responses, 35 per cent of greenhouse operations are larger than 40,000 sq. ft. (0.9 acres). About 42 per cent range from 10,000 sq. ft. to 40,000 sq. ft. (i.e. 0.2 acres to 0.9 acres) and the remaining 22 per cent have less than 10,000 sq. ft. or 0.2 acres. Table 1.5 shows the grouping of the various sizes of greenhouse operations by region in Alberta.

**Table 1. 5: Size of Greenhouse Operations in Alberta**

Region	Greenhouse Area (sq. ft.)				Number of Growers by Region
	< 10,000	10,000 to 19,999	20,000 to 40,000	>40,000	
1. Fort McMurray	0	0	0	0	0
2. Grande Prairie	4	6	2	3	15
3. Whitecourt	1	5	1	0	7
4. Edmonton	10	12	7	11	40
5. Bonnyville	1	2	2	3	8
6. Lloydminster	7	4	2	0	13
7. Red Deer	14	15	6	9	44
8. Calgary	3	2	6	5	16
9. Medicine Hat	2	0	4	29	35
10. Lethbridge	1	3	4	9	17
<b>Total</b>	<b>43</b>	<b>49</b>	<b>34</b>	<b>69</b>	<b>195</b>
<b>Per cent of Total</b>	<b>22%</b>	<b>25%</b>	<b>17%</b>	<b>35%</b>	<b>100%</b>

## Year Greenhouses were Constructed

Table 1.6 presents the year(s) greenhouses in Alberta were constructed. Based on survey responses, majority of greenhouse construction took place from year 2000. Thirty four per cent of the area was built between 2001 and 2010 and another 34 per cent from 2011 and 2019. About 21 per cent of greenhouses were built from 1991 to 2000, seven per cent from 1981 to 1990 and three cent in 1980 and prior.

**Table 1. 6: Year Greenhouses were Constructed**

Region	Year Greenhouse was built					Number of Growers by Region
	1980 or Prior	1981 to 1990	1991 to 2000	2001 to 2010	2011 to 2019	
1. Fort McMurray	0	0	0	0	0	0
2. Grande Prairie	0	0	4	3	6	13
3. Whitecourt	0	2	2	1	2	7
4. Edmonton	3	5	6	9	11	34
5. Bonnyville	0	0	4	1	2	7
6. Lloydminster	0	0	1	5	3	9
7. Red Deer	1	2	7	16	11	37
8. Calgary	1	1	2	4	5	13
9. Medicine Hat	0	0	5	6	6	17
10. Lethbridge	0	0	1	7	6	14
<b>Total</b>	<b>5</b>	<b>10</b>	<b>32</b>	<b>52</b>	<b>52</b>	<b>151</b>
<b>Per cent of Total</b>	<b>3%</b>	<b>7%</b>	<b>21%</b>	<b>34%</b>	<b>34%</b>	<b>100%</b>

## Expansion of Greenhouse Facilities by Region

Table 1.7 shows that of the 181 respondents, 126 operations or 70 per cent have expanded and the remaining 55 operations have not. Nineteen per cent of all the expansions occurred from 2011 to 2019, 39 per cent from 2001 to 2010 and 30 per cent from 1991 to 2000. Expansions in multiple years reported by operators were counted as one.

**Table 1. 7: Expansion of Greenhouses by Region**

Region	Have you ever had any expansion in your operation			If Yes, Year(s) Expansion Occurred					
	Yes	No	Number of Growers	1980 or Prior	1981 to 1990	1991 to 2000	2001 to 2010	2011 to 2019	Number of Expansion
1. Fort McMurray	0	0	0	0	0	0	0	0	0
2. Grande Prairie	12	2	14	0	0	3	2	1	6
3. Whitecourt	6	1	7	0	1	2	0	1	4
4. Edmonton	29	7	36	2	3	5	7	3	20
5. Bonnyville	7	1	8	0	0	2	0	0	2
6. Lloydminster	8	5	13	0	0	1	1	2	4
7. Red Deer	29	15	44	0	1	5	9	3	18
8. Calgary	11	3	14	1	1	1	1	0	4
9. Medicine Hat	13	16	29	0	0	3	4	2	9
10. Lethbridge	11	5	17	0	0	1	6	3	11
<b>Total</b>	<b>126</b>	<b>55</b>	<b>181</b>	<b>3</b>	<b>6</b>	<b>23</b>	<b>30</b>	<b>15</b>	<b>77</b>
<b>Per cent of Total</b>	<b>70%</b>	<b>30%</b>	<b>100%</b>	<b>4%</b>	<b>8%</b>	<b>30%</b>	<b>39%</b>	<b>19%</b>	<b>100%</b>

## Greenhouse Structures and Area by Region

Table 1.8 presents the structure of greenhouses and their corresponding areas. Based on the responses, double poly account for about 72 per cent of total area followed by glass at 23 per cent.

**Table 1. 8: Greenhouse Structures and Area**

Region	Greenhouse Structure and Area (Sq. M.)					Total Area by Region	Number of Growers by Region
	Glass	Single Poly	Double Poly	Polycarbonate	Other		
1. Fort McMurray	0	0	0	0	0	0	0
2. Grande Prairie	3,121	418	60,830	883	9,182	74,434.2	15
3. Whitecourt	279	0	9,022	481	0	9,781.8	7
4. Edmonton	51,711	3,188	105,357	12,133	0	172,389.5	40
5. Bonnyville	0	0	90,827	470	0	91,297.7	8
6. Lloydminster	0	0	12,467	264	0	12,731.1	13
7. Red Deer	24,719	2,004	146,747	21,717	0	195,187.1	44
8. Calgary	0	0	68,827	1,985	0	70,812.1	16
9. Medicine Hat	187,540	1,672	462,379	15,930	0	667,522.0	35
10. Lethbridge	113,564	3,066	217,532	8,292	240	342,694.2	17
<b>Total</b>	<b>380,934</b>	<b>10,349</b>	<b>1,173,989</b>	<b>62,156</b>	<b>9,422</b>	<b>1,636,850</b>	<b>195</b>
<b>Per cent of Total</b>	<b>23%</b>	<b>1%</b>	<b>72%</b>	<b>4%</b>	<b>1%</b>	<b>100%</b>	<b>100%</b>

## Greenhouse Crop Sector by Region

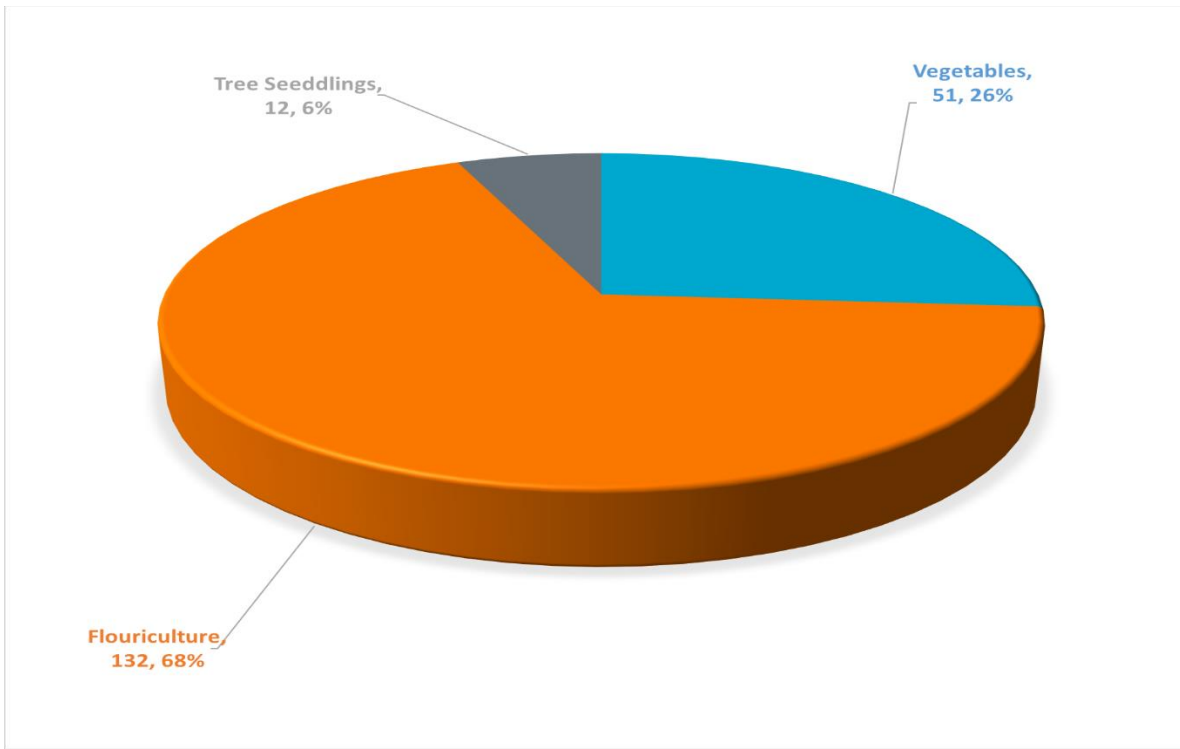
Table 1.9 and Figure 4 shows the number of greenhouses by sector in Alberta. About 68 per cent or 132 greenhouses are in floriculture, 51 greenhouses or 26 per cent in vegetables and the remaining six per cent or 12 greenhouses in tree seedlings. Some greenhouses are in more than one sector.

**Table 1. 9: Number of Greenhouses by Sector in Alberta**

Region	Number of Greenhouses by Crop Sector			Number of Greenhouses by Region
	Vegetables	Floriculture	Tree Seedlings	
1. Fort McMurray	0	0	0	0
2. Grande Prairie	1	12	2	15
3. Whitecourt	1	6	0	7
4. Edmonton	2	37	1	40
5. Bonnyville	0	4	4	8
6. Lloydminster	3	10	0	13
7. Red Deer	8	33	3	44
8. Calgary	3	13	0	16
9. Medicine Hat	28	5	2	35
10. Lethbridge	5	12	0	17
<b>Total</b>	<b>51</b>	<b>132</b>	<b>12</b>	<b>195</b>
<b>Per cent of Total</b>	<b>26%</b>	<b>68%</b>	<b>6%</b>	<b>100%</b>



**Figure 4: Number of Greenhouses by Sector in Alberta**



## Operation of Greenhouses by Region

Table 1.10 indicates operation of greenhouses by region. Based on survey responses, 40 per cent or 72 greenhouses operate year round while the remaining 60 per cent or 109 greenhouses operate seasonally.

**Table 1. 10: Operation of Greenhouses by Region**

Region	Operation		Number of Growers by Region
	Year round	Seasonal	
1. Fort McMurray	0	0	0
2. Grande Prairie	4	10	14
3. Whitecourt	3	4	7
4. Edmonton	15	21	36
5. Bonnyville	2	6	8
6. Lloydminster	4	9	13
7. Red Deer	11	33	44
8. Calgary	3	11	14
9. Medicine Hat	21	8	29
10. Lethbridge	9	7	16
<b>Total</b>	<b>72</b>	<b>109</b>	<b>181</b>
<b>Per cent of Total</b>	<b>40%</b>	<b>60%</b>	<b>100%</b>

## Financing of Greenhouse Operations

Table 1.11 shows number of greenhouse operations that are financed and those that are not. Of the 181 respondents, 91 operations or approximately 50 per cent have financing and the remaining do not.

**Table 1. 11: Financing of Greenhouse Operations**

Region	Financing		Number of Growers by Region
	Yes	No	
1. Fort McMurray	0	0	0
2. Grande Prairie	7	7	14
3. Whitecourt	2	5	7
4. Edmonton	13	23	36
5. Bonnyville	4	4	8
6. Lloydminster	5	8	13
7. Red Deer	23	21	44
8. Calgary	5	9	14
9. Medicine Hat	22	7	29
10. Lethbridge	10	6	16
<b>Total</b>	<b>91</b>	<b>90</b>	<b>181</b>
<b>Per cent of Total</b>	<b>50.3%</b>	<b>49.7%</b>	<b>100%</b>

## Source of Financing (Loans)

Table 1.12 shows the source of loans obtained by growers. Most growers (67 per cent) obtained their loans from banks, 13 per cent from Farm Credit Canada (FCC), 11 per cent from Agriculture Financial Services Corporation (AFSC) and the remaining eight per cent were self-financed. Some of the growers obtained loans from more than one institution.

**Table 1. 12: Source of Financing (Loans)**

Region	Financial Institution				Number of Growers by Region
	FCC*	AFSC**	Bank	Self-financed	
1. Fort McMurray	0	0	0	0	0
2. Grande Prairie	1	0	5	2	8
3. Whitecourt	0	1	1	0	2
4. Edmonton	3	2	7	3	15
5. Bonnyville	0	1	3	0	4
6. Lloydminster	1	1	3	3	8
7. Red Deer	4	2	17	0	23
8. Calgary	1	1	3	0	5
9. Medicine Hat	2	1	18	0	21
10. Lethbridge	1	2	8	0	11
<b>Total</b>	<b>13</b>	<b>11</b>	<b>65</b>	<b>8</b>	<b>97</b>
<b>Per cent of Total</b>	<b>13%</b>	<b>11%</b>	<b>67%</b>	<b>8%</b>	<b>100%</b>

\* Farm Credit Canada

\*\* Agriculture Financial Services Corporation

## Greenhouse Production Certified as Organic by Region

Table 1.13 indicates greenhouse production certified as organic by region. Only two growers or one per cent of respondents indicated that their production is certified as organic.

**Table 1. 13: Greenhouse Production Certified as Organic by Region**

Region	Production Certified as Organic		Number of Growers by Region	Crop and Area Under Organic Production (sq. m.)			
	Yes	No		Cucumber	Tomato	Pepper	Total Area
1. Fort McMurray	0	0	0	0	0	0	0
2. Grande Prairie	0	14	14	0	0	0	0
3. Whitecourt	0	7	7	0	0	0	0
4. Edmonton	0	36	36	0	0	0	0
5. Bonnyville	0	8	8	0	0	0	0
6. Lloydminster	0	13	13	0	0	0	0
7. Red Deer	0	44	44	0	0	0	0
8. Calgary	0	14	14	0	0	0	0
9. Medicine Hat	1	28	29	4,088	0	0	4,088
10. Lethbridge	1	15	16	1,672	1,568	941	4,181
<b>Total</b>	<b>2</b>	<b>179</b>	<b>181</b>	<b>5,760</b>	<b>1,568</b>	<b>941</b>	<b>8,269</b>
<b>Per cent of Total</b>	<b>1%</b>	<b>99%</b>	<b>100%</b>	<b>70%</b>	<b>19%</b>	<b>11%</b>	<b>100%</b>

## Breakdown of Sales by Market Channel

Table 1.14 shows the breakdown of sales by market channel. Leading responses included “own retail shop” at 47 per cent, “wholesale/cooperative” at 27 per cent, and “farmers markets” at 11 per cent. Sales to grocery stores, independent garden centres and box stores each had four per cent respectively.

**Table 1. 14: Breakdown of Sales by Market Channel**

Region	Majority of Sales							Number of Growers by Region
	Own retail shop	Wholesale / Coop	Farmers' Markets	Supermarkets / Grocery Stores	Independent Garden Centres	Mass Merchandisers/Box Stores	Other	
1. Fort McMurray	0	0	0	0	0	0	0	0
2. Grande Prairie	12	2	3	1	1	2	0	21
3. Whitecourt	7	2	3	1	0	0	0	13
4. Edmonton	30	8	6	2	4	1	5	56
5. Bonnyville	4	4	0	1	0	0	0	9
6. Lloydminster	11	5	2	0	1	0	0	19
7. Red Deer	34	12	10	1	2	3	2	64
8. Calgary	8	8	3	1	0	1	1	22
9. Medicine Hat	5	24	0	1	1	2	1	34
10. Lethbridge	11	5	2	3	1	1	0	23
<b>Total</b>	<b>122</b>	<b>70</b>	<b>29</b>	<b>11</b>	<b>10</b>	<b>10</b>	<b>9</b>	<b>261*</b>
<b>Per cent of Growers</b>	<b>47%</b>	<b>27%</b>	<b>11%</b>	<b>4%</b>	<b>4%</b>	<b>4%</b>	<b>3%</b>	<b>100%</b>

\* Multiple growers

# Annual Gross Sales of Greenhouse Operations

Table 1.15 presents the annual sales volume of greenhouse operations in Alberta.

**Table 1. 15: Annual Gross Sales of Greenhouse Operations**

Region	Operation's Annual Gross Sales										Number of Growers by Region
	Under \$50,000	\$50,001 to \$100,000	\$100,001 to \$500,000	\$500,001 to \$1 Million	\$1 Million to \$2 Million	\$2 Million to \$3 Million	\$3 Million to \$4 Million	\$4 Million to \$5 Million	\$5 Million to \$6 Million	Over \$6 Million	
1. Fort McMurray	0	0	0	0	0	0	0	0	0	0	0
2. Grande Prairie	3	1	7	0	2	1	0	0	0	0	14
3. Whitecourt	0	5	1	1	0	0	0	0	0	0	7
4. Edmonton	4	2	14	4	5	3	1	0	0	1	34
5. Bonnyville	1	0	3	1	1	1	0	0	1	0	8
6. Lloydminster	5	3	4	0	0	0	0	0	0	0	12
7. Red Deer	8	7	14	5	6	0	2	1	0	1	44
8. Calgary	2	1	3	3	2	0	0	2	0	0	13
9. Medicine Hat	0	1	10	4	5	4	3	0	1	1	29
10. Lethbridge	2	0	5	4	1	0	1	0	0	3	16
<b>Total</b>	<b>25</b>	<b>20</b>	<b>61</b>	<b>22</b>	<b>22</b>	<b>9</b>	<b>7</b>	<b>3</b>	<b>2</b>	<b>6</b>	<b>177</b>
Per cent of Growers	14%	11%	34%	12%	12%	5%	4%	2%	1%	3%	100%

Based on survey responses, 34 per cent of growers have annual sales of \$100,001 to \$500,000, followed by the “under \$50,000” category with 14 per cent. The “\$500,001 to \$1 million” and “\$1 million to \$2 million” categories were the third leading response at 12 per cent each.

Nine per cent of respondents reported annual sales volume of \$2 million to \$4 million, three per cent reported annual sales volume of \$4 million to \$6 million and those with over \$6 million accounted for about three per cent of the total number of respondents.

## Section 2: Heating System / Efficiencies

### Type of Heating System

Table 2.1 shows the type of heating system used in Alberta greenhouses. Some growers used more than one heating system. Based on the responses, 57 per cent of growers use forced air furnaces, followed by hot water at 24 per cent, in-floor heating at seven per cent and steam at six per cent.

**Table 2. 1: Types of Heating Systems Used in Greenhouses**

Region	Type of Heating System							Number of Growers by Region
	Hot Water	Steam boiler	Forced air furnace	In-floor Heating	Pipe under growing media	Soil Heating	Combine Heat and Power	
1. Fort McMurray	0	0	0	0	0	0	0	0
2. Grande Prairie	3	0	13	1	0	0	0	17
3. Whitecourt	4	0	5	3	0	1	0	13
4. Edmonton	9	4	30	4	3	1	0	51
5. Bonnyville	1	1	8	0	1	0	0	11
6. Lloydminster	3	0	12	1	0	0	1	17
7. Red Deer	13	2	34	6	0	0	1	56
8. Calgary	5	1	12	1	1	0	0	20
9. Medicine Hat	15	5	14	1	4	0	0	39
10. Lethbridge	6	2	11	1	0	0	0	20
<b>Total</b>	<b>59</b>	<b>15</b>	<b>139</b>	<b>18</b>	<b>9</b>	<b>2</b>	<b>2</b>	<b>244*</b>
<b>Per cent of Total</b>	<b>24%</b>	<b>6%</b>	<b>57%</b>	<b>7%</b>	<b>4%</b>	<b>1%</b>	<b>1%</b>	<b>100%</b>

\* Multiple growers

### Type of Heating Fuel

Table 2.2 indicates the type of heating fuel used in greenhouses by region. Natural gas continues to be the fuel of choice at 85 five per cent, followed by propane at nine per cent and wood at three per cent.

**Table 2. 2: Type of Heating Fuel**

Region	Type of Heating Fuel						Number of Growers by Region
	Natural Gas	Propane	Coal	Wood	Oil	Electric	
1. Fort McMurray	0	0	0	0	0	0	0
2. Grande Prairie	12	4	0	1	1	0	18
3. Whitecourt	7	1	0	0	0	0	8
4. Edmonton	34	2	2	2	0	1	41
5. Bonnyville	8	1	0	0	0	0	9
6. Lloydminster	13	0	1	0	0	0	14
7. Red Deer	39	7	1	1	0	1	49
8. Calgary	13	1	0	0	0	0	14
9. Medicine Hat	29	0	0	0	0	1	30
10. Lethbridge	15	1	0	1	0	0	17
<b>Total</b>	<b>170</b>	<b>17</b>	<b>4</b>	<b>5</b>	<b>1</b>	<b>3</b>	<b>200</b>
<b>Per cent of Total</b>	<b>85%</b>	<b>9%</b>	<b>2%</b>	<b>3%</b>	<b>1%</b>	<b>2%</b>	<b>100%</b>

## Energy Saving Systems

Table 2.3 shows the energy saving systems used in greenhouses by region. Approximately 41 per cent or 113 growers use centralized furnace with greater than 95 per cent energy efficiency rating. Approximately 22 per cent or 61 growers use boilers with greater than 95 per cent energy efficiency rating. The next leading response is energy curtains at 11 per cent.

**Table 2. 3: Energy Saving Systems Used in Greenhouses**

Region	Energy Saving Systems Used in Greenhouses							Number of Growers by Region
	Boiler, >95%	Centralized furnace, >95% efficient	Radiant tube heater	Heat storage	Energy curtains	In-floor heating	Foundation and side walls insulated	
1. Fort McMurray	0	0	0	0	0	0	0	0
2. Grande Prairie	2	10	1	0	3	2	1	19
3. Whitecourt	2	5	0	0	0	2	2	11
4. Edmonton	11	22	3	0	8	4	8	56
5. Bonnyville	2	7	0	0	1	0	0	10
6. Lloydminster	2	11	1	0	0	0	2	16
7. Red Deer	12	29	7	2	6	10	6	72
8. Calgary	4	6	2	1	1	2	3	19
9. Medicine Hat	19	13	1	4	3	2	4	46
10. Lethbridge	7	10	0	2	7	1	0	27
<b>Total</b>	<b>61</b>	<b>113</b>	<b>15</b>	<b>9</b>	<b>29</b>	<b>23</b>	<b>26</b>	<b>276</b>
<b>Per cent of Total</b>	<b>22%</b>	<b>41%</b>	<b>5%</b>	<b>3%</b>	<b>11%</b>	<b>8%</b>	<b>9%</b>	<b>100%</b>

## Efficiency of Energy Curtains

Table 2.4 shows the efficiency rating of energy curtains used in greenhouses. Approximately 13 growers or 46 per cent use energy curtains with less than 50 per cent efficiency rating.

**Table 2. 4: Energy Efficient Systems Used in Greenhouses**

Region	Per cent Efficiency of Energy Curtains					Number of Growers by Region
	Less than 30%	31% to 50%	51% to 75%	76% to 90%	Greater than 90%	
1. Fort McMurray	0	0	0	0	0	0
2. Grande Prairie	0	2	0	1	0	3
3. Whitecourt	0	0	0	0	0	0
4. Edmonton	2	1	2	2	1	8
5. Bonnyville	0	0	1	0	0	1
6. Lloydminster	0	0	0	0	0	0
7. Red Deer	1	3	0	1	1	6
8. Calgary	0	0	0	0	0	0
9. Medicine Hat	1	1	1	0	0	3
10. Lethbridge	0	2	0	4	1	7
<b>Total</b>	<b>4</b>	<b>9</b>	<b>4</b>	<b>8</b>	<b>3</b>	<b>28</b>
<b>Per cent of Total</b>	<b>14%</b>	<b>32%</b>	<b>14%</b>	<b>29%</b>	<b>11%</b>	<b>100%</b>

## Heating Cost of Greenhouse Operations in Alberta

Table 2.5 shows the heating cost of greenhouse operations in Alberta. Approximately 83 per cent or 161 growers responded to the heating cost question. Average heating cost was estimated at \$8.82 per sq. m. or \$0.82 per sq. ft. This translates into a total heating expenditure for the greenhouse industry in Alberta of approximately \$14.44 million in 2019.

**Table 2. 5: Heating Costs per Year**

Region	Heating Costs Per Year			
	Heating costs \$	Area Heated (sq. ft)	Area Heated (sq. m)	Number of Growers by Region
1. Fort McMurray	0	0	0	0
2. Grande Prairie	462,200	744,000	69,120	12
3. Whitecourt	89,000	105,294	9,782	7
4. Edmonton	965,047	1,272,663	118,234	33
5. Bonnyville	1,086,043	966,728	89,812	7
6. Lloydminster	130,200	115,300	10,712	11
7. Red Deer	1,204,275	1,751,903	162,757	39
8. Calgary	635,260	651,808	60,577	11
9. Medicine Hat	5,208,100	5,076,468	471,619	26
10. Lethbridge	1,921,700	3,595,727	334,054	15
<b>Total</b>	<b>11,701,825</b>	<b>14,279,891</b>	<b>1,326,668</b>	<b>161</b>
Heating costs/sq. ft.	\$0.82			
Heating costs/sq. m.	\$8.82			

## Carbon Dioxide Recovery by Greenhouse Operations

Table 2.6 shows greenhouse operations in Alberta that have a carbon dioxide (CO<sub>2</sub>) recovery system. Based on survey responses, only 11 per cent of the growers in Alberta had a CO<sub>2</sub> recovery system in greenhouses.

**Table 2. 6: Recovery of Carbon Dioxide from Greenhouses**

Region	Do you have a CO <sub>2</sub> recovery system?		Number of Growers by Region
	Yes	No	
1. Fort McMurray	0	0	0
2. Grande Prairie	0	14	14
3. Whitecourt	0	7	7
4. Edmonton	3	33	36
5. Bonnyville	1	7	8
6. Lloydminster	1	12	13
7. Red Deer	4	40	44
8. Calgary	1	13	14
9. Medicine Hat	15	14	29
10. Lethbridge	4	12	16
<b>Total</b>	<b>29</b>	<b>152</b>	<b>181</b>
<b>Per cent of Total</b>	<b>16%</b>	<b>84%</b>	<b>100%</b>



# Section 3: Environmental Control

## Type of Environmental Control System

Table 3.1 presents environmental control systems. Most growers had more than one environmental control system in their greenhouses. About 31 per cent or 100 greenhouses have exhaust fans, followed by those who use wall vent and fans at 24 per cent, gutter vents at 20 per cent, ventilation systems at 13 per cent and eight per cent with natural ridge vent systems.

**Table 3. 1: Types of Environmental Control Systems**

Region	Type of Environmental Control Systems						Number of Growers by Region
	Gutter vents	Wall vent and fan	Pad, fan and wall vent	Ventilation	Exhaust fans	Natural ridge vents	
1. Fort McMurray	0	0	0	0	0	0	0
2. Grande Prairie	4	7	2	4	8	1	26
3. Whitecourt	1	3	0	1	4	2	11
4. Edmonton	11	15	5	5	22	8	66
5. Bonnyville	4	3	2	3	4	0	16
6. Lloydminster	3	3	0	3	9	1	19
7. Red Deer	12	21	1	16	26	4	80
8. Calgary	9	7	2	2	7	2	29
9. Medicine Hat	16	13	3	7	15	2	56
10. Lethbridge	5	5	0	3	5	6	24
<b>Total</b>	<b>65</b>	<b>77</b>	<b>15</b>	<b>44</b>	<b>100</b>	<b>26</b>	<b>327</b>
<b>Per cent of Total</b>	<b>20%</b>	<b>24%</b>	<b>5%</b>	<b>13%</b>	<b>31%</b>	<b>8%</b>	<b>100%</b>

\* Multiple growers

## Summer and Winter Ventilation

Based on a total of 181 survey respondents, approximately of 34 per cent or 61 growers had summer and winter ventilation (fan and jet) while 66 per cent reported none in all regions.

**Table 3. 2: Summer and Winter Ventilation**

Region	Do you have Summer and Winter Ventilation (fan and jet)?		Number of Growers by Region
	Yes	No	
1. Fort McMurray	0	0	0
2. Grande Prairie	2	12	14
3. Whitecourt	1	6	7
4. Edmonton	14	22	36
5. Bonnyville	3	5	8
6. Lloydminster	7	6	13
7. Red Deer	10	34	44
8. Calgary	6	8	14
9. Medicine Hat	13	16	29
10. Lethbridge	5	11	16
<b>Total</b>	<b>61</b>	<b>120</b>	<b>181</b>
<b>Per cent of Total</b>	<b>34%</b>	<b>66%</b>	<b>100%</b>

## Horizontal or Vertical Air Flow Fans

Table 3.3 presents information on greenhouses that have horizontal or vertical air flow fans in Alberta. Based on survey responses, 71 per cent or 128 growers have and the remaining 29 per cent or 53 growers do not.

**Table 3. 3: Horizontal or Vertical Air Flow Fans**

Region	Do you have horizontal or vertical air flow fans?		Number of Growers by Region
	Yes	No	
1. Fort McMurray	0	0	0
2. Grande Prairie	11	3	14
3. Whitecourt	4	3	7
4. Edmonton	26	10	36
5. Bonnyville	7	1	8
6. Lloydminster	9	4	13
7. Red Deer	27	17	44
8. Calgary	9	5	14
9. Medicine Hat	21	8	29
10. Lethbridge	14	2	16
<b>Total</b>	<b>128</b>	<b>53</b>	<b>181</b>
<b>Per cent of Total</b>	<b>71%</b>	<b>29%</b>	<b>100%</b>

## Cooling System

Table 3.4 shows that 16 per cent or 29 growers have cooling systems in their greenhouses and the remaining 84 per cent do not have. Of those who have, 42 per cent each use fogging and misting coolers, nine per cent use evaporative coolers and the remaining six per cent use air conditioners.

**Table 3. 4: Cooling System**

Region	Do you have a cooling system?		Number of Growers by Region	If yes, type of cooling system?				Number of Growers by Region
	Yes	No		Fogging	Misting	Evaporative	Air-conditioning	
1. Fort McMurray	0	0	0	0	0	0	0	0
2. Grande Prairie	0	14	14	0	0	0	0	0
3. Whitecourt	1	6	7	0	1	0	0	1
4. Edmonton	6	30	36	3	2	0	1	6
5. Bonnyville	2	6	8	1	1	0	0	2
6. Lloydminster	0	13	13	0	0	0	0	0
7. Red Deer	3	41	44	0	2	0	1	3
8. Calgary	1	13	14	0	0	1	0	1
9. Medicine Hat	15	14	29	10	8	1	0	19
10. Lethbridge	1	15	16	0	0	1	0	1
<b>Total</b>	<b>29</b>	<b>152</b>	<b>181</b>	<b>14</b>	<b>14</b>	<b>3</b>	<b>2</b>	<b>33</b>
<b>Per cent of Total</b>	<b>16%</b>	<b>84%</b>	<b>100%</b>	<b>42%</b>	<b>42%</b>	<b>9%</b>	<b>6%</b>	<b>100%</b>

## Curtains

Table 3.5 presents growers who use curtains in their greenhouses. Of the 181 growers, 24 per cent or 44 growers have curtains and the remaining 76 per cent do not use curtains.

**Table 3. 5: Use of Curtains**

Region	Do you have curtains?		Number of Growers by Region
	Yes	No	
1. Fort McMurray	0	0	0
2. Grande Prairie	3	11	14
3. Whitecourt	0	7	7
4. Edmonton	13	23	36
5. Bonnyville	2	6	8
6. Lloydminster	3	10	13
7. Red Deer	9	35	44
8. Calgary	2	12	14
9. Medicine Hat	3	26	29
10. Lethbridge	9	7	16
<b>Total</b>	<b>44</b>	<b>137</b>	<b>181</b>
<b>Per cent of Total</b>	<b>24%</b>	<b>76%</b>	<b>100%</b>

## Relative Humidity Control System

Table 3.6 shows that 29 per cent or 53 growers have relative humidity control systems in their greenhouses and the remaining 71 per cent do not have.

**Table 3. 6: Relative Humidity Control System**

Region	Do you have a relative humidity control system?		Number of Growers by Region
	Yes	No	
1. Fort McMurray	0	0	0
2. Grande Prairie	1	13	14
3. Whitecourt	1	6	7
4. Edmonton	7	29	36
5. Bonnyville	2	6	8
6. Lloydminster	2	11	13
7. Red Deer	11	33	44
8. Calgary	4	10	14
9. Medicine Hat	18	11	29
10. Lethbridge	7	9	16
<b>Total</b>	<b>53</b>	<b>128</b>	<b>181</b>
<b>Per cent of Total</b>	<b>29%</b>	<b>71%</b>	<b>100%</b>

# Section 4: Computer Use

## Type of Computers used by Greenhouse Growers

Table 4.1 indicates types of computers used by growers. Based on the responses, some used more than one type of computer. Leading responses include Basic Thermostats at 34 per cent or 63 growers, manual control at 29 per cent, Priva at 19 per cent and Argus at 17 per cent.

**Table 4. 1: Type of Computers Used in Greenhouses**

Region	Type of Computer					Number of Growers by Region
	Priva	Argus	Basic Thermostats	Manual Control	Others - e.g. cell phones	
1. Fort McMurray	0	0	0	0	0	0
2. Grande Prairie	1	1	4	8	1	14
3. Whitecourt	0	0	6	1	0	7
4. Edmonton	1	3	15	12	2	31
5. Bonnyville	3	1	4	2	0	10
6. Lloydminster	2	1	7	5	0	15
7. Red Deer	11	2	15	17	0	45
8. Calgary	0	4	6	4	0	14
9. Medicine Hat	16	13	3	2	0	34
10. Lethbridge	1	7	3	2	2	13
<b>Total</b>	<b>35</b>	<b>32</b>	<b>63</b>	<b>53</b>	<b>5</b>	<b>183</b>
<b>Per cent of Total</b>	<b>19%</b>	<b>17%</b>	<b>34%</b>	<b>29%</b>	<b>3%</b>	<b>100%</b>

## Computer Use in Greenhouses

Table 4.2 indicates the use of computers. About 17 per cent of growers use computers for environmental control, 39 per cent for book-keeping, 30 per cent for crop scheduling, 14 per cent for irrigation control, 41 per cent each for e-mail and internet search respectively.

**Table 4. 2: Uses of Computers by Greenhouse Growers**

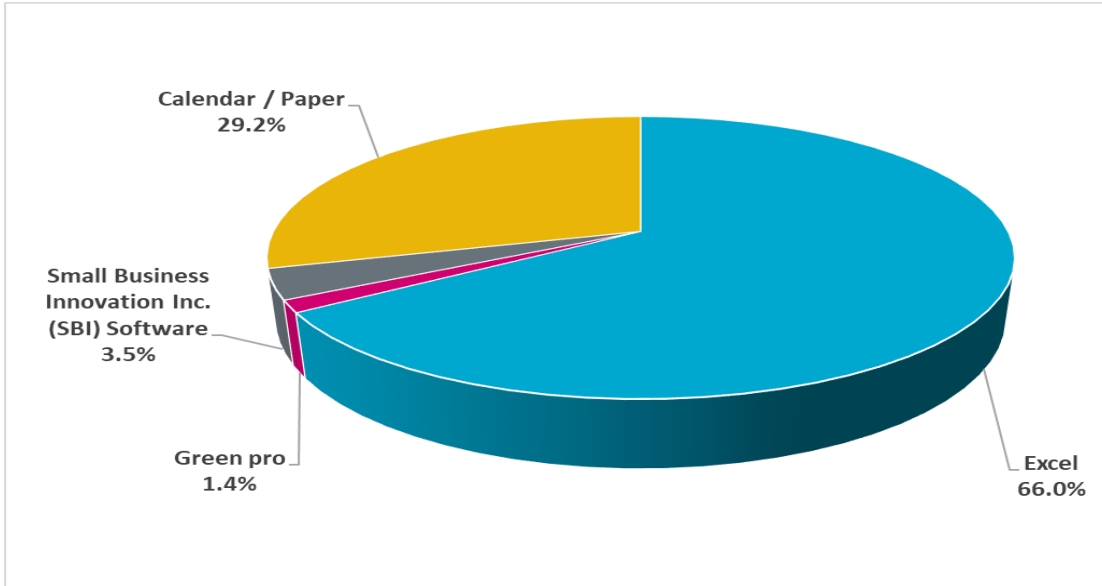
Region	Type of Computer						Number of Growers by Region
	Environmental control	Book-keeping	Crop scheduling	Irrigation control	E-mail	Internet	
1. Fort McMurray	0	0	0	0	0	0	0
2. Grande Prairie	2	14	10	3	14	14	57
3. Whitecourt	0	7	4	0	7	7	25
4. Edmonton	8	31	25	8	35	34	141
5. Bonnyville	2	7	5	2	8	8	32
6. Lloydminster	4	12	6	3	12	12	49
7. Red Deer	17	43	31	12	43	43	189
8. Calgary	6	12	10	4	13	13	58
9. Medicine Hat	22	21	19	18	23	23	126
10. Lethbridge	10	15	14	8	15	15	77
<b>Total</b>	<b>71</b>	<b>162</b>	<b>124</b>	<b>58</b>	<b>170</b>	<b>169</b>	<b>415*</b>
<b>Per cent of Total</b>	<b>17%</b>	<b>39%</b>	<b>30%</b>	<b>14%</b>	<b>41%</b>	<b>41%</b>	<b>100%</b>

\*Growers using multiple programs.

# Crop Scheduling Programs

Regarding crop scheduling, growers were asked to report on the programs they use. Figure 5 shows the crop scheduling programs used by greenhouse growers in Alberta.

**Figure 5: Crop Scheduling Programs Used by Growers**



Based on the responses, approximately 66 per cent use Microsoft Excel, 29 per cent use calendar and paper, four per cent use SBI software, one per cent use Green pro. The regional breakdown of this information is presented in Table 4.3.

**Table 4.3: Crop Scheduling Program Used by Greenhouse Growers**

Region	Crop Scheduling Program				Number of Growers by Region
	Excel	Green pro	Small Business Innovation Inc. (SBI) Software	Calendar/Paper	
1. Fort McMurray	0	0	0	0	0
2. Grande Prairie	6	0	1	6	13
3. Whitecourt	4	0	0	0	4
4. Edmonton	18	1	0	10	29
5. Bonnyville	5	0	0	3	8
6. Lloydminster	5	0	0	3	8
7. Red Deer	23	1	1	9	34
8. Calgary	7	0	1	4	12
9. Medicine Hat	16	0	0	4	20
10. Lethbridge	11	0	2	3	16
<b>Total</b>	<b>95</b>	<b>2</b>	<b>5</b>	<b>42</b>	<b>144</b>
<b>Per cent of Total</b>	<b>66.0%</b>	<b>1.4%</b>	<b>3.5%</b>	<b>29.2%</b>	<b>100%</b>

# Section 5: Lighting Systems

## Type of Lighting System in Greenhouses

Table 5.1 lists the multiple lighting systems used by growers and their corresponding per cent area in greenhouses. Leading responses include high pressure sodium (HPS) lights at 58 per cent followed by Light Emitting Diode (LED) at 37 per cent and photo period lights at two per cent.

**Table 5. 1: Lighting Systems in Greenhouses**

Region	Type of Lighting System				Average Per Cent Area of Lighting System				Number of Growers by Region
	High Pressure Sodium (HPS)	Photo Period Light	Light Emitting Diode (LED)	Other lighting	High Pressure Sodium % Area	Photo period light % Area	LED % Area	Other lighting % Area	
1. Fort McMurray	0	0	0	0	0	0	0	0	0
2. Grande Prairie	4	0	0	0	16	0	0	0	4
3. Whitecourt	2	0	1	0	3	0	3	0	3
4. Edmonton	11	1	9	1	4	0	4	5	22
5. Bonnyville	5	0	1	0	47	0	3	3	6
6. Lloydminster	1	0	3	0	4	0	15	0	4
7. Red Deer	12	1	8	0	6	0	3	10	21
8. Calgary	5	0	2	1	5	0	14	0	8
9. Medicine Hat	3	0	2	0	7	0	3	0	5
10. Lethbridge	4	0	4	0	6	6	5	1	8
<b>Total</b>	<b>47</b>	<b>2</b>	<b>30</b>	<b>2</b>	<b>8</b>	<b>1</b>	<b>5</b>	<b>4</b>	<b>81</b>
<b>Per cent of Total</b>	<b>58%</b>	<b>2%</b>	<b>37%</b>	<b>2%</b>	<b>46.3%</b>	<b>3.6%</b>	<b>29.2%</b>	<b>20.8%</b>	<b>100.0%</b>

## Total Number of Lights in Greenhouses

Table 5.2 shows the total number of lights by type in all regions. Based on responses from 81 growers the total number of lights was estimated at 47,431.

**Table 5. 2: Number of Lights in Greenhouses**

Region	Number of Lights				Total Number of Lights	Number of Growers by Region
	HPS	Photo Period Light	LED	Other lighting		
1. Fort McMurray	0	0	0	0	0	0
2. Grande Prairie	649	0	0	0	649	4
3. Whitecourt	8	0	12	0	20	3
4. Edmonton	274	0	362	60	696	22
5. Bonnyville	1,999	0	1,000	8	3,007	6
6. Lloydminster	10	0	30	0	40	4
7. Red Deer	5,164	0	8,299	8,027	21,490	21
8. Calgary	337	0	344	2	683	8
9. Medicine Hat	19,470	70	850	0	20,390	5
10. Lethbridge	312	7	132	5	456	8
<b>Total</b>	<b>28,223</b>	<b>77</b>	<b>11,029</b>	<b>8,102</b>	<b>47,431</b>	<b>81</b>
<b>Per cent of Total</b>	<b>60%</b>	<b>0%</b>	<b>23%</b>	<b>17%</b>	<b>100%</b>	

# Total Wattage in Greenhouses

Table 5.3 shows the total wattage in all regions. Based on responses from 81 growers the total wattage was estimated at approximately 21.6 million watts.

**Table 5. 3: Total Wattage in Greenhouses**

Region	Total Wattage Per Lighting System				Combined Total Wattage	Number of Growers by Region
	HPS	Photo period light	LED	Other lighting*		
1. Fort McMurray	0	0	0	0	0	0
2. Grande Prairie	463,000	0	0	0	463,000	4
3. Whitecourt	3,600	0	3,000	0	6,600	3
4. Edmonton	50,601	0	79,801	2,000	132,402	22
5. Bonnyville	568,400	0	0	240	568,640	6
6. Lloydminster	70,000	0	83,000	0	153,000	4
7. Red Deer	77,050	0	420,330	302,400	799,780	21
8. Calgary	50,500	0	21,100	120	71,720	8
9. Medicine Hat	19,174,000	14,000	164,500	0	19,352,500	5
10. Lethbridge	12,750	0	31,800	500	45,050	8
<b>Total</b>	<b>20,469,901</b>	<b>14,000</b>	<b>803,531</b>	<b>305,260</b>	<b>21,592,692</b>	<b>81</b>
<b>Per cent of Total</b>	<b>94.8%</b>	<b>0.1%</b>	<b>3.7%</b>	<b>1.4%</b>	<b>100.0%</b>	

\* Other lighting include fluorescent, regular bulbs

# Section 6: Water Use

## Source of Water

Table 6.1 shows the source of water used by growers in all regions. Thirty two per cent of respondents indicated that their water is sourced from dugouts, 22 per cent from wells, 37 per cent from city water and the remaining nine per cent from irrigation canals and rivers.

**Table 6. 1: Source of Water Used by Greenhouse Growers**

Region	Source of Water					Number of Growers by Region
	Dugout	Well	Irrigation Canal	River	City Water	
1. Fort McMurray	0	0	0	0	0	0
2. Grande Prairie	5	2	0	1	7	15
3. Whitecourt	3	3	0	0	3	9
4. Edmonton	10	10	0	0	21	41
5. Bonnyville	3	11	0	1	2	17
6. Lloydminster	3	5	0	0	7	15
7. Red Deer	24	11	2	1	10	48
8. Calgary	7	4	3	1	1	16
9. Medicine Hat	5	0	3	0	23	31
10. Lethbridge	8	2	7	0	5	22
<b>Total</b>	<b>68</b>	<b>48</b>	<b>15</b>	<b>4</b>	<b>79</b>	<b>214</b>
<b>Per cent of Total</b>	<b>32%</b>	<b>22%</b>	<b>7%</b>	<b>2%</b>	<b>37%</b>	<b>100%</b>

## Quantity of Water Used by Greenhouse Growers

Table 6.2 shows that only 12 per cent of 181 respondents know the total quantity of water they use. These growers indicated that they use approximately 184 million gallons of water for a total 3,461,934 sq. ft. area. It is interesting to note that a large number of growers did not keep records of water use.

**Table 6. 2: Quantity of Water Used by Greenhouse Growers**

Region	Do you know the total quantity of water you use?			If yes, quantity of water used and corresponding area			
	Yes	No	Number of Growers	Cubic metre (m3)	Gallon	Area (sq. m)	Area (sq. ft.)
1. Fort McMurray	0	0	0	0	0	0	0
2. Grande Prairie	1	13	14	14,000	3,698,408	20,439	220,000
3. Whitecourt	0	7	7	0	0	0	0
4. Edmonton	6	30	36	14,100	3,724,720	11,339	122,052
5. Bonnyville	2	6	8	51,137	13,509,030	42,747	460,128
6. Lloydminster	2	11	13	122	32,150	1,184	12,740
7. Red Deer	6	38	44	589,828	155,815,974	59,515	640,610
8. Calgary	2	12	14	154	40,550	1,765	19,000
9. Medicine Hat	1	28	29	11,875	3,137,043	13,230	142,404
10. Lethbridge	2	14	16	14,402	3,804,605	171,406	1,845,000
<b>Total</b>	<b>22</b>	<b>159</b>	<b>181</b>	<b>695,617</b>	<b>183,762,479</b>	<b>321,624</b>	<b>3,461,934</b>
<b>Per cent of Total</b>	<b>12%</b>	<b>88%</b>	<b>100%</b>	Average water use = 2.2 m3/sq. m. or 53.1 gallons/sq. ft.			

Note: Conversion rate, One Cubic meter (1.00 m<sup>3</sup>) = 264.172 Gallon



Water use is generally standard per unit area of the greenhouse. Based on the survey responses, average water use is estimated at 2.2 cubic metre per square metre or 53.1 gallons per square feet.

## Collection of Water from Greenhouse Roof

Based on survey responses, 45 per cent of growers collected water from greenhouse roofs while 55 per cent did not (Table 6.3).

**Table 6. 3: Collection of Water from Greenhouse Roof**

Region	Do you collect water from the roof of your greenhouse?		
	Yes	No	Number of Growers by Region
1. Fort McMurray	0	0	0
2. Grande Prairie	6	8	14
3. Whitecourt	2	5	7
4. Edmonton	18	18	36
5. Bonnyville	3	5	8
6. Lloydminster	6	7	13
7. Red Deer	25	19	44
8. Calgary	11	3	14
9. Medicine Hat	5	24	29
10. Lethbridge	5	11	16
<b>Total</b>	<b>81</b>	<b>100</b>	<b>181</b>
<b>Per cent of Total</b>	<b>45%</b>	<b>55%</b>	<b>100%</b>

## Water Quality

Regarding water quality, 32 per cent of 180 respondents reported their water was hard while 16 per cent and 53 per cent reported soft and medium water respectively.

**Table 6. 4: Quality of Water Used in Greenhouses**

Region	Quality of Water Used			Number of Growers by Region
	Hard	Soft	Medium	
1. Fort McMurray	0	0	0	0
2. Grande Prairie	1	4	9	14
3. Whitecourt	6	0	1	7
4. Edmonton	10	5	21	36
5. Bonnyville	3	0	5	8
6. Lloydminster	1	1	11	13
7. Red Deer	14	11	19	44
8. Calgary	8	2	3	13
9. Medicine Hat	6	4	19	29
10. Lethbridge	8	1	7	16
<b>Total</b>	<b>57</b>	<b>28</b>	<b>95</b>	<b>180</b>
<b>Per cent of Total</b>	<b>32%</b>	<b>16%</b>	<b>53%</b>	<b>100%</b>

## Analyses of Water of Used in Greenhouses

Table 6.5 shows that 80 per cent of respondents have had their water analyzed while the remaining 20 per cent or 37 growers have never had their water analyzed.

**Table 6. 5: Analyses of Water Used**

Region	Have you ever had your water analyzed?		
	Yes	No	Number of Growers
1. Fort McMurray	0	0	0
2. Grande Prairie	12	2	14
3. Whitecourt	6	1	7
4. Edmonton	28	8	36
5. Bonnyville	8	0	8
6. Lloydminster	6	7	13
7. Red Deer	39	5	44
8. Calgary	11	3	14
9. Medicine Hat	21	8	29
10. Lethbridge	13	3	16
<b>Total</b>	<b>144</b>	<b>37</b>	<b>181</b>
<b>Per cent of Total</b>	<b>80%</b>	<b>20%</b>	<b>100%</b>

## Sodium Level in Water Used

Table 6.6 shows that approximately 45 per cent of growers knew the sodium level in their water while the remaining 55 per cent did not.

**Table 6. 6: Sodium Level in Water Used**

Region	Do you know the sodium level in your water?		
	Yes	No	Number of Growers by Region
1. Fort McMurray	0	0	0
2. Grande Prairie	5	9	14
3. Whitecourt	3	4	7
4. Edmonton	16	20	36
5. Bonnyville	5	3	8
6. Lloydminster	6	7	13
7. Red Deer	24	20	44
8. Calgary	6	8	14
9. Medicine Hat	11	18	29
10. Lethbridge	6	10	16
<b>Total</b>	<b>82</b>	<b>99</b>	<b>181</b>
<b>Per cent of Total</b>	<b>45%</b>	<b>55%</b>	<b>100%</b>

## Water Treatment Used in Greenhouses

Table 6.7 shows that 41 per cent of respondents used filter system for water treatment, 41 per cent used acid mixing; 11 per cent used reverse osmosis, and four per cent used water conditioning.

**Table 6. 7: Type of Water Treatment Used in Greenhouses**

Region	Water Treatment Method						Number of Growers by Region
	Reverse osmosis	Distillation	Water conditioning	Filter system	Acid Mixing	Others	
1. Fort McMurray	0	0	0	0	0	0	0
2. Grande Prairie	2	0	0	8	5	0	15
3. Whitecourt	0	0	0	3	4	0	7
4. Edmonton	4	0	2	14	15	0	35
5. Bonnyville	0	0	1	2	1	0	4
6. Lloydminster	1	1	0	2	2	0	6
7. Red Deer	7	0	2	18	18	1	46
8. Calgary	3	0	0	6	5	0	14
9. Medicine Hat	0	0	0	4	8	1	13
10. Lethbridge	0	0	1	6	6	2	15
<b>Total</b>	<b>17</b>	<b>1</b>	<b>6</b>	<b>63</b>	<b>64</b>	<b>4</b>	<b>155</b>
<b>Per cent of Total</b>	<b>11%</b>	<b>1%</b>	<b>4%</b>	<b>41%</b>	<b>41%</b>	<b>3%</b>	<b>100%</b>

# Section 7: Irrigation Systems

## Type of Irrigation Systems

Table 7.1 shows the types of irrigation systems that growers use. Thirty-five per cent of the respondents used drip irrigation, 10 per cent used overhead sprinklers, 43 per cent used hand-watering systems and six per cent each have ebb and flow and irrigation booms respectively. Hand-watering is primarily used by seasonal bedding plant growers.

**Table 7. 1: Type of Irrigation Systems and Recycling Water**

Region	Irrigation System						Average Per Cent Area of Irrigation System				
	Drip Irrigation (D.I.)	Overhead Sprinklers (O.S.)	Hand Watering (H.W.)	Ebb and Flow (E.F.)	Irrigation booms (I.B.)	Number of Growers	D.I. % Area	O.S. % Area	H.W. % Area	E.F. % Area	I.B. % Area
1. Fort McMurray	0	0	0	0	0	0	0	0	0	0	0
2. Grande Prairie	7	3	11	1	0	22	39	78	72	100	0
3. Whitecourt	4	1	6	0	1	12	55	10	78	0	100
4. Edmonton	19	12	32	5	5	73	42	34	74	36	42
5. Bonnyville	1	0	4	0	4	9	25	0	100	0	94
6. Lloydminster	5	0	11	1	0	17	59	0	83	90	0
7. Red Deer	25	4	37	2	1	69	50	36	78	15	90
8. Calgary	6	5	11	5	3	30	43	41	48	39	13
9. Medicine Hat	24	3	5	1	3	36	90	29	65	100	80
10. Lethbridge	12	3	10	2	2	29	39	47	77	20	60
<b>Total</b>	<b>103</b>	<b>31</b>	<b>127</b>	<b>17</b>	<b>19</b>	<b>297</b>	<b>55</b>	<b>39</b>	<b>75</b>	<b>43</b>	<b>62</b>
<b>Per cent of Total</b>	<b>35%</b>	<b>10%</b>	<b>43%</b>	<b>6%</b>	<b>6%</b>	<b>100%</b>	<b>20%</b>	<b>14%</b>	<b>27%</b>	<b>16%</b>	<b>23%</b>

## Water Recycling

Table 7.2 shows that 29 per cent recycled greenhouse water while 79 per cent did not. Most of the small growers did not recycle their water.

**Table 7. 2: Water Recycling**

Region	Do you recycle your water?		Number of Growers	Per cent Area (%)
	Yes	No		
1. Fort McMurray	0	0	0	0
2. Grande Prairie	2	12	14	13
3. Whitecourt	1	6	7	14
4. Edmonton	7	29	36	12
5. Bonnyville	1	7	8	6
6. Lloydminster	3	10	13	12
7. Red Deer	11	33	44	21
8. Calgary	5	9	14	21
9. Medicine Hat	17	12	29	41
10. Lethbridge	5	11	16	26
<b>Total</b>	<b>52</b>	<b>129</b>	<b>181</b>	<b>21</b>
<b>Per cent of Total</b>	<b>29%</b>	<b>71%</b>	<b>100%</b>	

## Disposal of Waste Water

Table 7.3 indicates that 62 per cent of respondents or 113 growers disposed their water on the ground or field and 12 per cent through sewerage. Based on survey responses, 26 per cent had no waste water.

**Table 7. 3: Disposal of Waste Water**

Region	Method of waste water disposal			Number of Growers
	Ground / Field	Sewerage	No waste water	
1. Fort McMurray	0	0	0	0
2. Grande Prairie	8	3	3	14
3. Whitecourt	5	0	2	7
4. Edmonton	24	3	9	36
5. Bonnyville	6	0	2	8
6. Lloydminster	8	1	4	13
7. Red Deer	29	2	13	44
8. Calgary	9	0	5	14
9. Medicine Hat	13	9	7	29
10. Lethbridge	11	3	3	17
<b>Total</b>	<b>113</b>	<b>21</b>	<b>48</b>	<b>182</b>
<b>Per cent of Total</b>	<b>62%</b>	<b>12%</b>	<b>26%</b>	<b>100%</b>

## Section 8: Fertilizer Use

### Fertilizer Injector Systems Used in Greenhouses

Table 8.1 shows uses of fertilizer injector systems by growers. The leading response was Dosatron at 49 per cent followed by climate control at 15 per cent and Anderson at nine per cent. About 10 per cent used other systems including Injector pump, MixRite, Stack system, Zwart, Camalizer, and Wadsworth. Seventeen per cent did not use any kind of fertilizer injector system.

**Table 8. 1: Type of Fertilizer Injection System Used in Greenhouses**

Region	Type of fertilizer injector system					Number of Growers
	None	Anderson	Dosatron	Climate control	Other*	
1. Fort McMurray	0	0	0	0	0	0
2. Grande Prairie	6	3	4	0	1	14
3. Whitecourt	2	0	4	0	1	7
4. Edmonton	5	3	28	1	3	40
5. Bonnyville	2	1	3	2	1	9
6. Lloydminster	4	0	7	1	1	13
7. Red Deer	7	2	25	6	5	45
8. Calgary	3	5	6	0	2	16
9. Medicine Hat	2	3	7	16	2	30
10. Lethbridge	1	0	9	2	3	15
<b>Total</b>	<b>32</b>	<b>17</b>	<b>93</b>	<b>28</b>	<b>19</b>	<b>189</b>
<b>Per cent of Total</b>	<b>17%</b>	<b>9%</b>	<b>49%</b>	<b>15%</b>	<b>10%</b>	<b>100%</b>

\* Injector pump, MixRite, Stack system, Zwart, Camalizer, Wadsworth

### Type of Fertilizers Used in Greenhouses

Table 8.2 shows type and amount of fertilizers used in greenhouses. Approximately 56 per cent use pre-blends while the remaining 44 per cent use base ingredients. In total, about 338 tonnes of fertilizer were used by industry in 2019.

**Table 8. 2: Type and Amount of Fertilizers Used in Greenhouses**

Region	Type of fertilizer		Number of Growers	Amount of Fertilizer Used (kg)
	Pre-blends	Base ingredients		
1. Fort McMurray	0	0	0	0
2. Grande Prairie	11	5	16	16,285
3. Whitecourt	6	2	8	2,329
4. Edmonton	29	13	42	14,625
5. Bonnyville	4	6	10	52,346
6. Lloydminster	8	6	14	10,976
7. Red Deer	30	17	47	30,473
8. Calgary	7	7	14	12,150
9. Medicine Hat	7	24	31	115,135
10. Lethbridge	8	8	16	83,380
<b>Total</b>	<b>110</b>	<b>88</b>	<b>198</b>	<b>337,698</b>
<b>Per cent of Total</b>	<b>56%</b>	<b>44%</b>	<b>100%</b>	

## Use of Calcium Nitrate in the Greenhouse Fertilizer Program

Table 8.3 shows growers who use calcium nitrate as part of their greenhouse fertilizer program. Of the 181 respondents, 62 per cent or 113 growers indicated “yes” while the remaining 38 per cent or 68 growers indicated that they do not use calcium nitrate.

**Table 8. 3: Use of Calcium Nitrate as Part of the Greenhouse Fertilizer Program**

Region	Do you use Calcium Nitrate?		Number of Growers
	Yes	No	
1. Fort McMurray	0	0	0
2. Grande Prairie	9	5	14
3. Whitecourt	4	3	7
4. Edmonton	19	17	36
5. Bonnyville	6	2	8
6. Lloydminster	8	5	13
7. Red Deer	25	19	44
8. Calgary	8	6	14
9. Medicine Hat	25	4	29
10. Lethbridge	9	7	16
<b>Total</b>	<b>113</b>	<b>68</b>	<b>181</b>
<b>Per cent of Total</b>	<b>62%</b>	<b>38%</b>	<b>91%</b>

# Section 9: Plants Grown, Area and Retail

## Greenhouse Crop Area by Sector

Table 9.1 shows greenhouse crop area by sector in Alberta. Of the 195 growers in 2019, vegetable growers accounted for about 46 per cent of total greenhouse area or approximately 187 acres, followed by floriculture at 42 per cent or approximately 170 acres, and the remaining 12 per cent or 47.5 acres constitute tree seedlings.

**Table 9. 1: Greenhouse Crop Area by Region**

Region	Greenhouse Crop Area			Total Area by Region
	Vegetables (sq. m.)	Floriculture (sq. m.)	Tree Seedlings (sq. m.)	
1. Fort McMurray	0	0	0	0
2. Grande Prairie	418	21,990	52,026	74,434
3. Whitecourt	962	8,821	0	9,782
4. Edmonton	3,716	166,815	1,858	172,389
5. Bonnyville	0	4,991	86,307	91,298
6. Lloydminster	3,921	8,811	0	12,731
7. Red Deer	77,119	113,045	5,023	195,187
8. Calgary	7,077	63,735	0	70,812
9. Medicine Hat	597,087	23,337	47,097	667,522
10. Lethbridge	67,633	275,061	0	342,694
<b>Total Area (sq. m.)</b>	<b>757,933</b>	<b>686,606</b>	<b>192,311</b>	<b>1,636,850</b>
<b>Total Area (sq. ft.)</b>	<b>8,158,325</b>	<b>7,390,328</b>	<b>2,070,016</b>	<b>17,618,669</b>
Total Area (Hectares)	75.8	68.7	19.2	164
Total Area (Acres)	187.3	169.7	47.5	404.5
<b>Per cent of Total</b>	<b>46.3%</b>	<b>41.9%</b>	<b>11.7%</b>	<b>100%</b>

N=195

1 sq. m. = 10.7639 sq. ft.

1 Acre = 43,560 sq. ft.

1 Hectare = 10,000 sq. m.

## Vegetables

### Cucumber

Tables 9.2 shows cucumber growers by region in Alberta. Respondents reported multiple varieties. Of the 62 growers across the province (Table 9.2), 50 per cent or 31 growers produced Long English, 32 per cent Mini, 11 per cent Pickle and seven per cent grew Salad varieties of cucumber. Tables 9.3 shows greenhouse area under cucumbers.



**Table 9. 2: Variety of Cucumber Grown by Region**

Region	Variety of Cucumber Grown				Number of Growers by Region
	Long English	Mini	Pickle	Salad	
1. Fort McMurray	0	0	0	0	0
2. Grande Prairie	3	0	1	0	4
3. Whitecourt	2	1	0	1	4
4. Edmonton	2	2	1	1	6
5. Bonnyville	0	0	0	0	0
6. Lloydminster	1	4	3	1	9
7. Red Deer	7	8	0	1	16
8. Calgary	1	0	1	0	2
9. Medicine Hat	13	3	1	0	17
10. Lethbridge	2	2	0	0	4
<b>Total</b>	<b>31</b>	<b>20</b>	<b>7</b>	<b>4</b>	<b>62</b>
<b>Per cent of Total</b>	<b>50%</b>	<b>32%</b>	<b>11%</b>	<b>7%</b>	<b>100.0%</b>

**Table 9. 3: Greenhouse Area under Cucumber**

Region	Cucumber Area (sq. m.)				Total Area by Region (sq. m.)
	Long English	Mini	Pickle	Salad	
1. Fort McMurray	0	0	0	0	0
2. Grande Prairie	85	0	30	0	114
3. Whitecourt	636	11	0	48	695
4. Edmonton	8,163	270	70	70	8,572
5. Bonnyville	0	0	0	0	0
6. Lloydminster	239	470	55	30	794
7. Red Deer	19,970	7,632	0	400	28,002
8. Calgary	31	0	0	0	31
9. Medicine Hat	170,166	79,787	93	0	250,046
10. Lethbridge	1,356	1,096	0	0	2,453
<b>Total</b>	<b>200,645</b>	<b>89,266</b>	<b>247</b>	<b>547</b>	<b>290,707</b>
<b>Per cent of Total</b>	<b>69.0%</b>	<b>30.7%</b>	<b>0.1%</b>	<b>0.2%</b>	<b>100.0%</b>

## Tomato

Table 9.4 shows tomato growers by region in Alberta. Thirty-four per cent of 86 multiple variety growers produced Beefsteak, 24 per cent TOVs, 22 per cent Cocktail and 20 per cent other varieties such as Cherry, Roma and Grape tomatoes.

**Table 9. 4: Variety of Tomatoes Grown by Region**

Region	Variety of Tomatoes Grown				Number of Growers by Region
	Beefsteak	Tomato on Vine (TOVs)	Cocktail	Other*	
1. Fort McMurray	0	0	0	0	0
2. Grande Prairie	3	1	1	2	7
3. Whitecourt	2	0	0	0	2
4. Edmonton	3	2	3	2	10
5. Bonnyville	0	0	0	0	0
6. Lloydminster	4	2	2	1	9
7. Red Deer	6	8	5	5	24
8. Calgary	2	2	2	0	6
9. Medicine Hat	7	5	4	5	21
10. Lethbridge	2	1	2	2	7
<b>Total</b>	<b>29</b>	<b>21</b>	<b>19</b>	<b>17</b>	<b>86</b>
<b>Per cent of Total</b>	<b>34%</b>	<b>24%</b>	<b>22%</b>	<b>20%</b>	<b>100%</b>

Other\* - include Cherry, Roma and Grape Tomatoes

Not all growers reported were commercial vegetable growers. Many bedding plant growers produce tomato seedlings. Table 9.5 shows greenhouse area under tomatoes.

**Table 9. 5: Greenhouse Area under Tomatoes**

Region	Tomatoes Area (sq. m.)				Total Area by Region (sq. m.)
	Beefsteak	Tomato on Vine	Cocktail	Other	
1. Fort McMurray	0	0	0	0	0
2. Grande Prairie	203	74	74	121	473
3. Whitecourt	471	0	0	0	471
4. Edmonton	344	144	307	144	939
5. Bonnyville	0	0	0	0	0
6. Lloydminster	300	500	130	0	930
7. Red Deer	8,905	8,551	5,137	4,844	27,437
8. Calgary	42,549	141	141	0	42,831
9. Medicine Hat	50,434	42,399	23,365	44,420	160,617
10. Lethbridge	2,397	209	755	1,589	4,949
<b>Total</b>	<b>105,603</b>	<b>52,019</b>	<b>29,909</b>	<b>51,117</b>	<b>238,647</b>
<b>Per cent of Total</b>	<b>44%</b>	<b>22%</b>	<b>13%</b>	<b>21%</b>	<b>100%</b>

## Pepper

Table 9.6 shows pepper growers by region in Alberta. Not all growers reported were commercial vegetable growers. Many bedding plant growers produce pepper seedlings.

**Table 9. 6: Variety of Peppers Grown by Region**

Region	Variety of Pepper Grown				Number of Growers by Region
	Green	Yellow	Orange	Other	
1. Fort McMurray	0	0	0	0	0
2. Grande Prairie	1	0	0	0	1
3. Whitecourt	2	2	2	1	7
4. Edmonton	2	3	3	2	10
5. Bonnyville	0	0	0	0	0
6. Lloydminster	3	2	2	2	9
7. Red Deer	3	6	5	6	20
8. Calgary	0	0	0	2	2
9. Medicine Hat	1	5	4	5	15
10. Lethbridge	1	2	2	2	7
<b>Total</b>	<b>13</b>	<b>20</b>	<b>18</b>	<b>20</b>	<b>71</b>
<b>Per cent of Total</b>	<b>18%</b>	<b>28%</b>	<b>25%</b>	<b>28%</b>	<b>100%</b>

Based on survey responses, 18 per cent out of 71 multiple variety producers grew green, 28 per cent yellow, 25 per cent orange and the remaining 28 per cent other varieties including brown, hot, jalapeno and red peppers. Tables 9.7 shows greenhouse area under pepper.

**Table 9. 7: Greenhouse Area under Pepper**

Region	Pepper Area (sq. m.)				Total Area by Region (sq. m.)
	Green	Yellow	Orange	Other	
1. Fort McMurray	0	0	0	0	0
2. Grande Prairie	8	0	0	0	8
3. Whitecourt	40	40	40	11	131
4. Edmonton	137	143	172	43	496
5. Bonnyville	0	0	0	0	0
6. Lloydminster	145	100	100	100	445
7. Red Deer	8,239	5,372	4,870	2,084	20,564
8. Calgary	0	0	0	31	31
9. Medicine Hat	4,471	11,120	10,307	11,933	37,831
10. Lethbridge	209	2,160	2,160	4,111	8,640
<b>Total</b>	<b>13,248</b>	<b>18,935</b>	<b>17,650</b>	<b>18,312</b>	<b>68,146</b>
<b>Per cent of Total</b>	<b>19%</b>	<b>28%</b>	<b>26%</b>	<b>27%</b>	<b>100%</b>

## Lettuce, Eggplant and Other Crops

Table 9.8 displays lettuce and other crops grown in Alberta. Based on survey responses, 29 per cent of 45 multiple crop growers produced butter head lettuce, 22 per cent produced romaine and 24 per cent other lettuce including baby, red, green, and oak leaf lettuce. About 11 per cent grew eggplant and 13 per cent reported other crops such as spinach, cabbage, watercress and kale.

**Table 9. 8: Lettuce, Eggplant and Other Crops Grown by Region**

Region	Variety of Lettuce Grown			Eggplant and Other Crops		Number of Growers by Region
	Butter Head	Romaine	Other Lettuce*	Eggplant	Other Crops**	
1. Fort McMurray	0	0	0	0	0	0
2. Grande Prairie	0	1	0	1	0	2
3. Whitecourt	0	0	0	0	0	0
4. Edmonton	1	2	3	0	4	10
5. Bonnyville	0	0	0	0	0	0
6. Lloydminster	2	2	2	0	0	6
7. Red Deer	4	1	2	1	0	8
8. Calgary	2	2	0	0	1	5
9. Medicine Hat	2	1	2	1	0	6
10. Lethbridge	2	1	2	2	1	8
<b>Total</b>	<b>13</b>	<b>10</b>	<b>11</b>	<b>5</b>	<b>6</b>	<b>45</b>
<b>Per cent of Total</b>	<b>29%</b>	<b>22%</b>	<b>24%</b>	<b>11%</b>	<b>13%</b>	<b>100%</b>

\*Other lettuce include baby lettuce, red, green, and oak leaf lettuce

\*\*Other crops include spinach, cabbage, watercress and kale

Data in the Table 9.8 includes transplant growers. Table 9.9 shows greenhouse area under lettuce, eggplant and other ethnic vegetables.

**Table 9. 9: Greenhouse Area under Lettuce, Eggplant and Other Crops**

Region	Lettuce Area (sq. m.)			Eggplant and Other Crops Area (sq. m.)		Total Area by Region (sq. m.)
	Butter Head	Romaine	Other Lettuce	Eggplant	Other Crops	
1. Fort McMurray	0	0	0	0	0	0
2. Grande Prairie	0	42	0	4	0	46
3. Whitecourt	0	0	0	0	0	0
4. Edmonton	124	194	751	0	4,181	5,249
5. Bonnyville	0	0	0	0	0	0
6. Lloydminster	38	127	38	0	0	204
7. Red Deer	1,150	160	443	3,000	0	4,753
8. Calgary	1,907	204	0	0	212	2,323
9. Medicine Hat	6,494	139	474	139	0	7,246
10. Lethbridge	4,301	4,041	33,110	4,564	5,574	51,590
<b>Total</b>	<b>14,014</b>	<b>4,908</b>	<b>34,816</b>	<b>7,707</b>	<b>9,967</b>	<b>71,411</b>
<b>Per cent of Total</b>	<b>20%</b>	<b>7%</b>	<b>49%</b>	<b>11%</b>	<b>14%</b>	<b>100%</b>

\*Other lettuce include baby lettuce, red, green, and oak leaf lettuce

\*\*Other crops include spinach, cabbage, watercress and kale

## Growing Systems used by Vegetable Growers

Table 9.10 shows type of growing systems used by vegetable growers. Of the 73 growers, 74 per cent used growing media, 14 per cent used raised troughs and the remaining 12 per cent used plastic or cloth as floor cover.

**Table 9. 10: Type of Growing Systems Used by Vegetable Growers**

Region	Type of Growing Systems			Number of Growers by Region
	Growing media	Raised troughs	Floor cover plastic / cloth	
1. Fort McMurray	0	0	0	0
2. Grande Prairie	3	0	0	3
3. Whitecourt	2	0	1	3
4. Edmonton	6	0	1	7
5. Bonnyville	0	0	0	0
6. Lloydminster	2	1	0	3
7. Red Deer	11	2	0	13
8. Calgary	4	2	1	7
9. Medicine Hat	21	5	5	31
10. Lethbridge	5	0	1	6
<b>Total</b>	<b>54</b>	<b>10</b>	<b>9</b>	<b>73</b>
<b>Per cent of Total</b>	<b>74%</b>	<b>14%</b>	<b>12%</b>	<b>100%</b>

\*Multiple crops reported

## Bedding Plants / Ornamentals

### Potted Flowers

Table 9.11 shows the type of potted flowers grown across the province. Of the 548 multiple growers, 22 per cent grew annuals, 18 per cent perennials, 20 per cent vegetables and herbs, 18 per cent patio pots, 21 per cent hanging baskets and the remaining two per cent cut flowers.

**Table 9. 11: Type of Potted Flowers Grown**

Region	Potted Flowers						Number of Growers by Region
	Annuals	Perennials	Vegetables / Herbs	Patio pots	Hanging baskets	Cut flowers	
1. Fort McMurray	0	0	0	0	0	0	0
2. Grande Prairie	11	9	9	8	12	3	52
3. Whitecourt	6	6	6	5	6	0	29
4. Edmonton	31	28	30	26	31	3	149
5. Bonnyville	4	4	4	4	4	0	20
6. Lloydminster	10	8	9	9	9	1	46
7. Red Deer	33	24	30	26	32	2	147
8. Calgary	7	6	7	5	7	0	32
9. Medicine Hat	5	3	5	5	5	0	23
10. Lethbridge	11	8	11	9	10	1	50
<b>Total</b>	<b>118</b>	<b>96</b>	<b>111</b>	<b>97</b>	<b>116</b>	<b>10</b>	<b>548*</b>
<b>Per cent of Total</b>	<b>22%</b>	<b>18%</b>	<b>20%</b>	<b>18%</b>	<b>21%</b>	<b>2%</b>	<b>100%</b>

\*Multiple crops reported

## Vegetables

Table 9.12 shows the type of vegetables grown in floriculture operations. Thirty two per cent grew cucumbers, 33 per cent pepper and the remaining 35 per cent grow tomatoes.

**Table 9. 12: Type of Vegetables Grown**

Region	Vegetables			Number of Growers by Region
	Cucumber	Pepper	Tomato	
1. Fort McMurray	0	0	0	0
2. Grande Prairie	10	10	11	31
3. Whitecourt	6	6	6	18
4. Edmonton	22	22	25	69
5. Bonnyville	4	4	4	12
6. Lloydminster	9	10	10	29
7. Red Deer	29	29	30	88
8. Calgary	5	5	8	18
9. Medicine Hat	3	3	3	9
10. Lethbridge	9	9	9	27
<b>Total</b>	<b>97</b>	<b>98</b>	<b>106</b>	<b>301*</b>
<b>Per cent of Total</b>	<b>32%</b>	<b>33%</b>	<b>35%</b>	<b>100%</b>

\*Multiple crops reported

## Number of Cell Packs of Bedding Plants and Hanging Baskets

Table 9.13 shows the total cell packs of bedding plants and hanging baskets grown by Region

**Table 9. 13: Total Cell Packs of Bedding Plants and Hanging Baskets Grown by Region**

Region	Total Number of Plants Produced		Number of Growers by Region
	Cell Packs of Bedding Plants	Hanging Baskets	
1. Fort McMurray	0	0	0
2. Grande Prairie	171,722	16,250	12
3. Whitecourt	23,000	15,510	6
4. Edmonton	842,156	405,785	31
5. Bonnyville	26,693	2,650	4
6. Lloydminster	21,300	3,750	9
7. Red Deer	558,507	112,353	32
8. Calgary	261,200	103,294	7
9. Medicine Hat	161,260	120,350	5
10. Lethbridge	2,576,450	658,850	10
<b>Total</b>	<b>4,642,288</b>	<b>1,438,792</b>	<b>116</b>

Tables 9.14 shows the top ten bedding plants grown ranked by number of growers. Across the province, petunia ranked first with 110 growers or 14 per cent. This is followed by marigold with 97 growers or 13 per cent or, geranium with 91 growers or 12 per cent, begonia with 88 growers and lobelia with 86 growers.

**Table 9. 14: Top Ten Bedding Plants by Region Based on Number of Plants Grown**

Bedding Plants	Region										Total Number of Growers	Per cent of Total
	1	2	3	4	5	6	7	8	9	10		
Petunia	0	12	6	28	3	9	30	7	5	10	110	14%
Marigold	0	9	4	25	3	8	28	6	4	10	97	13%
Geranium	0	10	4	23	1	8	26	7	4	8	91	12%
Begonia	0	11	5	27	2	5	22	6	5	5	88	12%
Lobelia	0	8	5	21	2	6	25	6	5	8	86	11%
Pansy	0	9	3	14	2	7	27	6	3	10	81	11%
Alyssum	0	4	3	17	1	2	20	7	3	5	62	8%
Bacopa	0	6	5	14	0	4	16	4	4	6	59	8%
Snapdragon	0	2	3	15	3	3	15	5	3	8	57	7%
Tomatoes	0	3	2	6	2	5	12	1	1	1	33	4%
<b>Total</b>	<b>0</b>	<b>74</b>	<b>40</b>	<b>190</b>	<b>19</b>	<b>57</b>	<b>221</b>	<b>55</b>	<b>37</b>	<b>71</b>	<b>764</b>	<b>100%</b>

Table 9.15 shows the ranking of these top ten bedding plants based on total number of plants grown. Again, petunia topped the list with approximately 2.75 million plants or 48 per cent. Next, was marigold with 642,742 plants or 11 per cent and the third was calibrachoa with 10 per cent of the total number of plants grown.

**Table 9. 15: Top Ten Bedding Plants by Region Based on Number of Plants Grown**

Bedding Plants	Region										Total Number of Plants	Per cent of Total
	1	2	3	4	5	6	7	8	9	10		
Petunia	0	35,800	36,500	1,110,850	6,200	530,200	722,644	155,000	21,800	128,000	2,746,994	48%
Marigold	0	18,460	6,000	185,950	4,200	7,850	238,482	45,500	21,000	115,300	642,742	11%
Calibrachoa	0	600	4,000	524,700	0	5,300	24,500	0	200	1,600	560,900	10%
Begonia	0	15,500	9,000	237,650	1,700	3,050	114,850	19,090	23,600	4,380	428,820	8%
Geranium	0	24,800	12,000	59,140	250	6,650	157,520	63,700	2,500	17,700	344,260	6%
Pansy	0	9,160	16,000	70,050	8,250	8,800	143,644	36,000	1,000	12,200	305,104	5%
Tomatoes	0	2,300	1,500	17,200	7,036	4,300	244,940	0	15,000	0	292,276	5%
Lobelia	0	9,700	9,750	45,350	800	2,300	29,360	50,170	10,800	11,750	169,980	3%
Alyssum	0	4,060	8,400	35,130	100	1,000	31,320	22,330	500	2,700	105,540	2%
Snapdragon	0	1,000	3,850	22,430	2,500	1,800	10,900	40,860	500	4,500	88,340	2%
<b>Total</b>	<b>0</b>	<b>121,380</b>	<b>107,000</b>	<b>2,308,450</b>	<b>31,036</b>	<b>571,250</b>	<b>1,718,160</b>	<b>432,650</b>	<b>96,900</b>	<b>298,130</b>	<b>5,684,956</b>	<b>100%</b>

## Cut Flowers

Table 9.16 indicates cut flowers grown in Alberta. Based on survey responses, 30 per cent produced Asiatic lilies, followed by 17 per cent each with roses, alstroemeria and Asiatic and oriental lilies, and the remaining 17 per cent with other flowers.

**Table 9. 16: Cut Flowers Grown by Region in Alberta**

Region	Total Number Produced					Number of Growers by Region
	Roses	Alstroemeria	Asiatic lilies	Oriental lilies	Other	
1. Fort McMurray	0	0	0	0	0	0
2. Grande Prairie	2	1	3	2	1	9
3. Whitecourt	0	0	0	0	0	0
4. Edmonton	1	1	2	1	2	7
5. Bonnyville	0	0	0	0	0	0
6. Lloydminster	0	0	1	1	0	2
7. Red Deer	0	1	1	0	0	2
8. Calgary	0	0	0	0	0	0
9. Medicine Hat	0	0	0	0	0	0
10. Lethbridge	1	1	0	0	1	3
<b>Total</b>	<b>4</b>	<b>4</b>	<b>7</b>	<b>4</b>	<b>4</b>	<b>23</b>
<b>Per cent of Total</b>	<b>17%</b>	<b>17%</b>	<b>30%</b>	<b>17%</b>	<b>17%</b>	<b>100%</b>

## Vegetables Grown in Containers

Table 9.17 indicates vegetables grown in containers by bedding plants growers. Based on survey responses, 28 per cent grew tomatoes, followed by 25 per cent each with cucumbers and peppers and the remaining 22 per cent grew strawberries.

**Table 9. 17: Vegetables Grown in Containers in Alberta**

Region	Vegetables Grown in Containers				Number of Growers by Region
	Tomato	Cucumber	Pepper	Strawberry	
1. Fort McMurray	0	0	0	0	0
2. Grande Prairie	11	8	9	8	36
3. Whitecourt	6	6	6	6	24
4. Edmonton	27	24	24	20	95
5. Bonnyville	4	3	4	3	14
6. Lloydminster	7	7	7	7	28
7. Red Deer	30	27	27	24	108
8. Calgary	8	5	5	5	23
9. Medicine Hat	4	4	4	4	16
10. Lethbridge	9	9	9	7	34
<b>Total</b>	<b>106</b>	<b>93</b>	<b>95</b>	<b>84</b>	<b>378*</b>
<b>Per cent of Total</b>	<b>28%</b>	<b>25%</b>	<b>25%</b>	<b>22%</b>	<b>100%</b>

\*Multiple growers



## Tree Seedlings

Table 9.18 shows species of tree seedlings grown, number of seedlings grown annually as well as the number of growers by region.

**Table 9. 18: Tree Seedlings Grown in Alberta**

Region	Tree Seedlings Grown		Number of Tree Seedlings Grown Annually	Number of Growers by Region
	Pine	Spruce and deciduous material		
1. Fort McMurray	0	0	0	0
2. Grande Prairie	1	1	25,000,000	2
3. Whitecourt	0	0	0	0
4. Edmonton	1	1	1,500	1
5. Bonnyville	4	4	31,500,000	4
6. Lloydminster	0	0	0	0
7. Red Deer	2	3	1,016,000	2
8. Calgary	1	1	1,500,000	1
9. Medicine Hat	2	2	21,500,000	2
10. Lethbridge	0	0	0	0
<b>Total</b>	<b>11</b>	<b>12</b>	<b>80,517,500</b>	<b>12</b>
<b>Per cent of Total</b>	<b>48%</b>	<b>52%</b>		

Based on survey responses, approximately 48 per cent of tree seedling operations produced pine and the remaining 52 per cent produced spruce and deciduous materials. In 2019, the total number of tree seedlings produced in Alberta was estimated at 80.52 million.

### How Long Tree Seedling Stock are Kept

Table 9.19 presents information on how long tree seedling growers keep their stock. Thirty seven per cent of the respondents kept their stock for six months, another 37 per cent kept it for one year, 21 per cent kept it for two years while the remaining five per cent kept it for three years.

**Table 9. 19: How Long Tree Seedling Stock are Kept**

Region	How long tree seedling stock are kept						Number of Growers by Region
	6 months	1 year	2 years	3 years	4 years	5-8 years	
1. Fort McMurray	0	0	0	0	0	0	0
2. Grande Prairie	0	2	0	0	0	0	2
3. Whitecourt	0	0	0	0	0	0	0
4. Edmonton	0	1	0	0	0	0	1
5. Bonnyville	3	2	3	0	0	0	8
6. Lloydminster	0	0	0	0	0	0	0
7. Red Deer	1	0	1	1	0	0	3
8. Calgary	1	1	0	0	0	0	2
9. Medicine Hat	2	1	0	0	0	0	3
10. Lethbridge	0	0	0	0	0	0	0
<b>Total</b>	<b>7</b>	<b>7</b>	<b>4</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>19*</b>
<b>Per cent of Total</b>	<b>37%</b>	<b>37%</b>	<b>21%</b>	<b>5%</b>	<b>0%</b>	<b>0%</b>	<b>100%</b>

## Culinary or Medicinal Herbs Grown in Alberta

Table 9.20 presents culinary or medicinal herbs grown in Alberta. About 27 per cent of growers grew basil, 12 per cent rosemary, 11 per cent thyme, 12 per cent parsley, 10 per cent mint, two per cent dill and the remaining 25 per cent other herb crops such as oregano, sage, chives, cilantro, coriander, lemongrass, tarragon, lavender and stevia.

**Table 9. 20: Culinary or Medicinal Herbs Grown in Alberta**

Region	Type of Culinary or Medicinal Herb Grown							Number of Growers by Region
	Basil	Rosemary	Thyme	Pasley	Dill	Mint	Others*	
1. Fort McMurray	0	0	0	0	0	0	0	0
2. Grande Prairie	8	6	4	5	0	3	7	33
3. Whitecourt	6	4	2	2	0	2	6	22
4. Edmonton	22	10	8	9	2	10	21	82
5. Bonnyville	1	1	0	1	0	1	3	7
6. Lloydminster	7	3	2	3	1	2	5	23
7. Red Deer	23	9	13	6	1	8	22	82
8. Calgary	5	0	0	3	0	2	3	13
9. Medicine Hat	3	0	2	3	0	1	2	11
10. Lethbridge	7	3	2	3	2	2	7	26
<b>Total</b>	<b>82</b>	<b>36</b>	<b>33</b>	<b>35</b>	<b>6</b>	<b>31</b>	<b>76</b>	<b>299</b>
<b>Per cent of Total</b>	<b>27%</b>	<b>12%</b>	<b>11%</b>	<b>12%</b>	<b>2%</b>	<b>10%</b>	<b>25%</b>	<b>100%</b>

**Other\*** include oregano, sage, chives, cilantro, coriander, lemongrass, tarragon, lavender and stevia

## Production Schedule

Table 9.21: shows the production schedule for plants grown in Alberta. Based on responses from 37 growers, 70 per cent have summer delivery while the remaining 30 per cent have fall/winter storage.

**Table 9. 21: Production Schedule**

Region	Production Schedule		Number of Growers by Region
	Summer Delivery	Fall/Winter storage	
1. Fort McMurray	0	0	0
2. Grande Prairie	3	2	5
3. Whitecourt	0	0	0
4. Edmonton	7	1	8
5. Bonnyville	4	3	7
6. Lloydminster	0	0	0
7. Red Deer	5	1	6
8. Calgary	1	1	2
9. Medicine Hat	5	2	7
10. Lethbridge	1	1	2
<b>Total</b>	<b>26</b>	<b>11</b>	<b>37</b>
<b>Per cent of Total</b>	<b>70%</b>	<b>30%</b>	<b>100%</b>

## Growers Having Nursery Material

Table 9.22 shows the number of growers who have nursery material in their greenhouses. Twenty four per cent or 43 growers indicated they have nursery material and the remaining 76 per cent do not.

**Table 9. 22: Growers having Nursery Material**

Region	Do you have nursery material?		Number of Growers by Region
	Yes	No	
1. Fort McMurray	0	0	0
2. Grande Prairie	9	5	14
3. Whitecourt	2	5	7
4. Edmonton	10	26	36
5. Bonnyville	3	5	8
6. Lloydminster	3	10	13
7. Red Deer	9	35	44
8. Calgary	2	11	13
9. Medicine Hat	1	28	29
10. Lethbridge	4	12	16
<b>Total</b>	<b>43</b>	<b>137</b>	<b>180</b>
<b>Per cent of Total</b>	<b>24%</b>	<b>76%</b>	<b>100%</b>

## Comparison of 2019 Production to 2018

Table 9.23 compares last year's production of growers with 2018. Based on survey responses, production in 2019 was better than 2018. Of the 181 growers who responded to this question, 39 per cent reported that their production increased, 31 per cent reported that their production decreased and the remaining 30 per cent reported that their production was the same.

**Table 9. 23: Comparison of 2019 Production to 2018**

Region	Did your production in 2019 increase or decrease compared to 2018?			Number of Growers by Region
	Increased	Decreased	Unchanged	
1. Fort McMurray	0	0	0	0
2. Grande Prairie	5	5	4	14
3. Whitecourt	2	4	1	7
4. Edmonton	12	11	13	36
5. Bonnyville	4	1	3	8
6. Lloydminster	5	4	4	13
7. Red Deer	15	20	9	44
8. Calgary	7	7	0	14
9. Medicine Hat	10	2	17	29
10. Lethbridge	10	3	3	16
<b>Total</b>	<b>70</b>	<b>57</b>	<b>54</b>	<b>181</b>
<b>Per cent of Total</b>	<b>39%</b>	<b>31%</b>	<b>30%</b>	<b>100%</b>

## Consideration of Cannabis as a Greenhouse Crop

Table 9.24 presents information on whether growers would consider cannabis as a new crop for their greenhouse in the future. Of the 181 growers who responded to this question, seven per cent answered yes while the remaining 93 per cent said no.

**Table 9. 24: Consideration of Cannabis as a Potential Greenhouse Crop**

Region	Do you see cannabis as a new crop for your greenhouse?		Number of Growers by Region
	Yes	No	
1. Fort McMurray	0	0	0
2. Grande Prairie	3	11	14
3. Whitecourt	0	7	7
4. Edmonton	5	31	36
5. Bonnyville	0	8	8
6. Lloydminster	3	10	13
7. Red Deer	0	44	44
8. Calgary	0	14	14
9. Medicine Hat	1	28	29
10. Lethbridge	1	15	16
<b>Total</b>	<b>13</b>	<b>168</b>	<b>181</b>
<b>Per cent of Total</b>	<b>7%</b>	<b>93%</b>	<b>100%</b>

## Retail

Table 9.25 presents information on growers in retail. Of the 181 growers who responded to this question, 122 growers or 67 per cent retail while the remaining 33 per cent do not.

**Table 9. 25: Growers involved in Retail**

Region	Do you retail?		Number of Growers by Region	If yes:	
	Yes	No		Area (sq. ft.)	% of Retail Sales Volume
1. Fort McMurray	0	0	0	0	0
2. Grande Prairie	13	1	14	196,472	74
3. Whitecourt	6	1	7	77,951	77
4. Edmonton	30	6	36	845,371	83
5. Bonnyville	4	4	8	49,944	95
6. Lloydminster	11	2	13	84,500	75
7. Red Deer	35	9	44	540,057	70
8. Calgary	8	6	14	68,460	36
9. Medicine Hat	5	24	29	61,700	58
10. Lethbridge	10	6	16	434,147	86
<b>Total</b>	<b>122</b>	<b>59</b>	<b>181</b>	<b>2,358,602</b>	<b>74</b>
<b>Per cent of Total</b>	<b>67%</b>	<b>33%</b>	<b>100%</b>		

The total retail area was estimated at 2,358,602 sq. ft. About 74 per cent of the average sales volume came from retail. Bedding plants and ornamental growers account for over 80 per cent of the 122 growers who retail.

## Producers' Interest in Cost of Production Study

Table 9.26 lists producers' interest in a cost of production study. Out of 181 growers, 22 per cent were interested in a cost of production study while 78 per cent did not want to participate.

**Table 9. 26: Participation in a Greenhouse Cost of Production Study**

Region	Would you be interested in participating in a greenhouse cost of production study?		Number of Growers by Region
	Yes	No	
1. Fort McMurray	0	0	0
2. Grande Prairie	5	9	14
3. Whitecourt	2	5	7
4. Edmonton	9	27	36
5. Bonnyville	1	7	8
6. Lloydminster	2	11	13
7. Red Deer	10	34	44
8. Calgary	2	12	14
9. Medicine Hat	2	27	29
10. Lethbridge	7	9	16
<b>Total</b>	<b>40</b>	<b>141</b>	<b>181</b>
<b>Per cent of Total</b>	<b>22%</b>	<b>78%</b>	<b>100%</b>

# Section 10: Crop Problems

## Insect Problems

Table 10.1 indicates insect problems in all regions. About 25 per cent of growers have problems with aphids, 18 per cent have problems with thrips, 15 per cent with fungus gnats, nine per cent with shore flies, 11 per cent with whiteflies and 17 per cent with spider mites. About two per cent indicated they have no insect problems and remaining two percent indicated other insect problems such as lygus bugs, mealybugs, leaf hoppers, moths and scale insects.

**Table 10. 1: Insect Problems**

Region	Type of Insect Problem								Number of Growers by Region
	None	Aphids	Thrips	Fungus Gnats	Shoreflies	Whiteflies	Spider Mites	Other	
1. Fort McMurray	0	0	0	0	0	0	0	0	0
2. Grande Prairie	1	12	8	8	5	3	10	1	48
3. Whitecourt	0	7	3	3	3	2	5	0	23
4. Edmonton	3	28	23	22	13	15	23	3	130
5. Bonnyville	3	4	3	5	1	2	4	0	22
6. Lloydminster	2	9	7	5	1	1	6	1	32
7. Red Deer	1	40	30	18	15	17	25	3	149
8. Calgary	1	12	7	5	4	3	4	0	36
9. Medicine Hat	1	22	17	18	11	22	21	2	114
10. Lethbridge	2	14	12	8	4	3	7	0	50
<b>Total</b>	<b>14</b>	<b>148</b>	<b>110</b>	<b>92</b>	<b>57</b>	<b>68</b>	<b>105</b>	<b>10</b>	<b>604</b>
<b>Per cent of Total</b>	<b>2%</b>	<b>25%</b>	<b>18%</b>	<b>15%</b>	<b>9%</b>	<b>11%</b>	<b>17%</b>	<b>2%</b>	<b>100%</b>

## Practice of Integrated Pest Management (IPM)

Table 10.2 presents information on the practice of IPM activities by region in Alberta. Based on 181 survey responses, 90 per cent or 162 growers indicated that they have heard of the term IPM. Within this category of growers who have heard of IPM, 77 per cent or 139 growers actually practiced IPM and the remaining 23 per cent or 41 growers did not.

Of those who practice IPM, the “You category,” which refer to greenhouse owners, represent 63 per cent of those who most often perform IPM activities in the greenhouse. Hired employees was the next leading response with 28 per cent, followed by “independent crop consultants” with seven per cent and “extension agents or program scout” with two per cent.

**Table 10. 2: Practice of Integrated Pest Management (IPM) by Greenhouse Growers**

Region	Have you heard the term IPM?			Do you practice IPM?			If yes, who most often does the IPM?				
	Yes	No	Number of Growers	Yes	No	Number of Growers	You	Crop consultant	Hired employee	Extension agent	Others
1. Fort McMurray	0	0	0	0	0	0	0	0	0	0	0
2. Grande Prairie	13	1	14	11	3	14	11	0	5	0	0
3. Whitecourt	7	0	7	5	2	7	4	1	1	0	0
4. Edmonton	32	4	36	26	10	36	22	3	15	1	0
5. Bonnyville	8	0	8	5	3	8	5	0	2	0	0
6. Lloydminster	12	1	13	10	3	13	10	0	3	0	0
7. Red Deer	40	4	44	34	10	44	29	2	8	1	0
8. Calgary	13	1	14	11	3	14	8	1	4	0	0
9. Medicine Hat	22	7	29	22	6	28	19	4	9	1	1
10. Lethbridge	15	1	16	15	1	16	12	3	6	0	0
<b>Total</b>	<b>162</b>	<b>19</b>	<b>181</b>	<b>139</b>	<b>41</b>	<b>180</b>	<b>120</b>	<b>14</b>	<b>53</b>	<b>3</b>	<b>1</b>
<b>Per cent of Total</b>	<b>90%</b>	<b>10%</b>	<b>100%</b>	<b>77%</b>	<b>23%</b>	<b>100%</b>	<b>63%</b>	<b>7%</b>	<b>28%</b>	<b>2%</b>	<b>1%</b>

## Use and Purchase of Biological Controls

Table 10.3 shows that 119 growers or 66 per cent used biological control methods in their greenhouses. Fifty-two per cent of those who use biological controls purchased their products from Biobest Canada Ltd., 25 per cent from Koppert Biological Systems, 11 per cent from The Bug Factory, and remaining 13 per cent from other sources such as Direct Solutions, Professional Gardener Company, etc.

**Table 10. 3: Purchase and Use of Biological Controls**

Region	Do you use biological control?			If yes, where do you buy your biological control?				If yes, area and months of year	
	Yes	No	No. of Growers	Biobest Canada Ltd.	Bug Factory	Koppert	Other	Area (%)	Months of Year (earliest to latest)
1. Fort McMurray	0	0	0	0	0	0	0	0	—
2. Grande Prairie	7	7	14	6	0	1	1	82	March to August
3. Whitecourt	5	2	7	3	0	1	1	100	March to September
4. Edmonton	20	16	36	15	2	3	2	76	January to December
5. Bonnyville	3	5	8	1	1	0	1	60	April to September
6. Lloydminster	8	5	13	6	2	2	2	89	Feb to November
7. Red Deer	30	14	44	20	3	7	5	80	January to December
8. Calgary	11	3	14	6	1	2	4	84	January to December
9. Medicine Hat	25	4	29	13	5	17	1	97	January to December
10. Lethbridge	10	6	16	8	2	4	3	83	January to December
<b>Total</b>	<b>119</b>	<b>62</b>	<b>181</b>	<b>78</b>	<b>16</b>	<b>37</b>	<b>20</b>	<b>85</b>	
<b>Per cent of Total</b>	<b>66%</b>	<b>34%</b>	<b>100%</b>	<b>52%</b>	<b>11%</b>	<b>25%</b>	<b>13%</b>		

## Use of Pollinators (Bumble Bees)

Table 10.4 presents the use of pollinators (bumble bees). Approximately 18 per cent of the 181 respondents used bumble bees for pollination and the remaining 82 per cent do not.

**Table 10. 4: Use of Pollinators**

Region	Do you use pollinators?		Number of Growers by Region
	Yes	No	
1. Fort McMurray	0	0	0
2. Grande Prairie	1	13	14
3. Whitecourt	0	7	7
4. Edmonton	2	34	36
5. Bonnyville	0	8	8
6. Lloydminster	4	9	13
7. Red Deer	8	36	44
8. Calgary	2	12	14
9. Medicine Hat	12	17	29
10. Lethbridge	4	12	16
<b>Total</b>	<b>33</b>	<b>148</b>	<b>181</b>
<b>Per cent of Total</b>	<b>18%</b>	<b>82%</b>	<b>100%</b>

## Source of Pesticide Recommendations

Table 10.5 provides information on where growers get their pesticide recommendations. Forty per cent obtained pesticide recommendations from consultants and other growers. This is followed by 12 per cent from internet sources, three per cent from professional gardeners, and the remaining 45 per cent from others such as Koppert, Direct Solutions, Agrium, Alberta Blue Book (Crop Protection Manual), etc.

**Table 10. 5: Source of Pesticide Recommendations**

Region	Where do You get Your Pesticide Recommendation?				Number of Growers by Region
	Consultants and other Growers	Professional Gardener	Internet	Other*	
1. Fort McMurray	0	0	0	0	0
2. Grande Prairie	7	1	3	1	12
3. Whitecourt	4	0	0	1	5
4. Edmonton	17	2	6	9	34
5. Bonnyville	1	0	1	6	8
6. Lloydminster	7	0	0	2	9
7. Red Deer	10	1	4	17	32
8. Calgary	4	0	0	6	10
9. Medicine Hat	5	0	3	16	24
10. Lethbridge	3	0	1	8	12
<b>Total</b>	<b>58</b>	<b>4</b>	<b>18</b>	<b>66</b>	<b>146</b>
<b>Per cent of Total</b>	<b>40%</b>	<b>3%</b>	<b>12%</b>	<b>45%</b>	<b>100%</b>

\* Other include Biobest, Koppert, Direct Solutions, Westgro, Evergro, Agrium, etc.



## Disease Problems

Table 10.6 shows disease problems by region in Alberta. Based on survey responses, 54 per cent of producers reported that they have disease problems in their greenhouses. Of these, 23 per cent reported pythium, 46 per cent powdery mildew, 21 per cent grey mold, five per cent tobacco mosaic virus, five per cent cucumber green mottle mosaic virus and the remaining four per cent reported other diseases.

**Table 10. 6: Disease Problems in Greenhouse Crops**

Region	Do you have any disease problems?		Number of Growers	If yes, what kind of disease problems?					
	Yes	No		Pythium	Powdery Mildew	Grey Mold	TMV	CGMV	Other *
1. Fort McMurray	0	0	0	0	0	0	0	0	0
2. Grande Prairie	7	7	14	2	4	5	0	0	0
3. Whitecourt	4	3	7	2	2	4	0	0	0
4. Edmonton	20	16	36	8	19	5	2	1	1
5. Bonnyville	2	6	8	1	1	1	0	0	0
6. Lloydminster	8	5	13	1	8	1	0	0	1
7. Red Deer	20	24	44	10	16	5	1	1	0
8. Calgary	6	8	14	1	3	3	0	0	0
9. Medicine Hat	22	8	30	8	11	4	4	5	4
10. Lethbridge	9	7	16	2	6	3	1	0	0
<b>Total</b>	<b>98</b>	<b>84</b>	<b>182</b>	<b>35</b>	<b>70</b>	<b>31</b>	<b>8</b>	<b>7</b>	<b>6</b>
<b>Per cent of Total</b>	<b>54%</b>	<b>46%</b>	<b>100%</b>	<b>23%</b>	<b>46%</b>	<b>21%</b>	<b>5%</b>	<b>5%</b>	<b>4%</b>

\*Other include botrytis, phytophthora, gummy stem blight, etc.

TMV = Tobacco Mosaic Virus

CGMV = Cucumber Green Mottle Mosaic Virus

## Improvement of IPM Knowledge

Table 10.7 shows suggestions on how IPM could be improved. The leading responses were “Through workshops” with 40 per cent, “Newsletter” with 31 per cent, and “Grower alerts” with 27 per cent.

**Table 10. 7: Improvement of IPM Knowledge**

Region	Ways for improving knowledge in IPM				Number of Growers by Region
	Through workshops	Newsletter	Grower alerts	Other	
1. Fort McMurray	0	0	0	0	0
2. Grande Prairie	13	9	5	0	27
3. Whitecourt	6	3	4	0	13
4. Edmonton	31	19	19	3	72
5. Bonnyville	7	5	2	1	15
6. Lloydminster	11	7	8	0	26
7. Red Deer	25	27	19	4	75
8. Calgary	11	10	8	0	29
9. Medicine Hat	23	18	20	2	63
10. Lethbridge	16	12	12	0	40
<b>Total</b>	<b>143</b>	<b>110</b>	<b>97</b>	<b>10</b>	<b>360*</b>
<b>Per cent of Total</b>	<b>40%</b>	<b>31%</b>	<b>27%</b>	<b>3%</b>	<b>100%</b>

\* Multiple growers

# Section 11: Labour

## Number of People Employed in Greenhouses

Table 11.1 shows the number of people employed by region in greenhouses. Forty-one per cent or 1,277 employees were full time workers and the remaining 59 per cent or 1,851 were part time. Of the 181 growers, 31 per cent have employed students from Olds College or a similar institution.

**Table 11. 1: Number of Peopled Employed in Alberta Greenhouses**

Region	Number of people employed?			Have you employed students from Olds College or a similar institution?		
	Full Time	Part Time	Total	Yes	No	Number of Growers
1. Fort McMurray	0	0	0	0	0	0
2. Grande Prairie	109	147	256	4	10	14
3. Whitecourt	30	14	44	3	4	7
4. Edmonton	168	472	640	15	21	36
5. Bonnyville	66	116	182	3	5	8
6. Lloydminster	18	55	73	2	11	13
7. Red Deer	218	401	619	14	30	44
8. Calgary	105	121	226	2	12	14
9. Medicine Hat	391	260	651	7	22	29
10. Lethbridge	172	265	437	6	10	16
<b>Total</b>	<b>1,277</b>	<b>1,851</b>	<b>3,128</b>	<b>56</b>	<b>125</b>	<b>181</b>
<b>Per cent of Total</b>	<b>41%</b>	<b>59%</b>	<b>100%</b>	<b>31%</b>	<b>69%</b>	<b>100%</b>

## Availability of Skilled Employees

Table 11.2 shows issues growers have with availability of skilled employees? Based on survey responses, 46 per cent indicated that they have issues and 54 per cent said they do not.

**Table 11. 2: Concerns with Availability of Skilled Employees**

Region	Do you have issues with availability of skilled employees?		Number of Growers by Region
	Yes	No	
1. Fort McMurray	0	0	0
2. Grande Prairie	10	4	14
3. Whitecourt	4	3	7
4. Edmonton	16	20	36
5. Bonnyville	4	4	8
6. Lloydminster	4	9	13
7. Red Deer	16	28	44
8. Calgary	8	6	14
9. Medicine Hat	14	15	29
10. Lethbridge	7	9	16
<b>Total</b>	<b>83</b>	<b>98</b>	<b>181</b>
<b>Per cent of Total</b>	<b>46%</b>	<b>54%</b>	<b>100%</b>

# Foreign Workers

Table 11.3 lists the use of foreign workers in Alberta greenhouses. Of 180 respondents, 34 per cent or 61 growers have used foreign workers and the remaining 66 per cent or 119 growers have not. Of the 61 growers who have employed foreign workers, 47 per cent were Mexicans; 27 per cent Thailand, 13 per cent Philippines, eight per cent Caribbean, and the remaining five per cent were from Chile, Spain, Belgium and Trinidad.

**Table 11. 3: Use of Foreign Workers**

Region	Have you used foreign workers in your greenhouse?			If yes, how many, which country they come from and months of year they work						
	Yes	No	Number of Growers by Region	Number of Foreign Workers	Mexico	Thailand	Caribbean	Philippines	Other*	Months of Year (earliest to latest)
1. Fort McMurray	0	0	0	0	0	0	0	0	0	—
2. Grande Prairie	1	13	14	1	1	0	0	0	0	February to December
3. Whitecourt	2	5	7	9	2	0	0	0	0	February to September
4. Edmonton	13	23	36	68	13	1	1	1	1	February to December
5. Bonnyville	4	4	8	59	1	1	3	1	0	January to December
6. Lloydminster	1	12	13	1	0	0	0	0	1	April to September
7. Red Deer	10	34	44	148	8	1	0	2	1	March to November
8. Calgary	4	10	14	46	4	0	0	0	0	January to December
9. Medicine Hat	22	7	29	399	4	18	2	5	0	January to December
10. Lethbridge	4	11	15	150	3	0	0	1	1	January to December
<b>Total</b>	<b>61</b>	<b>119</b>	<b>180</b>	<b>881</b>	<b>36</b>	<b>21</b>	<b>6</b>	<b>10</b>	<b>4</b>	
<b>Per cent of Total</b>	<b>34%</b>	<b>66%</b>	<b>100%</b>		<b>47%</b>	<b>27%</b>	<b>8%</b>	<b>13%</b>	<b>5%</b>	

\* Other includes Chile, Spain, Belgium and Trinidad

# Section 12: Environmental Trends

## Environmentally Friendly Practices

Table 12.1 shows that 96 per cent of 181 growers reported their production practices were environmentally friendly.

**Table 12. 1: Environmentally Friendly Production Practices**

Region	Are your production practices environmentally friendly?		Number of Growers by Region
	Yes	No	
1. Fort McMurray	0	0	0
2. Grande Prairie	14	0	14
3. Whitecourt	6	1	7
4. Edmonton	35	1	36
5. Bonnyville	7	1	8
6. Lloydminster	13	0	13
7. Red Deer	42	2	44
8. Calgary	13	1	14
9. Medicine Hat	28	1	29
10. Lethbridge	15	1	16
<b>Total</b>	<b>173</b>	<b>8</b>	<b>181</b>
<b>Per cent of Total</b>	<b>96%</b>	<b>4%</b>	<b>100%</b>

## Recycling of Plastics and Containers

Table 12.2 shows that 81 per cent of 181 growers recycled their plastics and containers while the remaining 19 per cent or 35 growers did not.

**Table 12. 2: Recycling of Plastics of Containers**

Region	Do you recycle plastics and containers?		Number of Growers by Region
	Yes	No	
1. Fort McMurray	0	0	0
2. Grande Prairie	11	3	14
3. Whitecourt	7	0	7
4. Edmonton	26	10	36
5. Bonnyville	5	3	8
6. Lloydminster	12	1	13
7. Red Deer	37	7	44
8. Calgary	11	3	14
9. Medicine Hat	21	8	29
10. Lethbridge	16	0	16
<b>Total</b>	<b>146</b>	<b>35</b>	<b>181</b>
<b>Per cent of Total</b>	<b>81%</b>	<b>19%</b>	<b>100%</b>

## Use of Landfill for Disposal

Table 12.3 shows that 78 per cent of 181 growers used landfill for disposal while the remaining 22 per cent or 39 growers did not.

**Table 12. 3: Use of Landfill for Disposal**

Region	Do you use landfill for disposal?		Number of Growers by Region
	Yes	No	
1. Fort McMurray	0	0	0
2. Grande Prairie	9	5	14
3. Whitecourt	5	2	7
4. Edmonton	28	8	36
5. Bonnyville	7	1	8
6. Lloydminster	9	4	13
7. Red Deer	34	10	44
8. Calgary	9	5	14
9. Medicine Hat	28	1	29
10. Lethbridge	13	3	16
<b>Total</b>	<b>142</b>	<b>39</b>	<b>181</b>
<b>Per cent of Total</b>	<b>78%</b>	<b>22%</b>	<b>100%</b>

## Composting of Waste Material

Table 12.4 shows that 85 per cent of 181 growers composted their waste material while the remaining 15 per cent or 28 growers did not.

**Table 12. 4: Composting of Waste Material**

Region	Do you compost your waste material?		Number of Growers by Region
	Yes	No	
1. Fort McMurray	0	0	0
2. Grande Prairie	14	0	14
3. Whitecourt	7	0	7
4. Edmonton	34	2	36
5. Bonnyville	8	0	8
6. Lloydminster	9	4	13
7. Red Deer	39	5	44
8. Calgary	14	0	14
9. Medicine Hat	15	14	29
10. Lethbridge	13	3	16
<b>Total</b>	<b>153</b>	<b>28</b>	<b>181</b>
<b>Per cent of Total</b>	<b>85%</b>	<b>15%</b>	<b>100%</b>

# Section 13: Food Safety

Table 13.1 shows growers who were Hazard Analysis Critical Control Point (HACCP) compliant, had on farm food safety and environmental farm plans.

**Table 13. 1: Food Safety Issues**

Region	Are you HACCP Compliant?			On Farm Food Safety			Environmental Farm Plan		
	Yes	No	Number of Growers	Yes	No	Number of Growers	Yes	No	Number of Growers
1. Fort McMurray	0	0	0	0	0	0	0	0	0
2. Grande Prairie	4	10	14	1	13	14	6	8	14
3. Whitecourt	2	5	7	2	5	7	3	4	7
4. Edmonton	11	25	36	9	27	36	9	27	36
5. Bonnyville	1	7	8	0	8	8	2	6	8
6. Lloydminster	7	6	13	4	9	13	3	10	13
7. Red Deer	14	30	44	8	36	44	14	30	44
8. Calgary	6	8	14	4	10	14	3	11	14
9. Medicine Hat	20	9	29	23	6	29	17	12	29
10. Lethbridge	4	12	16	6	10	16	3	13	16
<b>Total</b>	<b>69</b>	<b>112</b>	<b>181</b>	<b>57</b>	<b>124</b>	<b>181</b>	<b>60</b>	<b>121</b>	<b>181</b>
<b>Per cent of Total</b>	<b>38%</b>	<b>62%</b>	<b>100%</b>	<b>31%</b>	<b>69%</b>	<b>100%</b>	<b>33%</b>	<b>67%</b>	<b>100%</b>

Of the 181 growers who responded to these questions, 38 per cent were HACCP compliant, 31 per cent had on-farm food safety programs and 33 per cent had environmental farm plans in their greenhouses.

# Section 14: Taxation and Other Issues

## Greenhouse Taxation and Classification

Table 14.1 shows that 75 per cent of greenhouses were taxed as farms, 19 per cent as businesses and six per cent as commercial operations. Approximately 13 per cent complained about high taxes while the remaining 87 per cent of the respondents did not have any taxation or greenhouse classification issues.

**Table 14. 1: Greenhouse Taxation and Classification Issues**

Region	How is your operation taxed?				Any taxation and or greenhouse classification issues?		
	Farming	Business	Commercial	Number of Growers	Yes	No	Number of Growers
1. Fort McMurray	0	0	0	0	0	0	0
2. Grande Prairie	9	4	1	14	1	13	14
3. Whitecourt	4	1	2	7	0	7	7
4. Edmonton	24	8	3	35	6	30	36
5. Bonnyville	6	2	0	8	0	8	8
6. Lloydminster	11	2	1	14	1	12	13
7. Red Deer	38	7	1	46	5	39	44
8. Calgary	13	3	0	16	5	9	14
9. Medicine Hat	25	3	2	30	3	26	29
10. Lethbridge	9	5	2	16	2	14	16
<b>Total</b>	<b>139</b>	<b>35</b>	<b>12</b>	<b>186</b>	<b>23</b>	<b>158</b>	<b>181</b>
<b>Per cent of Total</b>	<b>75%</b>	<b>19%</b>	<b>6%</b>	<b>100%</b>	<b>13%</b>	<b>87%</b>	<b>100%</b>

## Greenhouse Insurance

Table 14.2 presents information on whether greenhouse insurance is readily available in Alberta. Of 181 growers, 71 per cent or 129 growers reported that obtaining greenhouse insurance was not an issue.

**Table 14. 2: Availability of Greenhouse Insurance in Alberta**

Region	Is greenhouse insurance readily available?		Number of Growers by Region
	Yes	No	
1. Fort McMurray	0	0	0
2. Grande Prairie	7	7	14
3. Whitecourt	4	3	7
4. Edmonton	26	10	36
5. Bonnyville	6	2	8
6. Lloydminster	9	4	13
7. Red Deer	29	15	44
8. Calgary	11	3	14
9. Medicine Hat	25	4	29
10. Lethbridge	12	4	16
<b>Total</b>	<b>129</b>	<b>52</b>	<b>181</b>
<b>Per cent of Total</b>	<b>71%</b>	<b>29%</b>	<b>100%</b>

As shown in Table 14.3, 127 growers or 70 per cent purchased greenhouse insurance and the remaining 30 per cent did not. Of those who purchased insurance, 36 per cent used Western Financial, 23 per cent were with Wawanesa, eight per cent with Cooperators, seven per cent with BrokerLink and the remaining 26 per cent with other providers such as Intact, Hub Insurance, Marsh, etc.

**Table 14. 3: Greenhouse Insurance Companies**

Region	Do you purchase greenhouse insurance?			If yes, which insurance company do you use?					Number of Growers by Region
	Yes	No	Number of Growers	Western Financial	Wawanesa	Cooperators	BrokerLink	Other*	
1. Fort McMurray	0	0	0	0	0	0	0	0	0
2. Grande Prairie	8	6	14	0	2	0	0	1	3
3. Whitecourt	4	3	7	2	0	0	0	2	4
4. Edmonton	27	9	36	3	4	2	1	6	16
5. Bonnyville	7	1	8	1	1	0	0	1	3
6. Lloydminster	9	4	13	2	2	2	0	1	7
7. Red Deer	24	20	44	5	6	1	0	4	16
8. Calgary	11	3	14	0	1	2	2	1	6
9. Medicine Hat	27	2	29	15	1	0	1	3	20
10. Lethbridge	10	6	16	2	2	0	2	3	9
<b>Total</b>	<b>127</b>	<b>54</b>	<b>181</b>	<b>30</b>	<b>19</b>	<b>7</b>	<b>6</b>	<b>22</b>	<b>84</b>
<b>Per cent of Total</b>	<b>70%</b>	<b>30%</b>	<b>100%</b>	<b>36%</b>	<b>23%</b>	<b>8%</b>	<b>7%</b>	<b>26%</b>	<b>100%</b>

\* Other includes Intact, Hub Insurance, Marsh, etc.

## Main Suppliers of Plant Material

Table 14.4 lists the main suppliers of plant material as provided by the survey participants. It is important to note that some growers had more than one company as their main supplier.

**Table 14. 4: Main Suppliers of Plant Material**

Region	Who are your main suppliers of plant material?					Number of Growers by Region
	Ball Superior	JVK	High Q	Bevo Farm	Other*	
1. Fort McMurray	0	0	0	0	0	0
2. Grande Prairie	9	7	4	0	6	26
3. Whitecourt	4	2	2	0	1	9
4. Edmonton	18	13	3	1	17	52
5. Bonnyville	3	3	1	0	3	10
6. Lloydminster	8	3	1	1	2	15
7. Red Deer	20	14	5	3	15	57
8. Calgary	5	5	1	1	4	16
9. Medicine Hat	3	0	0	15	7	25
10. Lethbridge	8	8	0	1	6	23
<b>Total</b>	<b>78</b>	<b>55</b>	<b>17</b>	<b>22</b>	<b>61</b>	<b>233</b>
<b>Per cent of Total</b>	<b>33%</b>	<b>24%</b>	<b>7%</b>	<b>9%</b>	<b>26%</b>	<b>100%</b>



Thirty three per cent of the growers bought from Ball Superior, 24 per cent from JVK, seven per cent from High Q Greenhouses, nine per cent from Bevo Farm and 26 per cent from others such as, Professional Gardener, Alberta Seed Centre, Nordic, Oyen Greenhouses, Terralink, Walters, other Nurseries, etc.

## Growers Who Raise Their Own Seedlings

Table 14.5 shows that 134 respondents or 74 per cent raised their own seedlings and the remaining 26 per cent did not. Based on survey responses, growers who produced their own seedlings on average raised 39 per cent of the total seedlings they used.

**Table 14. 5: Greenhouse Growers Who Raise Their Own Seedlings**

Region	Do you raise your own seedlings?			If yes, what per cent?
	Yes	No	Number of Growers	
1. Fort McMurray	0	0	0	0
2. Grande Prairie	13	1	14	40
3. Whitecourt	6	1	7	44
4. Edmonton	30	6	36	46
5. Bonnyville	7	1	8	49
6. Lloydminster	12	1	13	51
7. Red Deer	33	11	44	41
8. Calgary	12	2	14	39
9. Medicine Hat	8	21	29	17
10. Lethbridge	13	3	16	48
<b>Total</b>	<b>134</b>	<b>47</b>	<b>181</b>	<b>39</b>
<b>Per cent of Total</b>	<b>74%</b>	<b>26%</b>	<b>100%</b>	

## Membership of Alberta Greenhouse Growers Association

Table 14.6 shows the number of survey participants who were or were not members of Alberta Greenhouse Growers Association (AGGA) in 2019. Of the 181 respondents, 75 per cent or 135 growers were members of the AGGA, while the remaining 25 per cent or 46 growers were not. The top three regions with the highest memberships were Red Deer followed by Edmonton and Medicine Hat.

Of those who were not members, 36 per cent indicated that AGGA's membership fee is too expensive, five per cent said they were members of other organizations, 21 per cent said they were not interested in becoming members, 10 per cent said they have never been approached, want more information or they are yet to join. Another 10 per cent said they wanted to be independent, 15 per cent reported that there are not a whole lot of benefits and three per cent said they will retire soon.

**Table 14. 6: Membership of Alberta Greenhouse Growers Association (AGGA)**

Region	Are you a member of AGGA?			If no, why?							Number of Growers by Region
	Yes	No	Number of Growers	Too expensive	Member of LANTA or Red Hat	Not interested	Yet to join or never been approached	Want to be independent	No need or not a whole lot of benefits	Will retire soon	
1. Fort McMurray	0	0	0	0	0	0	0	0	0	0	0
2. Grande Prairie	8	6	14	0	0	0	1	0	3	1	5
3. Whitecourt	4	3	7	0	0	3	0	0	0	0	3
4. Edmonton	29	7	36	2	0	0	0	2	0	0	4
5. Bonnyville	7	1	8	1	0	0	0	0	0	0	1
6. Lloydminster	8	5	13	1	0	1	1	0	1	0	4
7. Red Deer	32	12	44	3	0	4	1	2	0	0	10
8. Calgary	8	6	14	3	1	0	0	0	2	0	6
9. Medicine Hat	26	3	29	2	1	0	0	0	0	0	3
10. Lethbridge	13	3	16	2	0	0	1	0	0	0	3
<b>Total</b>	<b>135</b>	<b>46</b>	<b>181</b>	<b>14</b>	<b>2</b>	<b>8</b>	<b>4</b>	<b>4</b>	<b>6</b>	<b>1</b>	<b>39</b>
<b>Per cent of Total</b>	<b>75%</b>	<b>25%</b>	<b>100%</b>	<b>36%</b>	<b>5%</b>	<b>21%</b>	<b>10%</b>	<b>10%</b>	<b>15%</b>	<b>3%</b>	<b>100%</b>

## Use of Greenhouse Consultants

Table 14.7 presents information on whether survey participants employ the services of a consultant.

**Table 14. 7: Use of Greenhouse Consultants**

Region	Do you employ the services of greenhouse consultants?			If AGGA provided consulting services, would you become a member?			If no, why?				
	Yes	No	Number of Growers	Yes	No	Number of Growers	Too expensive	Will retire soon	Not interested	Others	Number of Growers
1. Fort McMurray	0	0	0	0	0	0	0	0	0	0	0
2. Grande Prairie	3	11	14	3	4	7	0	1	2	2	5
3. Whitecourt	1	6	7	1	2	3	0	1	0	1	2
4. Edmonton	12	24	36	3	6	9	2	0	1	1	4
5. Bonnyville	0	8	8	0	1	1	0	0	1	0	1
6. Lloydminster	3	10	13	2	3	5	1	0	1	1	3
7. Red Deer	14	30	44	3	10	13	1	1	4	4	10
8. Calgary	2	12	14	2	5	7	2	0	2	3	7
9. Medicine Hat	13	16	29	1	3	4	1	0	1	1	3
10. Lethbridge	4	12	16	2	1	3	0	0	0	0	0
<b>Total</b>	<b>52</b>	<b>129</b>	<b>181</b>	<b>17</b>	<b>35</b>	<b>52</b>	<b>7</b>	<b>3</b>	<b>12</b>	<b>13</b>	<b>35</b>
<b>Per cent of Total</b>	<b>29%</b>	<b>71%</b>	<b>100%</b>	<b>33%</b>	<b>67%</b>	<b>100%</b>	<b>20%</b>	<b>9%</b>	<b>34%</b>	<b>37%</b>	<b>100%</b>

As presented in Table 14.7, 52 growers or 29 per cent reported that they employ the services of a greenhouse consultant while the remaining 71 per cent did not. Of those who did not, 33 per cent indicated that they would become members if AGGA provided greenhouse consulting services.

## Suggestions on How AGGA can improve its Usefulness

Table 14.8 presents information on how AGGA could be more helpful to greenhouse operators and their business. Of the 99 respondents, 47 per cent reported that AGGA is already doing a good job, 29 per cent reported more extension activities and annual workshops, 15 per cent indicated that AGGA should continue to lobby government on greenhouse related issues that will result in cost savings (e.g., energy, legislation, minimum wage/overtime, classification, etc.). The remaining eight per cent reported other issues such as lowering membership fees, doing online surveys, setting up a recycling program for greenhouses and nurseries plant pots, doing things that will help tree seedling producers, and having some workshops in the Peace River.

**Table 14. 8: Suggestions on How AGGA can improve its Usefulness to Growers**

Region	How could AGGA be more helpful?				Number of Growers by Region
	Already doing a good job	More extension, annual workshops, etc.	Lobby government on greenhouse related issues	Other	
1. Fort McMurray	0	0	0	0	0
2. Grande Prairie	4	5	0	2	11
3. Whitecourt	2	1	1	0	4
4. Edmonton	8	7	3	0	18
5. Bonnyville	0	1	0	1	2
6. Lloydminster	4	3	0	1	8
7. Red Deer	13	7	6	3	29
8. Calgary	1	1	1	1	4
9. Medicine Hat	7	2	3	0	12
10. Lethbridge	8	2	1	0	11
<b>Total</b>	<b>47</b>	<b>29</b>	<b>15</b>	<b>8</b>	<b>99</b>
<b>Per cent of Total</b>	<b>47%</b>	<b>29%</b>	<b>15%</b>	<b>8%</b>	<b>100%</b>

## Attendance at Green Industry Show and Conference

Table 14.9 shows attendance at the Green Industry Show and Conference by growers during the last five years. Of 181 respondents, 73 per cent reported that they have while 27 per cent have not. On average, respondents have attended three times in the last five years.

**Table 14. 9: Attendance at the Green Industry Show and Conference in Last Five Years**

Region	Have you attended the Green Industry Show and Conference in the last five years?			If yes, how many times?	
	Yes	No	Number of Growers	Total by Region	Average by Region
1. Fort McMurray	0	0	0	0	0
2. Grande Prairie	11	3	14	27	2
3. Whitecourt	7	0	7	18	3
4. Edmonton	30	6	36	105	4
5. Bonnyville	4	4	8	7	2
6. Lloydminster	11	2	13	33	3
7. Red Deer	35	9	44	105	3
8. Calgary	11	3	14	46	4
9. Medicine Hat	10	19	29	35	4
10. Lethbridge	13	3	16	33	3
<b>Total</b>	<b>132</b>	<b>49</b>	<b>181</b>	<b>409</b>	<b>3</b>
<b>Per cent of Total</b>	<b>73%</b>	<b>27%</b>	<b>100%</b>		

## Business Threats in the Next Three to Five Years

Table 14.10 shows business threats that growers are anticipating in the next three to five years by region. Of 181 respondents, 72 per cent or 131 growers reported that they are anticipating business threats.

**Table 14. 10: Business Threats in the Next Three to Five Years**

Region	Are you anticipating any business threats in the next three to five (3-5) years?			If yes, what kind of threats?							
	Yes	No	Number of Growers	Energy costs	Labour shortages	Markets / Prices	Taxes / regulations	Import competition	Currency fluctuations	Other	Number of Growers
1. Fort McMurray	0	0	0	0	0	0	0	0	0	0	0
2. Grande Prairie	8	6	14	7	4	5	4	3	1	0	24
3. Whitecourt	4	3	7	4	3	2	2	1	1	1	14
4. Edmonton	26	10	36	22	14	21	19	10	8	3	97
5. Bonnyville	7	1	8	6	2	4	4	0	0	2	18
6. Lloydminster	8	5	13	6	1	7	7	3	0	2	26
7. Red Deer	32	12	44	28	8	24	20	7	2	2	91
8. Calgary	11	3	14	7	1	7	9	3	2	2	31
9. Medicine Hat	23	6	29	22	17	15	19	10	8	6	97
10. Lethbridge	12	4	16	8	5	10	7	3	2	1	36
<b>Total</b>	<b>131</b>	<b>50</b>	<b>181</b>	<b>110</b>	<b>55</b>	<b>95</b>	<b>91</b>	<b>40</b>	<b>24</b>	<b>19</b>	<b>434*</b>
<b>Per cent of Total</b>	<b>72%</b>	<b>28%</b>	<b>100%</b>	<b>25%</b>	<b>13%</b>	<b>22%</b>	<b>21%</b>	<b>9%</b>	<b>6%</b>	<b>4%</b>	<b>100%</b>

Of those who reported “Yes,” 25 per cent indicated that energy costs are weighing heavily on their minds as they look into the next three to five years. Next is markets/prices with 22 per cent, taxes and regulation with 21 per cent, labour shortages with 13 per cent, import competition with nine per cent, currency fluctuations with six per cent and the remaining four per cent reported other threats such as bad economy or recession, succession, crime/theft, online shopping and climate change.

## Business Opportunities in the Next Three to Five Years

Table 14.11 shows business opportunities that growers are anticipating in the next three to five years. Of 181 respondents, 45 per cent or 82 growers reported that they are anticipating business opportunities. Of these, 61 per cent reported that non-traditional crops will continue to have an impact in the next three to five years. Next leading responses include the buy local movement with 23 per cent, export markets with 10 per cent, organic or green products with four per cent and the remaining three percent reported other opportunities such as online marketing.

**Table 14. 11: Business Opportunities in the Next Three to Five Years**

Region	Are you anticipating any business opportunity in the next three to five years?			If yes, what kind?					
	Yes	No	Number of Growers	Buy local movement	Non-traditional products	Organic or green products	Export markets	Other	Number of Growers
1. Fort McMurray	0	0	0	0	0	0	0	0	0
2. Grande Prairie	3	11	14	2	14	0	0	1	17
3. Whitecourt	2	5	7	1	7	0	1	0	9
4. Edmonton	20	16	36	17	37	1	8	1	64
5. Bonnyville	4	4	8	2	8	1	0	2	13
6. Lloydminster	7	6	13	6	13	0	1	0	20
7. Red Deer	21	23	44	19	44	4	7	1	75
8. Calgary	5	9	14	4	14	0	2	1	21
9. Medicine Hat	10	19	29	10	31	2	6	0	49
10. Lethbridge	10	6	16	8	17	3	5	2	35
<b>Total</b>	<b>82</b>	<b>99</b>	<b>181</b>	<b>69</b>	<b>185</b>	<b>11</b>	<b>30</b>	<b>8</b>	<b>303*</b>
<b>Per cent of Total</b>	<b>45%</b>	<b>55%</b>	<b>100%</b>	<b>23%</b>	<b>61%</b>	<b>4%</b>	<b>10%</b>	<b>3%</b>	<b>100%</b>

\*Multiple responses

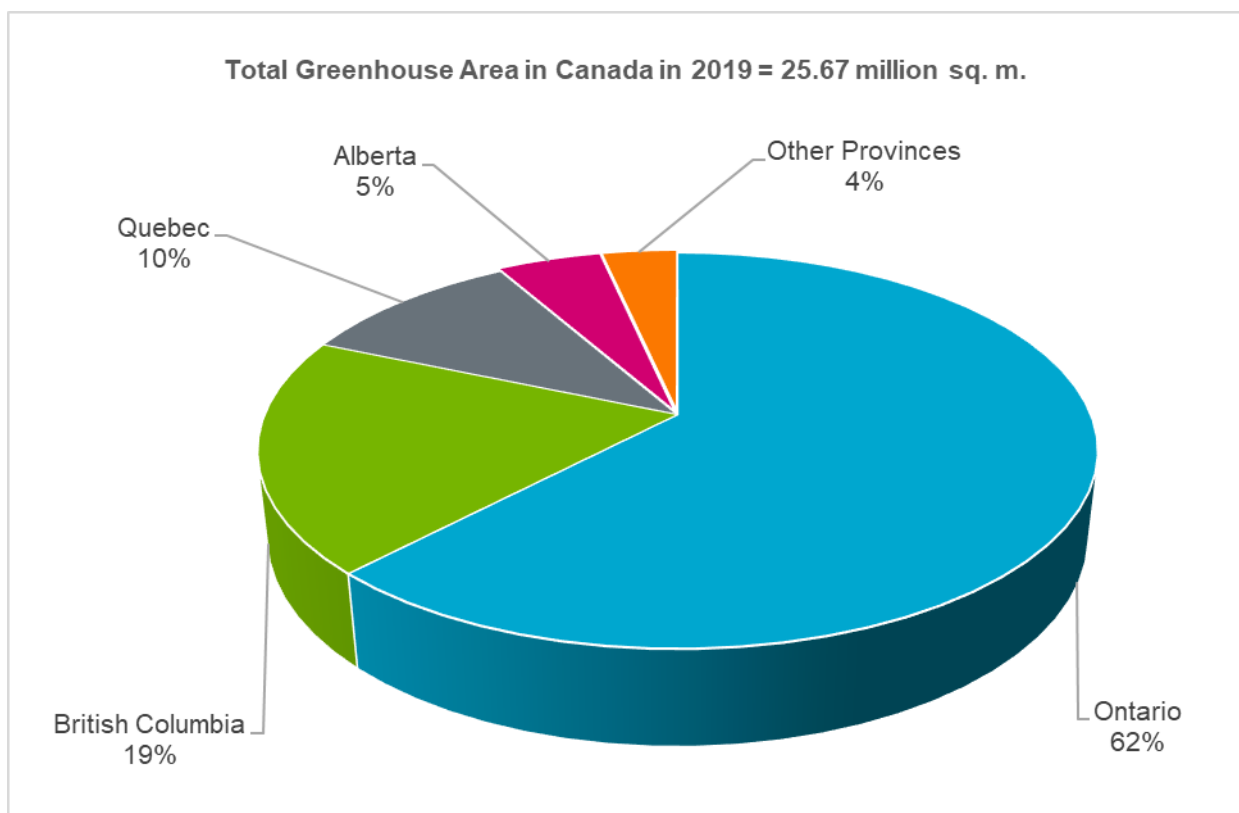
# Section 15: Other Key Industry Highlights

## Comparison of Greenhouse Crop Area by Province

Alberta's greenhouse industry ranks fourth in the country. Preliminary estimates of total greenhouse area by Statistics Canada in 2019 shows that Ontario continues to lead the greenhouse industry with 15.95 million square metres (1,595 hectares), followed by British Columbia at 4.94 million square metres (494 hectares) and Quebec at 2.65 million square metres (265 hectares). Operations that exclusively produce tree seedlings for reforestation are not included in these estimates. They were included in prior surveys before 2016.

In percentage terms, Ontario accounts for 62 per cent of all the greenhouse area in Canada, with British Columbia at 19 per cent and Quebec at 10 per cent. Alberta accounts for about five (5) per cent of the greenhouse area in Canada and the other provinces combined accounted for the remaining four per cent. Figure 6 shows estimates of total greenhouse area in Canada in 2019.

**Figure 6: Total Greenhouse Area in Canada, 2019**



**Source:** Statistics Canada

According to Statistics Canada, information on production, greenhouse area, sales, labour and expenses variables of operations which exclusively produce tree seedlings for reforestation have been excluded in their surveys since 2016.

## Other Alberta Highlights by Greenhouse Crop Sector

Over the past four decades, the Alberta greenhouse crops industry has diversified substantially in terms of types of crops being grown and marketed. Currently, the industry comprises of three distinct groups – vegetables, floriculture and tree seedlings. The major greenhouse crops that are grown include vegetables, bedding plants, potted flowers and ornamentals, cut flowers, herbs, perennials and tree seedlings.

### Vegetables

Vegetables currently account for about 187 acres or 46 per cent of total greenhouse crop area in Alberta. Since the last profile survey study published in 2015, the greenhouse vegetable industry in Alberta has grown significantly. The number of greenhouses however, has remained relatively unchanged (from 52 greenhouses in 2015 to 51 greenhouses in 2019). It is worth noting that the size of six of these vegetable greenhouse operations are approximately 10,000 sq. ft. or less. Table 15.1 shows the growth in production and value of Alberta's greenhouse vegetable industry from 2015 to 2019.

**Table 15. 1: Production and Value of Greenhouse Vegetables in Alberta**

Production and Value of Greenhouse Vegetables						
Alberta	2015	2016	2017	2018	2019	% Change (2019/2015)
<b>Production (kg)</b>						
Tomatoes	10,272,452	11,441,725	10,279,544	12,509,411	13,885,755	35%
Cucumbers	10,575,761	10,418,661	20,459,404	22,377,281	21,313,920	102%
Peppers	1,242,695	1,131,545	2,068,678	1,783,079	1,922,966	55%
Lettuce	104,447	123,012	125,731	240,119	440,949	322%
<b>Value (\$)</b>						
Tomatoes	\$20,203,816	\$22,576,507	\$19,891,095	\$25,786,796	\$29,131,354	44%
Cucumbers	\$27,731,340	\$27,284,096	\$44,245,871	\$49,563,334	\$48,645,244	75%
Peppers	\$4,111,194	\$3,756,449	\$4,507,275	\$4,120,776	\$4,802,914	17%
Lettuce	\$850,613	\$1,071,871	x	\$1,532,204	<b>\$1,819,003</b>	114%

Source: Statistics Canada

Based on the 2019 profile results, vegetable greenhouses are centered in three key regions (i.e. Medicine Hat, Red Deer and Lethbridge) with some production scattered around the province. The Medicine Hat region which includes the town of Redcliff (also well known as the “greenhouse capital of the Prairies”), accounts for about 79 per cent of the total greenhouse vegetable area of 757,933 sq. m. The other key producing regions (Red Deer and Lethbridge), account for 10 per cent and nine per cent respectively of total vegetable area.

The most commonly grown greenhouse vegetables are:

- Long English and mini cucumbers of different types.

- Beefsteak tomatoes, tomatoes on the vine (TOV), cherry tomatoes, cocktail tomatoes of different colours.
- Peppers of different colours, green, red, orange, yellow and other colours.
- Lettuce (butter head, romaine and different types of coloured lettuce).
- Eggplant, spinach, cabbage, watercress and kale.
- Potted flowers (annuals, perennials, hanging baskets, cut flowers, herbs, patio pots).
- Tree seedlings, primarily white and Colorado spruce and pine for reforestation.

Vegetable greenhouses in Alberta have organized marketing cooperatives. Red Hat Co-op, a producer organization is responsible for marketing greenhouse vegetables from the Medicine Hat/Redcliff area. Pik-N-Pak Produce Ltd. is another group of vegetable growers near Lacombe in Central Alberta.

## Floriculture

Floriculture (ornamental and bedding plants production) currently accounts for approximately 170 acres or 42 per cent of total greenhouse crop area in Alberta. It has the largest concentration near big cities although there are many smaller, seasonal greenhouses located around the province. Ornamental and bedding plants greenhouses are not as organized in any marketing cooperatives like vegetables and tree seedling growers, simply due to the diversity of crops grown and geographical locations.

Based on the 2019 survey, the top ten bedding plants grown by region in Alberta are petunia, marigold, calibrachoa, begonia, geranium, pansy, tomatoes, lobelia, alyssum and snapdragon. Greenhouses in Alberta produce cut flowers such as Asiatic lilies, roses, alstroemeria and oriental lilies. Some greenhouse operations concentrate on importing tropical plants, which are acclimatized to Alberta conditions before resale.

A considerable number of greenhouses produce more than one crop. The only greenhouses growing a single crop are those producing vegetables and a few also grow bedding plants. Greenhouses producing a variety of crops are in operation year round. The majority of the vegetable greenhouses are in operation for about ten months, February through November. Those producing bedding plants are in operation for about five months, February to June.

## Tree Seedlings

Tree seedlings account for the remaining 47.5 acres or approximately 12 per cent of total greenhouse crop area in Alberta. Greenhouse tree seedling production is scattered around the province from South to North with a large production and packing facility near Smoky Lake. Coast to Coast Reforestation or “C2C Trees” is a co-op of forest nurseries and cold storage facilities in Alberta.

## Alberta’s Trade Balance for Greenhouse Crops

Alberta is a net importer of greenhouse produce, with the bulk of imports occurring during the winter months. Trade data from Statistics Canada shows that in 2019, Alberta held approximately 6.8 per cent of the Canadian import share of food crops grown under cover, importing \$26.9 million of the nation’s total of approximately \$397.5 million. By definition, under cover includes crops grown in greenhouses, cold



frames, cloth houses, and lath houses. The crops grown are removed at various stages of maturity. Table 15.2 presents Alberta's trade balances for food crops grown under cover.

**Table 15. 2: Alberta's Trade Balance for Food Crops Grown under Cover**

	2015	2016	2017	2018	2019
Total Exports	\$415,945	\$701,322	\$4,736,000	\$9,524,079	\$4,724,521
Total Imports	\$20,654,942	\$25,332,438	\$22,553,146	\$24,908,901	\$26,900,339
Trade Balance	-\$20,238,997	-\$24,631,116	-\$17,817,146	-\$15,384,822	-\$22,175,818

**Source:** Trade Data Online (accessed: July 21, 2020)

The above values are just for greenhouse vegetables imported in Alberta. The value of imported vegetables can be significantly higher as inter-provincial shipments are not included. Import values clearly show that there is room to increase local production of vegetables, especially greenhouse tomatoes and peppers.

Table 15.3 presents Alberta's trade balances for nursery and floriculture products. The imports of \$10.8 million in 2019 represents approximately 2.0 per cent of the nation's total of \$550.6 million. Products imported include cut flowers and buds, live plants, cuttings and slips, bulbs, tubers, corms, crowns and rhizomes, roses, etc.

**Table 15. 3: Alberta's Trade Balance for Nursery and Floriculture Products**

	2015	2016	2017	2018	2019
Total Exports	\$84,171	\$64,630	\$43,516	\$59,957	\$122,269
Total Imports	\$7,081,684	\$7,368,696	\$15,261,075	\$11,103,192	\$10,777,493
Trade Balance	-\$6,997,513	-\$7,304,066	-\$15,217,559	-\$11,043,235	-\$10,655,224

**Source:** Trade Data Online (accessed: July 21, 2020)

# Section 16: Future Sustainability of the Alberta Greenhouse Crops Industry

The greenhouse crops industry in Alberta is a very dynamic sector of agriculture and innovations are constantly introduced and successfully adopted by the growers in order to remain competitive and sustainable. As an example, winter production of vegetables in Alberta started in early 2000 and now it has been adopted by a number of growers. The supply and demand chain has been established so much so that we can compete with the imports.

As the electrical load and demand increased, so growers started looking for generating their own electricity. As a result in 2019 one vegetable grower installed a 5 MW cogen facility to supply heat, power and carbon dioxide. Another grower is in the process of installing a similar system and many smaller growers are looking at cogen units. In the bedding plants sector, new plants both ornamentals and vegetables have been introduced to consumers.

Many forward thinkers in the Alberta greenhouse crops identified that “The Future of our greenhouse industry is bigger, broader, brighter and more collaborative than ever.” The market is constantly changing with demographic diversity, supply and demand issues. Natural disasters, calamities and pests are going to affect our crops and production capacities. Many growers were willing to predict that in this decade we will be able to become price makers and not just price takers.

Following trends have been identified by growers and other leaders in the industry. These trends are summarized in groups as much as possible with some over-lapping and duplication. Understanding these trends by the growers and investors is going to determine the future sustainability of the Alberta greenhouse crops industry.

- Greenhouse building/structure trends
- Crop management trends, e.g., high wire systems for cucumbers, better growing media, biological controls, etc. Emergence and spread of new diseases from viruses and bacteria.
- Marketing trends, e.g., cooperative marketing, direct to consumers, locally grown, one hundred (100) mile food movement, pesticide free and organics
- Sale and Social trends
- Business trends, e.g., minimum sustainable greenhouse unit changed, uncertainty in the market place, electronic ordering, use of technologies most beneficial to production
- Workplace/labour trends, e.g., finding and retaining employees with the skills and experience and motivation needed for the business, use of off-shore labour programs, training of labour, etc. Issues with Temporary Foreign Workers availability and retention issues
- Political/regulatory/legislative trends, e.g., laws at every level of the business from municipal, provincial and federal governments

## Greenhouse Building/Structure Trends

Many greenhouse manufacturers and suppliers say their customers are asking for new models that can accommodate a diverse crop mix (from ornamentals to vegetables to cannabis), while providing flexibility

in design, maintenance, and control of the environment. This trend has come into play to design better greenhouse structures.

The greenhouse design for vegetable growers has changed over the past decade based on research in environmental control. Greenhouses built in early 1970 to 1980 were primarily of glass as roofing and sidewalls glazing materials. With hailstorms every few years and not able to get insurance for glass structures, a major shift to plastic structures took place. Starting in 2008 due to interest in winter production, two growers have built significant sized greenhouses with glass as roof glazing material. Out of 187 acres of vegetable produced, 45 acres or 24 per cent are under special glass which lets more sunlight diffuse into the greenhouse. This trend of getting more natural light transmitted into the greenhouse and into the plant canopy was more evident in the planning of greenhouses. The cost is still high for such glass structures compared to double polyethylene greenhouses. Greenhouse structures in British Columbia are mostly glass in some areas. Currently, Ontario is expanding into glass structures as well.

There are many types of greenhouses being marketed by different builders and designers. A few examples are provided here:

Westbrook Greenhouse Systems Ltd. lists six different types of structures.

- i. Apex Greenhouses, “if condensation drip is your problem, Westbrook’s Apex greenhouse is your solution.”
- ii. Skyline II Greenhouses, The first North American designed open roof greenhouse.
- iii. Venlo Greenhouses, “Our newest glass house in the traditional Venlo style. Designed and manufactured in Canada for the North American market.”
- iv. Cabrio Venlo Greenhouses offer precise, large-scale growing for any commercial operation. Each Cabrio Venlo Greenhouse can be clad in glass, polycarbonate, or film and features a fully opening motorized roof to ensure maximum ventilation and up to 96% light transmission. Structures can be tailored to specific growing needs with custom sizes, design, bay spacing, and gutter height”. This is an example of how versatile greenhouse structures are becoming and the focus is on maximum light transmission. Solar Glass Greenhouses, “The world’s first curved glass greenhouse. Available in fan and ridge vented models.”
- v. Solar Poly Greenhouses, “The original Westbrook poly greenhouse. Available in fan and gutter vented models.”
- vi. Free Standing Greenhouses, “The Freestanding Greenhouse offers a sturdy structure at a budget any grower can handle.”

Extra-large gutters which can withstand snow, rain, wind and extreme heat have also been designed and offered for sale. These greenhouse offer more versatility to handle extreme weather.

Other companies like Harnois offers several design options for Northern climates. Newer designs are based on the fact that growers can grow multiple crops with different temperature and light requirements. Another trend was also noted that designing greenhouses which can withstand storms and hurricanes. These customized greenhouses will support all forms of hydroponics and soil-based farming.

Autonomous greenhouses have been in the news which can generate electricity through roof solar panels without affecting plant production. Research trials have been conducted and would be available in future.

## How is the industry going to respond to this trend in newer designs for better environmental control and light transmission?

Growers with older structures are slowly disappearing from the market place. Some growers are selling the increased valued land and others are investing in these newer structures. In the next five years, it appears that these older structures will disappear completely. The number of growers will decrease and the average size of the greenhouse will increase. This was also evident from the results of this profile study. Currently, there are about 51 vegetable growers left compared to over 60, a decade ago. About six of these growers have greenhouses that are approximately 10,000 sq. ft. or less.

In 2009 and 2010, two state of the art greenhouses were built in Alberta, units of five acres each. In 2014, one of those growers expanded to 15 acres. In 2020, the same grower expanded to 45 acres. These greenhouses have side walls over 21 feet high and this allows for raised troughs for growing cucumbers, tomatoes and peppers. These structures have better and more efficient environmental control systems. Not every grower will be able to invest in these new structures but slowly old, inefficient structures will disappear and new, better greenhouses will emerge. There is no doubt that the focus will be on better and more precise environmental controls.

Growers are constantly adding new greenhouses to the existing one and better structures are being adopted. In order to take advantage of these newer, smarter and efficient structures, growers must clearly understand and document their existing needs and future expansion plans. There are clear advantages to these newer structures for better natural light transmission and climate control.

## Vertical farms and use of transport (intermodal) containers for commercial production

Although surveying vertical farms and containers for commercial production was not part of this project, it was considered important to talk to some entrepreneurs about this development. There are seven vertical farming operations using warehouses, and transport containers. Most of them are built from scratch in warehouses while a couple of them are supplied by companies from British Columbia e.g. CubicFarms.

The space use efficiency is very high compared to greenhouses because of vertical stacking. For example, one facility consisted of a 4,000 sq. ft. floor area with six vertical units.



There are seven levels on each unit and the production area is around 16,000 sq. ft. The trend is to use LED lights. Salad crops are most suited to these vertical farms with research interest in growing vine crops like cucumbers, tomatoes and peppers.

A complete analysis of investment costs, operating costs and an economic analysis is needed in the future. The biggest technology component which accompanied these vertical farms is using Heating, Ventilation and Air Conditioning (HVAC) systems for climate controls. To handle these parameters, sensors and computers are used and the data can be monitored through laptops and mobile phones.

## Future trends in vertical farming

Due to market size and competition from USA and Mexico, the expansion will be limited in future although consumer demand of fresh, food safety, nutritious and locally grown salad crops will encourage more investment. How the financing agencies will view this type of agriculture remains to be seen. It appears that niche marketing will be the focus of vertical farms; it does not matter if it is in warehouses or containers or machines. Some of the advantages being advertised by many companies include:

“Reduction in the physical foot print of traditional farming while maximizing production/sq. ft. It is pointed out that these production system are not considered as certified organic and a constant debate if hydroponic production is in this category.” Many of the production practices although comply with the organic protocols like, no pesticide applied, water use efficiency, biological control strategies, yet they don’t qualify as certified organic. There is a constant debate taking place between soil grown and hydroponically grown crops producers regarding their organic status. At this time growing in soil is an essential component of organic certification. Other advantages being promoted are:

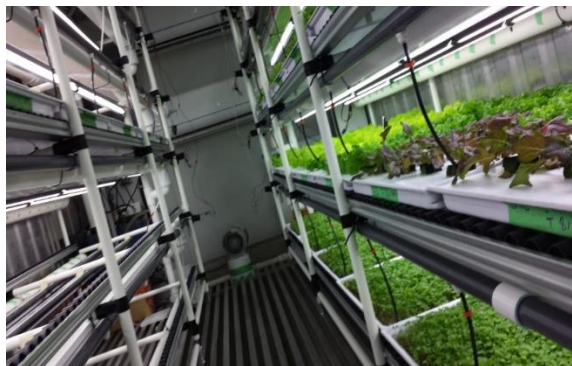
- Strictly controlled growing environment, eliminates variable light, optimum water and temperature management
- Significant reduction in the use of physical labor throughout the production process
- Dramatically reduced use of water resources

With natural calamities and disasters and food security issues arising as a consequence, more attention will be paid to these totally enclosed production facilities. Future investors should look into the immediate retail market before building such facilities.

## Growing in transport containers

With the availability of a large number of transport containers, this trend has been observed to produce fresh salad crops.

Most of the containers used are 8.5 feet by 40 feet with a height of 9.5 to 12 feet. So average total space is around 350 sq. ft. Generally four to five levels are built along the length of the containers with two stacks and a walkway in the middle. The grow space is around 500 sq. ft. LED lights with





blue dominant spectrum are used. Two types of irrigation systems are adopted, one is using drippers to feed the plants in trays and the other is a totally floating system.

These production systems brought along many automations for climate control, produce harvest and handling and seedling management. In climate control the major systems are dehumidifiers and air circulation in enclosed space along with complete water recirculation. Most of the municipalities require no dumping of fertilizer water in sewage. Remote control strategies have also been brought into play where temperature, light and relative humidity can be monitored. Special digital cameras are used to check on the growth of crops.



A “Dry Hydroponics” system developed in Holland, was adopted by a few growers. Dry Hydroponics refers to special plastic floating rafts in which there is air space between the seedlings and nutrient rich water. In this way the water logged situation is avoided. A bedding plants seasonal grower decided to adopt this system as a means of diversification and one year of operation has shown success in marketing fresh, no pesticides applied, grown in Alberta. One unique feature of this facility was crowd funding, where many consumers bought produce shares.

This is the fourth example of this system where water and nutrients are totally recycled and no water is wasted. This trend is going to continue as more focus is placed on less waste water and nutrients.



## Crop Management Trends

There are many crop management trends that will influence the future growth of the Alberta greenhouse industry. Besides having better greenhouse structures, growers must take advantage of following trends for higher yields:

### **Use of LED lights is increasing in year round production of vegetables**

LED lights are rapidly changing for spectrum and wattage and growers are taking advantage of these trends in better light management. An acre of greenhouse was built in 2016 using LED lights to grow tomatoes through winter. Top lights provided 100 micromols/m<sup>2</sup>/second of light. A year later, interlights were added in the canopy and this brought better yields. As a result, more tomato growers are installing

these inter light and other tomato growers will take advantage of these LED lights. It appears that cucumber growers will settle with High Pressure Sodium lights on top and LED in canopy.

Many plant propagators who provide rooted cuttings and plugs to growers also have adopted the use of LED lights to improve the rooting process and thus the seedling quality. This trend will continue to replace High Pressure Sodium lights. Herb growers are going to use more LED lights with blue spectrum.

## **High wire training system for cucumbers**

This system of training the plants has shown better production, slightly higher labour costs and better control over generative or vegetative growth of the plant. Even smaller sized growers are reporting good success with this training system. This production system has gained more popularity and is providing better forecasting for harvest/sqm/day. With good research and experience the growers are predicting yields of 400 cucumbers/m<sup>2</sup>/year.

At this time many top Alberta growers are obtaining yields as high as 290 cucumbers/m<sup>2</sup> with a lower range of around 250/m<sup>2</sup>. The average production is still around 150 cucumber/m<sup>2</sup>. So there are great opportunities with many growers to look at a high wire training system but to do that they must change the greenhouse structure to higher gutter height. It is hoped that they will take advantage of greenhouse structures in the market place.

Using troughs for production has shown better air circulation and better spacing of plants and stem management. Most of the new growers have adopted raised trough production systems in their new greenhouses.

## **Better use of plant physiology knowledge, in terms of leaf volume to fruit**

There is better research information available now on how many leaves should be left on plants compared to fruit.

## **Choice of growing media is a constantly changing trend**

Soil cultivation is basically out and soilless cultivation systems are in place. A trend is seen for niche marketing in organic production whereby soil cultivation is used. In the next five to 10 years, as more research becomes available in organic management of vegetables, there will be more management tools available for higher production. Watch for newer growing media like Biochar, which is being researched in Alberta. It is a charcoal-based material, with very desirable characteristics.

## **Growing “pesticide free” crops**

The trend in growing “pesticide free” crops by using biological controls has already taken hold but growers have reported difficulty on using the term “pesticide free”. The authorities responsible for handling such an issue don’t agree with this term in spite of the fact that growers take random test and scan for over 400 different types of herbicides, fungicides and pesticides. How is the industry prepared to take advantage of that trend? Until the commercial, wholesale markets are ready to give a better price, this type of production will remain for specialty and direct retail markets.

Certified organic production of greenhouse vegetables stayed at three growers in Alberta. It will take more time and research to develop all aspects of certified organic production.

## Using troughs for tomato production is standard now

All new greenhouses are built with troughs for cultivation. The cost of water is slowly increasing as well as water treatment costs. Most of the vegetable growers stayed with the use of Ultra Violet (UV) lights for disinfection with a small percentage adopting the use of heat pasteurization. No major shift occurred towards the use of Ozone.

Over the past decade there has been a major change in the type of cucumbers, tomatoes and peppers grown. More diversified crops are grown but there is no good research information on managing regular long English cucumbers and mini-cucumbers or beef steak and tomatoes on the vine during winter. To take advantage of these trends, more research information has to be developed. Mini cucumbers constitute just over 30 per cent of cucumber production. Beef steak and heritage tomato varieties are making a comeback.

Bedding plants and ornamental growers have constantly added new plants suitable for Alberta, especially more vegetables in pots or containers. This is called Container Gardening.

The use of consultants has increased over the past decade. In a recent brochure from a grower at the occasion of the inauguration of a new greenhouse project, 34 project supporters and suppliers and consultants were listed. This shows an inter-disciplinary approach and support needed to make projects successful.

The point being made is that cucumber producers cannot stay at 120 cucumbers per sq. m. and be sustainable. Similarly tomato producers must strive for production of over 65kg per sq. m. on a consistent basis.

## Marketing and Business Trends

Are the Alberta vegetable growers well positioned to take advantage of population changes? There is no doubt that greenhouse vegetable producers are going to remain as price takers and not price setters although it may change during this decade. Keeping this limitation in mind how far can this industry take advantage of these trends like locally grown, 100 mile diet, organic, pesticide free or reduced, biological controls used, etc. More similar trends will come across the industry and efforts should be made to stay ahead in marketing research. More partnership marketing has to be developed and encouraged. This happens when large companies show pictures of local greenhouse growers on the front cover of their brochure. Are we labelling our produce like cucumbers, tomatoes and peppers with information on picking date, best before date, packaged at and basic nutritional value for calories and minerals, etc.?

### **On the business side following trends are worth noting:**

Economic unit in terms of size of an average greenhouse has changed from one half acre in the 1980s to two acres in 2008. This is especially true for the commercial and wholesale markets. In 2020, approximately a hectare (2.2 acre) has become the minimum economic unit.



For direct marketing to smaller retailers in rural areas and farmers markets, the size could be far less than two acres. Many growers have done it successfully with 6,000 to 10,000 ft<sup>2</sup>. Family members have to contribute more time and energy to make it successful.

Are you aware of all the components of a good business? It is not just production of vegetables, but many other parts of a good business.

Understand and take advantage of “Millennial” customers. The time of “baby boomers” is slowing down. Millennials will be important not only as consumers and customers but also as employees for your business. Beyond wanting competitive pay and benefits, Millennials expect to feel appreciated for their efforts, see opportunities to advance, be more empowered in the workplace, and also have the flexibility to balance their lives at work and home," said Pam Hein, partner with communication consulting at Aon Hewitt. "Younger employees want to work in an environment where information flows freely and authentically and where people know they can count on one another. Data show there is a significant opportunity for employers to offer a more unique and compelling work experience that will match what Millennials want, and in turn increase retention long-term." As a greenhouse business manager you should be aware of these trends.

Urban Farming Trends: During the past few years Urban Farming has been a hot topic. Many cities in Alberta have a dedicated program. The City of Edmonton has an active Urban Farming and Food Initiative. How you as a greenhouse grower can be part of such initiatives? Take active part in these initiatives and you are in a position to supply plants to such initiatives.

Balcony gardens: Do you know that there is great interest in small space gardening? Balcony gardens is another trend. How can you grow more plant material for balconies? For example, you need to grow smaller hanging baskets or containers that don't need to be hung up. You need to grow vegetable varieties which are more compact not too vertical growing. Learn how to take advantage of such trends.

Emphasis over here is to be fully aware of all aspects of your business. Know your product and markets thoroughly.

## Workplace and Workforce Trends

There have been many important changes in the workplace and labour. Can I find and retain employees with the desired skills and motivation needed at salaries I can afford. While conducting the survey, many growers mentioned that availability of reliable labour at the price they could afford was an issue. At this time it appears that the greenhouse industry has to depend on “off shore” labour for a consistent supply of workforce. The survey identified that labour is brought in from Mexico, Thailand and Caribbean. There are many Federal and Provincial labour programs available but all have a strong, bureaucratic part that many growers have difficulty with. Sometimes it is an issue of greenhouses not classified as farms by the particular person you are dealing with and other times it is not getting the LMO (Labour Market Opinion) in time. You must be aware of issues involved in importing labour. The laws and regulations are constantly changing due to market changes. Here are few items that may be helpful:

Talk to growers who have been getting labour from other countries and have more experience.

Be a member of the AGGA and other associations who are strongly interested in these types of issues and can guide you in minimizing the problems.

Have a good working relationship with the labour you bring in. They can become an asset for you.

“Creative Hiring” is a buzz word used by the industry. It means you gear your business towards employing people rather towards “unemployment.” For example, one vegetable grower mentioned that they have invested into year round production by using supplemental lights and thus the labor is required year round rather than just seasonal. Some growers are focusing on hiring more women, indigenous people and young people who are familiar with greenhouse production. In addition to hiring just labor, creating interest in their job and giving them a role in plant management, biological control, sending them for workshops and career development. This approach creates long term relationships with your staff.

Try to develop contacts with key people in government with whom you can communicate easily. Invite them to visit your greenhouses. Many times it helps because they actually know what you are doing.

Be aware of rule changes. The duration of stay of labour may change and you are not aware of that. It is not going to help in making decisions.

Become a member of Greenhouse Marketing Forum; that is an amazing network of greenhouse growers. Its current membership is close to 180. There are lots of postings from growers about many aspects of their businesses. To become a member go to <http://groups.google.com/group/greenhouse-marketing-forum>

## Political/Regulatory and Legislative Trends

Rules and regulations could change at municipal, provincial and federal levels that may have a significant impact on the industry. These rules may range from irrigation legislation to taxing businesses. Every year many regulatory changes are taking place that appear to be somewhat detrimental to the greenhouse business. For example, a few years ago the Government of Alberta gave a ruling on the use of plastic on greenhouses where the public was allowed to come in in accordance with the building code requirements.

One grower was thus forced to use tempered glass and the cost went up. A tempered glass greenhouse built in the county of Cyprus was asked to have two doors at the end of each bay by a building inspector. Few years ago an inspector wanted to insulate the heating pipes in the greenhouse because accidentally it might cause burns to workers.

There have been many other issues relating to greenhouse classification by government departments. For example, Alberta Agriculture recognized greenhouses as farming operations while Alberta Labour did not and this resulted in labor use challenges. Alberta Greenhouse Growers Association (AGGA) made representations to different governments departments. In 2018, an overtime exemption was granted to greenhouses which was a temporary solution. During 2019, the government restored the greenhouse classification as greenhouses.

These are examples of what can happen with decisions made at various levels of government. Some other examples:

Water and irrigation related legislations issues are expected to increase at county, town, city and provincial levels. Already there is a report from the County of Lacombe where greenhouse growers are told not to take runoff water from the area so that the lake water level could be increased. The greenhouse expansion will be delayed because well water is not suitable for greenhouse irrigation. Using water treatment options like reverse osmosis are expensive and not environmentally friendly. The solution is going to be collect all rain water from greenhouse roofs, recycle water which has gone through the root zone and limit leaching practices.

Insurance rates will increase as liabilities increase. Change in weather conditions, floods, tornadoes and heavy snow-fall can all affect the business.

With the COVID-19 virus pandemic, greenhouses were affected as other businesses.

Major changes are taking place in the handling and disposal of chemicals and pesticides. It is anticipated that fewer chemicals may be available even for integrated pest management.

How are you going to handle these changes? You have to stay active at the association level. AGGA can play a much bigger role in helping with such issues. Information has to be acquired faster and you have to become more pro-active. Develop your skills to write letters and provide any data required to support your position.

## Bedding Plants and Ornamental Sector

Bedding plants and ornamentals makes up about 42 per cent of Alberta's greenhouse crops industry, while the remainder is shared between vegetables and tree seedlings. This sector is 72 per cent seasonal in nature and 28 per cent is year round in nature. Garden centres and nurseries are an integral part of this sector. Issues affecting the future of this sector are basically the same as vegetable growers but driving forces may be different.

## Customers Are Becoming More Sophisticated

This is an important trend because customers are demanding information on the products they are buying. They are demanding service at all levels, so much so, it is difficult for them to wait in a cashier's line. Demographic shifts are taking place where more elderly people are coming into your greenhouses. Millennial customers are and will be increasing in numbers. This is an ambitious group of young people who likely want to spend less time in the greenhouse. They would like to make their purchase selection of plants from your website. So they will be needing pre-determined combinations of plants. So prepare for new realities for the Millennials. This group will also be very interested in balcony gardens and roof top gardens.

Creative advertisement will attract people to your greenhouse especially when you are located outside the regional centres (cities). Why should they come to your greenhouse several kilometres away? For the past few years there is an increased emphasis and demand for container gardening or instant landscaping that has reduced maintenance. Similarly customers will be more interested in alternative landscapes like organic, wild flowers, and water gardening. Container gardening will become more popular especially due to weather conditions that we have been experiencing in Alberta for the past few

years. Time of actual planting of annuals in gardens is getting less and less due to rain and cold temperatures.

### **How the industry is going to respond to this trend?**

Sales and social is big a seller of product and produce. Bedding plants and ornamental growers are using Facebook, Twitter, Instagram and other social media to connect with their customers in advance. Many growers have standardized their hanging baskets like food menus. Very attractive names have been assigned to these baskets. Customers can order these baskets in advance. Once the basket is sold, the customer's name is placed on those orders. You come to the greenhouse and pick up your basket.

Create a good website for knowledge and information. This may be included in the advertisement and referred to at the time of sale. Many growers in rural areas were very active from 2014 to 2020 in pre-selling their plants and products like hanging baskets. These growers also introduced different trades from their local area.

From 2014 to 2020, there is a very interesting trend of holding workshops in greenhouses, holding community yoga sessions, and organizing different classes. This is a good way of attracting new customers and increase confidence in your product.

A very unique event was organized under the name New Blooms in 2017 at one of the greenhouses in the Morinville area. This was the effort and vision of Debbie Foisy, owner and operator of Foisy Greenhouses. Several key suppliers of new plant material, both vegetables and ornamentals and flowers from the US and other countries supplied the seeds and cuttings in advance and were grown in the greenhouse. The speakers talked about these plants and their uniqueness.

The event continues and in 2019 over 75 growers attended. This helped growers learn about new plant materials and how to grow them for commercial marketplaces. At the end plants are sold for a nominal price. This is a very good trend to establish connections with other growers, professionals and trade people. Seniors may want more written material in larger fonts and pictures; so print material accordingly. The Millennials want more interested in scanning the QR codes and get the information on site.

Pay attention to your image and reputation in the community. Ensure that employees are well trained, courteous and knowledgeable and are not in a hurry to answer customer questions. Many growers in rural areas are recruiting younger staff who are savvy with digital technologies and are from surrounding communities. Don't leave everything to your employees. Make sure that you are around to meet and greet people. The role model provided by Mrs. Louis Hole should be a benchmark for service and knowledge. Even as the Lt. Governor of the Province, she would come and mingle with customers and answer questions.

Ensure that it is a pleasant shopping experience. Have a good layout. It is always enjoyable to stay for a couple of minutes to look at the fish, turtles and birds and have the feed as well.

Use cooperative marketing practices if there are many growers within an area. Edmonton and vicinity has set up good Agri-tourism programs where people can go, enjoy tours and rides. Many other areas have

done similar advertising like passports. You visit three greenhouses, have your passports stamped and get a free hanging basket.

Work collectively as an industry. Become members of AGGA and other organizations.

## Fast Developing and Improving Communication Technologies

The survey indicated that the use of computers has increased considerably. Table 4.2 provided details about the use of computers. Among the five major uses of computers identified in the survey questionnaire, email and Internet came at the top. Eighty-two per cent of the growers use this communication technology for information from the Internet. This has impacted the industry and will keep on impacting in the future of information needed by the growers. The question is how to filter and manage the information for use in the greenhouse. Many times information is mere testimonial on a product. You have to purchase scientific information and afterwards know how good and useable it is. The following points may help the industry to respond to above issues:

Make sure that computer literacy is widely practiced by you and your staff. Staff should be trained in Internet use, creating your own websites and how to do navigation on the Internet and safety of the download is ensured. Avoiding virus infections is very important at every level of computer use. Use of cell phones for business dealings and development is increasing. Be aware of all these new tools and how to handle them effectively. Many growers held live webinars from their greenhouses highlighting their expertise in plants and people.

Use of cell phones with the ability to use credit and debit cards is increasing. Imagine if you carry such units around and when there is rush at the till, you can process the transactions right where the customer is.

Also learn how to conduct business on the Internet. Many greenhouses order materials and sell through the Internet. Make sure there is no typing errors in the orders you place and the orders you receive. Phone follow-up may be needed if something is not clear.

Filtering the technical information you get via the Internet can be done by examining the rationality and logic supplied in the information. Most commonly, one finds the information about the products that it will increase production by 100 per cent, will increase the growth of plants and similar aspects that have an emotional appeal to people. Instead of good research information, you may find many testimonials and that are not from reputable sources. Discuss with trusted researchers and extension people before you invest in such technologies or equipment.

Telephone technologies keep on changing as well. Do you have to go to a central telephone to take your phone call? That is a waste of time and energy. Use cell phones or other wireless means of communication. Also if you are using an answering machine for messages make them interesting to listen to and change them occasionally based on the stage of your business that is open, what is available, timings, etc. Full voice-mail boxes are annoying to customers, so make sure that there is enough room for new messages.

Consider implementing a point of sale system to track customer sales. It will be a valuable database for the future.

## Increasing Concerns for the Environment

Data obtained from this survey indicated a highly increased consciousness and awareness of the environment. In greenhouse situations many inputs can be controlled and have a less negative impact on the environment. Take the example of biological controls. More and more bedding plant growers are using less or no chemicals in growing quality plants. Growers use water management to control the growth of the plant rather than growth regulators. Similarly more growers have learned and use DIF to grow plants. DIF is managing the difference between day and night temperatures to regulate the plant compactness and overall growth. Other aspects of environment are:

Availability of chemicals and their use will change. Many pesticides are no longer available. You must constantly upgrade your knowledge of new chemicals so that you know what is around when you need it.

In order to meet the demands of customers for environmentally friendly products, use public relation campaigns to help educate them on environmental stewardship. Tell them you follow Alberta Environmental Farm Plan guidelines and other “green” programs

Efforts to recycle plastic films, trays, and containers will increase and data shows that growers already have different programs in place to recycle.

Water conservation will affect many aspects of greenhouse environment management.

Prominently display the information about your composting facility and water recycling practices.

Offer seminars in environmental stewardship.

Emphasize recycling of used containers. Many growers do that and more can be done.

## Regulatory concerns are increasing

There are many rules and regulations which affect almost all aspects of greenhouse businesses and impact the industry. Growers have expressed concerns on many rulings like the non-use of plastic in greenhouses where the public is allowed to enter. This has caused many growers to build tempered glass greenhouses which are far more expensive. Similarly, building codes enforcement has caused problems for some growers when the inspector did not recognize the farm classification of greenhouses. What should be done?

A concerted effort should be made at the association level to identify such issues and work on them.

## Other concerns

Irrigation related legislation will increase at all levels of government. The industry response should be to become more pro-active and where such legislation is going to affect greenhouse business negatively, letters should be written to concerned authorities about the impact of such regulations.



Workforce regulations will increase especially when foreign workers are brought in. We should be aware of such regulations in advance, not learning about them when the workers arrive.

Getting involved in associations like the AGGA and others is of great benefit in fighting the regulatory concerns.

## How Innovations are going to drive the Alberta greenhouse industry?

Innovations are constantly introduced to Alberta growers through conferences and trade shows and many growers are taking tours of greenhouses in Holland. Innovations and technologies are brought back and incorporated into the greenhouses.

- Technology can help your labor force become smarter. The right machinery will make your employees more efficient than they are today, and this is a message you need to communicate to them. It would not make your employees redundant, it will make them more efficient.
- Despite the wide array of technology now available to growers, the lack of reliable broadband internet access in some areas is an issue. So before using any technology, check this aspect out before investing.
- Before you add new technology in the greenhouse, it's critical to look at the technology in your office first. Let the team look at all the aspects of data collection and management. I have personally seen volumes of data collected four times a minute but growers could not make a sense out of it for practical application.
- Artificial intelligence can be a profitable tool in your greenhouse. Research is going on in managing autonomous greenhouses where growers don't enter the greenhouse and climate control, nutrition and irrigation is managed from outside. Leaf sensors and stem sensors transmit information where experts analyze the information and use it to turn plants into a vegetative or generative direction. This is coming and Alberta growers should be aware and gain knowledge of all these developments.
- You can always learn something when you venture out of your office and explore what other growers are doing. Even if the technology you discover is ultimately not something you're able to apply to your operation, you're sure to gain insights into how to make your business more efficient.
- One position you may want to consider adding to your staff is a chief data officer. The way new technologies are being developed and adopted, such a dedicated position will be really helpful. Many technology suppliers are getting much better at coming up with real solutions for problems growers are facing. It is very important to evaluate any research and performance data on these potential technologies.
- While technology is critical to helping growers solve problems, one thing it should not do is create a whole new set of problems. Many growers pointed out that they are looking for simplicity and predictability in new technologies. Not that every time if there is a problem, a technician has to come from the company's headquarters.
- When new technologies are being considered for adoption, try to develop partnerships with such companies.
- It is predicted that by 2050, the greenhouse industry in the Netherlands may be close to becoming carbon-neutral in terms of inputs and outputs. Use of energy conservation technologies and increasing productivity per unit of space will all help make Alberta greenhouses closer to meeting reduced carbon foot print.

## Getting ready to handle pandemics like COVID-19

While this report was being prepared, the COVID-19 virus has been declared to be a pandemic. Greenhouse businesses are being affected like any other business. What growers should do?

- You must have two pandemic plans ready for implementation. One is for you and your employees and the other is for your customers.
- Document all the precautions needed to stop the spread of such diseases. You have quite a bit of experience in dealing with plant diseases caused by bacteria, viruses and fungi. Use that experience of isolation, quarantine and treatment.
- For your customers, you need to promote that plants are not vector of any human diseases. You have been following food safety and security protocols since you started in the greenhouse business. When customers come in, provide them the information as to what steps you have taken to limit the spread of the pandemic and what you expect from the customers.
- Social distancing is being promoted as a tool to limit the spread of this virus. Explain to the customers as to the importance and value of this practice.
- Take all the precautions with your employees. When transplanting seedlings people are grouped together. You can provide them with different handling stations.
- They can have lunch at their own work stations rather than in a lunch room.
- Identify which surfaces need to be disinfected regularly and this may include cart handles.
- Locate disinfection solution at visible locations especially close to vegetable displays. People have a tendency to touch the vegetable before buying. Each customer can be handled a small disinfection bottle. You can make your own bottles with your logo as an advertisement tool.

Establish a traffic path for customers from point of entry to point of sale. Make a plan as to how you are going to handle the sales area. If you plan to space the customers, how you are going to do it? Educate your customers so that they don't feel offended



# APPENDICES

## Appendix 1: Other Comments, Concerns and Issues

The following provides a list of other comments, concerns and issues reported by survey participants.

No.	Other Comments, Concerns and Issues
1	Cost of natural gas distribution is higher than natural gas itself.
2	Minimum wage of \$15 too high.
3	Keep Dr. Mirza on.
4	Don't need carbon tax, Gas prices going up.
5	Govt. has raised taxes on business
6	Hard to get foreign workers.
7	Minimum labor cost too high. Instead of \$15 per hour, make it \$13.25 per hour.
8	Our cost of production is too high and we are not making money.
9	Survey sent out ahead of time. Survey over the phone is very comfortable. Survey is very comprehensive.
10	AGGA must have more funding from Government for IPM research. Supporting varietal trial for Northern climate.
11	Watch out for illegal business practices.
12	Survey should be short and simple. Ask only the changes from the last survey.
13	Set up recycling program for greenhouse and nurseries plant pots. Put survey in late summer or early fall.
14	At this time I did not see the value of this survey
15	Due to competition and poor economy we closed the door for bedding plant at the end of 2019. Can't afford to heat the GHs. We would use grow boxes for some plants.
16	Government should be more supportive to small business, low carbon tax, wage subsidies. Provide general information for small greenhouses.
17	High carbon tax. Tax is more than coal price.
18	Rising cost of materials.
19	Lot of competition with Box storage.
20	Stick to online survey.
21	Price of electricity is too high.
22	The red tape in government, particularly at the municipal level needs to be reduced and eliminated. It adds tremendous cost and time that many agricultural greenhouse projects and technology innovation and investment are grounded.
23	Prices are very low
24	Taxes and energy cost going up.

25	Needs research in Strawberries; not much information locally.
26	Young families are very interested in this business.
27	Local people not loyal to business; they go to price not quality.
28	More opportunities to visit the other growers to learn how they grow.
29	Visit different province to bring different mode. ,
30	All conferences should be under one roof it used to be.
31	AGGA should continue to lobby the government on greenhouse crop related issues.
32	Labour costs are too high; there is the need to look at automation. This is the only way this business will survive.

## PROFILE OF THE GREENHOUSE INDUSTRY IN ALBERTA, 2019

### Producer Survey

#### RATIONALE

Alberta Agriculture and Forestry (AF) in collaboration with Alberta Greenhouse Growers Association (AGGA) are undertaking this survey with funding from the Canadian Agricultural Partnership program, a five-year Federal-Provincial-Territorial initiative.

The purpose of the survey is to gather current benchmark data on greenhouse crop operations in Alberta. This includes size, distribution in different regions within the province, heating systems, water and energy use trends, labour, as well as opportunities and issues related to financing, environment, business climate and regulation, competitiveness with imports, and other benchmarks and future trends. The owner or a key contact with the greatest knowledge of the responding greenhouse operation should complete the survey.

The profile report will provide the Alberta greenhouse crop industry with an evidence-based decision-making tool. It will help industry to measure progress towards its strategic goals and provide key performance indicators to compare against competitors. It will improve the knowledge of growers to address the current issues/opportunities they are facing. New producers can also use the information to increase their understanding of how to continue to provide local and freshly grown vegetables and ornamentals to Albertans. The report will serve as a guide to government when developing and evaluating programs and policies for industry.

#### NOTICE OF COLLECTION

Personal information is collected for the purpose of developing benchmark data on the state of greenhouse crop operations in Alberta. Only aggregated, non-identifying information will be published and made available to the general public. The contact information you provide may be used to notify you electronically of the final report. The collection is authorized under section 33(c) of the *Freedom of Information and Protection of Privacy (FOIP) Act* and managed in accordance with Part 2 of the FOIP Act. Agriculture and Forestry will not use or disclose your information for any other purpose without your written consent or unless required to do so by law.

Questions about the collection or use of the information can be directed to the Senior Crop Economist, Economics Section, Alberta Agriculture and Forestry, #300 J.G. O'Donoghue Building, 7000 113 St NW, Edmonton AB T6H 5T6, 780-422-4054 or by email to [emmanuel.laate@gov.ab.ca](mailto:emmanuel.laate@gov.ab.ca).

## SECTION 1: PRODUCER/GREENHOUSE INFORMATION

**Q1: Please provide the following information about yourself and your greenhouse operation.**

- Q1.1: Name of greenhouse:
- Q1.2: Legal name of greenhouse:
- Q1.3: Name of Owner/Key Contact:
- Q1.4: Phone Number:
- Q1.5: Fax Number:
- Q1.6: Address:
- Q1.7: Postal Code:
- Q1.8: E-mail Address:
- Q1.9: Website:

**Q2: Indicate owner's level of education.**

- Grade 12 or less
- Other College/Courses
- M.Sc. or higher
- Olds College
- B.Sc.

**Q3: Indicate owner's number of years of greenhouse experience.**

**Q4 Indicate your type of business.**

- Family/Sole Proprietorship
- Incorporated
- Limited

**Q5: Indicate the total land area in acres associated with your greenhouse.**

**Q6: Indicate total size of your greenhouse facility.**

Sq. M. \_\_\_\_\_ or Sq. Ft. \_\_\_\_\_

**Q7: Indicate the year your greenhouse was built.**

**Q8: Have you ever had any expansion in your operation?**

- Yes
- No

Q8.1: If yes, please indicate the year(s) when expansion occurred.

**Q9 Indicate your greenhouse structure and area.**

- Glass Size (Sq. M.)
- Single poly Size (Sq. M.)
- Double poly Size (Sq. M.)
- Polycarbonate Size (Sq. M.)
- Other (please specify): Size (Sq. M.)

**Q10: Indicate your sector. Check all that applies.**

- Greenhouse vegetables
- Bedding Plants/Ornamentals
- Cut Flowers
- Tree Seedlings
- Other (please specify):

**Q11: Is your greenhouse operated year round or seasonally?**

- Year round
- Seasonal

**Q12: Is your greenhouse operation financed?**

- Yes  No

**Q12.1: If yes, please indicate source of financing (loan):**

- Farm Credit Canada  Agriculture Financial Services Corporation  
 Bank  Self-financed

**Q13: Do you have any production certified as organic?**

- Yes  No

**Q13.1: If yes, please specify crops and area under organic production.**

Crops: Area (Sq. M.):

**Q14: Indicate the channel where majority of your sales occur.**

- Your Own Retail Shop  Wholesale/Coop  
 Farmers' Markets  Supermarkets/Grocery Stores  
 Independent Garden Centres  Mass Merchandisers/Box Stores  
 Other Grower

**Q15: Indicate your operation's annual gross sale?**

- Under \$50,000  \$50,001 To \$100,000  
 \$100,001 To \$500,000  \$500,001 To \$1 Million  
 \$1 Million To \$2 Million  \$2 Million To \$3 Million  
 \$3 Million To \$4 Million  \$4 Million To \$5 Million  
 \$5 Million To \$6 Million  Over \$6 Million

## SECTION 2: HEATING SYSTEM / EFFICIENCIES

**Q16: Indicate the type of heating system you use. Check all that apply.**

- Hot water  Steam boiler  Forced air furnace  
 In-floor heating  Pipe under growing media  Soil heating  
 Combine heat and power (Cogeneration)  Other (please specify):

**Q17: Indicate type of heating fuel.**

- Natural Gas  Propane  Coal  
 Wood  Oil  Electric

**Q18: Which of the following apply to your heating system? Check all that apply.**

- Boiler, >95% efficient (AFUE or equivalent)  
 Centralized furnace, >95% efficient  
 Radiant tube heater  
 Heat storage  
 Energy curtains  
 In-floor heating  
 Foundation and side walls are insulated  
 Other (please specify):

**Q19: Indicate the percent efficiency of your energy curtains:**

**Q20: Indicate your total heating costs per year:**

**Q21: Do you have carbon dioxide (CO2) recovery?**

- Yes  No

## SECTION 3: ENVIRONMENTAL CONTROL SYSTEMS

**Q22: Indicate your environmental control system.**

- |                                       |  |   |
|---------------------------------------|--|---|
| <input type="checkbox"/> Gutter vents | <input type="checkbox"/> Wall vent and fan | <input type="checkbox"/> Pad, fan and wall vent |
| <input type="checkbox"/> Ventilation  | <input type="checkbox"/> Exhaust fans      | <input type="checkbox"/> Natural ridge vents    |

**Q23: Do you have summer and winter ventilation (fan and jet)?**

- Yes  No

**Q24: Do you have any horizontal or vertical airflow fans?**

- Yes  No

**Q25: Do you have a cooling system?**

- Yes  No

**Q25.1: If yes, please check all that apply:**

- Fogging  Misting  Evaporative  Air-conditioning

**Q26: Do you have curtains? (Blackout, Thermo, Side wall, Shade).**

- Yes  No

**Q27: Do you have a relative humidity control system?**

- Yes  No

## SECTION 4: COMPUTER USE

**Q28: Indicate the type of computer control system you have in your greenhouse? Check all that apply.**

- |   |   |  |
|---|---|--|
| <input type="checkbox"/> Priva          | <input type="checkbox"/> Argus                                    | <input type="checkbox"/> Basic thermostats |
| <input type="checkbox"/> Manual control | <input type="checkbox"/> Other e.g. cell phones (please specify): |  |

**Q29: Indicate what you use your computer for. Check all that apply.**

- |  |                                       |  |
|--|---------------------------------------|--|
| <input type="checkbox"/> Environmental control | <input type="checkbox"/> Book keeping | <input type="checkbox"/> Crop scheduling |
| <input type="checkbox"/> Irrigation control    | <input type="checkbox"/> E-mail       | <input type="checkbox"/> Internet        |

**Q30: What industry software do you use for crop-scheduling?**

- |  |   |
|--|---|
| <input type="checkbox"/> Excel                                   | <input type="checkbox"/> Green pro      |
| <input type="checkbox"/> Small Business Innovation Inc. Software | <input type="checkbox"/> Calendar/Paper |

## SECTION 5: LIGHTING SYSTEM

**Q31: Indicate your lighting system and per cent of area for each**

- |   |          |
|---|----------|
| <input type="checkbox"/> High Pressure Sodium       | Area (%) |
| <input type="checkbox"/> Light Emitting Diode (LED) | Area (%) |
| <input type="checkbox"/> Photo period light         | Area (%) |
| <input type="checkbox"/> Other (please specify):    | Area (%) |

**Q32: How many lights do you have?**

**Q33: Indicate the total wattage in your greenhouse.**

## SECTION 6: WATER USE

**Q34: Indicate where your water comes from.**

- Dugout                                       Well                                       Irrigation Canal  
 River     City Water

**Q35: Do you know the total quantity of water you use?**

- Yes     No

**Q35.1: If yes, indicate the total quantity of water in m<sup>3</sup>.**

**Q36: Do you collect water from the roof of your greenhouse?**

- Yes     No

**Q37: What is the quality of the water you use?**

- Hard water                                       Soft water                                       Medium

**Q38: Have you ever had your water analyzed?**

- Yes     No

**Q39: Do you know the Sodium level in your water?**

- Yes     No

**Q40: Indicate your water treatment method. Check all that apply.**

- Reverse osmosis  
 Distillation  
 Water conditioning  
 Filter system  
 Acid mixing  
 Other (please specify):

## SECTION 7: IRRIGATION SYSTEMS

**Q41: Indicate the type of irrigation system in your greenhouse and per cent of area for each.**

- Drip Irrigation                                      Area (%)  
 Overhead sprinklers                                      Area (%)  
 Hand watering                                      Area (%)  
 Ebb and flow                                      Area (%)  
 Irrigation booms                                      Area (%)

**Q42: Do you recycle your water?**

- Yes     No

**Q42.1: If yes, indicate percentage of area.**

**Q43: Indicate how you dispose of your waste water.**

- Ground/Field                                       Sewerage                                       No waste water

## SECTION 8: FERTILIZER USE

**Q44: Indicate the type of fertilizer injection system you have**

- None  Anderson  Dosatron  
 Controlled via climate control  Other (please specify):

**Q45: Indicate type of fertilizers you use.**

- Pre-blends  Base ingredients

Q46: Indicate amount of fertilizers you use in kilograms.

**Q47: Do you use calcium nitrate as part of your fertilizer program?**

- Yes  No

## SECTION 9: CROPS BEING GROWN, CORRESPONDING AREA AND RETAIL

**Q48: Indicate the type of vegetable you grow and corresponding crop area.**

**Q48.1 Cucumbers:**

- Long English Area (Sq. M):  
 Mini Area (Sq. M):  
 Pickles Area (Sq. M):  
 Salad Area (Sq. M):  
 Other (specify): Area (Sq. M):

**Q48.2 Tomatoes:**

- Beefsteak Area (Sq. M):  
 Tomato on Vine Area (Sq. M):  
 Cocktail Area (Sq. M):  
 Other (specify): Area (Sq. M):

**Q48.3 Peppers:**

- Green Area (Sq. M):  
 Yellow Area (Sq. M):  
 Orange Area (Sq. M):  
 Other (specify): Area (Sq. M):

**Q48.4 Lettuce:**

- Butter head Area (Sq. M):  
 Romaine Area (Sq. M):  
 Other (specify): Area (Sq. M):

**Q48.5 Eggplant:**

Area (Sq. M):

**Q48.6 Ethic Vegetables:**

- Okra Area (Sq. M):  
 Other (specify): Area (Sq. M):

**Q49: Indicate the growing system you use to grow your vegetables.**

- Growing media  Raised troughs  
 Floor plastic/cloth  Training system

**Q50: Indicate the type of plants you grow. Check all that apply.**



- Flowers: Potted       Annuals       Perennials       Vegetables/Herbs  
 Patio pots       Hanging baskets       Cut flowers
- Vegetables:       Cucumbers       Peppers       Tomato
- Tree seedlings:       Pine       Spruce and deciduous material

**Q50.1: How many cell packs of bedding plants do you grow?**

**Q50.2: List the top 10 bedding plants and number of individual plants you grow.**

**Q50.3: Indicate the number of hanging baskets you produce.**

Q50.4: Indicate the type of cut flowers you grow. Check all that apply.

- Roses       Alstroemeria       Asiatic lilies  
 Oriental lilies       Other flowers (please specify):

**Q50.5: Indicate the type of vegetable grown in containers. Check all that apply.**

- Tomatoes       Cucumbers       Peppers       Strawberry

**Q50.6: Indicate the total number of tree seedlings you grow per year.**

**Q50.7: Indicate the type of culinary or medicinal herbs you grow.**

**Q51: How long do you keep your tree seedling stock?**

- 6 months       1 year       2 years  
 3 years       4 years       5-8 years

**Q52: Indicate your production schedule.**

- Summer delivery       Fall/Winter storage

**Q53: Do you have nursery material?**

- Yes       No

**Q54: Did your production in 2019 increase or decrease compared to 2018?**

- Increased       Decreased

**Q55: Do you see cannabis as a new crop for your greenhouse in future?**

- Yes       No

**Q56: Do you retail?**

- Yes       No

**Q56.1: If yes, indicate area and percentage of sales volume.**

Area \_\_\_\_\_ % of Sales Volume \_\_\_\_\_

**Q57: Would you be interested in participating in a cost of production study?**

- Yes       No

## SECTION 10: CROP PROBLEMS

**Q58: Indicate the type of insect problems you have?**

- None       Aphids       Thrips       Fungus Gnats  
 Shoreflies       Whiteflies       Spider Mites       Other (please specify):

**Q59: Have you heard of the term Integrated Pest Management (IPM)?**

Yes  No

**Q60: Is IPM e.g. monitoring, scouting, etc. practiced in your greenhouse?**

Yes  No

**Q60.1: If yes, who most often does this?**

You  Independent crop consultant  Hired employee  
 Extension agent or Extension program scout  Other (please specify):

**Q61: Do you use biological control agents?**

Yes  No

**Q61.1: If yes, where do you buy your biological control?**

Biobest Canada Ltd.  The Bug Factory Ltd.  
 Koppert Biological Systems  Other (please specify):

**Q61.2: If yes, indicate per cent of area and months of the year?**

Area (%):  Months of Year:

**Q62: Do you use pollinators (bumble bees)?**

Yes  No

**Q63: Where do you get your pesticide recommendation?**

**Q64: Do you have any disease problems?**

Yes  No

**Q64.1: If yes, what kinds:**

Pythium  Powdery Mildew  Grey Mold  
 Tobacco Mosaic Virus  Cucumber Green Mottle Mosaic Virus  
 Other (please specify)

**Q65: How could your knowledge base in IPM be improved?**

Through workshops  Newsletter  
 Grower alerts  Other (please specify):

## SECTION 11: LABOUR

**Q66: Indicate the number of employees you have.**

Full time:  Part time (including seasonal):

**Q67: Have you ever employed students from Olds College or a similar institution?**

Yes  No

**Q68: Do you have issues with the availability of skilled employees?**

Yes  No

**Q69: Have you used foreign workers in your greenhouse?**

Yes  No

**Q69.1: If yes, how many and months of the year?**

**Q69.2: If yes, indicate where these foreign workers come from? Check all that apply.**

Mexico  Thailand  Caribbean  
 Philippines  Other (please specify):

## SECTION 12: ENVIRONMENTAL CONCERNS / TRENDS

**Q70: Do you consider your production practices as environmentally friendly? e.g., organic, reduced pesticide; natural, etc.**

Yes  No

**Q71: Do you recycle plastics and containers?**

Yes  No

**Q72: Do you use landfill for disposal?**

Yes  No

**Q73: Do you compost your waste material?**

Yes  No

## SECTION 13: FOOD SAFETY ISSUES

**Q74: Are you HACCP (Hazard analysis and critical control point) compliant?**

Yes  No

**Q75: Do you have on-farm food safety program?**

Yes  No

**Q76: Do you have an environmental farm plan?**

Yes  No

## SECTION 14: TAXATION, CLASSIFICATION AND OTHER ISSUES

**Q77: How is your greenhouse operation taxed?**

Farming  Business  Commercial

**Q78: Do you have any taxation and or greenhouse classification issues?**

Yes  No

**Q79: Is greenhouse insurance readily available?**

Yes  No

**Q80: Do you purchase greenhouse insurance?**

Yes  No

**Q80.1: Please provide the name of the company you use (Optional):**

**Q81: Who are your main suppliers of plant material?**

**Q82: Do you raise your own seedlings?**

Yes  No

**Q82.1: If yes, what percent:**

**Q83: Are you a member of Alberta Greenhouse Growers Association (AGGA)?**

Yes  No

**Q83.1: If no, please indicate reason:**

**Q84: Do you employ the services of a greenhouse consultant?**

Yes  No

**Q85: If AGGA provided consulting services, would you become a member?**

Yes  No

**Q85.1: If no, please indicate reason:**

**Q86: How could AGGA be more helpful to you and your business?**

**Q87: Have you attended the Green Industry Show and Conference during the last five years?**

Yes  No

**Q87.1: If yes, how many times?**

**Q88: Are you anticipating any business threats in the next three to five years?**

Yes  No

**Q88.1: If yes, indicate the type of threat.**

Energy costs  Labour shortages  Markets/prices  
 Taxes/regulations (i.e. property, payroll, environmental, etc.)  
 Import competition  Currency fluctuations  Other (please specify):

**Q89: Are you anticipating any business opportunities in next three to five years?**

Yes  No

**Q89.1: If yes, indicate the type of business opportunity.**

Buy local movement  Non-traditional products  Export markets  
 Organic or green products  Other (please specify):

**Q90: Do you have any other comments, concerns or issues?**

Yes  No

**Q90.1: If yes, please indicate.**

**THANK YOU FOR YOUR TIME AND INPUT!**