

**Urban is the New Rural:
An Exploratory Investigation of Community Gardens and Urban Agriculture
in Vancouver, BC**

by

R. Alberic Marginet

**A Thesis
Presented to
The University of Guelph**

**In partial fulfillment of requirements
for the degree of
Master of Science
in
Rural Planning and Development**

Guelph, Ontario, Canada

© R.A. Marginet, September, 2021

ABSTRACT

URBAN IS THE NEW RURAL: AN EXPLORATORY INVESTIGATION OF COMMUNITY GARDENS AND URBAN AGRICULTURE IN VANCOUVER, BC

R. Alberic Marginet

University of Guelph, 2021

Advisor:

Dr. Leith Deacon

Urban agriculture (UA) is a re-emergent issue in the Global North (Lovell, S., 2010; Vitiello, D., Brinkley, C., 2014a; Morgan, K., 2015). Capturing academic attention with social justice and sustainability, UA remains poorly understood (Hendrickson, M., Porth, M., 2012; Vitiello, D., Brinkley, C., 2014b; Opitz, I., et al., 2016).

Given the little academic attention on UA in Canada, this research examines the case study of Vancouver, British Columbia. Focusing on themes of social justice, agricultural capacity, and food systems planning, this research investigates measurements to describes UA development and provides data on UA in Canada.

This research follows an exploratory mixed methods design. Research begins with a closed-ended quantitative survey with community gardens in Vancouver, British Columbia, and is followed by qualitative semi-structured interviews capturing detail and explanation.

Indicating similar results observed elsewhere in literature, poor social justice can be observed. Despite this, strong development of land capacity and water access are also present.

ACKNOWLEDGEMENTS

I would like to acknowledge the people who have contributed to the completion of this research. Foremost, I extend a deep and sincere thank-you to my advisor Dr. Leith Deacon. Providing support, advice, encouragement, and someone to remind me that I'm doing better than I think, I don't know if I could have completed this if not for your help. I would also like to extend a thank-you Dr. Nicolas Brunet. Your instruction in Policy Development and Q2 was helpful and you provided me with much to consider; I wish I had had the chance to learn more from you during 2020-21.

To my very close friends, Pamala Turney, David Nowacki, and Harman Jassal. You gave me your ears, patience, and attention. Thank you for the advice, conversation and breaks you gave me from school. To my sister Anastasia Kubenic, thank-you for your methodological encouragement in perseverance, and your professional knowledge and expertise with agriculture. And finally, thank-you Dr. Leia Minaker, I appreciate your willingness to be my external committee members, and the expertise you bring with urban food systems.

PREFACE

This thesis is an original work by R. Alberic Marginet. This project contributes to the understanding and knowledge of urban agricultural development in Vancouver, British Columbia, and the national context of Canada. The research project, of which this thesis is a part, received research ethics approval from the University of Guelph's Research Ethics Board (See Appendix A, p. 101). Project title: Urban is the New Rural: An Exploratory Investigation of Community Gardens and Urban Agriculture in Vancouver, BC. REB # 20-10-024, January 14, 2021.

TABLE OF CONTENTS

ABSTRACT	ii
ACKNOWLEDGEMENTS	iii
PREFACE.....	iv
TABLE OF CONTENTS.....	v
LIST OF FIGURES.....	viii
LIST OF TABLES	ix
CHAPTER ONE: INTRODUCTION.....	1
1.0 INTRODUCTION	1
1.1 URBAN AGRICULTURE IN NORTH AMERICA	2
1.2 RESEARCH.....	3
1.3 METHODS.....	4
1.3.1 Survey	4
1.3.2 Interviews.....	5
1.3.3 Data Combination	5
1.4 ORGANIZATION OF THESIS.....	6
CHAPTER TWO: LITERATURE REVIEW	7
2.0 INTRODUCTION	7
2.0.1 History	9
2.1 URBAN AGRICULTURE AS SOCIAL JUSTICE.....	10
2.1.1 <i>The Capacity of Social Justice</i>	11
2.1.2 <i>The Danger of UA as Social Justice</i>	13
2.2 URBAN AGRICULTURE IS A LAND-USE.....	13
2.2.1 <i>Urban Agriculture as an Agricultural Land-use</i>	14
2.2.1.1 <i>Urban Agriculture and Peri-Urban Agriculture</i>	17
2.2.2 <i>Food Systems Planning</i>	19
2.2.3 <i>Environmental Services</i>	23
2.2.3.1 <i>Water Management</i>	23
2.2.3.2 <i>Carbon Footprint</i>	24
2.2.3.3 <i>Increasing Biodiversity</i>	25
2.2.3.4 <i>Dangers and Environmental Disservices</i>	25
2.3 LAND-USE ECONOMICS.....	26
2.4 CONCLUSION: URBAN AGRICULTURE IS... ..	28
CHAPTER THREE: RESEARCH METHODS.....	32
3.0 SCOPE AND OBJECTIVES	32
3.1 THEORETICAL FRAMEWORK	32
3.1.1 <i>Pragmatic Worldview</i>	33
3.1.2 <i>Mixed Methods</i>	34
3.1.3 <i>Exploratory Mixed Methods</i>	34
3.2 CASE STUDY SELECTION	35
3.3 RESEARCH DESIGN	35
3.3.1 <i>Literature Review</i>	36
3.3.2 <i>Quantitative Surveys with Community Gardens</i>	36
3.3.2.1 <i>Sampling</i>	37
3.3.2.2 <i>Quantitative Survey Method</i>	37
3.3.3 <i>Qualitative interviews with Garden Members</i>	38
3.3.3.1 <i>Participant Selection</i>	39

3.3.3.2 <i>Semi-structured Interview Method</i>	40
3.3.4 <i>Collaborative Cross-examination</i>	41
3.3.4.1 <i>Compare and contrast quantitative and qualitative data</i>	41
3.3.4.2 <i>Convergence and Triangulation of data</i>	42
3.3.4.3 <i>Identify inconsistencies</i>	42
3.3.5 <i>Open-Source Data</i>	43
CHAPTER FOUR: RESEARCH RESULTS.....	44
4.0 INTRODUCTION.....	44
4.1 <i>Secondary Demographic Data</i>	44
4.1.1 <i>Secondary Agricultural Capacity Data</i>	45
4.2 QUANTITATIVE SURVEY RESULTS.....	45
4.2.1 <i>Indications for Social Justice</i>	45
4.2.2 <i>Results of Agricultural Capacity</i>	47
4.2.2.1 <i>Land Capacity Results</i>	47
4.2.2.2 <i>Water Capacity Results</i>	49
4.2.2.3 <i>Knowledge Capacity Results</i>	51
4.2.3 <i>Results of Food Systems Planning</i>	52
4.2.3.1 <i>Food Systems Planning Production</i>	52
4.2.3.2 <i>Food Systems Planning Distribution</i>	53
4.3 SEMI-STRUCTURED INTERVIEW RESULTS.....	54
4.3.1 <i>Results of Social Justice</i>	54
4.3.1.1 <i>Lack of participation among Physical Minorities</i>	55
4.3.2 <i>Results of Agricultural Capacity</i>	57
4.3.2.1 <i>Agricultural Land Capacity</i>	57
4.3.2.1.1 <i>Waiting Times to Access Land Capacity</i>	58
4.3.2.2 <i>Qualitative Results for Water Capacity</i>	58
4.3.2.3 <i>Qualitative Results for Knowledge Capacity</i>	59
4.3.2.3.1 <i>Amateur Knowledge and Garden Composting</i>	61
4.3.3 <i>Food Systems Planning</i>	62
4.3.3.1 <i>Results of Food Systems Production</i>	62
4.3.3.2 <i>Results for Food Systems Distribution</i>	64
4.4 CONCLUSIONS.....	65
CHAPTER FIVE: DISCUSSION.....	66
5.0 INTRODUCTION.....	66
5.1 SOCIAL JUSTICE.....	66
5.1.1 <i>Demographics</i>	68
5.1.2 <i>Social Benefits</i>	71
5.2 AGRICULTURAL CAPACITY.....	74
5.2.1 <i>Agricultural Land Capacity</i>	75
5.2.1.1 <i>Land Access and Social Justice</i>	78
5.2.2 <i>Water Capacity</i>	79
5.2.3 <i>Knowledge Capacity</i>	81
5.3 FOOD SYSTEMS PLANNING.....	84
5.3.1 <i>Production</i>	85
5.3.2 <i>Distribution</i>	87
5.4 CONCLUSION.....	90
CHAPTER SIX: LIMITATIONS, CONCLUSIONS, AND RECOMMENDATIONS.....	92
6.0 INTRODUCTION.....	92
6.1 LIMITATIONS.....	92
6.1.1 <i>COVID-19</i>	92

6.1.1.1 Inability to perform Community Garden Site Visits.....	92
6.1.1.2 Lack of Participation Among Food Systems Planning Officials.....	93
6.1.2 Environmental Attitudes in Vancouver	93
6.2 RESEARCH CONCLUSIONS	94
6.2.1 Social Justice Measurements.....	94
6.2.2 Supervision of Non-Profit Organizations.....	94
6.2.3 Further research requirements for Knowledge Capacity.....	95
6.2.4 Summary	96
6.3 RECOMMENDATIONS	96
6.3.1 Further Research on the Development of UA Knowledge.....	96
6.3.2 Separation of production types.....	97
6.3.3 Supervision of Community Garden Organizations	98
6.3.4 Measurement of water consumption in community gardens.....	99
6.3.5 Standardization of Community Garden Plots.....	100
REFERENCE LIST	101
APPENDIX A: RESEARCH ETHNICS APPROVAL CERTIFICATION.....	105
APPENDIX B: COMMUNITY GARDEN ORGANIZATION INFORMATION LETTER	106
APPENDIX C: PARTICIPANT INFORMATION LETTER.....	109
APPENDIX D: COMMUNITY GARDEN SURVEY	112
APPENDIX E: LETTER OF INVITATION, JANUARY 15, 2021.....	120
APPENDIX F: LETTER OF INVITATION, FEBRUARY 2, 2021	121
APPENDIX G: LETTER OF INVITATION, FEBRUARY 15, 2021.....	122
APPENDIX H: SEMI-STRUCTURED INTERVIEW QUESTIONS.....	123

LIST OF FIGURES

Figure 4.1: Household Incomes in Vancouver	42
Figure 4.2: Visible Minority Population in Vancouver	42
Figure 4.3: Annual Income of Participants	44
Figure 4.4: Participant Income by Ethnicity	44
Figure 4.5: Methods of Garden Recruitment	44
Figure 4.7: Total Access of Land Capacity	46
Figure 4.8: Waiting times for Garden Access	46
Figure 4.9: Willingness to use Water Sources	47
Figure 4.10: Experiences with Water Access	47
Figure 4.12: Self-Identified Levels of Agricultural Expertise	49
Figure 4.13: Types of Produce Grown	50
Figure 4.14: Techniques of Agricultural Practices	50
Figure 4.15: Personally Identified Reasons for Use of Urban Agriculture	50
Figure 4.16: Produce Distribution Methods	51
Figure 4.17: Garden Access to Distribution	51

LIST OF TABLES

Table 2.1: Land-uses of urban agriculture	8
Table 4.6: Garden Organization and Land Access Types	46
Table 4.11: Where Knowledge is Commonly Found	49

Chapter One: Introduction

1.0 Introduction

Urban agriculture has a long history as a method of urban development (Lovell, S., 2010; Barthel, S., Isendahl, C., 2012; Tornaghi, C., 2014; Vitiello, D., Brinkley, C., 2014b) that recently re-emerged from the economic crisis of 2008. Recognizing that urban agriculture is a re-emergent planning trend is necessary because it draws attention to how modern planning has evolved as a discipline and the opposition from modern planning culture towards urban agriculture since the Industrial Revolution and Enlightenment (Barthel, S., Isendahl, C., 2012; Vitiello, D., Brinkley, C., 2014b). As a result of this cultural progression, much of the traditional knowledge and organization associated with urban agriculture has been lost in the attempt to modernize and sanitize densely populated urban centres (Brunstad, R., et al., 2005; Vitiello, D., Brinkley, C., 2014b). As academic research begins to indicate the importance of developing urban agriculture for reasons of sustainability, climate change, and social justice provisions (Pearson, C., 2007; Pearson, L., et al., 2010; Gentry, T., 2011; Tornaghi, C., 2014; Weidner, T., Yang, A., 2019), an increasing need to study urban agriculture can be identified if these objectives are to be achieved.

Urban agriculture refers to the practices and production of agricultural goods occurring within built-up urban centres (Lovell, S., 2010; Tornaghi, C., 2014; Opitz, I., 2016). Its practice is diverse and multifaced, including both large investment for-profit agriculture at the peri-urban fringes (Lovell, S., 2010; Opitz, I., et al., 2016, Brinkley, C., 2017) and small scale gardens within urban centres (Lovell, S., 2010; Tornaghi, C., 2014; Opitz, I., et al., 2016). Because these practices vary significantly between peri-urban and urban settings, the research conducted in this study focuses on the very small scale of community, backyard, and rooftop gardens identified specifically as urban agriculture (UA) by academic sources (Tornaghi, C., 2014; Badami, M., Ramankutty, N., 2015; Opitz, I., et al., 2016; Ayambire, R., et al., 2019).

Drawing from social justice literature, urban agriculture contributes to a newly recognized suite of planning theory known academically as food systems planning. Food systems planning is a departure from traditional modern planning in its concern with securing local means of agricultural production (including the acquisition and development of agricultural capacity) and encouraging fine-grained methods of distribution (Campbell, M., 2004; Horst, M., et al., 2017). Additionally, food systems planning includes access by urban populations to agricultural capacity and creating relatively closed-looped and sustainable systems of agriculture that integrate with the urban environment (Pearson, C., 2007; McClintock, N., 2010; Weidner, T., Yang, A., 2019).

1.1 Urban Agriculture in North America

Part of North America colonization by the English, French, and Spanish, UA has experienced a significant decline in the past 300 years. With the advent of high-speed transportation during the Industrial Revolution, food could be secured from greater distances, making it no longer essential for food to be produced locally (Barthel, S., Isendahl, C., 2012). Additionally, The Enlightenment identified the connections between disease and sanitation, and indicated that many animal husbandry practices performed in urban centres were an immediate health and sanitation risk (Vitiello, D., Brinkley, C., 2014b). The result of these features created a shifting focus for planning that began to emphasize increased population density at the cost of agricultural land capacity. While the complete negation of UA was not immediate, initial North American land-use policies in 19th century focused on regulating and removing agricultural practices. Over the next two centuries, these anti-agricultural policies became the foundations for modern zoning and land-use planning in urban centres (Vitiello, D., Brinkley, C., 2014b). Re-emerging briefly during 20th century periods of economic and social strife, it was not until the increasing food costs and food shortages created in the economic crisis of 2008 that UA

significantly reappeared. What marks this reappearance as different than previous reiterations of UA is that, while economic conditions have since improved, the demand for UA has not waned (Tornaghi, C., 2014, Morgan, K., 2015, Horst, M., et al., 2017).

1.2 Research

Based on systematic reviews of academic research, very little research has been conducted on the development of UA in Canada, with Canadian examples most commonly being referenced as corroborative support in American case study findings (Lovell, S., 2010; Hendrickson M., Porth, M., 2012).. While developments of UA can be identified in Montreal, Toronto, and Vancouver (Lovell, S., 2010; Hendrickson M., Porth, M., 2012; Oka, G., et al., 2014), none of these locations are sites of an in-depth case study analyzing how this development has occurred. As a result, the conditions of UA development in Canada contain significant gaps. For example, Canadian urban centres are creatures of their respective provincial governments and are subject to different organizational and political conditions than their American counterparts. Based on these subtle differences, a pertinent question to consider is whether Canadian cities suffer from the same problems identified elsewhere in North America (e.g., lack of access to land, lack of access to water, poor economic development, poor social justice development).

Typically, the measurements of UA in academic sources have been developed with gaps in understanding (Lovell, S., 2010; Hendrickson M., Porth, M., 2012; Badami, M., Ramankutty, N., 2015; Morgan, K., 2015). While social justice is a significant underlying feature of UA, it can be described as suffering from minimal uptake among food insecure groups. Additionally, while UA stresses the importance of sustainable closed-looped agricultural systems, academic research notes minimal attention on water sustainability (Hendrickson M., Porth, M., 2012; Opitz, I., et al., 2016; Weidner, T., Yang, A., 2019) with the most focus being made on carbon reduction (Pearson,

C., 2007; Gentry, T., 2011; Morgan, K., 2015; Weidner, T., Yang, A., 2019). Furthermore, while food systems planning has a focus on developing policies to procure the resources of agricultural production, it is unclear how to measure these performances within a larger context. Considering these characteristics, a need for the ability to appraise how effective UA is at achieving its goals can be identified. Organizing research around these issues, this study works to capture measurements capable of identifying the success of UA in Canada and provide data which other centres can use in the development of UA.

1.3 Methods

This research follows the design of an Exploratory Mixed Methods Case Study. Starting with a literature review of existing academic work on UA to provide foundation and direction, a three-part qualitatively led mixed methods organization was employed. This method begins with quantitative research (i.e., a closed-ended survey with community gardens) to inform a subsequent capture of qualitative data (i.e., semi-structured interviews with community garden members). The data captured in these steps is then combined and analyzed, using qualitative data to verify the accuracy of quantitative measurements, identify where improved measurements can be made, and how these results compare to the larger understanding and theories of UA.

1.3.1 Survey

A survey was developed to capture numeric and statistic data related to the use and experiences of UA (See Appendix D, Pg. 112). The survey questions were organized to capture numeric data based on a 5-point Likert scale ranked ordinally from low (1) to high (5). Survey questions focused on capturing representations of demographics (i.e., age, ethnicity, gender), access to resources (i.e., land, water, knowledge), and food systems planning features (i.e., production, distribution). The results were collected after completion of the survey and analysed

by averaging scores and response rates to provide data on how UA exists and is commonly being used.

1.3.2 Interviews

An interview guide was developed using the quantitative results captured during the survey. This guide focused on features of experience, demographics, access to land and water, and gardening knowledge to investigate contextual details and explore the use of UA in Vancouver (Appendix H: Semi-structured interview questions, Pg. 123). Interviews were conducted with multiple participants (N = 10) to explore personal experiences and opinion on features of social justice, agricultural capacity, and food systems planning.

1.3.3 Data Combination

The final stage of this research represents the mixed methods used to combine the quantitative and qualitative results. Using the themes and responses captured in qualitative research to lead investigation, quantitative results were compared and analyzed against qualitative sources to identify where convergence and dissonance of results existed. During this third stage, convergence is identified when three or more qualitative sources identify a common feature which is reflected in quantitative results. Triangulation can also be observed among results, and occurs when convergence can be found between quantitative and qualitative sources, and this convergence supports the findings of academic literature. In addition to convergence and triangulation, dissonance can also be observed among results. Dissonance is identified when quantitative data does not reflect common details and experiences identified in three or more qualitative reports. Dissonance can also be found when quantitative and qualitative data provide convergent indications that are conflict with reports provided by academic literature.

1.4 Organization of Thesis

The organization of this research thesis is structured in accordance with the following arrangements. Chapter Two provides the details uncovered during the in-depth academic literature reviews conducted at the outset of this research and identifies the common problems and themes of UA. Chapter Three describes the research design used by this study in detail. Chapter Four identifies the results uncovered during Part One and Part Two of research. Chapter Five represents the analysis and comparison of the results captured from this research. Chapter Six provides indications on where measurements have accurately captured performance metrics, how future performance measurements can be improved, and recommendations on how to best approach development of UA in Canada.

Chapter Two: Literature Review

2.0 Introduction

Urban agriculture (UA) conceptually lacks universal definition and common vision. Rather, UA is a social movement between many individual activists and stakeholder groups (Campbell, M., 2004). UA can be described as the urban production of agricultural goods including vegetables, fruit, animal goods, fiber, herbs, medicine, bee and insect keeping, and by-products (Lovell, S., 2010; Hendrickson M., Porth, M., 2012; Opitz, I., et al., 2016; Horst, M., et al., 2017). Typically, UA does not include the production of grains or root crops involving large equipment (Opitz, I., et al., 2016) but as a practice UA is diverse, occupying many gardening types and organization methods in the urban environment, to more industrial and large-scale practices at the peri-urban fringe (Tornaghi, C., 2014; Opitz, et al., 2016; Ayambire, R., et al., 2019). Critically, the lack of consensus around UA conceptualization is problematic for the development of policy and defense for agricultural practices (Hendrickson, M., Porth, M., 2012; Opitz, I., et al., 2016).

Described as a multifunctional range of interwoven pieces (Lovell, S., 2010; Morgan, K., 2015; Vaarst, M., et al., 2018), UA includes numerous elements beyond the production of agricultural goods. Social justice and access to affordable and healthy food by economically marginalized groups represent the largest thrusts of UA (Torganhi, C., 2012; Morgan, K., 2015; Horst, M., et al., 2017). Additionally, agriculture as an urban land-use represents a second focus, which can be further broken-down into urban and peri-urban agricultural practices, environmental services, land-use economics, and food systems planning (See Table 2.1).

Urban Agriculture has received increasing attention since the economic crisis of 2008 (Lovell, S., 2010; Vitiello, D., Brinkley, C., 2014a; Morgan, K., 2015), with a recent example found in the demand for garden centres as an essential service during the COVID-19 pandemic.

Land-use	Identified Components	References
Urban Agriculture	<ul style="list-style-type: none"> - Policy needs for access to water - Occurring on less than 2 acres - Gardening practices - Small-scale organization - Social justice focus 	Lovell, S., 2010; Hendrickson, M., Porth, M., 2012; Opitz, I., et al., 2016
Peri-urban Agriculture	<ul style="list-style-type: none"> - For profit organization - Industrial agriculture practices - Occurring on an excess of 20 acres - Use of greenhouses and large equipment - No protection from urbanization 	Opitz, I., et al., 2016
Environmental Services	<ul style="list-style-type: none"> - Carbon footprint reduction - Agricultural water footprint reduction - Increased biodiversity and habitat - Minimal research and understanding 	Pearson, C., 2007; Gentry, T., 2011; Weidner, T., Yang, A., 2019
Food Systems Planning	<ul style="list-style-type: none"> - Policies promoting local production - Policies for fine-grained distribution - Policies protecting agricultural capacity - Policies providing equitable land access 	Campbell, M., 2004; Vitiello, D., Brinkley, C., 2014a; Horst, M., et al., 2017; Wills, K., 2017
Land-use Economics	<ul style="list-style-type: none"> - Preference for urbanization by planning - Limited profitability of urban agriculture - Minimal creation of employment - Minimal capture of local economy 	Lovell, S., 2010; Opitz, I., et al., 2016; Horst, M., et al., 2017; Ayambire, R., et al., 2019

Table 2.1: Land-uses of urban agriculture

Re-emerging before during economic and/or social unrest, the current re-emergence has not diminished as conditions have improved. Rather, UA has gained momentum as a social movement to a point where demands for agricultural practices, such as backyard chickens, have become codified (City of Vancouver, 2010; Horst, M., et al., 2017; Toronto Municipal Code, 2019, January 31). While these new policies provide agricultural support, they highlight a barrier identified throughout the literature. This barrier is that UA continues to experience a lack of acceptance from a planning culture that has traditionally been organized to oppose agricultural activities (Lovell, S., 2010; Vitiello, D., Brinkley, C., 2014b; Tornaghi, C., 2014; Horst, M., et al., 2017).

2.0.1 History

Urban agriculture has been an important historic cornerstone of human settlement, providing a vital resource and integrated management system within urban and peri-urban settings (Lovell, S., 2010; Vitiello, D., Brinkley, C., 2014a; Vitiello, D., Brinkley, C., 2014b). The emphasis on UA began to change with the industrial age, where high-speed transportation and refrigeration enabled urban centres to access food from greater distances (Campbell, M., 2004; Barthel, S., Isendahl, C., 2012). As a result, the importance of UA within urban settings decreased in favour of an emphasis on density and development (Lovell, S., 2010; Vitiello, D., Brinkley, C., 2014a). In addition to industrialization, The Enlightenment also played an important role in removing agriculture from urban settings by revealing the links between sanitation and disease (Vitiello, D., Brinkley, C., 2014a). This new scientific understanding revealed many traditional animal-based practices as threats to public health and safety. Combined, these two social movements refuted the importance of UA, and classified agriculture as a strictly rural use (Lovell, S., 2010; Barthel, S., Isendahl, C., 2012; Vitiello, D., Brinkley, C., 2014a; Vitiello, D., Brinkley, C., D., 2014b).

Prior to industrialization, UA played a critical role in the sustainability and resilience of urban environments (Vitiello, D., Brinkley, C., 2014a). Common examples from antiquity (e.g., Rome, Ancient Greece, Constantinople), through the middle ages (i.e., public greens for community grazing and kitchen gardens), and into the colonization of the Americas (e.g., emphasis on peri-urban agriculture development) and beginning of the 18th century (e.g., livestock and waste management systems in New York City, Boston, Baltimore), can be observed (Lovell, S., 2010; Barthel, S., Isendahl, C., 2012; Tornaghi, C., 2014; Vitiello, D., Brinkley, C., 2014a). While agricultural systems and practices change with time and location, agriculture remained an

important urban land-use with focuses on sustainability, resilience, and waste management (Lovell, S., 2010; Vitiello, D., Brinkley, C., 2014a; Vitiello, D., Brinkley, C., 2014b). However, much of the traditional knowledge associated with UA was lost during the 19th century as zoning and bylaws were codified to remove UA practices (Vitiello, D., Brinkley, C., 2014a). This issue is further exacerbated in Canada as most Canadian centres began development in the 19th century.

2.1 Urban Agriculture as Social Justice

Academically identified as re-emerging in response to the 2008 economic crisis, modern urban agriculture is conceptualized as a form of social justice and the right for marginalized communities to access food and eat (Pearson, L., et al., 2010; Hendrickson, M., Porth, M., 2012; Vitiello, D., Brinkley, C., 2014a; Tornaghi, C., 2014; Morgan, K., 2015; Opitz, I., et al., 2016; Horst, M., et al., 2017). Social justice is promoted alongside food security, access to food, food systems planning and social and health benefits. This is consistent with the development of UA out of economic collapse, increased food costs, and ensuing food riots of 2008 (Lovell, S., 2010; Vitiello, D., Brinkley, C., 2014a; Morgan, K., 2015). Academic research has found that approximately 12% of North American households suffer from annual recurring food insecurity (Badami, M., Ramankutty, N., 2015; Opitz, I., et al., 2016; Horst, M., et al., 2017), with food insecurity being understood as the inability (and concern over the inability) to procure adequate healthy food regularly (Government of Canada, 2020). Additionally, the removal of UA can be linked to an increased uptake of social safety programs, soup kitchens, and food banks (Vitiello, D., Brinkley, C., 2014a). The number of food insecure across North America is expected to exceed 65 million by 2050 (United Nations, 2018; United Nations, 2019), as populations continue to collect in urban centres (Opitz, I., et al., 2016).

Despite the parameters around UA as a social justice issue, inconsistencies remain. Examples include the reduction of food deserts, access to fresh produce, and an emphasis on economic development (Lovell, S., 2010; Morgan, K., 2015; Ayambire, R., et al., 2019) which are complex and multidimensional issues; these problems arise as production, distribution, and social justice are independent and unconnected features (Brinkley, C., 2017; Horst, M., et al., 2017; Nicholls, C., Altieri, M., 2018). In many cases, UA often only benefits single households, and is arranged according to highly subsistent means (Opitz, I., et al., 2016). When there is enough produce for distribution, it is typically marketed to upper-middle class white neighbourhoods, rather than marginalized populations (Abbot, C., Myhre, A., 2000; Campbell, M., 2004; Morgan, K., 2015; Brinkley, C., 2017). In example, Montreal has over 8,200 plots available for UA with a population of 1.87 million residents (Lovell, S., 2010; Stats Canada, 2016). Even if each plot could feed 8 people, 8,200 plots only services 0.035% of Montreal's population. Considering the wider needs of 12% of the population, and the need that plots be within walking distance of households (Badami, M., Ramankutty, N., 2015; Opitz, I., et al., 2016; Horst, M., et al., 2017), social justice is not being served. It has been suggested that up to approximately 20% of urban landmasses are required to provide social justice and food security on average, which aligns with the agricultural footprint of classical cities (Barthel, S., Isendahl, C., 2012; Badami, M., Ramankutty, N., 2015). The size of such a footprint however shows that UA as a social justice faces major competition on the open market for land resources when economics and planning favour subdivision and urbanization (Lovell, S., 2010; Pearson, L., 2010; Opitz, I., et al., 2016; Ayambire, R., et al., 2019).

2.1.1 The Capacity of Social Justice

Within social justice, the need for land access represents a small part of a greater demand for capacity. More than just access to land and water, capital investment and agricultural

knowledge represent other key problems of UA as a social justice (Lovell, S., 2010; Pearson, L., et al., 2010; Hendrickson, M., Porth, M., 2012; Morgan, K., 2015; Opitz, I., et al., 2016; Horst, M., et al., 2017). It is well documented that in the Global North that modern UA has grown from a traditional leisure and recreational activity (Lovell, S., 2010; Pearson, L., et al., 2010; Opitz, I., et al. 2016). While UA practitioners show strengths in adapting agriculture to the urban environment, they are criticized as amateur and lacking technical knowledge (Pearson, L., et al., 2010; Vitiello, D., Brinkley, C., 2014b; Morgan, K., 2015; Opitz, I., et al., 2016). This is problematic as it reduces the limited output of agricultural goods (Brunstad, R., et al., 2005; Hendrickson, M., Porth, M., 2012; Opitz, I., et al., 2016). While major advances have been identified in the development of UA knowledge throughout other locations globally, differences of political and cultural conditions mean that most of these successes have little transferability into North America (Badami, M., Ramankutty, N., 2015; Nicholls, C., Alteiri, M., 2018; Ayambire, R., et al., 2019).

Policies restricting access to water and capital represent additional capacity barriers. Accessing these resources often requires land ownership, which is difficult for marginalized groups (Lovell, S., 2010; Pearson, L., et al., 2010; Hendrickson, M., Porth, M., 2012). Lack of access to water resulting from a lack of land ownership can be seen throughout academic literature (Lovell, S., 2010; Hendrickson, M., Porth, M., 2012; Morgan, K., 2015; Horst, M., et al., 2017). While suggestions to address this problem exist, lack of land ownership creates barriers in accessing the capital investment for these solutions (Hendrickson, M., Porth, M., 2012; Opitz, I., et al., 2016). As a result, there is a need to address this problem of land ownership in policy (Lovell, S., 2010; Graveline, N., et al., 2014; Morgan, K., 2015; Opitz, I., et al., 2016; Weidner, T., Yang, A., 2019).

2.1.2 The Danger of UA as Social Justice

Chia Tornaghi (2014) has found that current interests in UA and its emphasis on social justice by all levels of governments could result in justification to reduce social programming. In what she refers to as a Green New Deal, food programs and healthcare issues could be downloaded onto marginalized populations to reduce the social service costs of government. The cause for this concern is observable in several publications, including *The Hidden History of food systems planning* (Vitiello, D., Brinkley, C., 2014a) which reveals historic increases in social services following the removal of UA in North America. The positive health benefits often associated with UA through increased access to nutritious food and the reduction of food deserts also relates with this concern (Campbell, M., 2004; Lovell, S., 2010; Badami, M., Ramankutty, N., 2015; Morgan, K., 2015). These factors reflect Tornaghi's concern over the potential of governmental cost savings linked with social service reduction, which aligns with neo-liberal and New Public Management attitudes.

2.2 Urban Agriculture is a Land-Use

As a land-use, urban agriculture is composed of many interwoven elements. These include UA as an agricultural land-use, an environmental service, as food systems planning, and in terms of land-use economics. As an agricultural practice UA requires access to resources (i.e., land, water, land-use legitimacy) and capital investment (Pearson, L., et al., 2010; Hendrickson, M., Porth, M., 2012; Opitz, I., et al., 2016). As an environmental service, UA holds potential for sustainability and resilience by reducing stresses on energy systems, carbon footprints, waste and wastewater management, and wildlife habitat (Pearson, L., et al., 2010; Gentry, T., 2011; Hedrickson, M., Porth, M., 2012; Vitiello, D., Brinkley, C., 2014b; Morgan, K., 2015). With food systems planning, UA requires policies that make production and distribution accessible to all

producers and consumers (Tornaghi, C., 2014; Morgan, K., 2015; Opitz, I., 2016; Brinkley, C., 2017; Horst, M., et al., 2017; Nicholls, C., Altieri, M., 2018). As an issue of economics, UA must find a way to balance the demands and emphasis on land-use development and urbanization; a major weakness faced by UA currently (Lovell, S., 2010; Tornaghi, C., 2014, Opitz, I., et al., 2016; Ayambire, R., et al., 2019). In understanding UA as these themes, UA is viewed as a multifunctional urban system that promotes sustainable development and requires concrete means for agricultural land protection (Lovell, S., 2010; Gentry, T., 2011; Tornaghi, C., 2014; Morgan, K., 2015; Vaarst, M., et al., 2018). The following subsections discussed below provide data related to UA and its land use applications, where UA fits into food systems planning, and what environmental services can be determined from current academic research.

2.2.1 Urban Agriculture as an Agricultural Land-use

Urban agriculture has a long history that only relatively recently has been interrupted by the Industrial Revolution and high-speed transportation (Lovell, S., 2010; Barthel, S., Isendahl, C., 2012; Vitiello, D., Brinkley, C., 2014b; Morgan, K., 2015). Prior to these developments, UA was a cornerstone of all human settlement patterns (Lovell, S., 2010; Barthel, S., Isendahl, C., 2012; Tornaghi, C., 2014; Vitiello, D., Brinkley, C., 2014a). In addition to being an important feature of English, French and Spanish colonization throughout the Americas, it was also a significant aspect of indigenous, medieval, and ancient settlement patterns (Lovell, S., 2010; Barthel, S., Isendahl, C., 2012; Nicholls, C., Altieri, M., 2018). During food shortages, access to a local food supply was the difference between life and starvation (Barthel, S., Isendahl, C., 2012; Vitiello, D., Brinkley, C., 2014a). For example, in Constantinople, approximately 20% of the urban footprint was dedicated to ensuring food security during times of critical food shortage (Barthel, S., Isendahl, C., 2012). While UA practices change by location and era, the persistence of UA even into modern times of

social and economic unrest are common trends of agriculture as an urban land-use (Lovell, S., 2010; Vitiello, D., Brinkley, C., 2014b).

The number of practices associated with modern UA are extensive and include the production of food, fibres, medicine, agro-forestry, horticulture, and other by-products that can be associated with agriculture such as beeswax and compost (Lovell, S., 2010; Pearson, L., et al., 2010; Gentry, T., 2011; Hendrickson, M., Porth, M., 2012; Tornaghi, C., 2014; Morgan, K., 2015; Opitz, I., et al., 2016). Despite the prolific nature of UA, there are characteristics that organize it into 2 distinct types: urban agriculture, and peri-urban agriculture (Badami, M., Ramankutty, N., 2015; Opitz, I. et al., 2016; Ayambire, R., 2019). While research often combines these forms without distinction, urban agriculture and peri-urban agriculture have been identified as operating under very different circumstances and conditions (Badami, M., Ramankutty, N., 2015; Opitz, I., et al., 2016). In line with this distinction, the agricultural land-use requirements of these forms can also be separated.

An important requirement of UA as a land-use is access to water and the associated lack of policy providing it (Lovell, S., 2010; Hendrickson, M., Porth, M., 2012; Morgan, K., 2015; Opitz, I., et al., 2016; Horst, M., et al., 2017). While access to water can be promoted as an environmentally sustainable feature (Gentry, T., 2011; Morgan, K., 2015; Opitz, I., et al., 2016; Weidner, T., Yang, A., 2019), in UA's present state it is often requested via access to hydrants and water mains (Hendrickson, M., Porth, M., 2012; Horst, M., et al., 2017). This is wasteful when water harvesting, mulching and storm water management have been shown to provide more sustainable means of water access (Morgan, K., 2015; Opitz, I., et al., 2016; Weidner, T., Yang, A., 2019). Achieving sustainable water access however requires the ability to make capital investments. With land-use legitimacy and capital investment, sustainable access to water could

be downloaded into the private hands of individuals and cooperative groups (Pearson, L., 2010; Hendrickson, M., Porth, M., 2012). Here again policy is identified as a critical feature currently inhibiting development of UA.

Access to land for UA activities is a barrier that has been identified as part of social justice. Agriculture is unable to compete economically against commercial development and urbanization (Tornaghi, C., 2014; Morgan, K., 2015; Opitz, I., et al., 2016; Ayambire, R., et al., 2019). While long-term value is present, short-term profit is more economically attractive and preferred by urban planning culture and local government (Tindal, C., Tindal, S., 2004; Lovell, S., 2010; Pearson, L., et al., 2010; Tornaghi, C., 2014; Opitz, I., et al., 2016; Ayambire, R., et al., 2019). On the extremely small-scale, agriculture lacks profitability and suffers from land-taxes developed for more intensive uses (Pearson, L., et al., 2010). It has been suggested that to remain protected, urban agriculture requires subsidies and differential tax rates (Pearson, L., et al., 2010; Horst, M., et al., 2017). This is problematic however as research shows these mechanisms do not secure agricultural use (Nelson, A., 1992; Peterson, et al., 2002; Brunstad, et al., 2005; Horst, M., et al., 2017). Regardless, policy supporting agriculture is necessary because it provides land-use legitimacy and access to capital investment for landscape improvements (Hendrickson, M., Porth, M., 2012). In addition, policy also allows for the development of equitable conflict management that is not purely reactionary in nature (Pearson, L., et al., 2010; Opitz, I., et al., 2016).

It has been suggested that provisions for land and water could be created as part of the urban development for parks and open spaces, and by non-profit organizations (Lovell, S., 2010; Morgan, K., 2015; Horst, M., et al., 2017). In these circumstances land-use ownership and legitimacy are satisfied not by individual producers, but by municipal government and organizations including churches, schools, and low-income housing corporations (Tornaghi, C.,

2014; Horst, M., et al., 2017). This method has advantages in that it secures land for long-term agricultural use, but also disadvantages including potential lack of access by disadvantaged groups, and restrictive distribution policies enforced by local government (Tornaghi, C., 2014; Opitz, I., et al., 2016; Horst, C., 2017). In addition, local governments have shown a lack of interest in developing local food security through the use of public parks and green spaces (Lovell, S., 2010; Pearson, L., 2010; Morgan, K., 2015). While more intensive urban production types (e.g., hydroponics, aquaponics, greenhouses) are noted to exist by academic sources (Opitz, I., et al., 2016, Weidner, T., Yang, A., 2019), minimal data is provided on these types aside from identifying them as emergent trends.

2.2.1.1 Urban Agriculture and Peri-Urban Agriculture

Ina Opitz's, et al., (2016) article, *Contributing to Food Security in Urban Areas*, draws attention to an issue for consideration when understanding urban agriculture. It identifies significant variations between agriculture practices in urban and peri-urban regions. While often grouped together by research, these types of UA share little in common aside from being urban agriculture, and do not significantly impact each other (Badami, M., Ramankutty, N., 2015; Opitz, I., et al., 2016). From the types of production to the capacity of producers, the footprint of production space to the protection by government, there are major differences between these two types of UA.

Primarily, urban agriculture represents the small-scale agricultural activities associated with community and cooperative gardening, often occurring on less than two acres of land (Opitz, I., et al., 2016). Common types of production identified throughout the literature include residential gardens, community and allotment gardens, school gardens, rooftop and balcony gardens, and cooperative backyard gardens shared between two or more neighbors (Lovell, S., 2010; Tornaghi,

C., 2014; Opitz, I., 2016). As this type of agriculture has developed from recreation and leisure activities it tends to lack technical expertise, despite having a strong understanding of the agricultural challenges in urban landscapes (Brunstad, R., et al., 2005; Pearson, L., et al., 2010; Opitz, I., et al., 2016). Urban agriculture tends to supply individual households and close social networks of friends and family only. Rarely does it provide a supply large enough for commercial marketing through Farmers Markets and CSA (Opitz, I., et al., 2016; Horst, M., et al., 2017). In addition to a lack of knowledge capacity and limited distribution, other weaknesses include the lack of access to water, lack of access to land and often illegitimate land-use, and a lack of regulatory policy by local government providing protection (Lovell, S., 2010; Pearson, L., 2010; Hendrickson, M., Porth, M., 2012; Tornaghi, C., 2014; Opitz, I., et al., 2016).

Peri-urban agriculture is conversely a private for-profit operation typically conducted by highly knowledgeable experts. It occurs at the edges of urban centres where urbanization and development are beginning to occur, and includes industrial agriculture, livestock, greenhouses, aquaculture, and holdings typically exceeding 20 acres (Opitz, I., et al., 2016; Weidner, T., Yang, A., 2019). While benefiting from legislation and zoning that legitimize agricultural, the continued use of agriculture is often threatened by urbanization and commercial development (Lovell, S., 2010; Pearson, L., et al., 2010; Opitz, I., et al., 2016; Ayambire, R., et al., 2019). Economically focused on maximizing profitability through farm gate distribution, Farmers Markets, CSA, local food industry contracts (e.g., restaurants), and wholesale marketing, peri-urban agriculture is not necessarily focused on the production and distribution of food, and can also include petting zoos, fibre production, and horticultural (Abbot, C., Myhre, A., 2000; Brunstad, R., et al., 2005; Opitz, I., et al., 2016; Brinkley, C., 2017).

Due to the varied organization between urban and peri-urban agriculture, these two types of UA do not compete with each other (Badami, M., Ramankutty, N., 2015; Opitz, I., et al., 2016). Also, while a lack of policy is an identified barrier in the urban environment, this is not the case for peri-urban practices (Hendrickson, M., Porth, M., 2012; Opitz, I., et al., 2016). Understanding these two environments as unique therefore helps identify gaps currently existing in UA. The first of these is that greenhouses tend to be a peri-urban activity, despite opportunity existing in the urban environment for their development. This can potentially be explained by the lack of access to capital and land-use legitimacy in the urban environment (Hendrickson, M., Porth, M., 2012; Opitz, I., et al., 2016). Secondly, despite Continuous Productive Urban Landscapes (CPULs) that use food plants as landscape amenities being identified as able to increase access and capacity in urban agriculture, there are few examples of this practice being used (Pearson, L., et al., 2010; Lovell, S., 2010; Morgan, K., 2015). Third, the policy restrictions on distribution by small-scale production has been identified as a barrier towards the economic development of urban agriculture (Opitz, I., et al., 2016; Horst, M., et al., 2017). Fourth, despite peri-urban agriculture benefiting from land-use policy and zoning, it is negatively impacted by urbanization and the emphasis on commercial development by planning culture (Lovell, S., 2010; Nixon, D., Newman, L., 2016; Opitz, I., et al., 2016; Ayambire, R., et al., 2019).

2.2.2 Food Systems Planning

Food systems planning is a new description for an old system of development and planning knowledge (Vitiello, D., Brinkley, C., 2014a). It has significantly emerged in the past 15 years, arguably in connection with the conditions that have prompted UA (i.e., the increasing food costs and food riots of 2008). At its most basic level, it represents an integrated approach focused on urban management of food production, distribution, consumption, and waste cycling (Campbell,

M., 2004; Lovell, S., 2010; Hendrickson, M., Porth, M., 2012; Morgan, K., 2015). Despite its newness, food systems planning captures all the individual features associated with urban agriculture and can be considered one of the leading supports for UA (Vitiello, D., Brinkley, C., 2014a; Horst, M., et al., 2017).

Food systems planning is concerned with social justice, policy and regulation, development of land access and capacity, and the capture of local economy (Campbell, M., 2004; Lovell, S., 2010; Horst, M., et al., 2017). It is also connected with themes of environmental service provision, public health and nutrition, and the reduction of food deserts (Campbell, M., 2004; Pearson, L., et al., 2010; Morgan, K., 2015). As a planning focus on developing integrated food systems, it is a departure from the traditional role of modern urban planning. Specifically, planning culture has adopted a hands-off approach towards food systems since the beginning of the 20th century, letting the free market and food industry govern itself in planning food systems for urban environments. Aside from the zoning for retail, restaurants, and supply depots, Urban Planning has viewed food systems as outside its jurisdiction (Vitiello, D., Brinkley, C., 2014a; Morgan, K., 2015). Results of this attitude can be seen in the development of policy and zoning that exclude agriculture from the urban environments (Vitiello, D., Brinkley, C., 2014b), and in the attitudes of planning and local government which emphasize commercial land development as opposed to agriculture (Lovell, S., 2010; Pearson, J., et al., 2010; Opitz, I., et al., 2016; Ayambire, R., et al., 2019).

Food systems planning is the uptake by local and national governments to increase food security, accessibility, and health in urban environments (Tornaghi, C., 2014; Nicholls, C., Altieri, M., 2018). In addition to advocating for protection of agricultural lands, it is focused on the development of fine-grained distribution in association with local retail outlets, Farmers Markets, methods of CSA, and non-profit organizations such as hospitals, schools, and soup kitchens

(Campbell, M., 2004; Lovell, S., 2010; Tornaghi, C., 2014; Opitz, I., et al., 2016; Nicholls, C., Altieri, M., 2018). While production is a focus of food systems planning, maximizing production is not its goal. This is a result of production and equitable food access being shown as not codependent (Morgan, K., 2015; Horst, M., et al., 2017). Rather, food systems planning advocates access to resources for individuals to feed themselves in a self-respecting and culturally appropriate manner, in line with the UN Right to Food (United Nations General Assembly, 1948, Article 25). For these reasons, access to agricultural resources by marginalized groups is considered to be of importance for food systems planning.

Despite these goals, problems can be identified in food systems planning. Consistent with much of UA literature, there is an identified need for policy throughout research with specific focuses on provisions for land access and methods of distribution (Lovell, S., 2010; Pearson, L., 2010; Morgan, K., 2015; Opitz, I., et al., 2016; Horst, M., et al., 2017). There is also a lack of connection to UA in policies related to non-food issues that include health, education, and environmental services (Tornaghi, C., 2014; Morgan, K., 2015). Another common problem is the noted lack of research into the effects of local food systems, which means little knowledge is available that contributes to understanding and development of policy (Vitiello, D., Brinkley, C., 2014a; Badami, M., Ramankutty, N., 2015; Opitz, I., 2016; Horst, M., et al., 2017). Furthermore, problems with social justice have been noted in the lack of equitable access to agricultural land and affordable food sources (Campbell, M., 2004; Tornaghi, C., 2014; Brinkley, C., 2017).

Among these problems, emphasis on policy for provision of agricultural lands has received the most attention (Campbell, M., 2004; Pearson, L., et al., 2010; Morgan, K., 2015; Horst, M., et al., 2017). Many methods of providing access to agricultural land have been suggested, including urban agricultural land subsidies, differential tax rates, development of land trusts, and municipally

controlled ownership. Many of these suggestions however conflict with the larger understanding of agricultural land protection in the municipal environment. Research has shown that land subsidies do not promote best practices, can be costly to government resources, and do not ensure long-term agricultural protection (Nelson, A., 1992; Peterson, et al., 2002; Brunstad, R., et al., 2005; Horst, M., et al., 2017). The use of tax differentiation between agriculture and non-agriculture lands conflicts with the economic interests of local government as land taxes provide the funding for public services (Tindal, C., Tindal, S., 2004; Lovell, S., 2010). Legislated land reserves and trusts have been shown as the most effective method of agricultural land provision (Nelson, A., 1992; Gosnell, H., et al., 2011; Nixon, D., Newman, L., 2016). However, the success of these methods depends on joint interests by local and provincial governments and can prove highly unpopular with private landowners.

Within food systems planning research, the identification of UA stakeholders provides insight into the primary actors of this movement. These stakeholders consistently include local and provincial Government, producers, consumers, retail and local business, and non-profit organizations (Campbell, M., 2004; Tornaghi, C., 2014; Morgan, K., 2015; Wills, K., 2017; Nicholls, C., Altieri, M., 2018). In understanding these groups as interdependent networks and individual actors, an institutional vehicle in the form of Food Policy Councils can be identified for advancing policy and organizational culture for food system planning (Campbell, M., 2004; Lovell, S., 2010; Morgan, K., 2015). As a non-governmental organization, Food Policy Councils gather individual UA groups and provide them with a unified voice that has been identified as politically lacking (Campbell, M., 2004; Hendrickson, M., Porth, M., 2012; Opitz, I., et al., 2016; Horst, M., et al., 2017). Access to institutional funding has also been identified in the success of

Food Policy Council activities and the Food Policy Council of Toronto is identified as an ideal model as it receives funding through the Board of Health (Hendrickson, M., Porth, M., 2012).

While the analytical and technocratic styled Rational Comprehensive Planning method has been suggested for food systems planning based on historic success (Morgan, K., 2015), the complexities and many stakeholders of modern UA does not favour this approach. Instead, the Public Participatory model of engagement holds greater advantages in developing food systems which are intended to be socially equitable and accessible (Campbell, M., 2004, Morgan, K., 2015). As a result, Food Policy Councils can be identified as an institutional vehicle capable of providing political voice and power for these many disparate groups (Morgan, K., 2015).

2.2.3 Environmental Services

Environmental services are commonly associated with UA, and storm water management, food waste cycling, energy conservation and carbon footprint reduction are among the possible benefits (Pearson, L., et al., 2010; Gentry, T., 2011; Vitiello, D., Brinkley, C., 2014b; Morgan, K., 2015; Weidner, T., Yang, A., 2019). Despite increased emphasis on sustainability and resilience towards climate change within academia however, there remains comparatively little research on the effects of UA and environmental services in urban settings (Pearson, L., et al., 2010; Badami, M., Ramankutty, N., 2015; Brinkley, C., Vitiello, D., 2014a; Opitz, I., et al., 2016; Vaarst, M., et al., 2018).

2.2.3.1 Water Management

A significant beneficial environmental service that UA provides is the ability to address the water footprint of agriculture and storm water management in urban environments (Gentry, T., 2011; Weidner, T., Yang, A., 2019). These benefits can be achieved using household grey water, methods of water harvesting, and water management practices such as mulching (Opitz, I., et al.,

2016; Horst, M., et al., 2017; Weidner, T., Yang, A., 2019). As agriculture in the USA and UK are reported to use more than 50% the per capita water use (Gentry, T., 2011), the ability of UA to exist solely from water harvesting and storm water management holds great potential (Weidner, T., Yang, A., 2019). While many cities promote the use of bioswales and water retention ponds to evaporate storm water, agriculture can be identified as an untapped resource for water management (Gentry, T., 2011).

2.2.3.2 Carbon Footprint

The reduction of carbon footprint is one of the popular benefits associated with UA (Pearson, C., 2007; Gentry, T., 2011; Morgan, K., 2015). T. Gentry (2011) laments that industrial agriculture practices turn the carbon sequestering process of plant growth into a carbon emitting activity using fossil fuels and petro-chemicals. Despite his opinion, this literature review reveals that UA achieves no appreciable capture of carbon because of its use (Weidner, T., Yang, A., 2019). While a significant reduction of carbon footprint is possible, this reduction is achieved through a suite of secondary features not directly related to plant growth. For example, the use of aerobic digestion to process food waste and organic matter for use as fertilizer accounts for part of this reduction, which in turn reduces demands for petroleum-based fertilizers (Weidner, T., Yang, A., 2019). The reduction of food miles travelled also contribute towards reduction of carbon footprint (Pearson, L., et al., 2010; Morgan, K., 2015). Additionally, the use of aerobic digestion to produce biogas for combined heat and power systems account for reduced greenhouse gas production from food and organic waste, as well as demands for petroleum-based energy (Weidner, T., Yang, A., 2019).

While reducing water and carbon footprint is possible with UA, these benefits ultimately require a highly technical and capital-intensive process beyond the capacity of most UA

practitioners (Hendrickson, M., Porth, M., 2012; Badami, M., Ramankutty, N., 2015; Opitz, I., et al., 2016). Furthermore, the development of these environmental services requires the involvement of local and provincial government for development of policy (Gentry, T., 2011; Morgan, K., 2015), and programming to overcome the lack of knowledge on the use of waste products as an agricultural resource (Pearson, C., 2007; Opitz, I., et al., 2016).

2.2.3.3 Increasing Biodiversity

While other services such as reduced Urban Heat Island effect, energy conservation, and air and water quality have been suggested (Pearson, L., et al., 2010; Morgan, K., 2015; Badami, M., Ramankutty, N., 2015), no data into their provision or effect has been discovered in the literature. As a result, this review is unable to make an assessment into their effectiveness. Because of this, biodiversity is the last of quantifiable environmental service being provided (Campbell, M., 2004; Lovell, S., 2010). Rather than providing wildlife habitat however, the biodiversity identified here is of an agricultural variety. This includes heirloom seed varieties, culturally-specific foods, heritage animal breeds, and protection for pollinators such as bees (Campbell, M., 2004; Tornaghi, C., 2014; Horst, M., et al., 2017). Developing this biodiversity however requires the interest of individual participants, development of agricultural knowledge, and local government policy that allows the keeping of livestock and beehives (apiaries) (Opitz, I., et al., 2016; Horst, M., et al., 2017). This is to say that while promoting biodiversity through UA is possible, UA does not automatically increase biodiversity because of its practice.

2.2.3.4 Dangers and Environmental Disservices

In addition to the positive environmental services provided by UA, it is also noted that several disservices can be associated with UA. These include damaging the provision of social justice (Pearson, C., 2007; Tornaghi, C., 2014; Brinkley, C., 2017) and the consequences of UA

on environmentally contaminated soils (Oka, G., et al., 2014; Horst, M., et al., 2017). Organic production is a popular agricultural method, and it is generally accepted as providing environmental services and stewardship (Pearson, C., 2007; McClintock, N., 2010). In addition to demanding higher prices, it can cater to a more economically advantaged market. The problem is that organic foods tend to be marketed to affluent neighbourhoods where higher prices can be sought and can exclude access by marginalized groups (Tornaghi, C., 2014; Brinkley, C., 2017). The marginalized are often left to garden on lands that have been environmentally degraded by industrial processes (Horst, M., et al., 2017). This poses risks as these locations potentially contain concentrations of heavy metals and chemicals that can be taken up by agricultural production (Oka, G., et al., 2014; Horst, M., et al., 2017). As a result, while the promotion of UA as an environmental benefit is common, it requires more research as a practice to understand who is benefitting (Torganhi, C., 2014).

2.3 Land-Use Economics

There are two economic factors that persist throughout the literature on UA. First is an emphasis on the commercial development of land that precludes agriculture from existing in the urban environment (Lovell, S., 2010; Pearson, L., et al., 2010; Opitz, I., et al., 2016; Ayambire, R., et al., 2019). Second is that that small-scale agriculture does not generate significant income and therefore is not viewed as economically viable by local government (Hendrickson, M., Porth, M., 2012; Horst, M., et al., 2017). Together, these factors create an imbalance that outweighs the long-term benefits of agriculture and calls into question the economic advantages that are often associated with UA.

The emphasis on commercial development in the urban environment is a commonly cited barrier to UA. Commercial development provides better short-term profits than agriculture resulting in an emphasis on subdivision and development of agricultural lands (Lovell, S., 2010;

Pearson, L., 2010). The result of this puts peri-urban agriculture under constant threat of urbanization as it suffers from minimal protection against commercial development (Opitz, I., et al., 2016; Ayambire, R., et al., 2019). While expansion of the urban periphery can be understood as its own genera, it provides theories used by UA to explain the need for land protection, including leap-frog development, urban growth boundaries, and smart growth (Nelson, A., 1992; Gosness, H., et al., 2011; Nixon, D., Newman, L., 2016). What can be learned from these peri-urban growth controls is that legislation is necessary to guide development and protect agricultural capacity. It is important to note however that government legislation has only succeeded in slowing urbanization, but has not stopped it (Gosness, H., et al., 2011; Nixon, D., Newman, L., 2016).

It is for this reason that local government has also been cited as a necessary stakeholder in creating space for UA (Lovell, S., 2010; Morgan, K., 2015; Horst, M., et al, 2017). Focusing on use of public green space and acquisition of surplus lands for community agriculture, this method ensures protection of agricultural capacity for marginalized groups (Lovell, S., 2010; Pearson, L., et al., 2010; Morgan, K., 2015). This involvement however has been met with concern by local government, who have expressed apprehension over the profitability of agricultural activities and the loss of tax income (Hendrickson, M., Porth, M., 2012). As a result, there has been minimal uptake by local governments in developing UA as an integrated landscape feature (Morgan, K., 2015).

The concern for UA's profitability by local government is not without cause. While it has been reported that UA can be highly profitable (Lovell, 2010; Howell, M., 2017), these instances can be argued as the exception. Most commonly, urban agriculture is a small-scale activity performed by individuals to reduce the costs of purchasing fresh produce and fruit (Opitz, I., et al., 2016, Horst, M., et al., 2017). Despite proponents of UA advocating its ability to develop

employment and capture local economy (Lovell, S., 2010; Badami, M., Ramankutty, N., 2015), there is little evidence that supports these claims. Instead, the income saved using UA tends to be spent on other household costs (Horst, M., et al., 2017). Furthermore, much of the labour involved in UA operates on a volunteer basis as opposed to providing economic employment. While it has been argued that economic employment is possible, the number of full-time jobs sustainable by UA activities is minimal at best (Horst, M., et al., 2017). This issue is further complicated by policy barriers that restrict small-scale urban agriculture from marketing or economic distribution (Opitz, I. et al., 2016; Horst, M., et al., 2017). Considering this all, land use economics is a barrier of UA, but additional research and understanding is required.

2.4 Conclusion: Urban Agriculture is...

Urban agriculture is both a form of social justice and a for-profit agricultural land-use in the urban and peri-urban environment including backyard, rooftop, and community gardens within urban centres, to larger more intensive agricultural uses at the peri-urban fringe (Hendrickson, M., Porth, M., 2012; Opitz, I., et al., 2016; M., Horst, M., et al., 2017). It is a multifunctional system with focuses on access by marginalized populations, the production and distribution of food locally, and the provision of identified environmental services including reduction of carbon footprint, management of storm and wastewater, and the cycling of food wastes (Lovell, S., 2010; Morgan, K., 2015; Weidner, T., Yang, A., 2019). It requires policy and legislation by local and provincial Governments for effective development, including the protection of agricultural lands in the peri-urban landscape, regulations that legitimize agricultural land-use in the urban landscape, and policies that allow access to wastewater and storm water resources (Lovell, S., 2010; Hendrickson, M., Porth, M., 2012; Morgan, K., 2015; Horst, M., et al., 2017).

For the effective local production and distribution of agricultural goods, equitable access and finer more discriminating policies must be in place (Tornaghi, C., 2014; Brinkley, C., 2017; Horst, M., et al., 2017). This includes access to agricultural space within the urban landscape located in public green spaces and parks, and in conjunction with affordable housing and non-government organizations (Campbell, M., 2004). To achieve long-term protection, this space is ideally municipally owned, or owned by non-profit organizations such as churches and school (Horst, M., et al., 2017). Policies for distribution include the ability to supply local retail, restaurant, grocery, and public markets through a variety direct access such as Farmers Markets and garden retail stands, CSA shares of garden produce, as well as access to wholesale distribution (Campbell, M., 2004; Vitiello, D., Brinkley, C., 2014a; Brinkley, C., 2017). These policies must not only benefit for-profit operations, but also the very small-scale of individuals in community, co-operative and backyard gardens who have traditionally been ignored (Opitz, I., et al., 2016; Horst, M., et al., 2017).

As a land-use, UA has been identified as requiring a minimum urban footprint of 1.2% in the Canadian context to achieve social justice (Badami, M., Ramankutty, N., 2015). This footprint is described as networks of productive landscapes throughout the urban setting, leading to larger private land holdings at the peri-urban fringe. These productive landscapes include community and cooperative gardens, public park orchards, and CPULs (Lovell, S., 2010; Morgan, K., 2015). With exception in the peri-urban environment, UA does not include food items that require large machinery (Lovell, S., 2010; Opitz, I., et al., 2016). Additionally, UA operates without petrochemicals or fertilizers and relies instead on the use of closed-loop resources that are readily available (Pearson, C, 2007; McClintock, N., 2010).

For the delivery of environmental services, work aimed at identifying these services and agriculture's role within them is necessary. While not a direct reducer of carbon footprint or waste management, UA provides these environmental services by uptake and cycling waste management by-products and reducing miles traveled (Pearson, C., 2007; Weidner, T., Yang, A., 2019). To effectively achieve this closed-loop cycling, UA must be part of the environmental policies focused on these services (Morgan, K., 2015). Addressing water footprint, agriculture represents a primary consumer of water resources (Postel, S., 1996; Gentry, T., 2011). Policies providing access to storm water harvesting and wastewater in the urban environment are necessary for both UA development and environmental service delivery (Hendrickson, M., Porth, M., 2012; Horst, M., et al., 2017). With access to these resources, UA can provide water management with minimal impact on the water footprint of urban centres (Gentry, T., 2011; Opitz, I., 2016; Weidner, T., Yang, A., 2019).

While a potential source of economic employment and activity, UAs success at these activities remains undefined. It has been shown that UA is capable of being profitable, while at the same time being recognized as unable to provide significant employment or income (Lovell, S., 2010; Horst, M., et al., 2017). It can be argued that prohibition on small-scale distribution is a significant contributor to this problem, however more research is necessary to improve the clarity of this issue (Opitz, I., et al, 2016; Horst, M., et al., 2017). Therefore, land-use economics are a significant barrier to UA currently and a source of apprehension to development by Local Governments (Lovell, S., 2010; Hendrickson, M., Porth, M., 2012; Opitz, I., et al., 2016).

Finally, UA suffers from a lack of research and academic rigour. While offering many opportunities for sustainable development and resilience, urban agriculture theory suffers from a significant lack of understanding. This lack of understanding can be observed in numerous policy

development needs and regulations related to UAs core features. Theoretically, these core features can be identified as 1) social justice, 2) environmental services, 3) food systems planning, and 4) economic development. As these features create a multifunctional and interwoven mix of requirements with no simple solutions, many wicked problems exist within UA that defy easy answers. Clearly though, the need for policy and research assisting in policy development represents the most pressing issue currently faced by urban agriculture.

Chapter Three: Research Methods

3.0 Scope and objectives

The goal of this research is to study and evaluate the development of urban agriculture and food systems planning in the Canadian context. Using Vancouver, British Columbia, as a case study this research is divided into a three-part mixed-methods design with five iterative research objectives:

Research Method: Exploratory Mixed-Methods

Part One:

Objective #1: Capture numerically based data using an ordinal Likert Scale to represent the uses and experiences of UA, including features of social justice, access to agricultural capacity, and food systems planning

Part Two:

Objective #2: Capture qualitative data through conversation and interviews on features of social justice, agricultural capacity, and food systems planning

Part Three:

Objective #3: Compare and contrast quantitative and qualitative data
Objective #4: Identify where measurements provide accurate indications
Objective #5: Identify where measurements provide inconsistencies

3.1 Theoretical Framework

This research employs social justice as a theoretical framework to evaluate UA and the development of food systems planning in Vancouver, British Columbia. Social justice in UA refers to the ability by vulnerable populations to improve their food security by improving equity and access to fresh, healthy food, agricultural capacity, and reducing the impacts caused by urban lack of access to food retail (food deserts) and dependence on cheap, unhealthy sources of food (food swamps) (Tornaghi, C., 2014; Badami, M., Ramankutty, N., 2015; Horst, M., et al., 2017).

Vulnerable populations are defined by this research as including marginalized communities (e.g., visible minorities, foreign immigrants, disabled individuals) and/or economically disadvantaged individuals.

Food systems planning is a broad theoretical overlap of UA initiatives and food security objectives partaken by urban planning and municipal government. Focused on creation of policy and provision to the means of production, access to distribution, food systems planning is concerned with improving food security in urban settings (Campbell, M., 2004; Tornaghi, C., 2014; Horst, M., et al., 2017). Influenced by themes of social justice and agricultural capacity development, food systems planning represents urban policies that protect and provide access to agricultural capacity, allow for multiple methods of distribution, and promotes the development of food waste cycling and other environmentally sustainable features of agriculture (Campbell, M. 2004; Pearson, L., et al., 2010; Wills, K., 2017).

Despite this overall understanding of UA and food systems planning however, many elements of UA remain poorly understood. Using the foundations of social justice and food systems planning, this investigation works to provide data and research to assist in the academic development of UA in Canada.

3.1.1 Pragmatic Worldview

This research design identifies strong influences of a pragmatic worldview. Pragmatism is a problem-solution oriented research philosophy that is interested in identifying problems and seeking solutions using the best available methods (Creswell and Creswell, 2018). Rather than employing a purely qualitative or quantitative research method, pragmatism focuses on the complexity of problems, and works to find the most expedient solutions. A common feature of pragmatic research is the use of mixed-methods research designs (Terrell, S.R., 2012).

3.1.2 Mixed Methods

Mixed methods research emerged throughout the 20th century in response to weaknesses exhibited by purely quantitative and/or qualitative research methods. Employing a combination of both quantitative and qualitative methods together, mixed-methods research has gained popularity for its ability to provide analytical convergence between methods (Fetters, M., et al., 2013; Creswell and Creswell, 2018). Mixed methods research can be used to validate quantitative results and contextual details through qualitative analysis (Fetters, M., et al., 2013). The data gathered from each research method (e.g., quantitative surveys and qualitative interviews) is gathered iteratively during Part One and Part Two, and then combined and analyzed together during Part Three. The ability of qualitative data to provide verification of quantitative results represents the pragmatic reason why mixed methods were desirable.

3.1.3 Exploratory Mixed Methods

The iterative organization of this research is an example of Exploratory Mixed Methods (Fetters, M., et al., 2013; Creswell, J.W., Creswell J.D., 2018). This is described as a qualitative led approach that is supplemented by quantitative research and data and can be identified by three features observed throughout this research. First is the focus on research questions that explore themes, reasons and circumstances (Fetters, M., et al., 2013; Creswell, J.W., Creswell J.D., 2018). Second, this research does not focus on issues of causality, magnitude, or generalizability, which are the research questions of quantitatively led investigation (Fetters, M., et al., 2013). Finally, the use of qualitative data to verify quantitative results represents the pragmatic objectives of Part Three of research, which is described as a common application of Exploratory Mixed Methods design (Fetters, M., et al., 2013; Creswell, J.W., Creswell J.D., 2018).

Part One represents the use of quantitative surveys to capture numeric indications of demographics, agricultural capacity (i.e., land, water, knowledge), and food systems planning (i.e., production and distribution). This is followed by qualitative interviews using semi-structured conversations to investigate the quantitative survey results. The final step in this method combines the quantitative and qualitative data to identify if conformity can be observed between the results, and provide descriptions, details, and experiences to indicate where quantitative and qualitative results do not provide conformity.

3.2 Case Study Selection

Case studies are a common research approach of Exploratory Mixed Methods due to their ability to provide detailed investigation of themes, circumstances, and/or initiatives (Fetters, M., et al., 2013; Creswell and Creswell, 2018). They are also a common method used by research on UA (Barthel, S., Isendahl, C., 2012; Hendrickson, M., Porth, M., 2012; Vitiello, D., Brinkley, C. 2014b; Weidner, T., Yang, A., 2019). Vancouver, British Columbia, is chosen as the case study for this research for subjective and objective reasons. Subjectively, Vancouver is the only Canadian city west of the 100th meridian with a visible presence of UA. Objectively, Vancouver represents one of two locations in Canada (the other being Montreal, Quebec) with the provincial legislation and local policy identified by academic literature as necessary in the development of UA (Nelson, A., 1992; Gosnell, H., et al., 2011; Hendrickson, M., Porth, M., 2012; Nixon, D., Newman, L., 2016; Horst, M., et al., 2017). The alternative location, Montreal, Quebec, was not considered due to the inability of the researcher to speak fluent French.

3.3 Research Design

The design of this research can be identified as occurring in four steps. The first step conducted prior to academic research is the literature review. This provides the foundations on

which the three steps of the Exploratory Mixed Methods research are structured. Part One of research is organized to capture quantitative data using a community garden survey rated on an ordinal 5-point Likert scale, with one representing low and five representing high. The data collected during this phase is used to frame the questions asked in Part Two of research. Part Two represents the capture of qualitative data through semi-structured interviews with community garden members. These conversations are analyzed with the use of NVivo 12, where they are deconstructed to identify the common details and themes discussed during interviews. Part Three involves a cross-analysis and comparison between the data gathered in quantitative and qualitative research to verify the accuracy of results and identify where and why measurements are not accurate.

3.3.1 Literature Review

Prior to conducting the case study on UA in Vancouver, a systematic literature review was conducted to provide an overview on the theories, knowledge, and structures of UA. The data collected from this review highlighted the primary stakeholders of UA, best-known practices and organizational frameworks currently associated with developing UA, and the commonly identified barriers in the development of UA (See Section 2.0: Literature Review, Pg. 7). This literature review provided the foundations on which subsequent data acquisitions (i.e., survey and interview) was developed, and indicated where research needed to be focused. The knowledge provided by this literature review was used in the evaluation and analysis Parts One, Two and Three of this research design.

3.3.2 Quantitative Surveys with Community Gardens

Because of the focus of study (social justice development of UA), and Exploratory Mixed Methods design (use of qualitative research to verify quantitative results), quantitative methods

capturing numeric data were employed first. This decision was based on social justice and UA being strongly understood as inter-connected, and therefore provided good indications of where measurements need to be made. While beginning with a qualitative research method would have provided additional granular data on where survey questions should focus, but these details would not have changed the overall design of the quantitative survey.

3.3.2.1 Sampling

Community gardens publicly registered with the City of Vancouver were accessed on September 1, 2020, using open-source data at vancouver.ca. This data provided 101 community gardens representing 3,603 possible participants. The survey did not reach 652 participants due to a lack of accurate contact details, and/or the inability to co-ordinate with community garden organizations. An additional 221 participants were excluded from this research on account of community garden connections with schools and youth programs, which excludes their participation by way of research ethics. The possibility was offered by community garden organizations to snowball survey participation. This was not considered due to the focus of research on capturing indications of social justice and the potential interference by private home owning individuals with these results. Because of this sampling method, random sampling cannot be ensured in the results collected.

3.3.2.2 Quantitative Survey Method

To capture a representation of urban agriculture in Vancouver, the quantitative survey was distributed among community gardens registered with the City of Vancouver (See Appendix D, Pg. 112). The survey was performed using the online Qualtrics eSurvey software provided in partnership with the University of Guelph.

Survey questions examined concepts of social justice (demographic data), agricultural capacity (i.e., access to land, water, knowledge), and experiences with food systems planning (i.e., production, distribution). Questions were provided in a series of 29 closed-ended questions with data being captured on an ordinal 5-point Likert scale with one representing lowest and five representing highest. An option for non-participation in each question was also made available.

The survey was conducted over a 45-day period, from January 14, 2021, to February 28, 2021. A research invitation and survey link were distributed by email among community garden organizations with the request to forward the link and invitation to individual garden members (See Appendices B, C, E, F, G). This process was repeated on February 2, 2021, and February 15, 2021.

After the survey was closed, quantitative results were downloaded to Microsoft Excel as a .CSV file and cleaned to remove all incomplete and erroneous responses. Clean results were then uploaded back into Qualtrics and analyzed separately for statistical analysis and evaluation. These results have been analysed using the central tendencies and statistical mean averages of numeric indications on the performance of UA in Vancouver.

3.3.3 Qualitative interviews with Garden Members

Qualitative method is employed for the second step due to its use as an investigative tool. Based on the pragmatic approach and objective of this research, qualitative methods provide the most effective and efficient means to evaluate the accuracy of quantitative measurements. This is because qualitative research can be semi-open, allowing for the capture of granular details not easily accessed in quantitative research. In addition, the use of qualitative methods provides an efficient means of investigation due to its ability to pick-up and follow trends in-situ, allowing for a broader scope of investigation than that provided by quantitative means.

3.3.3.1 Participant Selection

Selection criteria was used to choose which community garden members would participate in qualitative interviews. This selection process focused on selecting individuals to explain and provide insight into quantitative results. To achieve this, i) six interviews were selected according to age groups, and ii) four interviews were chosen based on waiting times. A maximum of 10 interviews were identified as a desired limit of research, with theoretical saturation observed after eight interviews were completed. Based on qualitative descriptions, theoretical saturation was achieved when interviews could provide no additional information on themes of social justice, agricultural capacity, and food systems planning. Interviews with food systems planning officials were also pursued, but due to the limitations of COVID-19 they were unable to be completed (See Section 6.1.1, Pg. 92).

A list of potential participants was created on February 1, 2021. Fourteen of 20 potential participants belong to the groups based on age, with two individuals representing the 18 – 29 age group, six individuals representing the 30-49 age group, and six individuals representing the 50+ age group. Six of 20 potential participants were selected based on their indication of waiting less than one year to access community garden space. The individuals in each of these groups were chosen according to alternating patterns that equally spaced representatives according to their sign-up between January 14, 2021, and February 2, 2021.

Two invitation groups of equal size were used to recruit interviewees. Interview invitations were submitted to group one beginning February 2, 2021, and group two beginning February 15, 2021. An attempt to contact each potential interviewee occurred three times over the course of a two-week period before the removal of research participants. A second group of interviews was

planned for creation on March 1, 2021, but because 10 interviews had been achieved with saturation by this time, this second group was not developed.

The research design desired an upper limit of 10 interviews if an excess of 100 surveys were received, and 20 interviews if fewer than 100 surveys were received. Based on 155 surveys being received as of March 1, 2021, with 131 completed survey responses provided, 10 interviews were considered a sufficient representation to explore the results of quantitative research. Achieving theoretical saturation of interviewees was based on the provisions of new and distinctive details that describe the use of UA as provided by interview sources. When no additional data was being generated, theoretical saturation was achieved. This research identified saturation having been achieved after the completion of eight interviews.

3.3.3.2 Semi-structured Interview Method

Focusing on social justice, agricultural capacity, and experience with food systems planning, telephone interviews were conducted with 10 participants out of a total 73 self-identifying individuals from the community garden survey. The interview process included obtaining signed consent via email correspondence and verbal consent at the beginning of each interview. Interviews are approximately 35 minutes in length and survey participants are chosen according to the methods identified in section 3.3.3.1. Each interview is audio recorded, transcribed into Microsoft Word, and then analyzed using NVivo 12 to identify common themes and topics referenced in each discussion.

Each interview represents an approximate 35-minute block of time. Interviewees were asked to share their experiences and observations of community gardens and provide details that can be used in iterative analysis for convergence during Part Three of research. A set of 12 semi-structured questions were asked in all interviews (See Appendix H, Pg. 123), with these questions

relating to issues of social justice (e.g., who is using, who is benefiting, who is not), agricultural capacity (i.e., access to land, water, knowledge), and food systems planning (i.e., production, distribution, food waste cycling). In particular, quantitative data indicates a lack of participation among ethnic minorities, ambiguous results on knowledge capacity, and a lack of economic distribution; qualitative research worked to explore these details.

Interviews were deconstructed using NVivo 12, and overlapping research themes (e.g., social justice, food systems planning, agricultural capacity) and experiential details can be observed among all interview discussions.

3.3.4 Collaborative Cross-examination

The collection of quantitative and qualitative data during Parts One and Two are performed iteratively with the objectives of Part Three guiding this collection. The objectives of Part Three are, i) the comparison and contrasting of data provided by quantitative and qualitative research, ii) identification of where convergence and accuracy can be indicated, and iii) identification of where dissonance exists and why. Convergence can be identified when quantitative data can be accurately identified and described by 3 or more qualitative sources. Triangulation can also be identified when quantitative and qualitative data provide convergence, and this convergence is reflected in academic research. Dissonance can be identified when quantitative data and qualitative descriptions do not provide accurate reflection of data.

3.3.4.1 Compare and contrast quantitative and qualitative data

Quantitative data and statistic details allows research to make inferences across areas of social justice, agricultural capacity, and food systems planning. Qualitative research provides the capture of conversational details with firsthand sources, organized into themes and experiences related to issues of social justice, agricultural capacity and food systems planning. Comparison

and contrast of these respective data sets is used to identify when convergence and dissonance exist between mixed methods measurements. Due to the exploratory research design, preferential bias has been given to qualitative data when identifying where dissonance occurs.

3.3.4.2 Convergence and Triangulation of data

When data from both quantitative and qualitative research provide large overlapping details, data is considered to have conformity and accuracy. Conformity is measured for each quantitative survey result, as well as by research focus area (social justice, agricultural capacity, food systems planning). Conformity is considered to exist when three or more qualitative sources can confirm the results indicated in quantitative research. Focus areas are considered to have conformity when the multiple subset data groups related to social justice, agricultural capacity, and food systems planning, indicate overall accuracy.

In addition to conformity, data can be additionally considered to have triangulation. When conformity can be found between quantitative and qualitative research results, and results are reflective of common details reported by academic literature, the data can be triangulated. Seeking triangulation is important in this research because it provides larger indications of the UA standards against which research results are being measured.

3.3.4.3 Identify inconsistencies

When data from quantitative and qualitative research does not provide a consistency of response, data is considered to be inconsistent. This can be identified when three or more qualitative sources provide indications that opposed quantitative measurements, and more commonly when qualitative data identifies a lack of quantitative data being collected. Each question of the quantitative survey is evaluated for inconsistency and information representing focus areas of social justice, agricultural capacity, and food systems planning, are evaluated for

inconsistency. When inconsistencies are identified, the reasons for inconsistency are explored and evaluated to provide explanation, and how to correct the inconsistency.

In addition to inconsistencies among internal data, inconsistencies between convergent research data and academic sources can also be identified. This occurs when there is convergence between mixed methods results, but this convergence does not conform with academic reports. When this type of inconsistency is identified, reasons are investigated among City of Vancouver policy and policy documents related to urban agriculture.

3.3.5 Open-Source Data

In addition to the quantitative survey data, additional quantitative data has been gathered from open-source data (i.e., Statistics Canada, Vancouver.ca, and swanhose.com). Used in connection with quantitative details captured by research, this open-source data provides additional data used in analysis and discussion of data related to demographics and social justice, and the agricultural capacity of land and water. Presented in two following subsections, i) Secondary Demographic Data, and ii) Secondary Agricultural Capacity Data, these details allow research to calculate estimates and compare the results of research data.

Chapter Four: Research Results

4.0 Introduction

The following chapter provides the results captured from both quantitative and qualitative investigations. Presented in three sections, the first section provides the open source data captured by research. The second section contains quantitative data acquired from the survey (January 14 to February 28, 2021). This section is broken-down further into three subsections: i) social justice, ii) agricultural capacity, and iii) food systems planning. The second section presents data gathered via qualitative interviews with 10 individuals conducted between February 17 and March 1, 2021. This section is likewise broken into three subsections: i) social justice, ii) agricultural capacity, and iii) food systems planning.

4.1 Secondary Demographic Data

Secondary open-source data gathered by Statistics Canada during the 2016 Canadian Census was collected by research to assist in the analysis of demographic data representing the use of UA in Vancouver. In specific, data related to annual household income and details of ethnicity were gathered for comparison. Shown in Figure 4.1, Statistics Canada indicates that 110,495 of a total 283,915 households (38.9%) earn an annual household income of less than \$49,999. Census Canada data also indicates that individuals representing non-visible minorities in Vancouver account for 299,200 of 618,210 individuals (48.4%).

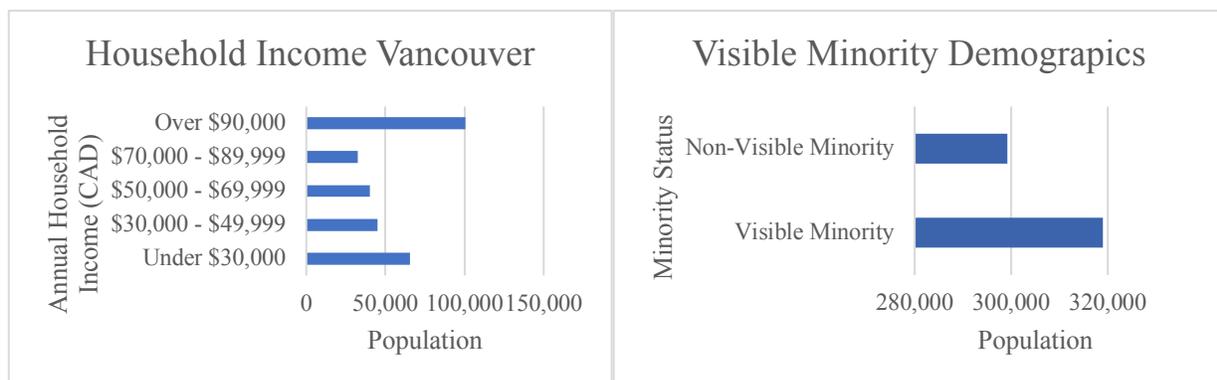


Figure 4.1: Household Incomes in Vancouver Figure 4.2: Visible Minority Population

4.1.1 Secondary Agricultural Capacity Data

Secondary open-source data provided by the City of Vancouver and the online source Swan Hose was gathered to provide quantitative details used to analyze results of agricultural capacity gathered in research. Connected with quantitative details on Agricultural Land Capacity, the city of Vancouver indicates the existence of 5,059 garden plots as of February 4, 2021 (vancouver.ca). Details from Swan Hose provided indication of water hose water flow rate being approximately 34 to 64 litres per minute (swanhose.com).

4.2 Quantitative Survey Results

The quantitative survey was conducted as a closed-ended capture of data with community garden members occurring between January 14 and February 28, 2021 (See Appendix D, Pg. 112). The data gathered from this survey helped to frame the conditions currently existing in community gardens in Vancouver. As this research design is focused on capturing performance measurements related to social justice and agricultural capacity, results are presented in three subsections: i) social justice, ii) agricultural capacity, and iii) food systems planning.

4.2.1 Indications for Social Justice

The quantitative data highlights a disconnect between use by food secure and food insecure groups. Food insecure groups are described as individuals who suffer from recurring annual periods where they lack access to nutritious food sources and/or adequate daily caloric intake (Government of Canada, 2020). For the purpose of this research, vulnerability populations identified potentially suffering food insecurity are defined as earning an annual household income of less than \$49,999 (CAD). This household income was chosen based on research by Statistics Canada (Canada.ca) which indicates that the poverty line for a family of four is \$49,106 (CAD).

The most common individuals identifying with use of UA in Vancouver presently are food secure groups belonging to the middle and upper-middle classes (see Figure 4.3). By comparison,

individuals earning less than \$49,999 CAD annually only represent approximately 20% of participation¹.

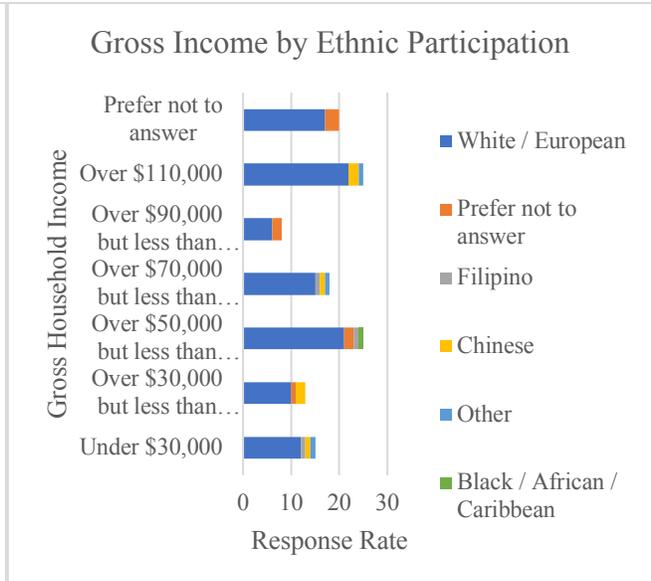
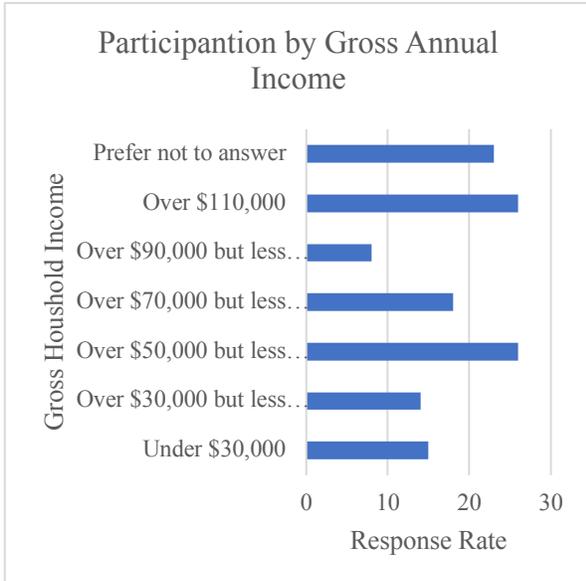


Figure 4.3: Annual Income of Participants

Figure 4.4: Participant Income by Ethnicity

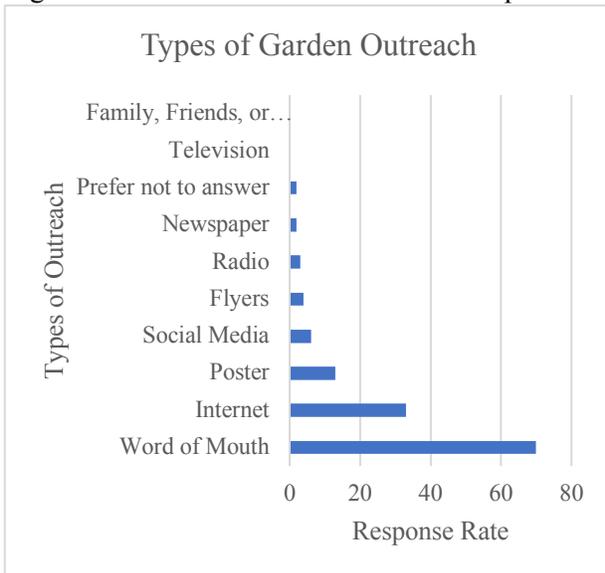


Figure 4.5: Methods of Garden Recruitment

Further breakdown of economic income by ethnic background (Figure 4.4) reveals that participation in UA can be observed as primarily occurring among individuals of white European

¹ 23 of 130 individuals (17.7% of participation) chose to not provide a response on their annual income level

ethnicity. This result indicates an overrepresentation of ethnically white individuals when compared to ethnic demographics collected in the 2016 Census (Figure 4.2).

When the methods of outreach and membership recruitment used by community gardens (Figure 4.5) are examined, it can be observed that the three most common methods used presently are, i) word-of-mouth (66.7%), ii) the internet (31.4%), and the use of posters (12.4%). Aside from these methods, no other type of outreach is identified by more than 6% of survey responses. Based on these results, the most common methods of outreach presently used by community gardens are word-of-mouth and the internet.

4.2.2 Results of Agricultural Capacity

Agricultural capacity in urban environments includes access to the land, water, and knowledge necessary for agricultural production. While these resources exist under the cover of agricultural capacity, each of these resources require independent investigation. The following section provides data on the development of agricultural capacity in Vancouver and is divided into three subsections: i) land capacity, ii) water capacity, and iii) knowledge capacity.

4.2.2.1 Land Capacity Results

The most common type of land access in Vancouver, indicated by 63.8% of responses, is community gardens with individual plots (Table 4.6). Based on frequency of response rates indicating this type of land access (83 responses), plot sizes can relate to the response rate of plots being 10 square meters or less (100 responses) (Table 4.7).

These results additionally indicate a minimum of 26 individuals using community gardens in addition to having private backyard access as this survey was only submitted to community garden organizations. Excluding private land ownership responses ($n = 26$), the remaining response counts (minus use of orchards and windowsills, $n = 37$) is 162, with 104 individuals

having participated. This therefore indicates that the doubling-up of garden plots is a common occurrence among participants.

While the doubling of plots is identified, there is not a representative increase in total land access exceeding 10 square meters (Figure 4.7). Considering this detail, the average individual garden plot indicates being less than 5 square meters in actual size.

	%	Count
Public Garden Types		
Cooperative garden space with individual plots	63.80%	83
Use of garden space provided by a private organization	6.20%	8
Cooperative garden space without individual plots	4.60%	6
Private Land Ownership Types		
Ownership of garden space with a mortgage	6.90%	9
Ownership of garden space with no mortgage	5.40%	7
Rental of garden space including utilities	6.20%	8
Rental of garden space excluding utilities	1.50%	2
Lack of Land Access		
Illegitimate use of empty lots for gardening (No ownership status)	1.50%	2
Illegitimate use of other people's garden space (Guerilla Gardening)	0.80%	1
No ownership of garden space	6.20%	8
Additional Information		
Use of windowsills and balconies for garden space	27.70%	36
City owned orchards	0.80%	1
Use of garden space provided by the city	41.50%	54
Prefer not to answer	0.00%	0
Total	100%	130

Table 4.6: Garden Organization and Land Access Types

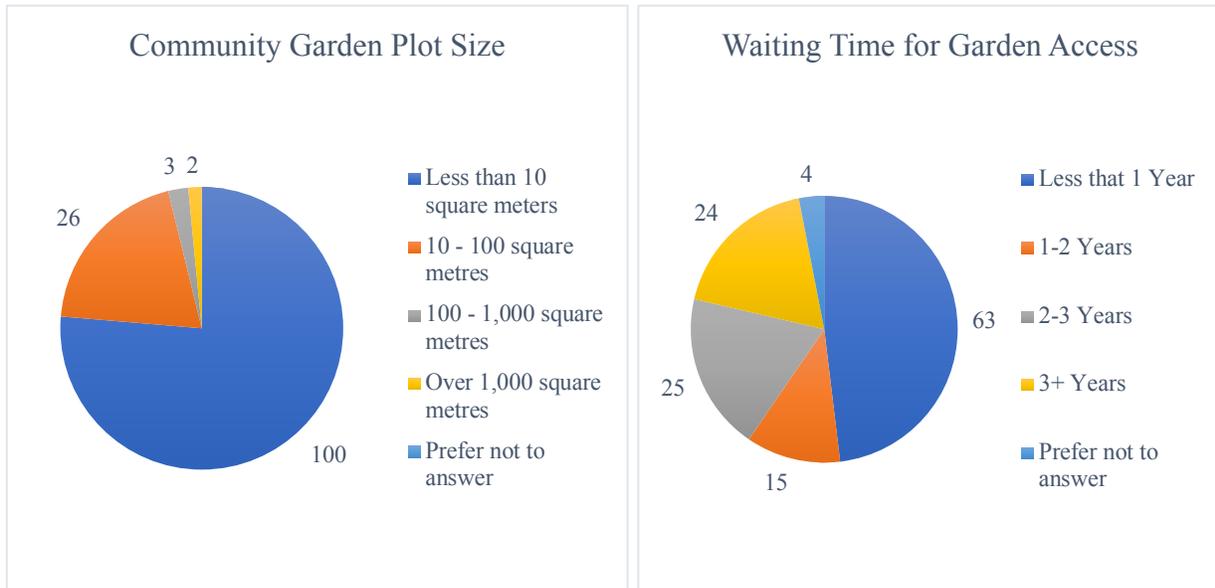


Figure 4.7: Total Access of Land Capacity. Figure 4.8: Waiting times for Garden Access

Access to land capacity can be observed in the waiting times indicated by individuals before having access to garden plots (Figure 4.8). Providing an unexpected and skewed response rate, 63 individuals indicate having waited less than a year for access with the next most common responses indicating a waiting time of two to three years ($n = 25$) and three plus years ($n = 24$). By comparison, the interim waiting time of one to two years only received a response rate of $n = 15$. Because of this skewed response rate, waiting times for land access are identified as requiring qualitative investigation.

4.2.2.2 Water Capacity Results

Results illustrate both positive and negative indications of water access (e.g., ease of water access, water access provided via unsustainable sources) and highlight concerns over water capacity within Vancouver. Community garden members largely indicate a positive experience with water access (Figure 4.10). Despite these positive indications, results also indicate the water source being supplied from city water mains (Figure 4.9).

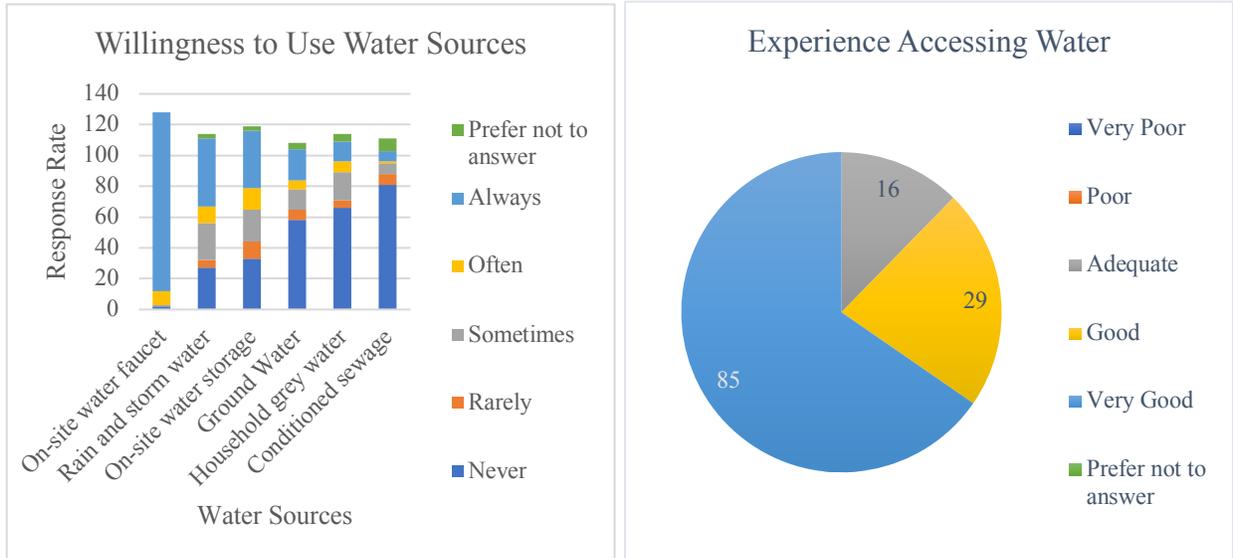


Figure 4.9: Willingness to use Water Sources Figure 4.10: Experiences with Water Access

Figure 4.9 indicates individuals' willingness to access various water sources, rated by desirability on a Likert scale out of five. Consistently, as sustainability of source water increases, the willingness of use by individuals decreases. Conditioned sewage, household grey water and ground water are considered the most sustainable water sources in academic literature but indicate the least desirable sources among individual use. All three of these options rate an aggregate willingness of 2.4 or less out of five on a Likert scale, with 53.7% of responses unwilling to use groundwater (one out of five on a Likert scale), 57.9% of responses unwilling to use grey water, and 73.0% of responses unwilling to use conditioned sewage.

While the source of water represents issues of unsustainability, the experience with water use indicated in Figure 4.10 shows positive results with accessing water. The data indicated here represents this result in two different ways. The first of these representations is that no response indicates an experience with water access being less than a three out of five on the Likert scale. The second of these indications is that 65.4% of responses indicate their experience with accessing water being five out of five on the Likert scale, with the overall average experience with water access scoring 4.5 out of five.

4.2.2.3 Knowledge Capacity Results

Quantitative research used questions focused on where individuals find knowledge and their expertise with agricultural practices to evaluate the technical knowledge capacity found in community gardens in Vancouver. Because of limited academic understanding on the topic of knowledge capacity, the results captured in the survey do not provide the desired indication of knowledge levels. Using a series of questions related to where individuals obtain their knowledge and their proficiency with agricultural practices however, the results gathered do provide data on the topic of knowledge. These results indicate that the most popular source for finding new knowledge is through internet sources (Table 4.10). Results also indicate that the agricultural practices with the least among of technical expertise, rated by an average Likert score of 3.0 or less, are water management, preparing compost, identification and management of pests, and the management of fruit plants (Table 4.11).

	Min	Max	Mean	Std Dev.	Var.	Total
I use Google to find knowledge	1	5	3.83	0.84	0.7	131
I use community organizations that distribute information	1	5	2.4	1.12	1.25	129
I attend workshops led by professionals	1	5	2.3	1	1.01	128
I use government websites focused on agriculture	1	5	2.2	1.01	1.01	129
I use social media (i.e., <i>Facebook, Twitter, Instagram, etc.</i>)	1	5	2.08	1.22	1.48	129
I speak with professionals at Farmers' Markets	1	5	1.89	0.92	0.85	127

Table 4.11: Where Knowledge is Commonly Found

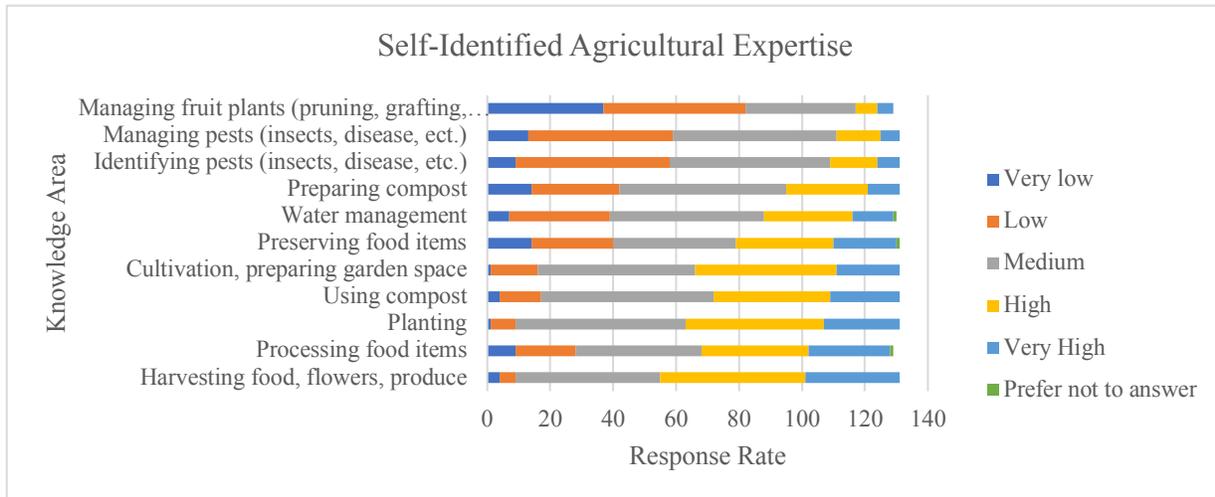


Figure 4.12: Self-Identified Levels of Agricultural Expertise

4.2.3 Results of Food Systems Planning

The final section of quantitative results provides data on food systems planning in Vancouver. Including aspects of production and distribution, the data reported here is divided into two subsections focusing on these features.

4.2.3.1 Food Systems Planning Production

The most common types of production identified in Vancouver are vegetables, herbs and spices, and the production of flowers (Figure 4.13). A minor level of fruit production is also observed, with responses on this type divided into three roughly equal categories indicating uses of i) never ($n = 42$), ii) rarely ($n = 36$), and iii) always ($n = 33$). In addition, the means of production indicate ideological alignment with organic methods and minimal pest control (Figure 4.14). This is convergent with data indicating reasons of use (Table 4.15) where 92 of 128 responses indicate a four or higher response out of five when identifying environmental sustainability as a reason for using UA.

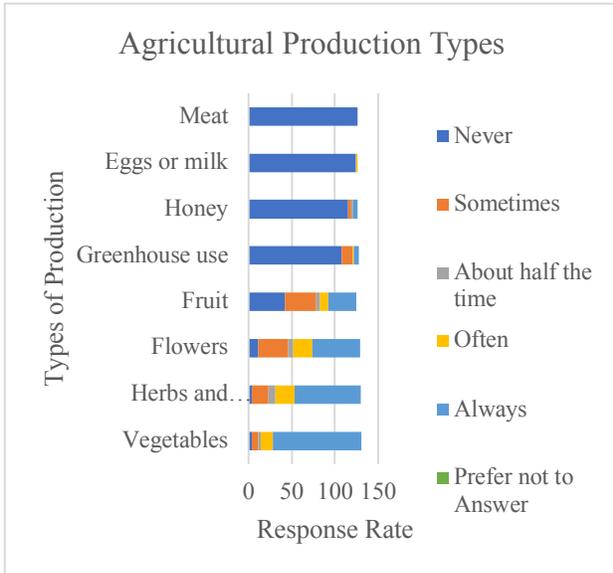


Figure 4.13: Types of Produce Grown

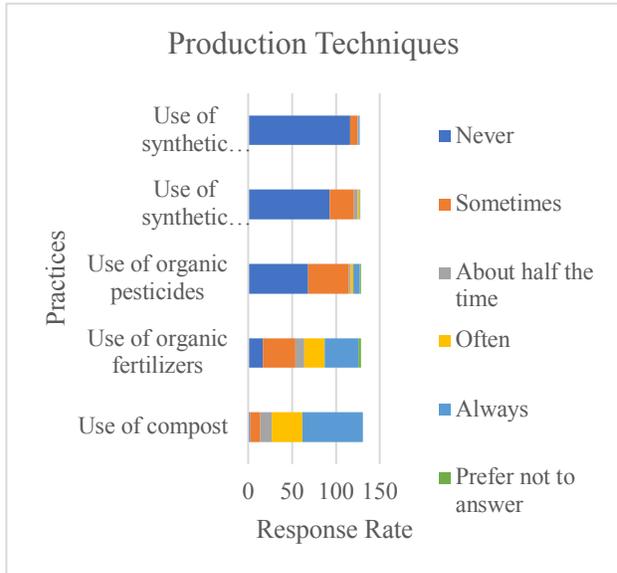


Figure 4.14: Agricultural Practices

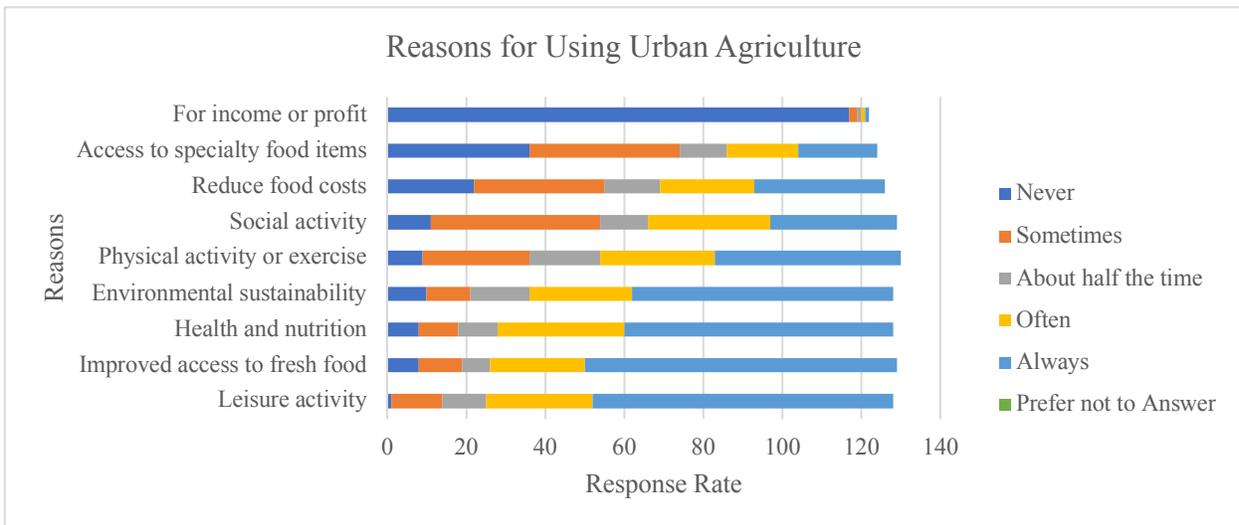


Figure 4.15: Personally Identified Reasons for Use of Urban Agriculture

4.2.3.2 Food Systems Planning Distribution

All produce grown is used primarily within personal households and only sometimes extends to include close social contacts (Figure 4.16). There is no indication that economic sales are occurring with 85.5% of responses indicating that sale of produce does not apply to them

(Figure 4.17) and this is consistent with indications made in Figure 4.15 which show that 95.9% of participants never use UA to generate profit.

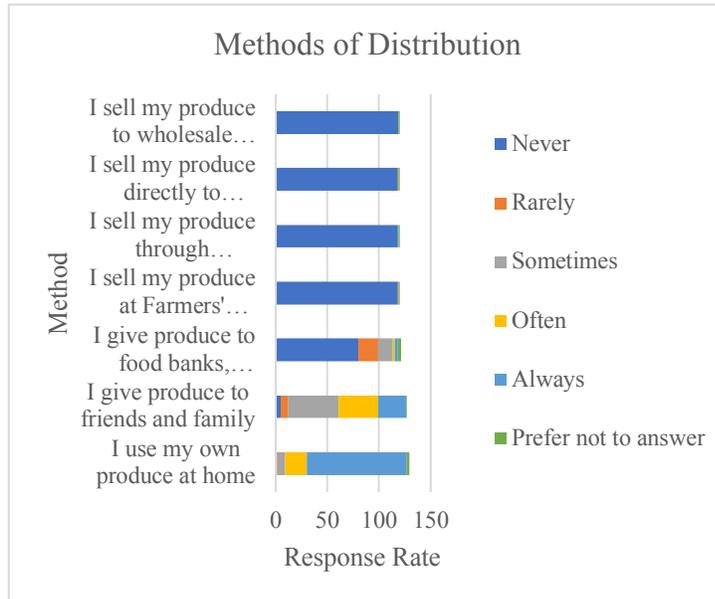


Figure 4.16: Produce Distribution Methods

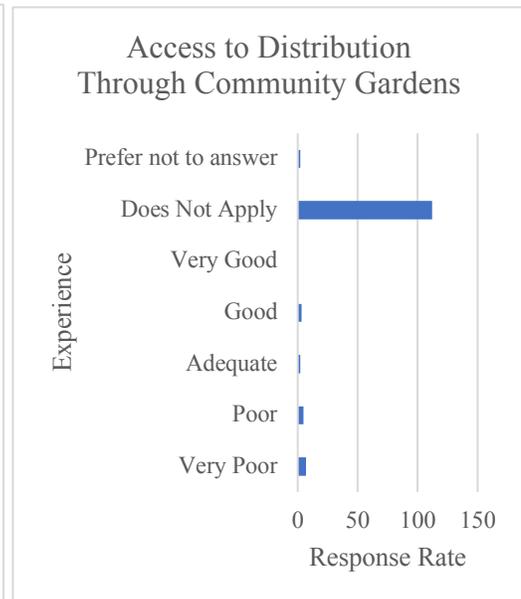


Figure 4.17: Access to Distribution

4.3 Semi-structured interview results

The following section presents the results of qualitative interviews. Developed as an inquiry capturing conditions and lived experiences among community garden participants (10 interviews), the results of qualitative interviews provide context and added detail to the results captured in the quantitative survey (section 4.1). The details of qualitative interview results are presented in three breakout sections: i) social justice, ii) agricultural capacity, and iii) food systems. These sections represent the larger themes being explored by research during interviews. These themes and the emergent sub-themes identified within them are presented below.

4.3.1 Results of Social Justice

In an effort to add additional detail to the quantitative data on social justice ascertained from the quantitative survey (Appendix D, p. 112), interview participants were asked to share their

personal experiences with the participation of minority groups (i.e., visible minorities and marginalized populations). The following quote provides a strong indication of the visible minority participation as similarly reported by six of ten sources:

“What I can tell you about the ethnic composition of our community garden, our community is, yeah it’s- it’s white dominated. Uh, you know we’re in Marpole, so I think actually the dominate population is actually ethnic Chinese here, and we do have some folks I think that would identify that way um as part of the garden, but yeah, not- they’re not the majority. Definitely our community garden does not reflect the diversity of- of the neighbourhood.” (Interview 3, Lines 109 – 116)

In addition to this quote, another source provides details indicating a skewed perspective of who represents a visible minority. When asked to describe the participation by visible minority groups, this source provided the following statement:

“Um but I-I feel that ethnic minorities in the city of Vancouver are really um the backbone of-of-of backyard gardening we have a lot of um Italian and-and-and Chinese elders who-who share their knowledge.” (Interview 1, Lines 98 – 100)

Of all ten interviews conducted, only a one interview provided any descriptive detail on visible minority participation in their community garden, which is indicated in the following account:

“We have quite a mixed group of people, we have Filipino, and a lot of Asian people, and black, yeah, I think we more or less represent the make-up of our community, which is kind of a mixed community. Not as much as it could be, but it is.” (Interview 6, Line 134 – 136)

4.3.1.1 Lack of participation among Physical Minorities

In addition to lack of participation among visible minority groups, an equally strong lack of participation among physically disabled groups was noted. Plots for individuals with mobility issues are identified in eight interviews, with six interviews describing that these plots often sit unused. A very telling quote that captured this issue can be observed in the following remark:

“We were required to have raised beds, like quite- like 3-foot high, you know rectangular beds uh for disabled people and we were also involved with the school, the school uh there’s an elementary school right next door, so we put in 6- no, oh there was, there was uh no there were 2 raised beds in the original garden and then there’s 6 more in the new part, and we have had great trouble getting people to use- use those beds.” (Interview 6, Lines 121 – 126)

Even in interviews with individuals who identify a physical disability (n = 2), the description of garden members using UA conforms to quantitative and qualitative indications of a white and mobile demographic of use:

“I’m just trying to picture who I meet during our- our you know cleaning parties and our volunteer parties, and- and honestly um you know the demographic is usually um young white families or older- older white families to be frank. In the downtown core. There’s not a lot of people of colour, there’s not a lot of peoples with disabilities that I see, um yeah (laugh).” (Interview 5, Lines 172 – 188)

In the only interview where accessible plots show moderate success, this success appears as the result of efforts by community garden organization, which is described in the following statement:

I’ve found 1 lady well I found another family that was indigenous, multi-generation, grandma, parents and children um and the children, one of them was disabled in- in a wheelchair, so it was a raised bed so it was ideal, but they left because it was too much theft, and too much controversy, and stuff like that from their beds, um so I’ve assigned it, one to an indigenous senior who was depressed and wasn’t going out of her house, and so now she’s got a bed. And she’s loving it because she gets out and socializes more and it’s-it’s really raised her her uh her mental health. (Interview 5, Lines 308 – 315)

A more common response related to this issue identified in five interviews however, shows that this level of effort and community engagement is not equally shared:

“We actually had 6 raised planters set aside for people with disabilities, wheelchairs, etc. who people who can’t bend, and um, until I came on the board those sat vacant because nobody-nobody wanted them. So when I came on board I said can’t we (laugh) since we we we could use the funds from the rentals, can’t we rent them out until somebody wants them, and we said yes, so they’ve been rented out to regular gardens, but still nobody has contacted me in the past year saying they need a raised plot.” (Interview 3, Lines 52 – 58)

4.3.2 Results of Agricultural Capacity

The following section provides qualitative results on the development of agricultural capacity. Divided into subsections of i) land capacity, ii) water capacity, and iii) knowledge capacity, this section provides data on the real-world experiences and personal backgrounds with access to, and use of, agricultural capacity as described by individual participants.

4.3.2.1 Agricultural Land Capacity

Agricultural land capacity was described by all interviewees as being minimal in size. This assessment was connected with the ability to share and distribute produce, in which five of ten interviews identify that their plot capacity is too small to allow for any substantial method of distribution beyond personal use. One participant provides their opinion on this land capacity feature below:

“Uh, I don’t sell it. Um we have such small plots, and if you asked me for the size I wouldn’t be able to tell you. I could only tell you how much I pay per year, but yeah, I-I don’t sell it, I don’t know anyone else in the garden that sells it, or at least they don’t advise me that they do.” (Interview 4, Lines 152 – 155)

The specific size of plots is more accurately indicated in the details provided by four sources of data. Of these sources, the best description of common plot dimensions is provided in the following quote:

“Our plots are very small, like some- I actually have one of the largest plots which is about I don’t know about 6 feet or 8 feet along the sidewalk and then it’s 14 feet back, and I think that is the largest one in the garden. Other people have like 4 foot squares.” (Interview 6, Lines 179 – 183)

With the dimensions of another plot being described in connection with this second smaller size:

“After being on a very long waiting list, like a five-year waiting list, I finally got a small garden plot at um the Mole Hill Community Garden and um I have a small plot, it’s about four feet by about six feet, and I’ve been gardening there for about 10 years.” (Interview 7, Lines 45 – 47)

4.3.2.1.1 Waiting Times to Access Land Capacity

In addition to plot sizes, the availability of plots and the waiting times to access garden plots is described throughout interviews. Addressed by six participants, the waiting lists for garden access is noted to be in excess of three years, which is best described by the following quote:

“Oh, well gee, I can answer this several ways. Um. I think the waiting list is probably around 300 people, and we’re finding that it can be 3 or 4 years before somebody gets assigned a plot.” (Interview 7, Lines 96 – 98)

In addition to these three-plus year waiting times, data was also provided on the reasons why waiting times of a year or less have been experienced by individuals. Three common reasons are provided, of which joining community gardens during the ground-breaking year of operation is the most common reason (n = 6) and access to private backyard space also commonly mentioned (n = 3). In addition to these reasons, two sources indicate accessing community gardens in less than one year despite the existence of waiting lists. This situation is described best in the following statement:

“I went to, I knew um the- there was a couple that use to be um there was a couple that-that used to be, I guess they were the whatever, not the president, anyway, the person that kind of runs it, and um I ran into them over there one night and I said um and I said, ‘I don’t know how to get on the list for this.’ So actually, it’s probably, a year’s not- not accurate in terms of- I actually had been kind of going online trying to figure out how to go on a list for this garden for a while, like maybe at least a year, um and I couldn’t figure it out. I just could not find anything that was online, and then I ran into- to them over there and I said, ‘How does this work?’ So they sent me a link.” (Interview 9, Lines 121 – 129)

4.3.2.2 Qualitative Results for Water Capacity

Water capacity is reported among academic sources as representing a barrier in the development of UA. This is indicated as both a lack of access to water access by individuals using UA and a lack of sustainable water sourcing when water is available. In relation to these details, the access to water in Vancouver is described as a positive experience but indicates strong degrees of unsustainability. The best description of this situation can be found in the following:

“The reality is I look at the area, and you know there’s a hose probably every like every 30 feet and you can get- all the gardens have access to a hose of some sort and uh you just turn it on and you’ve got water and I mean, I’ve definitely seen- I’ve definitely seen some folks in my area come and just fill jugs of water to take home. Now I don’t know what they’re using them for but you know it’s just like wup that’s- there you go. Absolutely unsustainable.” (Interview 5, Lines 266 – 271)

While this attitude of unsustainability can be heard in an additional three interviews, there is a lack of understanding that use of city drinking water is a potential sustainability problem. This attitude ranges from two participants who indicate not having enough knowledge to comment on sustainability, to four participants who disbelieve an issue of sustainability exists. These attitudes can be found in the following quotes:

“I guess I have questions it’s something I haven’t studied, so I have questions about if we wanted to gather the rain off the roof of this facility that we’re at... what are the... is it OK if there’s stuff off the roof being watered onto our crops... I-I guess I don’t know I’d have to look into that.” (Interview 3, Lines 239 – 242)

“Of course the definition of sustainable is- is always questionable. You have to, you know, build the infrastructure to- for a system. It takes tanks and tubes and plastic and uh, and maintenance and security and quite a few other things, so uh- Gray-water would be great, or uh, but we get so much water in Vancouver that uh we probably use a lot less of the tap than a lot of other jurisdictions do to uh go through to go to water on their sites.” (Interview 11, Lines 209, 213 – 217)

While rainwater is the cited counter argument to the claims that access from water mains is unsustainable, only three interview sources can identify water catchment existing in their gardens, with no participants providing examples of water harvesting.

4.3.2.3 Qualitative Results for Knowledge Capacity

The familiarity, awareness and personal experience with technical agricultural practices represents the knowledge capacity of UA. In Vancouver this knowledge can be described as existing at an amateur level of capacity, having been developed out of community connections and personal experiences. Described in all interviews as a leisure activity (n = 10), only one source identifies this leisurely knowledge as representing an amateur level of knowledge capacity:

“Well, I always feel, I always question my ability and-and I feel like I’m not a real gardener I just dabble in it more or less.” (Interview 4, Lines 65 – 66)

More commonly, there is an attitude of willful stubbornness towards the development of technical agricultural knowledge, with nine participants reporting that they required no additional instruction:

“I feel again that it’s um it’s a very- urban gardening is kind it’s-it’s-it’s self-sustainability, and I think to, to a certain extent people need to do it on their own, more than have. You know the city can do a lot of things to encourage it and make it easier without you know without totally taking by the hand and providing that knowledge directly firsthand.” (Interview 1, Lines 261 – 265)

In connection with this attitude, there is also a personal belief exhibited in these nine interviews that indicates an idea that they learn nothing new from participation in continuous learning:

“Because I- because I have gardened all my life um and I do get uh I get Stokes seed catalogues and West Coast Seed catalogs and Garden Works stuff, and then all the emails and that sort of thing. I don’t always look at them because I’m not- I’m not usually learning anything new.” (Interview 6, Lines 262 – 265)

Despite this common belief however, only a single participant can describe having an educational background with agriculture. Even in this instance however, there is a disconnect between the agricultural education received and the technical knowledge capacity that education provides:

“I came back to do a Masters degree in Agricultural Economics and um sort of had a desire to balance that with um I guess development of my own ability to grow food, and just an interest in urban agriculture.” (Interview 3, Lines 27 – 29)

While nine interviews indicate a personal belief in their own agricultural proficiency, six of these sources provide data that describes their fellow garden members as lacking technical knowledge, such as the quote given here:

“We have a woman growing kiwis, or at least kiwi plants. She doesn’t seem to know how to take care of them, so she hasn’t actually gotten any kiwis in 10 years (laugh) um because you need to prune them correctly and, uh she doesn’t know how to do that, and she’s not willing to listen to others. We all have a right to tend our garden how we choose, even if it’s uh inefficiently.” Interview 10, Lines 127 – 131)

Interestingly, these descriptions identifying a lack of technical proficiency among other gardeners mirrors the attitudes presented by the nine individuals claiming to have adequate knowledge capacity.

4.3.2.3.1 Amateur Knowledge and Garden Composting

The best indication of an amateur capacity in Vancouver's community gardens can be observed in connection with the success of composting. This data provides good indication because food waste cycling requires technical knowledge, and the use of onsite compost is described by seven participants. Despite indications as the primary source of soil nutrient used in community gardens, management of compost is described in frustration by six sources. Described as suffering from a uniform level of knowledge capacity and willingness to learn, this problem can be observed in the following two quotes:

“Um, we do have a compost heap, and it's kinda frustrating because- of course the compost heap has rules. Somehow, you're supposed to leave your clippings and stuff, so nothing greater than 2 inches and no weeds and no um food scraps, because if we put food scraps in there then we attract the skunks and the raccoons, and the rats.” (Interview 4, Lines 170 – 173)

*“Our experience in the garden is, oh it's, *sigh* goodness I hate to even tell you this, it's-it's not worked all that well. And we're just in the process of redoing compost bins because they were wooden and they're broken down. But it has been in all years at the garden, uh, it- despite all the signage and contracts people sign and everything else, it's very hard to get gardeners to put things in chopped up.” (Interview 6, Lines 219 – 223)*

In only one interview is the use of compost described as successful, and this success is ascribed to the dedication of one individual who can be considered a self-made expert:

“Um, we, we have some pretty long-time hardcore gardeners in there (Laugh), so um you know we have this one gentleman who was just obsessed with compost and uh so he was really good at teaching people what he knew. So, um you know we don't put weeds in [the compost bins], like you know, we get a lot of goutweed, um we don't put the weeds in there. We put the weeds in the- in the city um green bins, um and uh we all take care of [the compost bins], you know we all turn it, we all

check it, and keep it going, so, and then um I know uh the society buys a load every year as well, so, yeah.” (Interview 7, Lines 174 – 180)

4.3.3 Food Systems Planning

Food systems planning, or the official municipal policies related to accessing the means of production and distribution, are described in the following section. Divided into two subsection handling details of i) production, and ii) distribution, the data presented in the following section provides details on qualitative experiences of individuals related to their ability to produce agricultural goods and their experience with distribution and sharing those goods.

4.3.3.1 Results of Food Systems Production

Production limitations are identified in qualitative data from Section 4.3.2.1 and Section 4.3.2.3, respectively describing land capacity and amateur knowledge as limiting production. In addition to these limitations, interview sources provide details indicating further limits on the production capacity of community gardens. Specifically, these additional limits relate to the use of horticulture and a lack of equity in accessing the means of production.

Horticulture is identified in five interviews as part of the common gardening habits in Vancouver, as can be identified in the following quote:

“I have a rectangular plot that’s sloped slightly upward, so I have it in 4 terraces, and along the left side I have uh flowers and bulbs and then at the back I have peonies and roses and stuff, and then in the other 3 or 4 tiers I have flowers and vegetables and that sort of thing.” (Interview 6, Lines 77 – 80)

Considering the limited plot sizes and plot availability however, community gardens may not be the best place for this type of gardening. As indicated below, other land capacity provides more suitable access for this production type:

I look after the traffic circle down at the corner of our block, and about maybe five years ago ah, five-six years ago, I got a plot in the community garden um about a block away so I could grow some more vegetables.... I just was kinda like, ‘Oh, they- the city planted up this traffic circle. They’re not watering it, it’s all dying. I

should probably like do something here.’ (Interview 9, Lines 61 – 63, Lines 78 – 80)

In addition to this potential misuse of land capacity, community gardens also report a general lack of equity occurring among the means of production. Examples of this can be found in both the access to garden plots and the access to garden activities (e.g., apiaries). Already observed from reports in section 4.2.2.1, a lack of uniform plot size within gardens can be observed. This lack of equitable land access is best noted in the use of accessible plots as physically disabled individuals are considered stakeholders of UA in Vancouver:

“[The plot we were given is] a raised bed for the wheelchair uses and it ended up working out perfectly for me because that’s exactly what I require, um we’re still on the wait list for a real plot- a bigger plot if it does- if something comes up... [U]ltimately what I would like to see is more just personally I think looking at the plots and what-not and I go ‘it’s great that there are raised beds for those with disabilities,’ but I think there could also be better- better layout to still allow me to access a larger plot...” (Interview 5, Lines 65 – 68, 93 – 96)

In addition to this, an additional lack of equity can also be observed with the access to apiaries and the production of honey. While beekeeping is not uncommon, all ten participants describe the keeping of solitary bee varieties which do not produce honey:

“We have um Mason Bees, which are- are-are you probably know they don’t produce honey, um but they still do pollination and stuff.” (Interview 7, Lines 117 – 119)

When it comes to beekeeping for honey however, barriers towards equitable use are described by four different sources, which can be observed in the following two quotes:

“When it comes to bees, uh people are (laugh) people are in another world. They get a little hyper vigilant about uh the honey they’re connected to. As you may know, there’s like- they’ll start to hoard the honey, they don’t let others in on the process, they uh yeah, it seems like it’s- it’s gold to a lot of beekeepers, and they uh shut out other members of the community from either participating in the community hives, or uh extraction of honey, or tending to the bees.” (Interview 10, Lines 160 – 165)

I have a question about how we're kind of structured to do the beekeeping, uh so far you have to be a member of the garden to be part of the beekeepers, and I think we might have more interest if- in the whole thing, if we do kind of- kind of a Beekeepers Club, or something like that, uh where people didn't have to belong to the garden... Because what I've seen happen too is that the people that are uh kinda looking after the bees are not tending their garden (laugh) another reason why I'd separate the two. (Interview 7, Lines 158 – 162, Lines 164 – 166)

4.3.3.2 Results for Food Systems Distribution

As described in connection to the limited land capacity in Section 4.2.2.1 no economic distribution appears to occur from community gardens. Instead, the types of distribution that do exist are either personal in nature, or shared among close personal connections:

“Well, I mostly use it myself, um but this woman from the Philippines and I do share things, sometimes we share uh bedding plants, like tomatoes and stuff, cabbage and stuff like that, um and she shares her rhubarb with me and I share you know some other things with her, um there's not, I'm-I'm not doing so much sharing it because it's such a small plot.” (Interview 7, Lines 170 – 173)

While two sources indicate an exception to this, both of these sources represent community gardens with a community and social justice focus as opposed to being gardens with individual plots. As a result, while wider scale distribution can be observed in the following quote, these sources do not represent common garden conditions.

“I share with my family, uh our volunteers obviously get the produce that they've helped to grow, umm, and yeah, I'd say there's trading I've seen going on with the community garden group. Um and then yeah like we have apple orchards, and- and there's um, um modular housing that went in just adjacent to our farms, so we've given them buckets of apples, we're trying to establish a more permanent relationship where they become like a subsidized CSA member and use this produce that we give to them each week, so yeah, we're in the developing of working to provide that.” (Interview 3, Lines 141 – 147)

The only conditions where wider distribution appears to occur from community gardens comes as a result of garden theft. This is indicated by five participants, of which three identify theft in the downtown core as a significant problem. While this illegitimate access is generally

despised by all garden members, it represents the only example of equitable distribution occurring from community gardens presently:

*“[W]e have a homeless population we- we need to deal with our homeless and our mental health because *clear throat* you know where- where my garden is located, we’re close to a-a-a few um rehab centres and whatnot and um I’m fine with the neighbourhood, but the reality is that if those folks are homeless and hungry, and there’s food right there for them, they’re taking it. I get that. I understand that. Mmm the majority of our gardeners in that area get that, and so really there’s bigger issues to be solved before we uh decide, hey this is- you know, we have an economy to grow.” (Interview 5, Lines 233 – 239)*

4.4 Conclusions

While UA is promoted as a method of social equity and food access among vulnerable populations, research indicates this objective is not being widely achieved. While participants do indicate the use of UA as a means of food security, the wider lack of participation by vulnerable groups reveals that minimal social justice is being created. Considering this indication, the results presented throughout Chapter 4 reflect many of the failures observed academically in Chapter 2. Gathering data via quantitative survey and qualitative interview, a wide range of individual participation and involvement is represented in these results. This includes individuals of economic disadvantage, physical disability, visible minority, and community garden organizational members. Considering the scope of this participation, a saturation of data in themes of social justice, agricultural capacity and food systems planning can be observed in these results. The following chapter thus identifies sub-themes related to provisions of social justice via UA while also exploring the success of using performance measurements to investigate the developments of UA.

Chapter Five: Discussion

5.0 Introduction

The following chapter presents the discussion on the measurements of UA in Vancouver. The chapter is presented in three sections. Section One examines demographic measurements and the performance of social justice being created by UA in Vancouver. Additionally, this section includes investigations on the social benefits created among vulnerable groups and where these benefits exist. Section Two presents the measurements of agricultural capacity in Vancouver, including the access to land, water, and knowledge which are identified as the means of agricultural production. Section Three builds on these first two sections to give an overview of food systems planning in Vancouver and the indications that can be observed. While measurements used by research to capture indications of UA performance, such as demographic and land capacity results, exhibit high degrees of accuracy, improvements to the measurements of water and knowledge capacity can be identified as a necessary.

5.1 Social Justice

Developing social justice is a fundamental objective of food systems planning and represents a significant contributing factor in the development of UA (Pearson, L., et al., 2010; Hendrickson, M., Porth, M., 2012; Tornaghi, C., 2014; Vitiello, D., Brinkley, C., 2014a; Morgan, K., 2015; Opitz, I., et al., 2016; Horst, M., et al., 2017). Focusing on growing issues of food insecurity in urban centres, the primary stakeholders of UA are vulnerable and marginalized urban populations (Tornaghi, C., 2014; Badami, M., Ramankutty, N., 2015; Opitz, I., et al., 2016; Horst, M., et al., 2017). Thus, capturing demographic data assists in identifying who is benefitting from the development of UA. The results from this research highlight the development of social justice in Vancouver and indicates a very poor performance based on dominate participation of white middle and upper-middle class individuals. While minimal participation by marginalized

populations can be observed, the details revealed in this research show that without direct participation of vulnerable groups, little social justice is created by UA.

Reflecting the reports made by academic research that indicate vulnerable groups can fail to benefit from UA development (Tornaghi, C., 2014; Brinkley, C., 2017; Horst, M., et al., 2017), research results triangulate these conditions as existing Vancouver. This is observed in the poor participation among individuals of visible minority, physically disabled, and economically disadvantaged background is observed from mixed methods results. The results from research corroborate these academic findings which report that private non-profit organizations can fail to connect with target vulnerable audiences (Tornaghi, C., 2014; Horst, C., 2017). While private non-profit organization in Vancouver do not actively exclude vulnerable populations, community gardens organized by community members at large appear to lack the resources for creating effective social outreach.

The following discussion on social justice is thus divided into two subsections. The first subsection distinguishes the demographic use of UA and identifies where convergence and accuracy of measurements can be observed. This data provides strong evidence that vulnerable populations are not benefitting for UA development, and adds to academic findings that show private non-profit organizations as a poor administrative choice in creating social justice (Tornaghi, C., 2014; Opitz, I., et al., 2016; Horst, M., et al., 2017). The second subsection discusses broader social benefits created by UA and the conditional needs of these benefits to provide social justice. This includes where benefits are being realized for vulnerable populations in the development of UA, and how social justice can be understood when middle and upper-middle class participation dominates UA use.

5.1.1 Demographics

At its core, UA is promoted as a means of creating social justice among vulnerable communities (Pearson, L., et al., 2010; Hendrickson, M., Porth, M., 2012; Tornaghi, C., 2014; Morgan, K., 2015; Horst, M., et al., 2017). Frequently emphasized for developing food equity and security among vulnerable populations, UA has not been shown to meet this objective in academic research (Tornaghi, C., 2014; Brinkley, C., 2017; Horst, M., et al., 2017), and this finding is triangulated by the research data captured in this study. While participation by food insecure groups does occur in Vancouver, this participation level is minimal. Rather, food secure white populations represent approximately 75% of UA participation in Vancouver (Table 4.3), which reflects the findings of Catherine Brinkley (2017). Furthermore, the participation by vulnerable populations is identified as negligible by seven qualitative sources, who described participants as being white non-disabled individuals.

In addition to a lack of visible minority participation, qualitative research also reveals a strong lack of physically disabled participation occurring in Vancouver's community gardens. This detail is identified with frustration among qualitative sources because the *Vancouver Food Strategy* (2013) and *Accessible Community Garden Guidelines* (2011) emphasize the development of accessible garden plots in community gardens. As no qualitative sources describe successful examples of access by physically disabled individuals however, an emergent subtheme among interview participants is that these accessible plots represent a waste of useful space. In all interviews but one, accessible garden plots are reported to sit vacant and un-used by physically disabled individuals. Even in interviews with individuals identifying physical disability (n = 2), the predominant user group is described as white older non-disabled individuals, which conforms with quantitative demographic results. In only one interview are accessible plots described as being filled with some degree of success by their intended audience. This success comes at the cost of

considerable effort on the part of garden organization. Furthermore, this effort is not shared among all garden organizations, with a more minimalistic attitude of outreach being observed in seven sources.

Supporting the evidence that vulnerable groups are not benefitting from UA, quantitative results from this study reflecting the reasons for use of UA provide corroborative details. Shown in Figure 4.14, the lowest ranked reasons for use of UA are the features academically associated with UA by vulnerable populations. The production of culturally appropriate food items is identified with visible minority and immigrant participation (Campbell, M., 2004; Tornaghi, C., 2014; Horst, M., et al., 2017), and use of UA to generate profit and economic food security is identified among marginalized populations (Lovell, S., 2010; Badami, M., Ramankutty, N., 2015; Opitz, I., et al., 2016; Horst, M., et al., 2017). As these features indicate Likert scores of less than three out of five, these features represent minor reasons for use by research participants. The use of UA to reduce food costs joins these lowest ranking features, with all three of these reasons providing the highest response rates of never (one of five), and the lowest responses for always (five of five).

Despite the participation among vulnerable groups being low, minimal levels of participation can be observed. Vulnerable groups, earning less than \$49,999 annually, make up approximately one in five individuals, and more likely represent 25% of participation (Figure 4.1). All these participants represent vulnerable populations of an ethnically white background. While improved food security for marginalized populations can therefore be observed (Figure 4.3), these benefits are not equitably distributed throughout the visible minority demographics of Vancouver. As Vancouver's urban demographics indicate 299,200 of 618,210 individuals who are of a white ethnicity (48.4%) (Census Canada, 2016), the 88% of community garden participation

representing ethnically white individuals (Figure 4.3) shows an overrepresentation of use, and indicates potential barriers existing towards access.

Results also indicate that certain garden organizations perform social justice better than others. While not a fault of any particular organization or indication of an exclusionist attitude, this feature appears to be an unintended consequence of garden organization policy. The *Operational Guidelines for Community Gardens on City Land Other Than City Parks* (Vancouver, n.d.) states that community gardens are to operate as private non-profit organizations, independent from the City of Vancouver. This use of non-profit organization therefore conforms with academic reports which indicate non-profit organization preference by municipal government (Tornaghi, C., 2014; Horst, M., et al., 2017). When these garden organizations are structured around or within larger social organizations like affordable housing or interconnected communities, they show better success at connecting UA with vulnerable populations. When these garden organizations are comprised of neighbourhood members from the general population with no overarching social objectives however, social justice performance appears to decrease. This data likewise also conforms with indications that private non-profit organizations can fail to create social justice (Tornaghi, C., 2014; Opitz, I., et al., 2016; Horst, M., et al., 2017).

While additional data could better indicate the extent of this organizational lack of social justice development, the potential for its existence can be found in the quantitative data representing garden outreach. Figure 4.4 denotes the primary method of outreach currently exist through word-of-mouth advertisement, indicated by 66.7% of responses. The next most common method of outreach is identified as online resources indicated by 31.4% of garden participants and use of posters indicated by 12.4% of responses. No other forms of outreach provide significant indications of use. Using qualitative data to triangulate these results, three participants describe the

online sign-up process as a difficult, with seven interviews indicating having had to sign-up to their community garden in person.

Considering the predominate demographics of use and minimal outreach methods thus being indicated, it can be hypothesized that poor social justice performance in UA is potentially caused by the private non-profit organization structure of community gardens. When these garden organizations are operated by the general public, they appear to lack the ability to perform outreach with visible minority and vulnerable populations. As a result, the white middle and upper-middle classes using UA only are only successfully connecting with like middle and upper-middle class individuals. Therefore, the poor performance of social justice being show in these measurements suggest that outreach is a cause in the lack of social justice being created. If an improved outreach capacity was available to garden organizations, it is theorized by research that the performance of social justice should show improvements.

Continuing the investigation of social justice development, the following section will address the social benefits associated with UA. Identifying what benefits do and do not exist for vulnerable groups, the conditions of how these benefits are created and who they benefit currently are investigated.

5.1.2 Social Benefits

Many benefits are theoretically attached to UA (e.g., improved food access, improved food security, reduced food costs, health and nutrition, economic development), but many of these benefits are left with little academic detail provided on how they are created (Campbell, M., 2004; Lovell, S., 2010; Pearson, L., et al., 2010; Morgan, K., 2015; Horst, M., et al., 2017). While all these benefits have connection to UA, Vancouver provides a strong case study because it necessitates research into if and how these benefits exist when vulnerable populations do not

participate in UA. Based on the research results captured, the social benefits of physical health, nutrition, reduced food costs, and economic development only create social justice when food insecure groups are involved with UA. Other benefits however (e.g., access to fresh food, improved mental health, increased social interconnection) are created more equitably regardless of participation.

Benefits like physical health, leisure and recreation, improved nutrition, physical exercise, and reduction of food costs can be identified in this study as only benefitting the individuals using UA. While these benefits indicate strong uptake in Vancouver (Figure 4.14), the high participation rate among food secure groups creates little social justice from these benefits. If participation by vulnerable groups were to be increased however, the amount of social justice created from these benefits would also theoretically increase. This is because these benefits are of a highly personal nature and can be explained using the analogy of an observer. An observer gains no physical exercise from watching, does not have access to the full range of produce on the sidelines, and does not benefit from the cost savings or nutritional advantages provided by that full range of produce.

Despite the lack of these personal benefit, non-garden members do enjoy some benefit from community gardens in Vancouver. This is because of garden policy stating that community gardens must remain open to the public (*Parks Board Urban Agriculture Policy*, 2015, p.3). Among the benefits enjoyed by non-garden member are access to green space, access to fresh food, and an improved social and community development. Despite non-membership access being an unwanted feature among qualitative participants (n = 4) who cited it as a main cause of theft (n = 5), this access represents one of the few equitable benefits being created by UA in Vancouver.

Another commonly cited benefit created by community gardens is the enhanced neighbourhood interconnection and community development described by interviews (n = 10). Creating an improved knowledge of community both within and beyond garden membership, this benefit results from speaking with pedestrians, noticing common faces and routines, the sharing of produce, and the development of connections between disparate socio-economic groups. In addition, non-community garden members are also described as advantaging from this community development in that they are able to connect with community gardens and access the excess produce being grown by garden members.

As a result of this community development feature, food insecure groups without garden access are able to enjoy the benefit of access to fresh food as described by academic literature (Campbell, M., 2004; Lovell, S., 2010; Horst, M., et al., 2017; Tornaghi, C., 2014). This result is conditional however and has limits on where and how this access is created. While access to fresh food is possible for non-garden members, the identified benefits of health and nutrition are not. While many interview sources indicate some excess of produce they share, in most interview (n = 6) this produce is identified as leafy greens (i.e., lettuce). If non-garden members wish for a wider range of food access from gardens, this must be created through theft.

Despite these reports indicating mixed results at creating benefits for vulnerable groups, several features can be taken from these details to indicate best methods of community garden development. Namely, non-profit gardens with individual plots can be triangulated by research and academic literature (Tornaghi, C., 2014; Horst, M., et al., 2017) as not creating social justice. However, representing uncommon organizational garden types (Table 4.5), cooperative community gardens without individual plots show improved equity in developing social benefit as they do not limit access to garden members. Finally, corroborating academic indications on the

importance of proximity and social justice (Badami, M., Ramankutty, N., 2015; Opitz, I., et al., 2016), the largest success of these benefits are described as occurring when community gardens are located within marginalized neighbourhoods ($n = 5$) because of the improved access disadvantaged individuals have to these gardens.

5.2 Agricultural Capacity

Agricultural capacity is defined in academic literature as being the access to land capacity (Pearson, L.J., Pearson, L., Pearson, C.J., 2010; Hendrickson, M., Porth, M., 2012; Opitz, I., et al., 2016; Horst, M., et al., 2017), water capacity (Gentry, T., 2011; Hendrickson, M., Porth, M., 2012; Weidner, T., Yang, A., 2019), and agricultural knowledge (Morgan, K., 2015; Opitz, I., et al., 2016; Horst, M., et al., 2017; Nicholls, C., Alteiri, M., 2018). Capturing indications of this capacity is difficult however due to both a minimal understanding of UA capacity and multiple opinions on how such access should be created. Some academic sources would criticize the capacity in Vancouver as providing neither the quantities nor appropriate sources of these resources. Conversely, other sources would praise the capacity developed in Vancouver as significant, using the quantitative data on experiences and access to denote success. In further complication, the data collected in Vancouver indicates both positive and negative indications occurring simultaneously, reflecting overall mixed results as a consequence. Thus, this research has examined the indications captured and used them to develop where better indications and additional measurements could be made.

While the data used to indicate land and water capacity contain gaps, a good indication on development of these features can be observed. Despite an apparent lack of land capacity (Badami, M., Ramankutty, N., 2015), and common oversights on the sustainability of water access (Figure 4.9) (Hendrickson, M., Porth, M., 2012; Horst, M., et al., 2017; Weidner, T., Yang, A., 2019), the

performances indicated can be identified as positive. The performance measurements for knowledge capacity however can be identified as containing major flaws and this is due to barriers experienced by research. While corroborating academic indications on amateur knowledge levels (Morgan, Opitz, Horst), the results of knowledge capacity reveal the need for additional knowledge development to improve the understanding of UA knowledge capacity. Dividing the following section on capacity into subsections of land, water and knowledge capacity respectively, the following discussion explains how performance measurements were made, and where additional data would improve the indications provided by these measurements in the future.

5.2.1 Agricultural Land Capacity

Land capacity in Vancouver is nowhere near theoretical saturation for provisions of social justice, but the development of land capacity by the City of Vancouver has not been insignificant. The problem found in the triangulation of academic research and research results is that a *lot* of land capacity is required to develop food security and social justice. Considering the amount of land capacity development in Vancouver over the past decade however, good progress has been made in developing this capacity.

According to the research of Badami and Ramenkutty (2015), approximately 1.2% of the urban footprint in North America is required as land capacity if UA is to address food security for vulnerable populations. Following this logic, the following calculation represents the minimal

$$\text{Municipal Footprint} \times 1.2\% = \text{Minimum UA Land Capacity}$$

land capacity for UA to provide social justice in Vancouver. Vancouver, with a geographic area of 114.97 square kilometers (Statistics Canada, 2016), required 1.38 square kilometers of land capacity. Considering the standard community garden plot is reported by quantitative and qualitative results as being less than 10 square meters, with 5,059 plots existing, it can be reasoned

that Vancouver's land capacity is less than 0.05 square kilometers, or 0.04% of Vancouver's geographic footprint.

This may not appear impressive, but when compared against data from Montreal (Lovell, S., 2010), Vancouver has developed almost twice the land capacity. This is based on reports that Montreal has over 8,200 community garden plots. When split against the geographic footprint (365.65 square kilometers) and municipal population of Montreal (1.7 million) (Census Canada, 2016), Montreal has 22.4 plot per square kilometer, with 207.9 citizens per plot. By comparison, Vancouver's land capacity when similarly broken-down reveals 44.0 plots per square kilometer, with 124.8 citizens per plot. In making this type of comparison, Vancouver can be identified as outperforming Montreal in the development of land capacity.

Despite this more tangible and positive indication, research data identifies concern over Vancouver's ability to continue this land capacity development. In specific, three signs of stress can be observed in research which indicate that Vancouver has begun to exhaust its available supplies of land capacity. These signs include quantifications of limited short-term land capacity, reports identifying a lack of new capacity being developed, and data on the common waiting times as triangulated between quantities and qualitative results.

The first two of these signs of stress are closely interrelated and deal with Vancouver's goal of developing 5,000 community garden plots by 2020. While Vancouver reports having created 5,059 plots in February 2021 (Vancouver.ca), a minimum of 736 plots are scheduled for commercial development in the next 5 years. As a result, Vancouver has only created 4,323 long-term garden plots. Further complicating this issue, numerous sources (n = 4) indicate having encountered barriers now in place on further development of land capacity in Vancouver's public parks. Three of these sources report having lost, or will soon lose, land capacity due to

development, and claim that the Vancouver Parks Board will not relocate the capacity being lost. Providing additional indication of this land stress, 41.5% of quantitative responses indicate their community gardens exist in public parks (Table 4.5) which are academically identified often being withheld from agricultural development of community gardens (Lovell, S., 2010, Pearson, C., 2007; Morgan, K., 2015).

The third sign of stress is found in the convergent data on waiting times seen in results. Despite quantitative data showing waiting times as commonly being a year or less (Table 4.7), multiple qualitative reports (n = 7) provide details to refute this indication. These sources instead identify current waiting times in excess of three years. Exploring why quantitative results indicate a year or less waiting times, five sources describe having joined a garden in its ground-breaking year. Thus, applying this explanation to quantitative results, a very low turn-over rate can be observed among community garden members.

Together, all results captured on Land Capacity indicate that while Vancouver has made progress in land capacity development, additional land capacity is still required. The need for this capacity can be observed in the long waiting lists being described, the upcoming loss of 726 plots scheduled over the next 5 years. These results also indicate that Vancouver may be reaching the limits of land capacity available in public parks, concern over where to develop future capacity can be identified. Due to these indications, the need for a long-term strategic plan on land capacity development can be identified as necessary in Vancouver. In addition to these stresses and concerns, the following subsection on land capacity and social justice identifies further barriers of land capacity as experienced by vulnerable populations in the creation of community garden spaces.

5.2.1.1 Land Access and Social Justice

A lack of participation among vulnerable food-insecure groups can be observed in results on social justice performance, which is also reported in academic literature (Tornaghi, C., 2014; Horst, M., et al., 2017). Following this theme, research data provides three features that correlate with this lack of land access among marginalized populations. The first of these issues is found in the powers that private non-profit organizations have and the potential misuses of that power when deciding memberships. The second issue reveals that disadvantaged groups lack access to the tools for developing community gardens. The final issue identifies where a lack of unilateral organization between private non-profits is causing limits on the land capacity available to the wider population of Vancouver.

Identified in academic literature, private non-profit organization can be observed as not necessarily creating social justice (Campbell, M., 2004; Lovell, S., 2010; Horst, M., et al., 2017). A potential reason for this, indicated in two interviews, is that community garden organizations have a large degree of power over the management of garden membership. Both of these sources describe having been able to bypass community garden waiting lists and gain immediate access to a garden plot by having a social connection with an executive board member of their community garden. Considering this detail, community garden organization can be observed as having the ability to pick and choose memberships for available plots at will. As a result, questions related to the insular demographics of community gardens as caused by a potential abuse of power must be considered as a possibility.

Accessing the organizations, tools and resources to organize community gardens can also be identified as a barriers faced immigrant populations. With two interview sources describing this feature existing among individuals trying to develop community gardens, and an additional two

sources of correspondence providing a third example of this barrier, the data provided from these resources show that minority groups can be blocked both by language proficiency and awareness of the resources available to develop community gardens. Considering the overall lack of visible minorities and disadvantaged participation, this barrier represent another plausible explanation on the lack of social justice being observed in private non-profit garden organization (Horst, M., et al., 2017, Tornaghi, C., 2014).

The final social justice issue related to land capacity is based on indications of 66.7% of participation occupy a no fewer than two garden plots. Identified as a convergent issue from both quantitative and qualitative data, the small plot sizes and lack of long-term security (identified in 736 plots) cause individuals to seek out additional land capacity for use. This is problematic based on the limited land capacity identified (Badami, M., Ramankutty, N., 2015) and the dominate participation among middle and upper-middle classes. These features create injustices as the reach of available land capacity is diminished, and vulnerable populations can be identified as being barred from land access due to the desire by food-secure populations to use more space. Private non-profit involvement with this problem can therefore be observed in the fact that non-profit organizations operate as insular organizational units.

5.2.2 Water Capacity

The research results and performance measurements of Water Capacity in Vancouver provide very mixed results. Vancouver shows major success in creating an easily accessible experience with water in community gardens which is reported as lacking in academic case studies (Hendrickson, M., Porth, M., 2012; Opitz, I., et al., 2016; Horst, M., et al., 2017). However, all research data points to the source of water being drawn from city water mains, which is indicated as the least sustainable source for providing water capacity (Morgan, K., 2015; Opitz, I., et al.,

2016; Weidner, T., Yang, A., 2019). As a lack of additional quantitative data complicates further performance analysis of water capacity, research can identify what additional data is missing to make these decisions.

Academic literature reports that the lack of water access is a major barrier in development of UA (Hendrickson, M., Porth, M., 2012; Opitz, I., et al., 2016; Horst, M., et al., 2017), but this barrier does not exist in Vancouver. Data collected in quantitative and qualitative research give a convergent indication that water is highly available in community gardens. Observed in Table 4.9, no experience with water access indicates being less than three out of five (adequate), with 88.7% of respondents indicating an experience of four or better. When described in qualitative reports, water is reported as highly accessible, with multiple access points existing in all gardens. Thus, considering the lack of access reported in American case studies (Hendrickson, M., Porth, M., 2012; Horst, M., et al., 2017), this may be a unique feature of the Canadian context and the provincial management of natural resources including water.

Despite success with accessibility however, negative features of sustainability are visible from the research data. According to previous academic studies (Pearson, C., 2007; Gentry, T., 2011; Weidner, T., Yang, A., 2019), water mains provide an unsustainable source for water access with the use of urban wastewater (i.e., grey water, storm water) promoted as being the sustainable alternative. Yet a strong lack of understanding of water sustainability can be observed when discussing water access in qualitative research. Four participants indicate major doubts over issues of sustainability, accounting that rainfall in Vancouver reduces the impact on water demand. While rainwater is identified by Weidner and Yang (2019) as an effective alternate water source, rainwater requires water storage to provide sustainable use. When rainwater and water storage are

discussed in interviews however, only two participants identify the use of rainwater, and only three participants report the having access to onsite water storage.

To provide more effective performance measurements, data related to cubic water consumption needs to be captured, and without this data research can only predict water consumption based on the following inferences. Considering a common plot size of less than 10 square meters and the use of water faucets to supply water, research can assume between 5-10 minutes of watering is required for the average plot. As the standard water hose is classified to provide between 34 to 64 liters per minute (Swan Hoses, <https://www.swanhose.com/>), with 5,059 garden plots existing, anywhere between 860,000 to over 3,000,000 liters of water are used weekly in community gardens. This assumption is made on the condition that plots are only watered once per week and does not consider that water is used by non-garden members as identified in section 4.3.2.2.

While the data captured assists in identifying unique features and speculative calculations on the use of water capacity in Vancouver, no definitive indication of success or failure can be made from these results. To provide more definitive results, additional quantitative data on the consumption rate of water need to be captured. Without access to this data, it is not possible to make a truly accurate assessment of water sustainability beyond this point.

5.2.3 Knowledge Capacity

Capturing indications of UA knowledge capacity provided the least effective attempts in making performance measurements. The reason for this difficulty relates to two different complications experienced by research. The first complication is a poor understanding of UA knowledge capacity in academic literature. Identified as existing at an amateur level by academic sources (Tournaghi, C., 2014; Opitz, I., et al., 2016; Horst, M., et al., 2017), no academic data

indicates the reasons for this assessment aside from UA having grown from a leisure and recreation activity. The second complication occurs as a result of bias on personal knowledge capacity observed among individuals. Despite the inability to capture effective measurements of knowledge however, the data provided does indicate why an amateur knowledge capacity can be identified with UA in Vancouver.

Due to minimal academic understanding, research into performance measurements of UA knowledge capacity began in a place of disadvantage. While high levels of UA knowledge capacity are identified elsewhere globally (i.e., South America) (Nicholls, C., Alteiri, M., 2018), North American UA knowledge is described as existing at an amateur level (Tournaghi, C., 2014; Opitz, I., et al., 2016; Horst, M., et al., 2017) and research results corroborate this. Despite quantitative data failing to indicate knowledge level, qualitative data provides better representation of this feature. Examples of water management and composting knowledge provide these indications. As identified already in Section 5.2.2, disbelief towards issues of water sustainability and poor water practices (e.g., lack of water harvesting, lack of water storage, lack of rainwater use) have already been identified in the knowledge capacity of water. Because of identified issues of water sustainability (Gentry, T. (2011; Opitz, I., et al., 2016; Weidner, T., Yang, A., 2019), this lack of knowledge capacity in water management indicates a lack of important technical knowledge on issues of sustainability.

Data on compost provides additional details, despite compost being identified as the most common fertilizer in community gardens (table 4.14), only two interviews describe success with creating on-site composting. Conversely five sources describe their composting efforts as representing a major frustration due to poor technical knowledge capacity among community garden members. Describing their compost bins as containing poorly processed and sorted waste,

these five sources indicate garden membership having to sort and process compost bins on a biannual basis. Based on this indication, and the fundamental importance of compost in UA community gardens (Pearson, C., 2007; McClintock, N., 2010), an amateur level of knowledge can be associated with composting as well as water management.

Further complicating performance measurements of knowledge capacity, a biased overestimation of personal knowledge can be identified in multiple interviews (n = 9). With six participants stating that they never learning anything new from continuous learning, their most common complaint about knowledge capacity is the lack of knowledge among other individuals. Describing these individuals as unwilling to accept advice or continuous learning, a similarity of attitude can be identified between these two groups. When the sources of knowledge were investigated, the most common places individuals seek knowledge is identified as the internet and community garden organizations (Table 4.10), and from seed catalogs (n = 4) and other garden members (n = 10). In terms of formal education with agriculture only one participant in ten can identify agricultural education, however this educational background is in agricultural economics as opposed to technical agricultural practice.

Based on the details that have been discovered it can be determined that the measurements used of capture knowledge level have provided poor indications. Despite this, the details captured by research provide data on where and how to improve these measurements in the future. Foremost among these indications is a further need to investigate and research UA knowledge capacity. As quantitative research provided the most effective results in this investigation of knowledge, the use of a constructivist research method can be recommended as providing the most effective method for this research. As for capturing more effective indications of knowledge capacity, it can be determined that focusing on agricultural practices and expertise is too heavily biased to provide

effective indications. Instead, future measurements need to focus on less subjective data relating to knowledge, such as those capturing education levels and the frequency of continuous learning.

5.3 Food Systems Planning

Food systems planning theoretically represents the policies, programming, and organizational framework of UA. To investigate performance measurements on such a broad topic, the issues of production and distribution were focused on by research. Heavily interwoven with social justice and agricultural capacity (Campbell, M., 2004; Lovell, S., 2010; Horst, M., et al., 2017), the results and discussions from sections 5.1 and 5.2 are recalled here to provide additional evidence to corroborate the details being shown.

Research indicates that Vancouver's food systems planning exists in a subsistent state of organization and development. Neither an indication of positive nor negative performance, the classification of subsistence agriculture provides a representative overview of agriculture in Vancouver. Defined as small-scaled production focus on growing food for individuals use, subsistence agriculture is identified as lacking both technical knowledge capacity, economic development, and distribution of produce (Opitz, I., et al., 2016).

Using the additional data on social justice development to make a measurement, the performance of Vancouver's food systems plan can be described as very poor. This is due to a lack of participation among vulnerable groups as indicated by research, and the barriers identified that prevent access by vulnerable groups. Despite this poor performance of social justice however, success can be identified in Vancouver's food systems planning in the lack of economic development promoted by the city of Vancouver. Despite this lack of economic development conflicting with academic research, the subsection on distribution indicates why promoting

economic development currently could increase the lack of social justice being delivered via UA in Vancouver.

5.3.1 Production

As discussed in section 5.2, UA knowledge capacity in Vancouver exists at an amateur level with individuals identifying commonly small plots of 5 square meters or less. Together these features reveal the existence of subsistence agriculture in Vancouver as the land capacity does not allow for substantial production and the knowledge capacity further reduces productivity. Subsistence agriculture could be considered a negative indication of performance, but as academic case studies and research report subsistence agriculture as a common feature UA (Lovell, S., 2010; Hendrickson, M., Porth, M., 2012; Badami, M., Ramankutty, N., 2015; Opitz, I., et al., 2016; Horst, M., et al., 2017). For this reason, the theme of social found commonly throughout academic literature (Hendrickson, M., Porth, M., 2012; Tornaghi, C., 2014; Opitz, I., et al., 2016; Horst, M., et al., 2017) is used to assist in making an evaluation of performance. By combining these features, the poor participation among food-insecure populations reveal that vulnerable groups do not have access to the means of production in Vancouver's Community Gardens.

Food systems planning does not emphasize increased production on account of increased production not corresponding with increased food access and equity (Morgan, K., 2015; Horst, M., et al., 2017). It is for this reasons that subsistence agriculture does not indicate a level of performance. Food systems planning does strongly promote access by vulnerable groups to the means of production however (Campbell, M., 2004; Lovell, S., 2010; Tornaghi, C., 2014; Horst, M., et al., 2017) and based on this emphasis the performance of food systems plan in Vancouver can be considered very poor. With only minimal participation by vulnerable populations, and an overwhelming lack of visible minority and physically disabled participation, food-insecure groups

do not have access to the means of production. This lack of access can be ascribed to several barriers that have been identified in research, including issues with non-profit garden organizations, a lack of supervision over community gardens, and a lack of productive streaming lining which can be identified as creating a further waste of land capacity.

Barriers to access by vulnerable groups can be observed in the private non-profit organization of community gardens. Identified academically as not necessarily creating equitable access among food-insecure groups (Opitz, I., et al., 2016; Horst, C., 2017), reasons why non-profit organizations fail to create access by vulnerable groups have been explored by research. Investigation of outreach by non-profit organizations indicates that community gardens organizations follow the path of least resistance when recruiting new membership. Identified in quantitative research as occurring primarily by word-of-mouth (66.7%) and online methods (31.4%), qualitative research identifies several sources (n = 5) who identify online resources as difficult to use. Further indicating this lack of outreach, interviews with community garden organization members (n = 7) indicate only one example of a comprehensive outreach by non-profit garden organizations, with the remaining six sources indicating a more relaxed outreach with marginalized populations.

In addition to this lack of outreach, the lack of unilateral supervision over community garden organizations can also be identified as causing problems. This is revealed in the data showing numerous individuals doubling-up on community garden plots. Linked with the insular nature of private non-profit garden organization, minimal cooperation and unilateral oversight between garden organizations reveals a lack of mechanism in place to ensure equity. The result of this as indicated via convergent quantitative and qualitative research is that 67.7% of garden plots are being doubled-up by individuals.

A lack of productive streamlining within community gardening structure can also be identified as reducing the access to the means of production. Whether individuals want to grow food, horticulture, or honey, all these activities require a garden membership and garden plot rental. Indicated in three qualitative reports, individuals wishing to pursue beekeeping specifically must rent a garden plot regardless of their intent to garden. Furthermore, the popularity of horticulture (3.6 out of five on the Likert scale) by individuals of middle and upper-middle class (Figure 4.13) reduces the land capacity available to vulnerable groups. But if garden activities were streamlined, a finer-grained division of production and land access could be created. In addition to beekeeping not requiring the rental of garden plots, use of horticulture can take advantage of land capacity not included in the Vancouver food systems plan. Identified in two qualitative interviews and the *Boulevard Gardening Guidelines* (Vancouver, n.d.), boulevard right of ways and traffic calming circles provide capacity for horticulture in Vancouver.

What these indications reveal is that the multiple barriers and poor organizational framework limit participation in food systems planning. Observed in the operational methods of non-profit garden organizations, the lack of supervision and/or mechanisms to reduce abuse of land access, and the lack of division among production types, multiple problems currently limit access to the means of production in Vancouver.

5.3.2 Distribution

Continuing with the indications of subsistent agriculture in Vancouver's food systems plan, the data related to distribution provides further evidence supporting this classification. Shown in both quantitative and qualitative data, minimal distribution of garden produce outside of personal use and sharing with close social connections can be identified. Furthermore, minimal economic sale of produce can be found occurring from community gardens. As subsistence agriculture is

described as lacking distribution outside of personal use and social connections, with minimal economic development occurring (Opitz, I., et al., 2016) the data captured from research provides strong evidence supporting the indications that food systems plan in Vancouver exists in a subsistence state.

As shown in Figure 4.16, the most common methods of distribution identified in Vancouver are the personal use of produce and sharing produce with close personal connections, which is common among UA production in community gardens (Tornaghi, C., 2014; Opitz, I., et al., 2016; Horst, M., et al., 2017). Aside from these distribution types however, no other significant methods of distribution can be observed. This is corroborated by qualitative reports, with all participants (n = 10) indicating only the personal use of produce and sharing with close social connections. Despite the *Operational Guidelines for Community Gardens on City Land Other Than City Parks* (n.d.) providing the option to share excess produce with charitable organizations, this feature is not utilized. This indicates that the fine-grained distribution methods identified by academic sources (Campbell, M., 2004; Horst, M., et al., 2017) are not being developed in Vancouver.

While academic sources report that economic sale of excess produce is an important feature of community gardens (Lovell, S., 2010; Opitz, I., et al., 2016; Horst, M., et al., 2017), the data collected by this research discourages the uptake of this feature in Vancouver presently. This is based on the very poor social justice being indicated and the minimal participation in UA among food-insecure groups. While economic sales are promoted as they improve economic food security among vulnerable populations (S. Lovell, 2010), these sales generally target middle and upper-middle class neighbourhoods (Brinkley, 2017). Considering the dominate participation by middle and upper-middle classes in UA presently, it can be determined that minimal social justice and

economic food security would be created by the ability to sell produce. In addition, there is a major attitude of rejection across mixed methods results towards the economic sale of produce in community gardens. Observed in Figure 4.14 and figure 4.16, there is almost no economic sale of garden produce currently, and minimal negative experience resulting from this lack of economic development.

When discussed in qualitative interviews, the potential for economic sale of produce is strongly rejected by qualitative sources. Despite three of these seven sources admitting that economic sale of produce is not a bad idea in theory, all seven sources indicate major concern over how the sale of garden produce might negatively impact community garden dynamics. Among these concerns, two sources are worried about increased thefts if garden produce were to have economic value, with another source identifying worries that individuals with technical expertise might displace the amateur gardeners currently using community gardens. Furthermore, three other sources identify the size of garden plots as a barrier towards economic sales, indicating that plots are too small to make the sale of produce viable.

In connection with the details on production, the data on distribution provides further proof supporting the existence of subsistence agriculture in Vancouver. Despite criticisms by academic literature on lack of economic development as negative progress, the data captured by research does not support economic sale of produce at this time. Due to the minimal participation by food-insecure groups, the economic advantages provided by sale of produce would not provide any improvement or creation of social justice. While this is not to say there is no room for economic development in the future, the data on distribution indicates more important issues than economic development currently. Among these more important issues, improved uptake on distribution with

charitable organizations can be identified as representing where developments in distribution are needed presently.

5.4 Conclusion

Lack of policy and programming are the academically cited limits in development of UA presently (Lovell, S., 2010; Hendrickson, M., Porth, M., 2012; Morgan, K., 2015; Horst, M., et al., 2017) and this is obvious in the results provided by this research. Using themes of social justice, agricultural capacity, and food systems planning to measure the performance of UA development in Vancouver, the lack of fine-grained policy development can be observed throughout research data. From a lack of access by food insecure groups and vulnerable populations, to the limits and missteps in developing agricultural capacity, to the organizational structure and mechanisms managing community gardens, many problems with UA development can be identified. Despite this need for policy however, successes can also be observed as having occurred, among which the degrees of land capacity development and the experiences with water access indicates that Vancouver is making progress with the development of UA. As a result, the performance measurements of UA investigated by this research provide data indicating the directions for future development and examples for other Canadian cities of follow.

At the forefront of these results, the lack of participation among marginalized populations indicates gaps in UA currently existing in Vancouver. Corroborating the reports of academic literature (Campbell, M., 2004; Horst, M., et al., 2017), there is a clear lack of connection existing between non-profit garden organizations and the key stakeholders of UA, including visible minorities, marginalized populations, and physically disabled individuals. While this does not appear to be an intentional exclusion, mixed methods data does reveal where potential causes of this lack of social justice may be occurring. As a result, the framework of independent non-profit

organization in community gardens may be creating unintended consequences with the ability to engage vulnerable audiences.

It can also be observed that the development of land and water capacity represents complex undertakings, which the City of Vancouver has only started to address. Considering the academically identified requirement for 1.38 square kilometers of land capacity (Badami, M., Ramankutty, N., 2015), the need to develop a strategic long-term plan to create this land capacities is necessary. Despite the success at developing land and water access, research shows that this only represents a first step towards these developments. Furthermore, while a successful development of water capacity can be argued (Hendrickson, M., Porth, M., 2012; Horst, M., et al., 2017), issues of sustainability can also be identified as existing (Opitz, I., et al., 2016; Weidner, T., Yang, A., 2019). Based on this, additional water consumption rates are required to provide performance measurements with more concrete indications of use and performance.

In conclusion, the data gathered provides evidence and indications on directions for the future developments of UA in Vancouver. Despite the flaws identified in the capture of measurements, the data provided by these measurements has allowed research to make observations on the success and shortfalls of UA performance. Capturing clear indication of social justice development, only the measurements of water and knowledge capacity indicate the need for adjustments. Even without these more specific metrics however, the ability to make effective deductions and inferences based on the data provides direction for UA development. As a result, the data provided from these measurements succeeds in identifying where policy and programming developments need to occur, where problems exist, indications on the urgency of these problems, and how to effectively move in a positive direction to correct these issues.

Chapter Six: Limitations, Conclusions, and Recommendations

6.0 Introduction

The following section provides data on the limitations experienced by research, conclusions on the use of performance measurements to investigate UA, and recommendations reached by research on future directions for research and UA management techniques of UA. Beginning with the limitations of research first, this section identifies how COVID-19 and other factors have complicated research and the results provided from it. Following this, a summary of conclusions has been provided to indicate the results and effectiveness of using performance measurements to analyze and understand UA. Finally, the last subsection provides five recommendations on the development of UA that can be applied in Vancouver and the Canadian context to improve the effectiveness of performance measurements and increase equity and social justice being created as a result of UA development.

6.1 Limitations

6.1.1 COVID-19

As a result of the ongoing COVID-19 pandemic, several limiting factors have impacted this research.

6.1.1.1 Inability to perform Community Garden Site Visits

Due to the travel restrictions implemented within Canada (since March 16th, 2020), research was not able to include in-person observations of community gardens in Vancouver. As a result, the data captured in the quantitative survey, conducted between January 15 and February 28, 2021, took a wide scoping approach in the collection of data on the use of UA. Due to the inability to physically visit community gardens in Vancouver, many subtle details such as plot sizes, existence of accessible plots, types of production, and participatory demographics could not be observed prior to quantitative research beginning.

6.1.1.2 Lack of Participation Among Food Systems Planning Officials

A second limitation of this study is the relatively minimal participation among food systems planning officials. Attempts were made to contact officials between January 24 and March 5, 2021, with focuses on the Vancouver Food Policy Council (n = 5), the City of Vancouver Department of Social Planning (n = 2), Planning and Development (n = 2), the Vancouver Parks Board (n = 2) and City Council (n = 1). Despite these attempts, only one interview was completed. Furthermore, because of this low participation rate, this one interview had to be discarded on account of providing anonymity. Because these attempts were made during the midst of the Covid-19 pandemic, the poor participation can be attributed to the low priority of research when compared against other factors. As many of these organizations and departments faced unprecedented challenges with the continuation of programming, ensuring public health and safety, and handling staffing turnovers, little additional time was available to participate in interviews. Additionally, the Vancouver Parks Board was managing an internal review of food systems planning during this time, and many of the individuals contacted were preoccupied by prior commitments involving these reviews. While qualitative saturation was achieved after the 8th interview with community garden members, the lack of participation by food systems planning officials means that additional details and aspects of Vancouver's food systems planning have potentially been missed because of this limitation.

6.1.2 Environmental Attitudes in Vancouver

An additional limitation on the transferability of data captured in this research can be observed in the environmental attitudes present in Vancouver. Recognized for environmentally supportive attitudes, Vancouver has developed its UA programming out of a long history of urban involvement with agriculture. Due to this attitude, many of the developments present in Vancouver may not be transferable to other Canadian cities.

6.2 Research Conclusions

Providing a critical lens for investigation, the use of performance measurement as an evaluative tool has been successful in the research of UA. Offering insight into both the successes and failures of UA, and where they are occurring, these measurements provide directions for the development of UA in Canadian cities.

6.2.1 Social Justice Measurements

The most effective performance measurements provided in this research have been those related to development of social justice and food equity. This is due to social justice being a well-developed feature of UA, and therefore enjoys the most complete level of academic understanding. Revealing minimal participation by vulnerable groups including marginalized populations, visible minorities, and physically disabled individuals, these measurements indicate the lack of social justice development of UA in Vancouver. Furthermore, these measurements provide data on the reasons behind this lack of participation, and where modifications to food systems planning in Vancouver needs to be made.

Revealing multiple problems with use of non-profit organizations as the framework for community gardens, this feature can be identified as a cause of the lack of social justice in results. Indicating a poor uptake of social outreach, autocratic control, a lack of checks and balances, and insular attention to details, research results corroborate academic findings that non-profit organizations are not effective at promoting social justice. While not indicating an exclusionist attitude towards participation by vulnerable groups, the data provides explanation as to why community gardens are dominated by white middle and upper-middle class membership.

6.2.2 Supervision of Non-Profit Organizations

Connected to the lack of social justice created by non-profit organizations, research results indicate a need for supervision by non-partisan management. Based on the results of performance

measurements, a lack of conformity and equity can be observed throughout community garden organization in Vancouver. Examples include the inconsistent sizes of community garden plots, the outreach efforts of garden organizations, the need to streamline production and land capacity access, oversights of existing waiting lists, and the doubling up of garden plots by individuals.

Presently, private non-profit organization of community gardens is preferred because it downloads the responsibilities of UA from local government onto these organizations. Because of this however, these non-profits organizations operate independently, with minimal oversight moderating their operations. As a result, this lack of supervision means that no checks or balances exist to limit the missteps of equity being created in community gardens. For these reasons, a mechanism for supervision can be identified as necessary by municipal government to ensure that social justice and equity are being encouraged among non-profit organization.

6.2.3 Further research requirements for Knowledge Capacity

Finally, while social justice is a well-established part of UA development and food systems planning, other aspects UA do not enjoy this benefit. This is clearly observed in the measurements used to capture the levels of knowledge capacity existing in community gardens. With academic literature providing nothing more than the indication of amateur knowledge levels existing in North America, research barriers can be identified as complicating attempts as making performance measurements. Due to the importance of knowledge capacity in the overall evaluation of food systems planning, an improved understanding of UA knowledge capacity must be gathered.

More than representing the simple capture of knowledge level, many subtle aspects of knowledge capacity can be identified as poorly developed. This includes the lack of desire to gain knowledge by individuals, how to encourage continuous learning, and methods of disseminating

credible knowledge. Based on this, additional research on the understanding and details of knowledge capacity can be identified as necessary in the future development of UA.

6.2.4 Summary

Altogether, the use of performance measurements has provided an effective method of analysis to evaluate the development of UA. Despite indicating poor social justice development, that these performance measurements can identify the causes leading towards this lack of social justice means that they are an effective investigative tool. Providing indications of where further research is necessary, and how to make more effective measurements, the data provided in this research gives a good indication on how performance measurements can be used as an evaluative tool of UA. Furthermore, the indications observed in this research provide other Canadian cities with a better understanding of UA and allow them to plan and develop equitable and socially just UA as a result.

6.3 Recommendations

The following recommendations are presented based on the results captured by quantitative and qualitative methodologies. There are five recommendations that can be made from this research, including: 1) additional research on development of UA knowledge, 2) the separation of production types, 3) supervision of non-profit garden organizations, 4) measurements of water consumption in community gardens, and 5) standardization of community garden plots.

6.3.1 Further Research on the Development of UA Knowledge

Of all the measurements captured by research, the investigation of knowledge capacity can be identified as suffering from the greatest number of barriers which have interfered with the accuracy of results. The lack of academic research and understanding on the topic of UA knowledge itself has created the largest of these barriers. Providing scant few details on knowledge

capacity aside from its existence at an amateur level, the investigation of performance measures for knowledge was provided with minimal background to develop an evaluation of knowledge levels.

Additional complications in measurements can also be observed among participants using UA. Specifically, the exaggerated sense of agricultural expertise among participants, the limited desire to engage in continuous learning, and the refusal by individuals to acknowledge their limitations indicates that a more complex issue is at play. Lastly, as described throughout qualitative research into knowledge, participants emphasize a desire for local development of knowledge that has been uniquely created within Vancouver and British Columbia as opposed to imported from other locations.

Considering these barriers, this research recommends that further study on UA knowledge capacity be pursued by academic research. Because the use of qualitative methods provided a strong performance in the investigation of knowledge capacity, further research into UA knowledge would benefit most from this research method.

6.3.2 Separation of production types

Separating production types was recommended by community garden participants in connection with the use of apiaries. Indicating that all production types (e.g., gardening, beekeeping, horticulture) are amalgamated under community garden organizations, individuals tending the apiaries are also required to rent garden plots. As the individuals performing beekeeping show minimal interest in gardening activities, the suggestion was made for beekeeping and gardening to be divided and separate.

This premise was mirrored by an additional participant who identified separating their garden activities between two locations. Using neighbourhood traffic circles to perform

horticulture, they could dedicate use of community garden capacity to food production. While not suggesting the division of production types, their personal separation of production into differential locations provides precedent that addresses the current misuse of land capacity in community gardens for horticultural activities.

Together, these details and recommendations suggest a practical solution addressing how to increase land capacity and participation rates in community gardens. If beekeeping, gardening and horticulture were divided into separate activities, it would allow participants the opportunity to choose their garden activities. Individuals preferring to focus on horticulture could have access to different spaces than individuals who prefer to grow food. Likewise, individuals preferring beekeeping would not be required to rent garden plots unless they had the desire to do so. In doing so, available land capacity could be more focused and additional land capacity could be created along traffic right of ways while reducing the maintenance cost of these spaces on local government.

6.3.3 Supervision of Community Garden Organizations

Research results indicate that supervision of community garden organizations is required to ensure equity and social justice development. The lack of outreach capacity shown by private non-profit organizations and the minimal effort indicated in recruiting physically disabled individuals to fill accessible plots both provide indication that social justice is not a priority among many private non-profit garden organizations currently. Further indicating this feature, the predominate participation by white, middle and upper-middle class demographics show that non-profit organizations are only connecting with similar user demographics.

A liaison position was recommended during interviews, with this recommendation based on the precedent that the Vancouver Parks Board offered such a liaison to community gardens in

the past. In addition, a similar a liaison position was identified as existing in the City of Surry. Providing a link between community garden organizations and Parks Board administration, it was suggested that such a position could bridge the gaps existing within community garden organizations.

Building on this recommendation, research instead suggests for the use of a single online point of access for community garden advertisement and sign-up. Offered via municipal webpage (i.e., Vancouver.ca), the recruitment for community gardens could be uploaded as a municipal responsibility while leaving the operation of community gardens in the hands of non-profit organizations. Using GIS algorithms and collecting data on personal addresses, this online point of access could manage waiting lists and garden outreach, while providing advantages that are lacking in non-profit organizations. Providing an easy and professionally managed method of garden sign-up, using this type of digital supervision would effectively remove the barriers towards participation among vulnerable groups that are currently observed in the private non-profit management of community gardens.

6.3.4 Measurement of water consumption in community gardens

As identified in section 5.2.2, the consumption rate of water is an important piece of quantitative data for measuring the performance of water sustainability. The most effective source to obtain this data can be identified in the water utility costs associated with community gardens. Removing the chance for all subjective biasing, the flow rates and consumption recorded by water utilities provide an accurate account of how much water is being used regularly in community gardens. By capturing this data at its source, effective measurements and calculations on the impacts of water sustainability can be identified from this data.

6.3.5 Standardization of Community Garden Plots

Throughout research results, the sizes of garden plots vary significantly in size; anywhere between 1.5 meters square up to 10 meters square. Indicating a lack of plot size conformity both within and between community gardens, this variable plot size represents a potential injustice as the access to land capacity is not equitable. Considering this, a need for community garden policy to standardize the size of garden plots can be identified. By removing the variations in land access, improved equity and accessibility to land capacity would be created. By making the size of garden plots a standard measurement, all individuals participating in gardening can be assured that their experience with accessing land capacity are fair and equitable.

Reference List

- Abbot, C., Myhre, A. (2000). Community-supported agriculture: a sustainable alternative to industrial agriculture? *Human Organization*, Vol. 59(2), p. 187-197. Accessed from: DOI: 10.17730/humo.59.2.715203t206g2j153
- Ayambire, R., Amponsah, O., Peprah, C., Takyi, S. (2019). A review of practices for sustaining urban and peri-urban agriculture: implications for land use planning in rapidly urbanizing Ghanaian cities. *Land Use Policy*, Vol. 84, p. 260-277. Accessed from: DOI: 10.1016/j.landusepol.2019.03.004
- Badami, M., Ramankutty, N. (2015). Urban agriculture and food security: a critique based on an assessment of urban land constraints. *Global Food Security*, Vol. 4, p. 8-15. Accessed from: DOI: <http://dx.doi.org/10.1016/j.gfs.2014.10.003>
- Barthel, S., Isendahl, C., (2012). Urban gardens, agriculture, and water management: Sources of resilience for long-term food security in cities. *Ecological Economics*, Vol. 86, p. 224-234. Accessed from: DOI: 10.1016/j.ecolecon.2012.06.018
- Brinkley, C. (2017). Visualizing the social and geographical embeddedness of local food systems. *Journal of Rural Studies*, Vol. 54, p. 314-325. Accessed from: <http://dx.doi.org/10.1016/j.jrurstud.2017.06.023>
- Brunstad, R., Gaasland, I., Vårdal, E. (2005). Multifunctionality of agriculture: an inquiry into the complementarity between landscape preservation and food security. *European Review of Agricultural Economics*, Vol. 32(4), p. 469-488. Accessed from: <https://academic.oup.com/erae/article-abstract/32/4-469/621337/>
- Campbell, M. (2004). Building a common table: The role for planning in community food systems. *Journal of Planning Education and Research*, Vol. 23, p. 341-355.
- City of Vancouver (n.d.). Boulevard Gardening Guidelines. Accessed from: <https://vancouver.ca/home-property-development/boulevard-gardening-guidelines.aspx#redirect>
- City of Vancouver (n.d.). Operational Guidelines for Community Gardens on City Land Other Than City Parks. Accessed from: <https://vancouver.ca/files/cov/CommunityGardensGuidelines.pdf>
- City of Vancouver (2010; April, 8). Guidelines for keeping backyard hens. *Standing Committee on Planning and Environment: Policy Report Licensing*, VanRIMS No.: 08-2000-20. Accessed from: <https://council.vancouver.ca/20100408/documents/penv3.pdf>
- City of Vancouver (2011). Background and Details Accessible Community Garden Guidelines. *Joint Subcommittee on Accessible Community Gardens*. Accessed from: <https://vancouver.ca/files/cov/Community-Gardens-Accessibility-Guidelines-2011.pdf>

Creswell, J.W., Creswell, J.D. (2018). *Research Design: Qualitative, Quantitative and Mixed Methods Approaches*. 5th Edition. Sage Publications Inc.

Fetters, M., Curry, L., Creswell, J.W. (2013). Achieving Integration in Mixed Methods Designs – Principles and Practices. *Health Services Research*, Vol. 48 (6), p. 2134 – 2156.

Gentry, T. (2011). Agrarian urban architecture. *WIT Transactions on Ecology and the Environment*, Vol. 152, p. 13-23. Accessed from: DOI: 10.2495/FEVV110021

Gosnell, H., Kline, J., Chrostek, G., Duncan, J. (2011). Is Oregon’s land use planning program conserving forest and farm land? A review of the evidence. *Land Use Policy*, Vol. 28, p. 185-192. Accessed from: DOI: 10.1016/j.landusepol/2010.05.012

Government of Canada (2020). Household Food Insecurity in Canada: Overview. *Health Canada*. Accessed from: <https://www.canada.ca/en/health-canada/services/food-nutrition/food-nutrition-surveillance/health-nutrition-surveys/canadian-community-health-survey-cchs/household-food-insecurity-canada-overview.html>

Graveline, N., Aunay, B., Fusillier, J., Rinaudo, J. (2014). Coping with urban & agriculture water demand uncertainty in water management plan design: the interest of participatory scenario analysis. *Water Resource Management*, Vol. (28), p. 3075-3093. Accessed from: DOI: 10.1007/s11269-014-0656-5

Hendrickson, M., Porth, M. (2012). Urban Agriculture – Best Practices and Possibilities. *University of Missouri Extension – Division of Applied Social Sciences* June, 2012). Accessed from: <https://www.canr.msu.edu/foodsystems/uploads/files/urban-agriculture-best-practices.pdf>

Horst, M., McClintock, N., Hoey, L. (2017). Intersection of planning, urban agriculture, and food justice: A review of the literature. *Journal of the American Planning Association*, Vol. 83 (3), p. 277-295. Accessed from: 10.1080/01944363.2017.1322914

Howell, M. (2017). Guess how many farms are in Vancouver. *Vancouver Courier*, 2017, September 11. Accessed from: <https://www.vancourier.com/opinion/guess-how-many-farms-are-in-vancouver-1.22629596>

Lovell, S. (2010) Multifunctional urban agriculture for sustainable land use planning in the United States. *Sustainability*, Vol. 2, p. 2499-2522. Accessed from: DOI: 10.3390/su2082499

McClintock, N. (2010) Why farm the city? Theorizing urban agriculture through a lens of metabolic rift. *Cambridge Journal of Regions, Economy and Society*, Vol. 3, p. 191-207. Accessed from: DOI: 10/1093/cjres/rsq005

Morgan, K. (2015). Nourishing the city: the rise of the urban food question in the Global North. *Urban Studies*, Vol. 52(8), p. 1379-1394. Accessed from: DOI: 10.1177/0042098014534902

- Nelson, A. (1992). Preserving prime farmland in the face of urbanization: Lessons from Oregon. *Journal of the American Planning Association*, Vol. 58(4), p. 467-488. Accessed from: DOI: 10/1080/01944369208975830
- Nixon, D., Newman, L. (2016). The efficacy and politics of farmland preservation through land use regulation: Changes in southwest British Columbia's Agricultural Land Reserve. *Land Use Policy*, Vol. 59, p. 227-240. Accessed from: DOI: 10/1016/j.landusepol.2016.07.004
- Nicholls, C., Alteiri, M. (2018). Pathways for the amplification of agroecology. *Agroecology and Sustainable Food Systems*, Vol. 42(10), p. 1170-1193. Accessed from: DOI: 10/1080/21683565.2018.1499578
- Oka, G.A., Thomas, L., Lavkukich, L.M. (2014). Soil assessment for urban agriculture: a Vancouver case study. *Journal of Soil Science and Plant Nutrition*, Vol. 14(3), p. 657-669. Accessed from: DOI: 10.4067/S0718-95162014005000052
- Opitz, I., Berges, R., Piorr, A., Krikser, T. (2016). Contributing to food security in urban areas: differences between urban agriculture and peri-urban agriculture in the global north. *Agriculture and Human Values* Vol. 33, p. 341-358. Accessed from: DOI 10.1007/s10460-015-9610-2
- Pearson, C. (2007). Regenerative, semiclosed systems: a priority for twenty-first century agriculture. *Bioscience*, Vol. 57(5), p. 409-418. Accessed from: <https://academic.oup.com/bioscience/article-abstract-57/5/409/221738>
- Pearson, L.J., Pearson, L., Pearson, C.J. (2010). Sustainable urban agriculture: stocktake and opportunities. *International Journal of Agricultural Sustainability*, Vol. 8(1 & 2), p. 7-19. Accessed from: DOI: 10.3763/ijas.2009.0468
- Peterson, J., Boisvert, R., Gorter, H. (2002). Environmental policies for a multifunctional agricultural sector in open economics. *European Review of Agricultural Economics*, Vol. 29, p. 423-443. Accessed from: DOI: 10.1093/eurrag/29.4.423
- Postel, S. (1996). *Dividing the waters: food security, ecosystem health, and the new politics of scarcity*. Worldwatch Institute, Washington, D.C.
- Statistics Canada. (2016). *Quebec, Ville [Census Subdivision] Quebec and Canada [Country]*. Accessed from: <https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CSD&Geo2=PR&Code2=01&SearchType=Begins&SearchPR=01&TABID=1&B1=All&type=0&Code1=2423027&SearchText=quebec>
- Statistics Canada. (2016). *Vancouver, City [Census Subdivision] British Columbia and Canada [Country]*. Accessed from: <https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CSD&Code1=5915022&Geo2=PR&Code2=01&Data=Count&SearchText=5915022&SearchType=Begins&SearchPR=01&B1=All&Custom=&TABID=3>

Swan Hose (n.d.). *The flow rate of a water hose*. Accessed from: <https://www.swanhose.com/garden-hose-flow-rate-s/1952.htm>

Terrell, S.R. (2012). Mixed-methods research methodologies. *The Qualitative Report*, 17(1), p. 254-280. Accessed from: <https://doi.org/10.46743/2160-3715/2012.1819>

Tindal, C. R., Tindal, S. N. (2004). *Local Government in Canada. Sixth Edition*. Scarborough, Ontario: Nelson

Tornaghi, C. (2014). Critical geography of urban agriculture. *Progress in Human Geography*, Vol. 38(4), p. 551-567. Accessed from: DOI: 10.1177/0309132513512542

Toronto Municipal Code (2019, January 31). Chapter 349, Animals. *Section 349-4.1*. Accessed from: https://www.toronto.ca/legdocs/municode/1184_349.pdf

United Nations (2018, May 16). 68% of the world population projected to live in urban areas by 2050, says UN. *United Nations Department of Economic and Social Affairs*. Accessed from: <https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html>

United Nations (2019, June 17). Growing at a slower pace, world population is expected to reach 9.7 billion in 2050 and could peak at nearly 11 billion around 2100. *United Nations Department of Economic and Social Affairs*. Accessed from: <https://www.un.org/development/desa/en/news/population/world-population-prospects-2019.html>

United Nations General Assembly (1948, December 10). Universal Declaration of Human Rights. *United Nations*. Accessed from: <https://www.refworld.org/docid/3ae6b3712c.html>

Vitiello, D., Brinkley, C. (2014a). The hidden history of food systems planning. *Journal of Planning History*, Vol. 12(2), p. 91-112. Accessed from: DOI: 10.1177/1538513213507541

Vitiello, D., Brinkley, C. (2014b). From farm to nuisance: animal agriculture and the rise of planning regulation. *Journal of Planning History*, Vol. 12(2), p. 113-135. Accessed from: DOI: 10.1177/1538513213507542

Weidner, T., Yang, A., (2019). The potential of urban agriculture in combination with organic waste valorization: assessment of resource flows and emissions for two European cities. *Journal of Cleaner Production*, Vol. 244. Accessed from: DOI: 10.1016/j.clepro/2019.118490

Wills, K. (2017). What is Food Systems Planning? *Michigan State Extension*, October 2, 2017. Accessed from: https://www.canr.msu.edu/news/what_is_food_systems_planning

Appendix A: Research Ethics Approval Certification



RESEARCH ETHICS BOARDS

*Certification of Ethical Acceptability of Research
Involving Human Participants*

APPROVAL PERIOD:	January 14, 2021
EXPIRY DATE:	January 13, 2022
REB:	G
REB NUMBER:	20-10-024
TYPE OF REVIEW:	Delegated
PRINCIPAL INVESTIGATOR:	Deacon, Leith (Leith.Deacon@uoguelph.ca)
DEPARTMENT:	School of Environmental Design & Rural Development
SPONSOR(S):	N/A
TITLE OF PROJECT:	Measuring the performance of Urban Agriculture

The members of the University of Guelph Research Ethics Board have examined the protocol which describes the participation of the human participants in the above-named research project and considers the procedures, as described by the applicant, to conform to the University's ethical standards and the Tri-Council Policy Statement, 2nd Edition.

The REB requires that researchers:

- Adhere to the protocol as last reviewed and **approved** by the REB.
- Receive approval from the REB for any **modifications** before they can be implemented.
- Report any **change in the source of funding**.
- Report **unexpected events or incidental findings** to the REB as soon as possible with an indication of how these events affect, in the view of the Principal Investigator, the safety of the participants, and the continuation of the protocol.
- Are responsible for **ascertaining and complying with all applicable legal and regulatory requirements** with respect to consent and the protection of privacy of participants in the jurisdiction of the research project.

The Principal Investigator must:

- Ensure that the ethical guidelines and approvals of facilities or institutions involved in the research are obtained and filed with the REB prior to the initiation of any research protocols.
- Submit an **Annual Renewal** to the REB upon completion of the project. If the research is a multi-year project, a status report must be submitted annually prior to the expiry date. Failure to submit an annual status report will lead to your study being suspended and potentially terminated.

The approval for this protocol terminates on the **EXPIRY DATE**, or the term of your appointment or employment at the University of Guelph whichever comes first.

Signature:

Date: January 14, 2021

Stephen P. Lewis
Chair, Research Ethics Board-General

Appendix B: Community Garden Organization Information Letter



INFORMATION LETTER

Title: Urban Agriculture Policy Measurement Research

Greeting,

My name is Richard Alberic Marginet. I am an M.Sc. candidate of Planning and Regional Development at the University of Guelph, Ontario. I am working with Dr. Leith Deacon to study Urban Agriculture experiences and Urban Agriculture policy in Vancouver.

The purpose of this letter is to invite the members of (community garden name) to participate in a survey exploring the use of Urban Agriculture in Vancouver. Questions relate to how Urban Agriculture is used, how Urban Agriculture is experienced, and how effective individuals find Urban Agriculture policies and programming.

As the organization group in charge of (community garden name), we are requesting to contact the individual members of (community garden address) and invite them to participate in this study. We ask to be provided with e-mail addresses of (community garden name) members so we can supply them with a link to the eSurvey.

Purpose of the Study

Urban Agriculture refers to the production of food and agriculture goods in cities. Recently there has been an increasing interest in developing Urban Agriculture in North America. The findings from this study will help us better understand how people engage with Urban Agriculture to assist in two objectives: 1) develop measurements to evaluate Urban Agriculture activities; and 2) To provide data that improves the development of Urban Agriculture policy.

Procedures

All participants must be 18 years of age. If individuals choose to participate in this study they will be asked to take part in an online survey. Survey questions will include:

1. Demographic questions (e.g. gender, age).
2. Experiences with using Urban Agriculture (e.g. what is being grow).
3. Experience with distribution (e.g. how produce is shared).

4. Access to garden space and resources (e.g. how far individuals must travel).
5. Access to programming (e.g. where individuals find knowledge).

The online survey should take no longer than 15 minutes to complete.

Participation & Confidentiality

Participation in this study is voluntary. Individuals may refuse participation, refuse to answer any questions, or withdraw from the study at any time with no effect on their future. If individuals would like to withdraw from the study, they can do so by closing their internet browser. Please note, however, that once completed, individuals will not be able to withdraw their data from the study as surveys are anonymous.

Every effort will be made to make sure that all data collected is held securely. We will never share personal information or email addresses with anyone else.

Please note that confidentiality cannot be guaranteed while data are in transit over the Internet. In order to enhance the privacy of responses, we recommend individuals use a private computer in a private setting. If individuals will use a public computer, they are advised clear the browser history and close the browser after use. Individuals will be given the choice to share their names in a consent form if they are willing to be contacted for a follow-up interview. All collected data will be stored on external hard drives, and portable jump drives which will be encrypted using advanced file security software (Bitlocker: www.uoguelph.ca/ccs/encryption).

Potential Risks

There are very few foreseen risks to participation in this study.

Social Risks: Given the characteristics of the community in which this study is occurring, it is possible that information provided may enable identity. However, in order to minimize this, all identifying information will be removed and results of this survey will be presented in aggregate form. If individuals are uncomfortable with any particular question, they do not have to provide an answer.

Psychological Risks: Given the characteristics of the community in which this study is occurring, it is possible that information provided may enable identity. However, in order to minimize this, all identifying information will be removed and results of this survey will be presented in aggregate form. If individuals are uncomfortable with any particular question, they do not have to provide an answer.

Economic Risks: Depending on gardening practices, individuals may be liable for fines, or expulsion from garden space, if practices conflict with existing policies. However, in order to minimize this, all identifying information will be removed and results of this survey will be presented as aggregate data. If individuals are uncomfortable with any particular question, they do not have to provide an answer.

Potential Benefits

Although there is no direct benefit to individuals participating in this study, taking part in this Urban Agriculture research may help improve Urban Agriculture understanding for more accurate policy development and improved access and experience. Findings from this study can help us to better understand the experiences of individuals, which may improve the development of resources for those struggling to access Urban Agriculture. If either the community garden organization or individuals are interested in receiving a summary of the findings, please contact the study researchers. We are happy to share the findings with you.

Compensation for Participation

Individuals are eligible for a draw for 1 of 5 \$15 CAD garden seed packages. Individuals will need to provide an email address and mailing address to join the draw. The email and mailing addresses will be collected separately from the rest of the study data and will not be linked to individual responses. Five (5) winners will be notified by email and sent their seed packages by Canada Post. All email and postal addresses collected for this draw will be deleted after the draw prizes have been awarded.

Ethics & Contact Information

This project has been reviewed by the Research Ethics Board for compliance with federal guidelines for research involving human participants. If you have any questions regarding your rights and welfare as a research participant in this study (REB #), please contact: Director, Research Ethics; University of Guelph; reb@uoguelph.ca; 519-824-4120 ext. 56606. You do not waive any legal rights by agreeing to take part in this study.

If you have any questions after the completion of the study, you may contact by Dr. Leith Deacon or Richard Alberic Marginet.

Please save and print a copy of this information letter to keep for your records.

Thank you for your participation.

<p>Dr. Leith Deacon Associate Professor Dept. of Rural Planning and Regional Development University of Guelph Guelph, ON N1G 2W1 leith.deacon@uoguelph.ca 519-824-4120 ext. 52521</p>	<p>Richard Alberic Marginet M.Sc. Planning Candidate Dept. of Rural Planning and Regional Development University of Guelph Guelph, ON N1G 2W1 rmargine@uoguelph.ca</p>
---	--

Appendix C: Participant Information Letter



INFORMATION LETTER

Title: Urban Agriculture Policy Measurement Research

The purpose of this letter is to invite you to participate in a study exploring the use of Urban Agriculture in Vancouver. Questions relate to how you use Urban Agriculture, how you have experienced Urban Agriculture, and how effective you find Urban Agriculture policies and programming.

If you are 18 years or older and have experience with using public and semi-public gardens in Vancouver, please consider taking part in this research study.

Purpose of the Study

Urban Agriculture refers to the production of food and agriculture goods in cities. Recently there has been an increasing interest in developing Urban Agriculture in North American cities. The findings from this study will help us better understand how people engage with Urban Agriculture to assist in two objectives: 1) develop measurements to evaluate Urban Agriculture; and 2) To provide data that improves the development of Urban Agriculture policy.

Procedures

You are being asked to participate in this survey because you use public and semi-public gardens in Vancouver. All participants must be 18 years of age. If you choose to participate in this study you will be asked to take part in a survey. Survey questions will include:

1. Demographic questions (e.g. age).
2. Your experience with using Urban Agriculture (e.g. what you grow).
3. Your experience with distribution (e.g. who you share your produce with).
4. Your access to garden space and resources (e.g. how far you must travel).
5. Your access to programming (e.g. where you find knowledge).

The survey should take no longer than 15 minutes to complete.

Participation & Confidentiality

Your participation in this study is voluntary. You may refuse participation, refuse to answer any questions, or withdraw from the study at any time. If you would like to withdraw from the study, you can do so by closing your internet browser. Please note, however, that once you complete

the survey and submit your responses, you will not be able to withdraw your data from the study as we are not able to identify which answers are yours.

Every effort will be made to make sure that all data collected is held securely. We will never share your personal information (email) with anyone else.

Please note that confidentiality cannot be guaranteed while data are in transit over the Internet. In order to enhance the privacy of your responses, we recommend that you use a private computer in a private setting. If you are using a public computer, please be sure to clear the browser history and close the browser after use. You will be given the choice to share your name in the following consent form. All collected data will be stored on recording devices, hard drives, and portable jump drives which will be encrypted using advanced file security software (Bitlocker: www.uoguelph.ca/ccs/encryption). Identifying information will only be accessible to Richard-Alberic Marginet and Leith Deacon. It will be collected separately from the survey to keep your identity confidential.

Potential Risks

There are very few foreseen risks to participation in this study.

Social Risks: Given the characteristics of the community in which this study is occurring, it is possible that information provided may enable identity. However, in order to minimize this, all identifying information will be removed and results of this survey will be presented as aggregate data. If you are uncomfortable with any particular question, you do not have to provide an answer.

Psychological Risks: Given the characteristics of the community in which this study is occurring, it is possible that information provided may enable identity. However, in order to minimize this, all identifying information will be removed and results of this survey will be presented as aggregate data. If you are uncomfortable with any particular question, you do not have to provide an answer.

Economic Risks: Depending on your gardening practices, you may be liable for fines, or expulsion from your garden space, if your practices conflict with existing policies. However, in order to minimize this, all identifying information will be removed and results of this survey will be presented as aggregate data. If you are uncomfortable with any particular question, you do not have to provide an answer.

Potential Benefits

Although there is no direct benefit to you by participating in this study, research has shown that taking part in Urban Agriculture research may help improve Urban Agriculture understanding for more accurate policy development improving access and experience. You may find helpful the resources provided about Urban Agriculture. Findings from this study can help us to better understand the experiences of people, which may assist in development of resources for those struggling to access Urban Agriculture. If you are interested in receiving a summary of the findings, please contact the study researchers. We are happy to share the findings with you.

Results of this research will be provided to the Vancouver Food Policy Council, the City of Vancouver, and in Richard-Alberic's thesis.

Incentive for Participation

You are eligible for a draw for 1 of 5 \$15 CAD garden seed packages. You will need to provide an email address and mailing address to join the draw. The email and mailing address you use will be collected separately from the rest of the study data and will not be linked to your responses to any questions in this study. Five (5) winners will be notified by email and sent their seed packages by Canada Post. All email addresses and postal addresses collected for this study will be deleted after the draw prizes have been awarded. The chances of winning are estimated to be 1 in 100 participants.

Ethics & Contact Information

This project has been reviewed by the Research Ethics Board for compliance with federal guidelines for research involving human participants. If you have any questions regarding your rights and welfare as a research participant in this study (REB # 20-10-024), please contact: Manager, Research Ethics; University of Guelph; reb@uoguelph.ca; (519) 824-4120 (ext. 56606). You do not waive any legal rights by agreeing to take part in this study.

If you have any questions after the completion of the study, you may contact by Dr. Leith Deacon or Richard Alberic Marginet.

Please save and print a copy of this information letter to keep for your records.

Thank you for your participation.

<p style="text-align: center;">Dr. Leith Deacon Associate Professor Dept. of Rural Planning and Regional Development University of Guelph Guelph, ON N1G 2W1 leith.deacon@uoguelph.ca 519-824-4120 ext. 52521</p>	<p style="text-align: center;">Richard Alberic Marginet M.Sc. Planning Candidate Dept. of Rural Planning and Regional Development University of Guelph Guelph, ON N1G 2W1 rmargine@uoguelph.ca</p>
---	--

11) Please indicate the Municipality where you live:

Vancouver

Surrey

Burnaby

Richmond

Coquitlam

Langley Township

Delta

North Vancouver District

Maple Ridge

New Westminister

Port Coquitlam

North Vancouver City

West Vancouver

Port Moody

Langley City

White Rock

Pitt Meadows

Electoral Area A

Bowen Island

Anmore

Lions Bay

Tsawwassen First Nation

Belcarra

12) Please indicate your gardening habits by choosing 1 to 5, or prefer not to answer for the following statements, (1 represents never and 5 represents always):

	1	2	3	4	5	Prefer not to answer
I grow vegetables						
I grow fruit						
I grow flowers						
I grow herbs and spices						
I raise animals for meat						
I raise animals for eggs and milk						
I raise bees						
I use greenhouses						

13) Please indicate your reasons for gardening by choosing 1 to 5, or prefer not to answer for the following statements, (1 represents never and 5 represents always):

	1	2	3	4	5	Prefer not to answer
Leisure activity						
Social Activity						
Health and nutrition						
Reduce food costs						
For income or profit						
Improved access to fresh food						
Access to specialty food items						
Physical activity or exercise						
Environmental Sustainability						

14) Select what gardening practices you regularly use by choosing 1 to 5, or prefer not to answer for the following statements, (1 represents never and 5 represents always):

	1	2	3	4	5	Prefer not to answer
Use of compost						
Use of organic fertilizers						
Use of synthetic fertilizers						
Use of organic herbicides, fungicides and/or insecticides						
Use of chemical herbicides, fungicides and/or insecticides						

15) What is the ownership type of the gardening space you use (choose all that apply):

- Ownership of garden space with a mortgage
- Ownership of garden space without a mortgage
- Rental of garden space including utilities
- Rental of garden space excluding utilities
- Cooperative garden space with individual plots
- Cooperative garden space without individual plots
- No ownership of garden space
- Use of windowsills and balconies for garden space
- Use of garden space provided by the city
- Use of garden space provided by private organization
- Use of windowsills or balcony space for gardening
- City owned orchards
- Illegitimate use of abandoned lots for gardening (no ownership status)
- Illegitimate use of other people's garden space (Guerilla Gardening)
- Prefer not to answer

16) Indicate how you learned about your gardening space, or your ability to make your own gardening space (Choose all that apply):

- Internet
- Social Media
- Radio
- Television
- Word of Mouth
- Flyers
- Posters
- Newspaper
- Family, Friends or Social connection
- Prefer not to answer

17) How long did you wait before having access to land for gardening:

- Less than 1 Year
- 1-2 Years
- 2-3 Years
- 3+ Years
- Prefer not to answer

18) How far do you travel from home to access your garden space:

- 5 minutes or less
- 5–10 minutes
- 10–15 minutes
- 15-20 minutes
- greater than 20 minutes
- Prefer not to answer

19) Indicate the size of the total garden space that you use regularly:

- Small (Less than 10 square metres)
- Medium (10 square metres to 100 square metres)
- Large (100 square meters to 1,000 square metres)
- Very Large (Over 1,000 square metres)
- Prefer not to answer

20) Rate your experience with accessing water for gardening:

- Very Poor
- Poor
- Adequate
- Good
- Very Good
- Prefer not to answer

21) Select your willingness to use the following types of water access by choosing 1 to 5, or prefer not to answer for the following statements (1 represents never and 5 represents always):

	1	2	3	4	5	Prefer not to answer
On-site water storage						
Water delivery						
On-site water faucet						
Ground water						
Household grey water						
Rain and storm water						
Conditioned sewage						

22) Please indicate how you distribute the agricultural goods you grow by choosing 1 to 5, or prefer not to answer for the following statements (1 represents never and 5 represents always):

	1	2	3	4	5	Prefer not to answer
I use my own produce at home						
I give produce to friends and family						
I give produce to soup kitchens, food banks, and other support groups						
I sell my produce at Farmers' Markets						
I sell my produce through Community Supported Agriculture method						
I sell my produce directly to grocery stores, retailers and restaurants						
I sell my produce to wholesale distributors						

23) How would you rate your access to sell your garden produce in the City of Vancouver:

- Very Poor
- Poor
- Adequate
- Good
- Very Good
- Does Not Apply
- Prefer not to answer

24) How would you rate the effectiveness of policies on your ability to sell your garden produce commercially in the City of Vancouver:

- Very Poor
- Poor
- Adequate
- Good
- Very Good
- Does Not Apply
- Prefer not to answer

25) How would you rate your community garden space at providing access to commercial marketing of your produce in the City of Vancouver:

- Very Poor
- Poor
- Adequate
- Good
- Very Good
- Does Not Apply
- Prefer not to answer

26) How often do you seek out new knowledge for gardening:

- Never
- Sometimes
- About half the time
- Often
- Always
- Prefer not to answer

27) Rate your expertise with the following garden activities by choosing 1 to 5, or prefer not to answer for the following statements (1 represents very low and 5 represents very high):

	1	2	3	4	5	Prefer not to answer
Preparing compost						
Using compost						
Cultivation, preparing garden space						
Planting						
Identifying pests (Insects, disease, etc.)						
Managing pests (Insects, disease, etc.)						
Managing fruit plants (pruning, grafting, etc.)						
Water management						
Harvesting food, flowers, produce						
Processing food items						
Preserving food items						

28) Rate your interest in gaining knowledge for the following activities by choosing 1 to 5, or prefer not to answer for the following statements (1 represents very low and 5 represents very high):

	1	2	3	4	5	Prefer not to answer
Preparing compost						
Using compost						
Cultivation, preparing garden space						
Planting						
Identifying pests (Insects, disease, etc.)						
Managing pests (Insects, disease, etc.)						
Managing fruit plants (pruning, grafting, etc.)						
Water management						
Harvesting food, flowers, produce						
Processing food items						
Preserving food items						

29) Please indicate where you regularly access information and knowledge about gardening and agriculture by choosing 1 to 5, or prefer not to answer for the following statements (1 represents never and 5 represents always):

	1	2	3	4	5	Prefer not to answer
I use Google to find knowledge						
I use government websites focused on agriculture						
I attend workshops led by professionals						
I speak with professionals at Farmers' Markets						
I use community organizations that distribute information						
I use social media (ie. Facebook, Twitter, Instagram, etc.)						

30) Thank you for completing this survey! Would you like to enter a draw to win 1 of five (5) \$15 CAD sets of gardening seed? (This information will not be connected with your survey answers).

Yes

No

Appendix E: Letter of Invitation, January 15, 2021

Greetings,

My name is Richard-Alberic Marginet. I'm working with Dr. Leith Deacon at the University of Guelph School of Environmental Design and Rural Development to research Urban Agriculture.

We would like to invite (Community Garden Name) to participate in our research and ask you to forward this invitation to community garden members.

Please find your copy of the information letter for this research attached to this email. It describes the risks, benefits, incentives, confidentiality, and details associated with this study and participation in it.

Members who choose to participate, please click the following link to the online survey. It should take no more than 15 minutes to complete.

https://uoguelph.eu.qualtrics.com/jfe/form/SV_38ANz6ailBr2fD7

Thank you for your time.

In Sincerity;

R. Alberic Marginet, B.Env.D

MSc. Planning and Regional Development Candidate
School of Environmental Design & Rural Development
University of Guelph | 50 Stone Rd E | Guelph, ON | N1G 2W1
rmargine@uoguelph.ca

Appendix F: Letter of Invitation, February 2, 2021

Greetings,

My name is Richard-Alberic Marginet. I'm working with Dr. Leith Deacon at the University of Guelph School of Environmental Design and Rural Development to research Urban Agriculture.

We continue to invite members of (Community Garden Name) to participate in our research and ask you to forward this gentle reminder to community garden members.

Our survey will end on February 28th, 2021, and we don't want garden members to miss this opportunity to participate.

Please find your copy of the information letter for this research attached to this email. It describes the risks, benefits, incentives, confidentiality, and details associated with this study and participation in it.

Members who choose to participate, please click the following link to the online survey. It should take no more than 15 minutes to complete.

https://uoguelph.eu.qualtrics.com/jfe/form/SV_38ANz6ailBr2fD7

Thank you for your time.

In Sincerity;

R. Alberic Marginet, B.Env.D

MSc. Planning and Regional Development Candidate
School of Environmental Design & Rural Development
University of Guelph | 50 Stone Rd E | Guelph, ON | N1G 2W1
rmargine@uoguelph.ca

Appendix G: Letter of Invitation, February 15, 2021

To (Community Garden Name),

My name is Richard-Alberic Marginet, and I am researching urban Agriculture with Dr. Leith Deacon at the University of Guelph, School of Environmental Design and Rural Development. A warm thank-you to all the members of (Community Garden Name) who have participated in our research. The support and participation observed from community garden members in Vancouver has been wonderful.

We are sending this message as a final reminder that our survey will end on February 28th, 2021. To any members of (Community Garden Name) who would like to participate but have not yet done so, please follow the link provided to our online survey. It should take no more than 15 minutes to complete.

https://uoguelph.eu.qualtrics.com/jfe/form/SV_38ANz6ailBr2fD7

Please find your copy of the information letter for this research attached to this email. It describes the risks, benefits, incentives, confidentiality, and details associated with this study and participation in it.

As always, thank you for your time.

In Sincerity;

R. Alberic Marginet, B.Env.D

MSc. Planning and Regional Development Candidate
School of Environmental Design & Rural Development
University of Guelph | 50 Stone Rd E | Guelph, ON | N1G 2W1
rmargine@uoguelph.ca

Appendix H: Semi-structured Interview Questions

Q1: Please take a moment to introduce yourself and your connection to urban agricultural.

Q2: What has your experience been with Urban Agriculture in Vancouver?

- Are you happy with this experiences, or where could improvements be made?
- Thefts?

Q3: How long did you have to wait before you had access to garden space?

- How did you gain access so quickly?
- Was this wait too long?

Q4: Vancouver has identified access by disadvantaged groups as a priority in its food systems plan; do you feel this is being achieved?

- How often do you see elderly, the physically disabled, or visible minorities using public gardens?

Q5: Vegetables, herbs and spices, flowers and fruit are the most commonly identified agricultural produces in Vancouver. Please take a moment to describe what you don't see being produced. Why?

- Are there: Beehives, strange and exotic plants, heirloom and rare species.

Q6: Aside from personal use, who do you share your garden produce with most often?

- Why do you share with these people/groups?
- Do you ever accept money or try to sell your produce? Why not?

Q7: Very few community gardeners indicate that they sell or accept money for their garden produce. Please share your opinions on why this is the case.

Q8: Community Garden Guidelines currently prohibit the sale of agricultural produce, indicating this is not the purpose for community gardens. Do you agree with this policy and reasoning? Please explain why you feel that way.

- would you prefer policies that allow for economic sales? Why?

Q9: Sustainability is a major element in Vancouver's Food Strategy.

- How far do you travel to reach your community garden. Is this common?
- What is your experience with composting? Do you produce good quality compost on site?

- Are most of the gardeners from the local area?
- Is it easy to get compost delivered? Do you compost on site?

Q10. Community Gardens currently create an unsustainable demand on Vancouver's water footprint. Knowing this, would you be willing to use more sustainable water source like like grey water, ground water, storm water, etc.? please describe.

Q11: There appears to be a demand for developing agricultural knowledge in Vancouver. Please tell me where you find agricultural information, and your experience searching for it.

How reliable would you consider the sources you find?

Q12: Should developing agricultural knowledge be a responsibility of the City of Vancouver? Why?