ASSESSING THE COMMUNICATION NETWORK OF A BUDDING INDUSTRY:
ROOFTOP URBAN AGRICULTURE IN TORONTO

By

Daphne Page, Bachelor of Arts.
Toronto, Ontario, July 15, 2014

A thesis presented to Ryerson University

In partial fulfillment of
the requirements for the degree of
Master of Applied Science
in the Program of
Environmental Applied Science and Management

Toronto, Ontario, Canada, 2014
© Daphne Page 2014

AUTHOR'S DECLARATION

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I authorize Ryerson University to lend this thesis to other institutions or individuals for the purpose of scholarly research.

I further authorize Ryerson University to reproduce this thesis by photocopying or by other means, in total or in part, at the request of other institutions or individuals for the purpose of scholarly research.

I understand that my thesis may be made electronically available to the public.

Daphne D. Page

Date July 30, 2014 - TORONTO, ONTARIO.

ii

Assessing the Communication Network of a Budding Industry: Rooftop Urban
Agriculture in Toronto.
Master of Applied Science, 2014
Daphne Page
Environmental Applied Science and Management, Ryerson University.

Abstract

This research provides an analysis of the Rooftop Urban Agriculture (RUA) community in Toronto by taking an inventory of participants and key players, and illustrating the communication network surrounding this emerging community. A Social network assessment is used to reveal network connections, and explore the level of cohesion of the RUA community in Toronto. Consideration is given to the implications that this has on its growth, representation, and potential areas of engagement with other actors, including municipal decision makers.

Semi-structured interviews reveal the driving values expressed by RUA practitioners and others involved with the practice, and the characteristics of this group's formation. Based on this information, RUA is identified in this work as an emerging Civic Food Network (CFN).

Based on the findings of the network assessment, this research argues that the lack of an organized and cohesive RUA Network is hindering the progress of this emerging group, and the potential for valuable knowledge sharing that would enable its growth. Finally, recommendations are provided to address how those practicing rooftop agriculture can seek to maximize knowledge sharing within the RUA community and build connections to the City of Toronto to strengthen this emerging CFN.

ACKNOWLEDGEMENTS

"With every success, the potential for growth within the rooftop agriculture industry grows."

- Lauren Mandel, Eat Up! 2013.

1   Table of Contents

List of Tables

List of Figures

List of Abbreviations

AFN: Alternative Food Network
CFN: Civic Food Network
GRHC: Green Roofs for Healthy Cities
RUA: Rooftop Urban Agriculture
SNA: Social Network Analysis
TDSB: Toronto District School Board
TFPC: Toronto Food Policy Council

1 Introduction

Producing food directly in cities is one of many civil society responses to the increasing concerns surrounding environmental sustainability, food security, Carbon emissions, loss of arable land and the proliferation of the industrialized food production system. While a barrier to urban food production is access to suitable growing space, a multitude of diverse food production activities offer options in the most concentrated areas of population. An emerging innovation that addresses this need for space in cities is rooftop urban agriculture (RUA). RUA is the practice of growing food on the otherwise unproductive space on buildings, and as such, merges the practices of urban agriculture and green roofs. As one of the many incarnations of urban agriculture, RUA initiatives are appearing in urban areas across the globe, such as London, Paris, Singapore, New York, as well as Vancouver and Toronto. RUA has started to pique the interest of civil society groups up to the level of municipal policy makers, being an emerging practice with significant potential social, environmental and economic benefits.

RUA is increasing in popularity and is positioned to gain further recognition and adoption in the coming decades, as global environmental concerns, population increase, and issues surrounding food production deepen. This presents rooftop agriculture as an exciting innovation at the very early stages of its development, offering a chance to research an emerging practice that has potential to be part of a creative and sustainable urban food system in the not too distant future.

While conducting preliminary research on the topic of rooftop agriculture, it was found that only a small number of studies have made mention of the practice in Toronto (Kaill-Vinish, 2009; Corey, 2013; Mandel, 2013). Only one report focuses

specifically on RUA best practices (Cascone, 2014). This lack of research is likely due to the very recent emergence of this activity in the city, making it difficult to get a clear picture of the extent of its development. Despite there being several RUA projects already established in the city, even informal inquiries with members of the urban agriculture and green roofs communities revealed only vague awareness of them. Unlike these two established groups, RUA was found to lack a defined organization or network to unite its projects, as well as a place in municipal policy.

This lack of information presented a unique opportunity to research RUA establishment in Toronto, as a snapshot in the development of a new form of urban agriculture, and its community of practitioners. This highlighted the need for an essential first step of exploring the RUA network through a social network assessment. This approach provides an opportunity to better understand who is practicing RUA, and how or if these actors are connecting with one another to share their experience and knowledge of this innovation. Simply put, are new projects "reinventing the wheel" rather than participating in a community and benefiting from the expertise of others?

Several concepts are explored in this research to better frame the emergence of RUA in Toronto, including: green roofs and urban agriculture, rooftop agriculture, alternative food networks and civic food networks, and social networks. These subjects are presented beginning at a broad, conceptual level, narrowing to the city-level to illustrate their relevance to Toronto's unique RUA experience, and finally to the network level, made up of local RUA actors. The strength of cohesion within this network is analyzed, with consideration to the implications that this has on its development, and the level of engagement it has with municipal decision makers.

This research examines urban agriculture and green roofs as the points of origin for RUA in Toronto as well as the policy mechanisms in place to support them, as RUA itself has no direct policy backing. This forms the basis of a discussion on potential entry points for RUA in Toronto's policy objectives, as the municipal government has the opportunity to be a key network actor in support of RUA. Furthermore, this research situates RUA within the literature of food network theory, specifically the concept of the civic food network (CFN) put forward by Renting *et al.* (2012), through examining the local RUA community and the values driving the emergence of this innovation. Finally, recommendations are provided suggesting how those practicing RUA in Toronto can seek to strengthen this emerging CFN.

In short, this research seeks to accomplish the following objectives:

1. To determine who are involved as network actors (individuals, organizations, interest groups, municipal decision makers, and others) in Toronto's RUA community;

2. To identify to what extent practitioners are connected for the purpose of sharing knowledge (using three project case studies);

3. To position RUA within the literature of food network theory by identifying this emerging community as a civic food network;

4. To provide recommendations to those within the network in order to promote and improve greater connectivity and cohesion for the benefit of this emerging movement.

2 Elements of a New Network

RUA finds its origins in the practices of urban agriculture and green roofs. This work outlines a background to these practices, including benefits that they offer (social, environmental and economic), as well as the values that their advocates feel that they represent. As one of many practices under the umbrella of urban agriculture, RUA reflects the motivations and values of those who practice it. The concept of the alternative food network (AFN) and the more recent theoretical framework of the civic food network (CFN), are explored to provide context for RUA's development. This offers an academic classification to define RUA as a unique group within the greater food system. The specific network structure, including the actors, their connections, and their roles, draws on social network analysis (SNA) as a tool to analyze these interactions and draw meanings from them. All of these concepts are explored in the following section in order to provide the context for Toronto's RUA community, as well as the background knowledge and tools for its analysis.

2.1 Urban Agriculture

A great deal of scholarship has emerged addressing the unsustainable ways that our food is being produced, and how large-scale industrial agriculture is contributing to environmental degradation and climate change (Weis, 2007; Millstone & Lang, 2008; Roberts, 2008; Steel, 2009). Many authors and researchers express concern over how food production levels will meet the needs of the growing global population in the coming decades (Hodgson, Campbell, & Bailkey, 2011; Elton, 2013; Gaus, 2013).

Prime North American agricultural land is being lost to development at thirty-seven acres (14.97 hectares) per hour (de la Salle & Holland, 2010), yet this runs counter

to production needs. According to the FAO "food production will have to increase by 70% by 2050 to feed a population headed toward 9.1 billion people" (Ladner, 2011). Typically, large agri-business companies that grow food at an industrial scale use intensive chemical inputs and cause degradation to non-renewable resources such as soil and water (Weis, 2007). Fears arise due to the unknown long-term impacts of genetically modified organisms (GMOs), the industrial production from large agricultural transnational corporations (TNCs) (Weis, 2007), and the threats to biodiversity from gene patenting of germplasm (Shiva, 2000), among many other issues. The "meatification" of diets (Weis, 2007), referring to the increased consumption of animal protein in the Western diet, a trend which is now spreading to Asia and India, presents sustainability issues over how to feed over seven billion hungry carnivores (Ladner, 2011). These are among some of the most pressing concerns resulting from the 20th century's industrial food production legacy. As Roberts (2008) explains, these are connected parts of a food system rather than independent issues. Many authors and researchers argue that to address these environmentally destructive side effects of the current system, a shift is needed. "We have collectively become aware that the food system we take for granted has… problems so big that we might have to reinvent the food system altogether if we want the world's population to stay fed and healthy for another century" (de la Salle & Holland, 2010).

The concept of "food miles" (Millstone & Lang, 2008) focuses on the carbon emissions from long distance transport of food, and is a key argument for why food should be produced closer to the urban consumer. Weis calls for the break with industrial farming and instead advocates "[a]gricultural efficiency and the ecological rationality of small farming" as a long term strategy for sustaining a growing population. Friedmann (2006) identifies local supply chains and close proximity to

urban consumers as being crucial to sustainability. A less technical, but no less concerning byproduct of the industrialized food system is the disconnection that consumers have from how and where their food is produced. The result is that many urbanites do not know how food is grown, or how to do it themselves, and many long for a way to reconnect and re-familiarize themselves with food (Ladner, 2011; Cockrall-King, 2012). These authors may focus on parts of the food system, such as production shipping or consumption, as they relate to the environment, but ultimately come to the same conclusion: to bring more production into the urban realm in order to combat existing issues.

Urban food production is being presented as a response to crisis. Simply put, urban agriculture is a term to describe a range of farming or growing activities that result in food being produced within urban and peri-urban areas, and includes "the growing, processing and distribution of food and food-related products (GrowTO, 2012). It "entails the production of food for personal consumption, education, donation, or sale and includes associated physical and organizational infrastructure, policies, and programs within urban, suburban, and rural built environments" (Hodgson, Campbell, & Bailkey, 2011). This identifies the social, spatial, political, economic, and network dimensions of this wide-reaching activity.

Urban agriculture is now being viewed by many as an essential part of a reformed system of sustainable production to combat climate change, environmental degradation, food insecurity (Cockrall-King, 2012), and economic inequality (Roberts, 2008; Gorgolewski, Komisar & Nasr, 2011). Research shows that "nearly 90% of Canada's population growth is concentrated in large metropolitan areas" (MacRae *et al.*, 2010), yet Toronto, being the largest of Canada's cities, is estimated to have only a three day supply of perishable foods should a disaster occur (Lue &

Koc, 1999; MacRae *et al*. 2010). Environmental and economic factors also mingle with the ethical, resulting in many urban dwellers seeking more control over what they eat and how they impact the planet. A simple desire for closer connections to food has brought a variety of agricultural activities into the urban realm, making "grow your own" initiatives trendy as an urban activity (Veen, Derkzen, & Wiskerke, 2012).

The most common and established forms of urban agriculture by far are small community based efforts, such as community gardens (Figure 1), allotments for subsistence (Figure 2), and the conversion of front and back yards into small plot intensive (SPIN) gardens (Figure 3) (de la Salle & Holland, 2010). The need to produce food in cities will likely become more appealing in the coming decades as urban population density increases, resulting in innovations in the ways in which urban agriculture is practiced, as well as where it takes place. RUA presents just such an innovation, using technology to grow food on city roof space. Rooftop agriculture as an emerging form of urban agriculture is appearing in a number of forms, including intensive rooftop agriculture (Figure 4), rooftop greenhouses (Figure 5), container gardening (Figure 6), and combinations of the above.

Figure 1: The Community Garden at FoodShare
Image from the Toronto Community Garden Network website. http://www.tcgn.ca/

Figure 2: London (UK) Allotment Gardens.
Image from http://www.telegraph.co.uk/

Figure 3: Small Plot Intensive (SPIN) gardening.
Image from: http://www.transitionnetwork.org/

Figure 4: RISC Edible Rooftop Forest, Reading, UK, an Intensive Food Producing Green Roof.
Source: http://www.permaculture.co.uk/

Figure 5: Lufa Farms, a Hydroponic Greenhouse System, Montreal, Qc.
Source: http://www.flickr.com/photos/lufafarms/10759387905/

Figure 6: Sky Garden at the University of Toronto, Rooftop Container Gardening
Source: Toronto Community Garden Network, http://www.tcgn.ca

Urban agriculture is seeing a surge of interest, with many books being published on the subject communicating the flaws in the current food system, and the benefits of the new "food revolution" of city farming. McAdam (2012) notes that municipalities react and mandate change more quickly than governments at the provincial or federal level, likely due to pressures from local communities (MacRae & Donahue, 2013). Some city governments have started to promote urban agriculture through the activities of food policy councils (MacRae & Donahue, 2013), and the publication of instructional materials, such as Vancouver's "Urban Faming Guidebook" (HC Lanarc - Golder, 2012), and "Get Growing Toronto: A Guide to Growing Food in the City" (LiveGreen Toronto, n.d). De la Salle and Holland (2010) apply the term "agricultural urbanism" to express the effort to build a city around food through the deliberate actions of city planning and policy. While not all cities are at this point of

development on their urban agriculture agenda (if they have one at all), the benefits of urban agriculture are finding their way into the mainstream. Hodgson *et al.* (2011) suggest that practitioners, planners, and municipal decision makers take a "community-based food systems approach", which requires looking at the pieces of the local food system and how they connect. This would allow social benefits to be realized and for relationships and local networks to become visible.

The multiple and varied benefits of urban agriculture go beyond simply producing food for sale or personal consumption. Urban agriculture is a practice that is being recognized as having an essential role in the local food systems as a tool to improve food security, being "physical and economic access to sufficient, safe and nutritious food that meets… dietary needs and food preferences for an active and healthy life" (World Food Summit, 1996). Through improving food security, in the forms described above, people experience reduced stress through access to food and reduced costs, improved nutrition, and access to related food industry jobs (UNDP, 1996). Urban agriculture has great potential for the local economy, which can be tapped through jobs in production, processing, packing, distribution and food service (de la Salle & Holland, 2010).

From an environmental angle, urban agriculture "can reduce greenhouse gasses and other pollutants caused by long-distance transportation and storage" (Koc, MacRae, Mougeot, & Welsh, 1999; Hodgson, Campbell, & Bailkey, 2011). Urban green spaces are used as venues for community building and cultural events, which improves community cohesion and the well-being of participants (Foden-Wilson, 2013). Increasingly urban agriculture spaces are being regarded as education and training grounds to reacquaint city dwellers with how to grow food, as well as to prepare it, and compost waste (de la Salle & Holland, 2010).

While there are many benefits to urban agriculture, some of these are intangible. Veen, Derkzen, and Wiskerke (2012) identify a "mental shift" for urban citizens in how they value locally grown food. Urban agriculture provides "experimental spaces… more in tune with their values, norms, needs, and desires… that result in food of distinct and better appreciated qualities" (Roep & Wiskerke, 2012).

Unfortunately, agriculture in cities faces certain challenges. While food production in cities has been known to take place on "forgotten parcels such as vacant lots, sidewalk strips, and park fragments" (Mandel, 2013), finding suitable and safe space to grow food is increasingly difficult. In some cities, zoning and bylaws restrict agricultural activities. Often, where city planning and policy have focused on urban agriculture, the majority of efforts have been on community gardens and farmers' markets (de la Salle & Holland, 2010), thus restricting the options for food producing activities. An example of this is the restriction on keeping chickens in Toronto (Hood, 2013), and the space requirements for beekeeping in the city (OMAFRA, n.d). Urban development, pollution, contaminated soils and water (Mandel, 2013), and brownfields all restrict the space available for growing (de la Salle & Holland, 2010; Ladner, 2011). New York City's Five Boroughs Report noted that urban agriculture in New York City often takes place in planter boxes to avoid the risk of soil contamination (Design Trust for Public Space, 2012). This approach, however, does not overcome a lack of available ground space for food production in areas of dense development. An obvious solution to this impediment is the use of unused, safe and accessible rooftop spaces that have the structural capacity for food production, thereby increasing the available space in the city for agriculture.

2.2   Green Roofs

"Green roofs, also known as eco-roofs, living roofs, planted roofs, or vegetated roofs, use plants to improve a roof's performance, its appearance or both" (Snodgrass &

McIntyre, 2010). With a slightly more technical definition reflecting its purposes, the city of Toronto's defines a green roof as "[a]n extension of an above grade roof, built on top of a human-made structure, that allows vegetation to grow in a growing medium and which is designed, constructed and maintained in accordance with the Toronto Green Roof Construction Standard" (City of Toronto, Municipal Code Chapter 492, Green Roofs, 2009). Due to the nature of these constructions having waterproof membranes, irrigation and drainage systems, and lightweight engineered growing media, green roofs are often viewed as technologies. Green roofs generally fall into one of two categories: extensive and intensive. Table 1 below illustrates the basic characteristics differentiating these three types of green roofs.

Table 1: Characteristics of Extensive and Intensive Green Roofs.

Characteristic	Extensive	Semi-Intensive	Intensive
Growing medium depth	6" or less	25% above or below 6"	More than 6"
Accessibility	Often inaccessible	May be partially accessible	Usually accessible
Fully saturated weight	Low 10-35 lb/ft2 (48.8 - 170.9 kg/m2)	Varies 35-50 lb/ft2 (170.9 - 244.1 kg/m2)	High 35-300 lb/ft2 (170.9 - 1,464.7 kg/m2)
Plant diversity	Low	Greater	Greatest
Cost	Low	Varies	High
Maintenance	Minimal	Varies	Varies, but is generally high

Source: Green Roofs for Healthy Cities "Green Roof Design 101" Introductory Course Book. 2013. With permission from GRHC.

Extensive green roofs are typically comprised of Sedums (a variety of succulents), and installed in the form of interlocking modular tray systems with a thin layer of growing media. The shallow layer of soil is not amenable to food production. Intensive green roofs provide a suitable depth of medium in which to grow produce in rooftop urban agriculture initiatives. While all green roofs must meet structural and safety requirements to accommodate the weight of materials, ensuring sufficient load-bearing capacity is especially important in the case of intensive green roofs due to the heavier weight of the wet soil layer. Table 2 illustrates the relative benefits of the different green roof types.

Table 2: General Advantages of Different Green Roof Categories.

Extensive	Semi-Intensive	Intensive
Lightweight	Combines best features of extensive and intensive	Greater diversity of plants
Suitable for large areas	Utilizes areas with greater loading capacity	Best insulation properties and storm water management
Low maintenace costs and may be designed for no irrigation	Greater coverage at less cost than intensive	Greater range of design
More suitable for retrofit projects	Average maintenance of projects	Usually accessible
Lower capital costs	Greater plant diversity	Greater variety of human uses
Easier to replace	Greater opportunities for aesthetic design than extensive	Greater biodiversity potential

Source: Green Roofs for Healthy Cities "Green Roof Design 101" Introductory Course Book. 2013. With permission from GRHC.

Urban food production typically takes place within the intensive or mixed or semi-intensive categories. These benefits include the ability to grow a greater range of plants, which is ideal for improving urban biodiversity (City of Toronto Guidelines for Biodiverse Green Roofs, n.d), as well as rooftop food production, and they typically allow for access, which creates event venues for community connection (Foden-Wilson, 2013). Being built directly on top of a roof structure, green roofs as described by the bylaw do not include container gardens or planter boxes, as these only offer stormwater retention capacity in the container soil, rather than across the roofspace. Container and planter boxes can provide urban agriculture/rooftop food production options, but are not considered as green roofs, in the way that intensive and extensive green roof systems are.

Green roofs in North America are gaining popularity, but they have a longer history in Europe, particularly in Germany where research into their varied benefits date back to the 1960s (Snodgrass & McIntyre, 2010). German green roof technology diffused throughout Europe and many governments started to adopt policy mechanisms such as subsidies, incentives, and bylaws to encourage their adoption (Snodgrass & McIntyre, 2010). In Canada, federal interest in green roofs dates back only to the 1990s. The Canada Mortgage and Housing Corporation (CMHC) released a report highlighting the benefits and potential for green roofs in Canada (Peck *et al*, 1999). This was followed in 2006 by a report released by the CMHC, clearly promoting green roofs and their diffusion, entitled "Green Roofs: A Resource Manual for Municipal Policy Makers" (Lawlor *et al*, 2006; White, n.d). Reports show the multiple ecological services and environmental benefits of green roofs (Oberndorfer *et al*, 2007), resulting in significant areas of savings for cities. Storm water capture and reduced run off lower water management costs for cities during storm events as well as lower the levels of pollution being flushed into water bodies; the cooling

effect of plants on the surrounding air moderates the urban heat island effect (UHI); and the insulative capacity of the plants and their growing medium lowers energy use in buildings, contributing to a reduction in energy related carbon emissions (Peck *et al*, 1999; Doshi, *et al*. 2005; Doshi & Peck, 2014). Further benefits include recreation space and the potential for community building, job creation within a new industry (Peck, Callaghan, Bass, and Kuhn, 1999), and increased biodiversity and habitat for urban species (City of Toronto Guidelines for Biodiverse Green Roofs, n.d). All of these benefits contribute to the economic justifications for green roofs in urban areas, although stormwater capture and storage and reduction to the UHI are the key areas of savings. Doshi, *et al.* (2005) calculated savings for the City of Toronto at $313,100,000 initially, with and additional $37,130,000 annually based on 12,315.7 acres (4,984 hectares) of available roof space. Unfortunately, the majority of green roof research presents benefits based on results drawn from the more commonly installed 'extensive' green roofs, therefore there is a lack of detailed research or case studies on intensive green roofs, particularly those used for food production.

2.3   Rooftop Urban Agriculture

Mandel (2013) defines rooftop agriculture as "the cultivation of plants, animals and fungi *on rooftops* for the purpose of human use and consumption." The basic practices of RUA are the same as urban agriculture, but occur on city roofs (ie: industrial, corporate, residential or institutional buildings) and can make use of technologies similar to green roofs. Interest in RUA has increased in recent years, with a handful of projects in North American cities emerging as first movers outside of Europe (Gorgolewski, Komisar, & Nasr, 2011), which has a longer tradition of urban food production (Steel, 2009), with different farming models. Innovative methods and uses of rooftop space are presenting several interesting farming styles,

such as intensive row farming on roofs, container gardening, rooftop green houses, aquaponics, hydroponics, or combinations of these. Examples of intensive rooftop farming operations include The Brooklyn Grange and Gotham Greens, both in Brooklyn, New York (detailed further below). These farms do not use planter boxes, but have produce growing directly in the soil on the roof surface.

Figure 7 illustrates rooftop agriculture as the intersection of urban agriculture and green roofs. This diagram shows a representation of this overlap – being urban agriculture and vegetated rooftops – and that rooftop agriculture unifies elements of both to form a distinct practice. RUA is simply a form of urban agriculture being practiced on the unused or underused spaces on city roofs. RUA is an innovative departure from traditional urban agriculture activities such as community gardens or allotments (see Figures 1 and 2). The adoption of this practice indicates an interest in new forms of food production in cities. Koc *et al.* (1999) state that "information and food-system innovations will be accepted … given the social and ecological concerns of its citizens", echoing the values that are often linked to local food production (Brunori, 2007; Roep & Wiskerke, 2012).
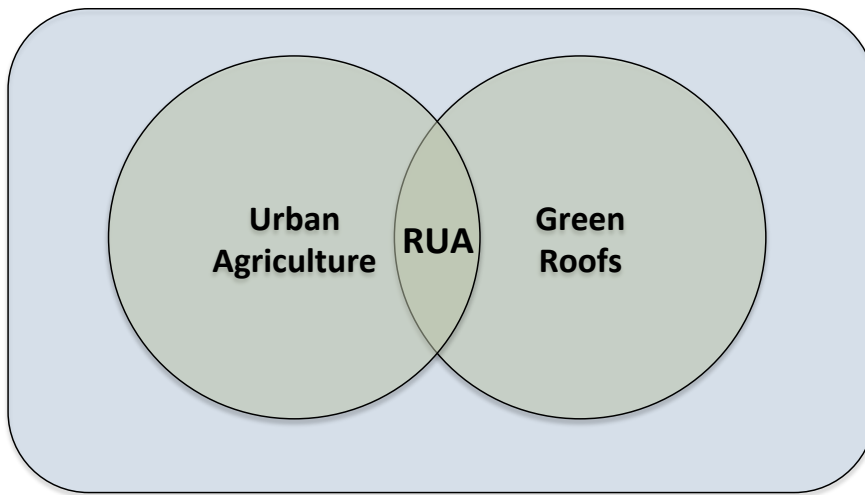
Figure 7: Rooftop Urban Agriculture (RUA) as the Intersection of Urban Agriculture and Green Roofs.

Some projects have gained significant publicity due to the scale of their operations, and are becoming recognized as models for other initiatives. Mandel (2013) distinguishes rooftop agriculture based on scale, from small-scale rooftop gardening, to rooftop *farms,* up to industrial rooftop agriculture. Each step up in size requires greater government regulation and attention from city planners and policy makers (Mandel, 2013). These regulations may include zoning alterations to allow agriculture in cities and on rooftops in particular, policies that encourage agriculture and livestock, bylaws that include food-production as a viable green roof option, local food purchasing policies, as well as composting regulations, among others (Hodgson, Campbell, & Bailkey, 2011; Mandel, 2013).

Gotham Greens (Figure 8) runs a rooftop greenhouse operation, utilizing hydroponics, in four rooftop green house locations in Queens and Brooklyn, NY. Gotham Greens was founded in 2008 and added additional rooftops in 2013. Eagle Street Rooftop Farm (est. 2010), the Brooklyn Grange Rooftop Farm (est. 2011), and

the Brooklyn Grange Navy Yard (est. 2012) (Figure 9) all use intensive-style row gardens to grow food directly on rooftops where they have negotiated long-term leases for their operations. A significant proportion of the produce being grown by these farms is salad greens (Mandel, 2013). Since 2011, Lufa Farms in Montreal (Figure 5) has developed a sizeable commercial greenhouse operation using a climate-controlled hydroponics system (Corey, 2013) that grows vegetable for CSA-style baskets. According to the company's website, this is the world's first commercial rooftop greenhouse, rather than intensive rooftop operation (Lufa Farms, n.d). Unlike many cities, Montreal allows agriculture to be practiced anywhere in the city (Mandel, 2013). Corey (2013) identifies the operation models of Lufa farms, the Brooklyn Grange, and Eagle Street Rooftop farm as "capital intensive", requiring significant initial investment and the involvement of engineers, architects, lawyers and consultants.

Figure 8: Gotham Greens – An Example of a Hydroponic Greenhouse System, Brooklyn and Queens, NY.
Source: http://gothamgreens.com/our-farm

Figure 9: Brooklyn Grange Navy Yard Farm – An Example of Intensive Row Farming, Brooklyn, NY.
Source: http://brooklyngrangefarm.com/farms/

The owners of these operations have not only taken on the challenge of carving out a niche for themselves as urban farmers embarking on a new form of commercial enterprise, but they have also taken on the task of educating the public. Several of these projects have become models for a new age in local food production: growing food where people live, and doing it on unused space. Lufa Farms calls this "Agriculture 2.0" (Corey, 2013), and the increase in these innovative projects since Gotham Greens in 2008, indicates the emergence of a new food production method for urban centres.

RUA is also being practiced through smaller scale, non-commercial-level endeavours, and are more reflective of traditional community urban agriculture practices (Mandel, 2013). Typically, these projects are container gardens of varying sizes, or intensive or mixed-intensive planting directly on rooftops more like a

standard green roof with membranes, drainage and irrigation systems. Plant types grown for these projects vary and allow for variety and experimentation, because as non-commercial enterprises, these projects do not have to maintain uniformity in product options for buyers. Many projects, including the Fairmont Royal York Hotel, Carrot Green Roof, and the Brooklyn Grange, also incorporate beekeeping into their farming practice, which not only improves local biodiversity, but may also provide an additional income stream, and opportunity for public education.

Academic publications on RUA as a practice are few, and hard to come by. Books have made mention to RUA as an expression of urban agriculture (Ladner, 2011; Cockrall-King, 2012), although only a single book has recently been published which focuses entirely on rooftop agriculture (Mandel, 2013). Mass media publications on RUA are the most common medium in which the subject of RUA has been presented to the general public (Baker, 2000; Marketwire, 2012; Brown, 2013). Numerous studies identify the benefits of both urban agriculture and green roofs separately, but few studies address the benefits of food produced on rooftops through intensive green roof operations, or other production means. Urban agriculture promotes social benefits such as improved local food security, education, community building, and employment opportunities, while green roofs offer a multitude of economic and environmental benefits. Rooftop urban agriculture, being a hybrid of both, has the potential to yield the social benefits of one plus the economic and environmental benefits of the other. RUA projects have started to generate public interest (Veen, Derkzen, & Wiskerke, 2012), and capture the imagination as a creative means of producing food from unused, uncontaminated urban spaces, in addition to the above benefits.

2.4 Food Networks

In an effort to move away from conventional vertical structures of food provisioning, new horizontal models have emerged as "a part of a wider social movement countering the various unsustainabilites evoked by prevailing food regimes" (Roep & Wiskerke, 2012). Rather than food being grown at industrial scales by corporate organizations, horizontal networks seek to "link small-scale producers in subregional learning and innovation networks that can foster endogenous growth" (Watts, Ilbery, & Maye, 2005). General examples of horizontal food models include community supported agriculture (CSA) basket schemes, farmers' markets, food cooperatives, as well as community gardens (Parkins & Craig, 2009; Veen, Derkzen, & Wiskerke, 2012). While not income generating, community gardens allow for individual gardeners to reduce reliance on conventional vertical food structures. Commercial producers in horizontal models would be Gotham Greens, the Brooklyn Grange and Navy Yard, and Lufa farms. These projects produce and sell food in their direct local areas, typically through CSA basket schemes or at local farmers' markets, rather than through affiliations with large market retailers, and with minimal transportation.

Koc *et al.* (1999) point out that industrial structures often ignore the potential of smaller-scale, local production chains. These segmentations of the larger food market into smaller, more horizontal network components (Watts, Ilbery, & Maye, 2005) have, since the 1990s, become known as alternative food networks (AFN), alternative agro-food networks (AAFNs) (Goodman, 2004), Short Agro-Food Supply Chains (SAFSCs) (Volpentesta, Ammirato, & Della Galla, 2013), and localized agri-food systems (Renting, Schermer, & Rossi, 2012). AFNs can be defined as creating food provisioning networks that are alternative to conventional options, either spatially through shorter supply chains, socially through increased community connection. AFNs can also include alternative production methods (Jarosz, 2008;

24

Veen, Derkzen, & Wiskerke, 2012), such as organics, and fair trade foods. As alternatives to the conventional food system, these options may offer a more sustainable journey from seed to table. AFNs rely on reinforcing relationships between producers and consumers to build a network and gain a competitive advantage (Volpentesta, Ammirato, & Della Galla, 2013).

The motivations behind the establishment of specific AFNs may vary, but according to Jarosz (2008), they "emerge from political, cultural and historical processes" that prioritize "various forms of capitalist restructuring." Simply put, changing social and ecological values have created a demand for more sustainable and conscientious forms of food provisioning. Psarikidou and Szerszynski (2012) refer to this as a "moral economy" based on an "ethical-foodscape," driving consumers to support initiatives that reflect their personal values, which in many cases, means producing food closer to home. This is reflected in the concept of "relocalization" discussed by Brunori (2007), which speaks to a greater sense of connection to and the perceived higher quality of locally produced foods through her study of the Slow Food movement in Italy. Table 3 presents some of the many positive associations that people may have with locally produced food. Among these qualities are improved health due to perceived higher nutritional content; better taste from fresher produce, and less transportation, linking to the environmental benefits and sustainability.

Table 3: Perceptions and Values Associated with Locally Produced Food.

Functional	Health
	Taste
Ecological	Food miles
	Biodiversity and landscape
Aesthetic	Diversity vs standardisation
	Distinction
Ethical	Authenticity
	Identity and solidarity
Political	To change the balance of power in the food chain
	To orient production and consumption patterns

Source: Brunori, 2007.

AFNs represent many of these values, and are typically linked to a desire to challenge the values of, or act in opposition to, the greater hegemonic food system (Parkins and Craig, 2009; Psarikidou and Szerszynski, 2012). Brunori's reference to solidarity and power balance in the food system reflects Veen, Derkzen, and Wiskerke (2012), who link the terms "politicalization" and "radicalism" to the creation of AFNs, illustrating the deliberate action of some AFNs to work counter to the industrial food system as organized efforts. Roberts (2008) identifies food movement organization as "the most recent entry on the list of people power social movements since the 1970s era." Social movements are defined as "broader networks of groups and individuals that work for social change… including… social justice, peace, environmental protection" whereas civil society groups are collective action efforts as "voluntary organizations that are outside both the corporate world and the state" (Naiman, 2012). These definitions can be relevant when identifying the actions and aims of food-related groups, including those working in alternative or civic food networks, such as urban agriculture activities, including RUA.

Non-commercial RUA activities may be classified along with other forms of urban agriculture as one of many incarnations of an AFN due to being an agricultural practice outside of the greater food system. However, due to the nature of RUA being largely civil society-based, non-profit, and values driven, this community appears, for reasons discussed in further detail below, to reflect the recent updated food network concept of the civic food network (CFN). The concepts of AFNs and CFNs address the values, motivations and characteristics of particular food initiatives as elements that make up a local food system.

Since the study of AFNs began in the 1990s, certain shortcomings have been associated with this approach to analysis of food networks. Renting *et al.* (2012) note that a lack of normative content makes the concept of an AFN vague, being simply alternative to conventional food chains, or at least "minimizing their involvement with conventional food chains" (Jarosz, 2008). The very concept of what constitutes alternativeness is vague and often changing; for example, once viewed as alternative, organic or fair trade produce have become more mainstream and are therefore debated as to their perceived alternative status (Renting, Schermer, & Rossi, 2012). Also, while AFNs seek to present an alternative option to the greater food system, they typically function on a similar business model, being for-profit, albeit often on a smaller scale (Jarosz, 2008).

Jarosz (2008) notes that AFNs can be limiting and exclusionary, and may not necessarily present more progressive views of race, gender, class, or equity in their production, over their industrial counterparts. Renting *et al.* (2012) echo this, noting that the framework for AFNs often fail to recognize "relevant underlying dynamics", specifically, the significant role of citizen participation and "governance mechanisms rooted in civil society". Psarikidou and Szerszynski (2012) observe that research on the social ties within food initiatives is often neglected. This may restrict, or

undervalue the importance of social capital, being the community connections and knowledge sharing within a network (Psarikidou & Szerszynski, 2012).

Based on the shortcomings of AFNs, an evolution of the concept has been proposed by Renting *et al.* (2012) in order to target the unique circumstances surrounding localized, and smaller-scale short food supply chains, called the Civic Food Network (CFN). While CFNs inevitably share many common links to its predecessor, such as the shifting societal values that drive the desire for new food options, the concept of the CFN was developed to take account of the civil-society activities driving a specific food network.

Renting, Schermer and Rossi (2012) present the following key points as defining aspects of the CFN as a new approach to analyzing food networks:

1. "Often cities are the starting point for food-system innovations associated with CFNs;

2. CFNs refer to new relationships that are developing between consumers and producers, who engaged together in new forms of food citizenship;

3. CFNs… may also include new forms of cooperation between different local actors;

4. CFNs are… showing the increasing importance of the role of civil society (and to some extent local and regional administrations) compared to market forces and the (national) state;

5. CFNs often embody different discourses, new knowledge and new symbolic frameworks, which are developed and shared through interaction amongst involved actors and which underpin new preferences and practices;

6. CFNs in many cases develop and build upon linkages with other new social movements and conceptual innovations related to different societal and economic spheres, ... in this regard, the development of new thinking and alternative practices around food often seems to represent an accessible area of experimentation, with the capacity to foster the further development of new discourses and forms of citizenship."

The defining elements of a CFN reflect many aspects of community-based urban agriculture initiatives, including the values and connections driving RUA (see section 4.8). Since attention to the social ties in food movements are often under-studied, this reinforces the value of analyzing the social capital and connections of RUA as a new form of urban agriculture with its own unique community. Mandel (2013) identifies rooftop agriculture as "one cog in the greater urban food system" and that, along with farming practices in a wide variety of urban spaces, it has a role to play in strengthening the diversity, and therefore the resilience of that local system.

2.5 Social Networks

Social networks, as conductors of group behaviour, have been recognized as having the potential to serve various functions, rooted in shared values (de Nooy, Mrvar, & Batagelj, 2005; Roldan Vera and Schupp, 2006). Networks present opportunities for 'diffusion' (Roldan Vera & Schupp, 2006), such as knowledge transfer within AFNs (Goodman, DuPuis, and Goodman, 2011; Volpentesta, Ammirato, & Della Galla, 2013), policy influence and mobility (Peck & Theodore, 2010), and innovations (Carolan, 2014). These network benefits are likewise reflected within the literatures of food networks (Section 2.4).

Some key concepts come forth from the literature pertaining to social networks, which are particularly applicable to food network aims. "[I]n the urban context, social sustainability has been conceived as requiring the development of sustainable community, involving concepts such as social capital, social cohesion, and social inclusion" (Psarikidou & Szerszynski, 2012). According to Burt (2005) social capital refers to the advantage created by the way people are connected, and how closely they interact and include other actors in collaborative efforts indicates cohesion and inclusion, respectively. The importance of collaboration is emphasized in AFNs, by echoing the role of social capital (through leadership, and knowledge sharing) in "processes of synergistic collaboration" (Volpentesta, Ammirato, & Della Galla, 2013). This may occur among actors, such as individuals, not-for-profits, businesses, and local government. The roles taken on by leaders, and other stakeholders in the food system have been recognized as playing a part in "creating healthier, more sustainable food systems, communities, and people" (Hodgson, Campbell, & Bailkey, 2011). Social Network Analysis distinguishes those actors who have a particularly prominent role in a network, noting that "[t]he capacities of an individual to act in society, and the implications of that action, depend not only on his/her attributes, but also on the pattern of relations within which he/she is located" (Roldan Vera & Schupp, 2006). The leaders, or local champions as they are referred to in this research, are positioned to disseminate knowledge, and facilitate connections, so that the network may grow and achieve its goals. This leadership is important to bringing a group together. Roldan, Vera and Schupp (2006) note that cohesion within a network is essential to effect desired change. Koc *et al.* (1999) recommend that due to the various sectors that urban agriculture professionals may come from (eg: private, non-profit, the public service), that it is of the greatest benefit to a network to connect with multiple leaders, in order to benefit from multiple perspectives.

The values driving urban agriculture network activities are complimented by social network capabilities, which reflects a shared element of sustainability and comes naturally from the ideals of food-focused network initiatives. The concept of social sustainability enters the language of network analysis and prioritizes multiple benefits: "the social goals of sustainable development such as health, equity, and social cohesion, and the means to achieve those goals, such as participation, empowerment, and accountability" (Psarikidou & Szerszynski, 2012).

With food networks (whether alternative or civic) having such grounding in values and the "moral economy", Psarikidou and Szerszynski (2012) refer to these as "ethical foodscapes" and "moral taskscapes." These terms reinforce the civic ideals that transform food from simply a material component of the food chain, into an "expression of cumulative moral sentiment" (Psarikidou & Szerszynski, 2012). An example of these values in action is conscientious purchasing practices that reflect the beliefs and concerns that people relate to their foods. The values assigned to food, particularly locally produced and sustainable foods, can be seen in Table 3. Therefore, the concept of social sustainability, with its benefits and means of attainment, parallels urban agriculture values. These values and beliefs become shared and communicated among like-minded individuals, and when coupled with "social proximity to available others" (Kossinets & Watts, 2006), these can eventually develop into a group with common interests, beliefs, and eventually objectives.

Volpentesta, Ammirato, and Della Galla (2013) present four stages of network development for Short Agro-Food Supply Chains (SAFSCs), (being a form of Alternative or Civic Food Network): Networking, Coordination, Cooperation and Collaboration. Networking involves making contact and sharing information for mutual benefit without necessarily having a common goal. Coordination builds on

this by committing to a higher level or group organization, and improving efficiency of exchange for better results. Cooperation begins to prioritize common goals, and utilize 'social capital', where individual accomplishments benefit the goals of the group. Collaboration presents the most cohesive and sophisticated network, which shares common values, and works for common goals through coordination and shared decision-making (Volpentesta, Ammirato, & Della Galla, 2013).

3   Methods

This section discusses how the methodology of this this research was designed and how the work itself was conducted. This research combined several approaches to understand many aspects of the local rooftop urban agriculture community, and to prepare for and conduct the data collection and analysis. This section addresses the rationale for choosing Toronto as a region for a social network assessment of rooftop urban agriculture establishment, as well as the selection of three RUA projects as specific case studies. Semi-structured interviews are used to determine who is involved in the local RUA network, how, and to what extent. Thematic analysis is applied to draw out key themes expressed throughout the interviews, and the social network assessment is used to identify actors and their roles in the emergence of RUA in Toronto.

3.1   The Study Area

In order to analyze Toronto's RUA community and its activities, in the context of an emerging network, a focused case study approach was chosen as the framework of this research. Toronto presented an appealing area for study due to its experience with the development of urban agriculture and green roofs at the civic level (through interest or activist groups, for example), and their growth through municipal policy. The convergence of these practices as rooftop agriculture presents several unique examples of project types, and presented a little-studied subject, concentrated in the downtown city core. An exploration of the city's existing RUA projects was undertaken through an inventory process (Section 3.1.1).

3.1.1   Urban Agriculture in Toronto

The City of Toronto has been active in its urban agriculture efforts since establishing Canada's first food policy council in 1991 through the Board of Health (now, Toronto Public Health) as a response to a civic call for urban agriculture engagement. Most recently, the TFPC along with Toronto Urban Growers (TUG) and the City of Toronto has led the implementation of the Toronto Agricultural Program, based on the objectives and recommendations outlined in the 2012 Grow TO Urban Agriculture Action Plan for Toronto. Numerous local food groups exist in the city (FoodShare, Carrot Common, Cultivate T.O, Second Harvest, Not Far From the Tree, the Toronto Community Gardener's Network, Toronto Urban Growers (TUG). All of these organizations show that there exists in Toronto a strong interest in urban agriculture and food, and that these proponents offer a large base of social capital driving its development. Despite this, the development of rooftop agriculture lags behind other forms of urban agriculture initiatives (Section 2.1) in the amount of attention it receives, particularly in municipal policy. Currently RUA is mentioned only as a small part the Grow TO report (GrowTO, 2012), although some research presents RUA as a part of a diversified urban food production solution for the city.

Toronto's enthusiasm for urban agriculture and the existing openness to RUA through the Grow TO report (2012) shows an early step toward RUA in the city. In a study conducted by MacRae *et al.* (2010), the authors determine that if Toronto were to produce 10% of its fruit and vegetables within city limits, of the 2,317 hectares required, 1,243.5 would need to be rooftop space (MacRae *et al.* 2010). The basis for this rooftop calculation came from a study of available rooftop space for green roofs application (Doshi, *et al.* 2005). Although the study did not include structural considerations for the feasibility of rooftop farming, it found that approximately 8% of the roofs in the city could be suited for green roof application,

totaling roughly 4,984 hectares (Doshi, *et al.* 2005). The potential for this level of food production was noted in a report released by the Metcalf Foundation, entitled "Scaling up Urban Agriculture in Toronto: Building the Infrastructure" (Nasr, MacRae, and Kuhns, 2010). This document was a precursor to the Grow TO Urban Agriculture Action Plan for Toronto, which not only reflected many of the same recommendations, but in 2013 was endorsed by City Council as Toronto's Agricultural Program. Through a number of motions, this program committed municipal decision makers, including Toronto City Planning (personal communication, Welsh, 2014; Toronto Food Policy Council, n.d), to aspects of the plan, such as increased support for urban agriculture initiatives. Both the Metcalf Foundation document, and the Grow TO report identify rooftops as having "untapped potential" as spaces for local food production, and reference Toronto's Official Plan (2007) as being in support of rooftop gardens, and urban agriculture (although, with no specific mention of rooftop food production) (City of Toronto Official Plan, 2007).

While RUA is only one small part of urban agriculture in Toronto, it can be linked to the very active urban agriculture community, and could benefit from its existing body of connections and expertise, as well as links to municipal decision makers. A strong urban agriculture dialogue and the resulting active policy environment makes this an exciting time to present information on RUA to those in the urban agriculture community, the various actors in RUA, and the municipal government. No baseline research has been conducted to define this network, making a study of RUA in Toronto an undertaking that has the potential to present completely new information to those involved in the network.

3.1.2 Green Roofs in Toronto

In 2009, the city of Toronto became the first municipality in North America to adopt a Green Roof bylaw (City of Toronto, Municipal Code Chapter 492, Green Roofs, 2009). The Green Roof Bylaw requires that "every building or building addition constructed after January 30, 2010, with a gross floor area of 2,000 square metres or greater shall include a green roof" (City of Toronto, Municipal Code Chapter 492, Green Roofs, 2009). The amount of coverage area required to be vegetated is based on the size of the roof, as a percentage of the space. This emerged from several years of discussion at the city level, and campaigning from local not-for-profit organization Green Roofs for Healthy Cities (GRHC), which developed in order to represent the green roof agenda and industry in Toronto and beyond. The City's experience with implementing this bylaw, and the connections that green roofs have to RUA make Toronto an interesting case study, as this may show an openness to RUA as an expression of green roofs, and a policy approach to parallel.

Opportunities to apply the various ecological services of green roofs within the city have included links to the city's Tower Renewal Program, through a detailed stormwater management study (The Municipal Infrastructure Group Inc.; Schollen & Company Inc, 2011); the Climate Change Action Plan, such as the LiveGreen EcoRoof Incentive Program, and increased green Infrastructure goals; and the city's Official Plan citing objectives surrounding biodiversity (City of Toronto Guidelines for Biodiverse Green Roofs, n.d; City of Toronto Official Plan, 2007). Doshi *et al.* (2005) found that cost savings due to improved storm water management, energy and UHI reduction were the most significant areas of potential cost savings, making these the guiding motivations for the content of the green roof bylaw's development. To encourage the application of green roofs, the city developed the LiveGreen Eco-Roof Incentive Program, which provides financial incentives for installing green

roofs on structures that meet certain criteria (Livegreen Toronto EcoRoof Incentive Program, n.d).

The Green Roofs bylaw has led to significant growth in the number of green roofs in the city. This increase has been documented through an annual "Green Roofs Industry Survey" conducted by Green Roofs for Healthy Cities since 2004. These surveys document the total amount of green roof coverage (in square feet) installed by its industry members annually in major metropolitan areas in Canada (Figure 10) and North America, as well as the types of green roofs being installed. It is clear from this figure that Toronto is the Canadian leader in green roof installation, but these numbers are primarily due to the presence of extensive green roofs, which predominate the installations in Canadian cities, including Toronto (Green Roofs for Healthy Cities, 2013).
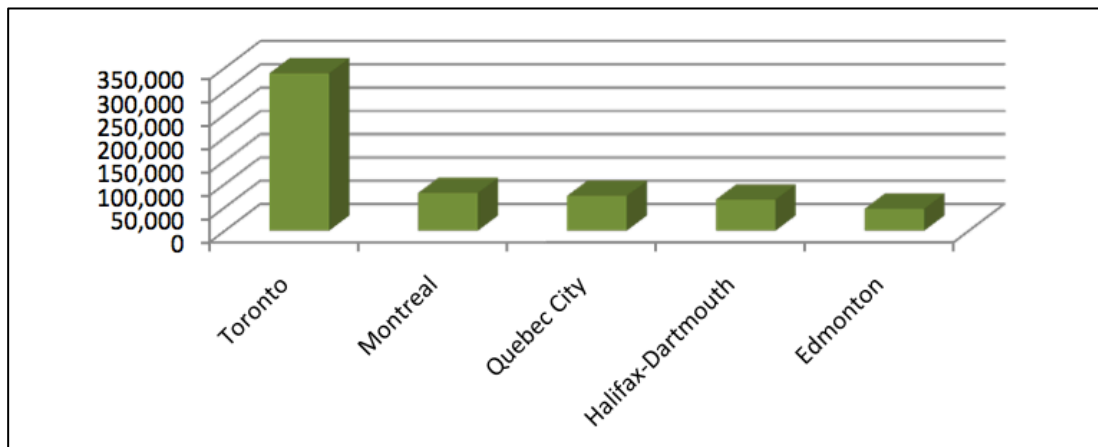
Figure 10: Top 5 Canadian Metro Regions – Green Roofs in 2012 by GRHC Corporate Members in Square Feet.
Source: Green Roofs for Healthy Cities, Annual Green Roof Industry Survey for 2012. (2013).

While the annual green roof industry installation survey only polls GRHC industry members, and therefore is not a comprehensive survey, it is the only inventory of green roof installation currently taking place for Canadian cities. Unfortunately, this inventory does not provide information on RUA activities as a form of intensive green roof installation.

In Toronto, the numbers of food-producing intensive green roofs are few, and the Green Roof bylaw and its related documents (City of Toronto, Green Roof Construction Standard, 2009; City of Toronto, Green Roof Construction Standard: Supplementary Guidelines, n.d) are silent on the subject of rooftop agriculture as a viable green roof option. The policy wording neither directly rejects, nor explicitly welcomes food-producing intensive green roofs, but simply provides a framework with construction standards to be adhered to. The bylaw framework, however, contains interpretive wording that would appear to exclude food production on an intensive green roof as being considered as a green roof under the terms of the bylaw. The bylaw requires that "[t]he plant selection and design shall be such that within three years of the planting date the selected plants shall cover no less than 80% of the vegetated roof" (City of Toronto, Municipal Code Chapter 492, Green Roofs, 2009). Unfortunately, it would seem that it would not be possible for rooftop food production operations to meet this requirement, due to the need for most crops to be sown, picked and replanted yearly. Based on this, there is concern that RUA systems will not have the stormwater retention benefits that a typical extensive green roof systems would have in its place (Jane Welsh, personal correspondence, 2014). Welsh refers to retention capacity of the roof without full vegetation cover; however, Mandel (2013) states that due to the thicker layer of growing media that intensive RUA projects (likely meaning those that are fully vegetated) have greater water retention capacity than extensive green roofs.

MacRae *et al.* (2010) note that rooftop food production in Toronto would present the added benefit of the food being organic, by virtue of the City's bylaws regarding pesticide and herbicide use.

Although container gardening would not be considered as a green roof under the Green Roof Bylaw, nor under the Eco-Roof Incentive Program for funding, it would qualify still as a method for rooftop food production. These are being considered within this study, as they are the most frequently implemented types of projects in Toronto at this stage in RUA development.

Toronto's experience with green roofs has largely been due to the efforts of GRHC, and as noted above, based on the recommendations made in several reports (Nasr, MacRae, & Kuhns, 2010, GrowTO, 2012) utilizing rooftop space for agriculture has been brought to the City's attention. The connections between the already established green roofs and agriculture initiatives are being made and presented to the city as a logical and desirable extension of the two. Having these two groups already active at the municipal level presents seemingly apparent entry points for RUA, and as such, this unique environment makes Toronto an interesting case study for the emergence of a RUA community.

3.1.3   Inventory of RUA Projects in Toronto

This work began with a desk analysis of local rooftop urban agriculture projects in the city of Toronto, including any information relating to these initiatives and organizational links that they may have. This was primarily online research with information being sought from the websites of known projects, followed by key word searches for news media articles and blog content. While only a small selection of books exist that refer to specific Toronto RUA projects, these were referred to as well. Additional information was provided through informal

conversations with members of the urban agriculture and green roofs communities. Some projects were only revealed throughout the course of interviews, through a snowball method, and were added to the inventory and incorporated into the research at that time.

During the initial inventory stage, information and general details were gathered and logged about the projects in an Excel spreadsheet, such as the project name, location, project type, and establishment date. Where available on project websites, other details were noted, such as project size, key values, and produce uses. These particulars were compiled throughout the research process by adding information from interviews and from further online searches. The inventory of existing projects provided an understanding of the extent of RUA development in Toronto, as well as details that would help determine which projects should be shortlisted as potential case studies.

3.1.4   Development of Interview Questions

To accomplish the objectives of this research, two question sets were created, one each for "Group 1: Key Informants", and "Group 2: Practitioners". The research process and the question sets were submitted to the Research Ethics Board and were granted approval on January 29, 2014. Questions were grouped according to general subject (for example, project-specific questions, or questions about the network), and question order was designed to create progression and flow of conversation for the semi-structured interview (Oppenheim, 1966). These questions formed the main outline of a semi-structured interview session for each participant, which was intended to allow the participant the flexibility to speak to the subject of the question asked, and expand as desired. Occasional questions were asked by the interviewer for clarification which were not included in the question-set, but allowed for additional relevant information to be gathered. Generally, "Group 1: Key

Informants" questions were designed to provide more information on who is involved in the local network, the general impressions surrounding RUA in Toronto, and related policy mechanisms. "Group 2: Practitioners" questions were designed to have these case studies reveal who they are aware of in the network, and how the network is being used.

There was some deliberate overlap with certain questions appearing for both groups. The inclusion of duplicate interview questions was designed to reveal shared experiences and impressions of the overall network by both Key Informants and Practitioners. By asking both groups of their knowledge of existing network participants, a greater number of these would be revealed, resulting in a more accurate map of the local network and its connections. These shared questions were designed largely for the purpose of drawing conclusions for Section 6 (Recommendations), such as how to improve the strength of connections between actors from various groups or sectors, such as government, not-for-profit, academic institutions, and others.

Group 1: "Key Informants" were asked 18 questions each during their interviews (Appendix A). Network-related questions were designed to draw out information that related to their roles as informed observers (rather than practitioners) who are likely to have a broad knowledge of the local network and its participants. The second grouping of questions focused on the municipal involvement through supports and policies that relate to the RUA network. These were included to get a deeper understanding of how the city is involved with the RUA community and to what degree the municipality appears to have mechanisms in place to either support RUA, or where RUA may be able to fit into these structures in the future. All participants were asked is they had any further questions or comments as a final

question to allow them to identify additional relevant information that was not asked in the interview. The selection of key informants is discussed in greater detail in Section 3.1.5.

Group 2: "Practitioners" were asked 26 questions (Appendix B), which were designed to reveal how these case study projects developed their rooftops, whether practitioners are accessing the knowledge of more experienced individuals or organizations in the development of their project, to what effect, and the unique challenges that the projects have had to face throughout the process of establishment. Similarly to the Key Informant questions, Practitioner questions were divided into network-related questions and questions relating to local mechanisms such as policies and incentives which may relate to RUA projects. For this group, network questions were designed to be more project-specific and focused on the interactions and information sharing that took place during the establishment of the project. Additionally, some questions were included to better understand the driving vision or civic values of the case study projects in order to place these RUA activities within the context of a CFN. Questions relating to city policies and any areas of possible municipal involvement in RUA were also asked in a way which made them specific to the projects which the practitioners were involved with. As with the Key Informants, Practitioners were asked is they had any further questions or comments as a final question to allow them to expand on their project experience beyond what was asked in the interview. The selection of participants for the Practitioner interviews is discussed in Section 3.1.6.

3.1.5   Participant Selection and Recruitment: Group 1: 'Key Informants'

Due to the nature of rooftop agriculture in Toronto as an emerging practice, the pool of individuals to draw upon for both Key Informants and Practitioners was quite small. This fact simplified the process of identifying potential participants, which

followed a selection process based primarily on a "hierarchy of credibility" (Van Den Hoonaard, 2012). Individuals identified as prospective participants were those who had close connections to RUA (for example, as researchers, food advocates, public servants, policy makers), as well as practical experience (an essential point for practitioner selection, as is discussed below). Early conversations with researchers and advisors at Ryerson and the Toronto Food Policy Council/Toronto Public Health provided guidance for this portion of the research, through recommending particular key players who are involved in RUA in some capacity.

Considering the main goal from this interview group was to determine who is involved in the RUA network, having a variety of participants with different professional backgrounds and links to the industry was determined to be necessary. To accomplish this, the Key Informants group was made up of a range of professions, each with some connection to rooftop agriculture in the city, such as municipal employees involved with policies and programs relating to RUA (specifically urban agriculture or green roofs), city planners, members of the Toronto Food Policy Council, researchers, experts working in the green roof industry, as well as not-for-profit advocacy and education groups.

In addition to the above selection methods, initial recruitment of Key Informants was also based partially on a snowball approach, which allowed for network connections to be followed, revealing connections and channels of influence within the RUA community by way of the interview participants. Through recommendations and referrals from advisors, listing names of individuals that surfaced often in local reports and studies of green roofs, and also in informal discussions with participants in the urban agriculture and green roofs communities, a larger pool of local experts was generated. Based on the relevance of their experience and level of involvement with RUA, some of these recommended

individuals were contacted and asked for their participation. Conversely, some individuals were not contacted because their involvement in the RUA community was determined to not be somewhat peripheral or vague, or because their career path had changed in recent years, thus reducing their connection to RUA in Toronto.

Part of the structure of the interview questions for both groups involved asking for additional names of individuals or organizations that they had been in contact with or aware of in the RUA network. On a number of occasions, interview participants recommended the names of other people to interview, and in some cases facilitated introductions to prospective participants who they knew to be involved in the network. This method allowed the number of interviews to increase, and to gain greater insight into existing connections, as well as to improve the accuracy of the network analysis. This was particularly helpful in order to increase the number of interviews when several initial selections failed to respond or declined to participate.

Requesting interviews was often done in person, if the prospective participant was present at a commonly attended meeting, for example, and this was followed up with an email containing more information on the research project, ethics, and possible meeting times. Some requests were made by email, such as in the case of an e-introduction from another participant, or when sending a request to an already known contact. In this case of a referral without an introduction from the interview participant, the prospective participant was informed that they were being contacted by recommendation of a mutual acquaintance for their expertise in the area of research. In all requests, participants were provided with detailed information on the aims and purpose of the study, ethics, and uses of the information. All email addresses were obtained through public websites or mutual contacts.

Of the twelve individuals contacted in total, nine responded and participated in the interview. Some of these individuals were added throughout the process due to recommendations from other participants. All participants gave their written permission to be recorded, and once being recorded were asked it they agreed to have their names included in this research. All agreed.

3.1.6   Participant Selection and Recruitment: Group 2: 'Practitioners'

Selection for the three Practitioner case studies began with taking an inventory of all known local rooftop agriculture projects in the city, as discussed in Section 3.1.1. The rooftop projects were subjected to a preliminary analysis based on size, establishment date and growing method, and the characteristics of the organization running the operation.

Projects of a larger scale are few in Toronto, making them easy to identify, and were given preference as these are typically innovators and community initiatives, linking to the CFN concept being explored in this research. Establishment dates were deemed to be important as newer projects/practitioners, have recent records and memory of who was involved, who was contacted for information, and what successes or barriers were present during establishment. RUA projects using planter boxes, intensive food-producing green roof projects, and mixed approaches (being a combination of planters and intensive methods) were included. A range of organizational actors were selected to gain greater insight into the development of RUA to show how vastly different industries, in scale and function, may have important shared connections, values, and experiences.

Having reviewed the project inventory details with consideration to size, establishment date, growing method, and organization characteristics, four projects were shortlisted which met the criteria. One not-for-profit, Carrot Green Roof,

responded to the request to be interviewed, as did TAS Design Build, an architecture firm. During the early stages of the Key Informant interviews, one of the participants initiated an introduction to Audrey Bayens, an employee of Telus (a national telecommunications company with offices across the country). After an email introduction, Bayens agreed to participate to showcase a new RUA project at Toronto's Telus headquarters.

These three projects became the case studies for this research and all met the criteria of being recently established, large-scale projects, and varying in organization type (one not-for-profit, one corporate, and one privately owned firm). The projects also showed some diversity in growing methods, including planter boxes of varying sizes and depths, and mixed-intensive. In total, five individuals participated as Practitioners in the interviews: one for Carrot Green Roof (CGR), two separately for TAS green roof, and two in the same interview for the Telus roof garden.

3.2   Data Collection: Interviews

Interviews took place throughout the months of February and March of 2014. Questions were the same for participants within each of the two groups, ie: participants in Group 1: Key Informants had the same list of questions, and participants in Group 2: Practitioners had the same list of questions. Interviews were conducted mostly in-person, typically in the office of the participant, or a conveniently located public space, such as a coffee shop. One interview was conducted by phone, and one over Skype to better accommodate schedules and geographic constraints of participants.

At the beginning of each interview, each participant was presented with an ethics consent form (see Appendix C) detailing the nature of the study and their role, this

information was also explained verbally to ensure understanding. Participants were asked to sign this form to confirm that they understood and accepted their role in the research, as well as to be recorded for the interview. For interviews that did not take place in person, a copy of the document was emailed to the participant, requesting that they read it over and keep it for their records, and they were asked while being recorded if they gave their consent to participate, as well as to be recorded. All participants were given the option of having their names kept confidential within the research; however, all waived this option and felt comfortable allowing their names to be associated with the work. This consent was captured on the recordings for each participant. All interviews were transcribed for review.

In certain cases, questions were skipped if they were not relevant to the individual being interviewed (eg: not within their realm of expertise or experience); if the participant had already addressed the subject of a question through a prior response, making asking a similar question redundant; if the participant asked to skip a question due to discomfort (eg: it being inappropriate for them to comment due to their professional role), or simply, a lack of knowledge. The decision whether or not to ask a particular question was based on what was deemed to be relevant at the time of the interview.

Since the data collected for this research are qualitative and textual in nature, a suitably robust analysis method was required in order to assess the responses given by participants during the interview sessions. Attride-Sterling's *Thematic networks: an analytic tool for qualitative research* (2001), offered a framework "for conducting thematic analysis of qualitative material" through a step-by-step process. While this framework was closely followed, it was adapted to suit the specific needs and objectives of the social network assessment component this research.

By analyzing themes as "basic" (obvious general themes in the text), "organizing" (categorizes basic themes to organize more abstract idea clusters), and "global" (overarching metaphors of a text), the layers of an interview can be revealed (Attride-Sterling, 2001). Revealing these themes is a systematic process, beginning with the basic themes, which are then classified ("organizing themes") according to the broader narratives. Attride-Sterling describes these organizing themes as "macro themes that summarize and make sense of clusters of lower-order themes abstracted from and supported by the data." The global theme is the single unifying conclusion drawn from the text(s), based on analysis of the other groupings of themes. Table 4 shows the adaptation of Attride-Sterling's qualitative assessment tool using a five-step process to achieve a methodical analysis of data.

Table 4: Steps in Analyses Employing Thematic Networks.

Analysis Stage A: Reduction or Breakdown of Text

Step 1: Code Material
- Devise a coding framework
- Dissect text into text segments using the coding framework

Step 2: Identify Themes
- Abstract themes from coded text segments
- Refine themes

Step 3: Construct Thematic Networks
- Arrange themes
- Select basic themes
- Rearrange into organizing themes
- Deduce global theme(s)

Analysis Stage B: Exploration of Text

Step 4: Explore and Describe Thematic Networks

Step 5: Interpret and Summarize the Network Patterns

Adapted from *Thematic networks: an analytic tool for qualitative research* (Attride-Sterling, 2001).

Step 1:

For this initial step, it was necessary to reduce the data contained within the interview texts for each participant to its most relevant content. This was achieved by reading through each interview, with attention to what theoretical information was being sought out from guiding questions for each Key Informant and Practitioner. This step utilized key words and passages as a means of breaking apart the text material. This allowed for relevant terms, quotations, and concepts to be identified. Key Informants and Practitioners groups were analyzed separately to identify the unique themes and narratives from both, as each group was examined to reveal different information, as per the objective of this research.

Interviews for Key informants were analyzed with particular attention to content that related to the greater RUA network (including names of network actors, and general impressions of the network). Interviews for Practitioners were analyzed with attention to two types of content: content that was specific to their RUA project, and content that related to the greater RUA network (including names of network actors, and general impressions of the network). In addition to thematic grouping, Practitioners interviews were analyzed in order to obtain case study details, and provide insight into the CFN concept.

Step 2:
From the key words, and points of interest in Step 1, basic themes were identified from the interview content and were noted.

Step 3: In this step, basic themes were arranged into groupings, with similar concepts being amalgamated into concept groups, as what Attride-Sterling (2001) notes will become the thematic networks. Themes that were noted in the above steps were organized into Excel tables for a clear representation of the content expressed by each group.

Step 4:
Based on the thematic groupings organized as tables, this step focused on describing the network, and further abstractions were made about the various connections and patterns that were present in the themes. The themes provided the main structure for the analysis of the interview data and served to illustrate the key concepts that emerged throughout the interview process.

Steps 5: Involved summarizing the network and interpreting the patterns based on the findings of steps 1 – 4. This information is presented in Sections 4.2 and 4.3.

3.3   Social Network Assessment

This research utilizes aspects of Social Network Analysis (SNA) to form the basis of a network assessment of the RUA community. SNA is a valuable research tool in social sciences research because of its ability to illustrate relational connections, revealing patterns of social influence, diffusion of innovations, social capital, and the application of technologies or interventions (Kossinets & Watts, 2006; Carolan, 2014). In "Building Smart Communities through Network Weaving," (2002) Krebs and Holley present SNA as a tool to answer the following questions, which were considered during the network assessment portion of this research (Section 4.5):

1. Are the right connections in place? Are any key connections missing?
2. Who are the people playing leadership roles in the community?
3. Who are not, but could be?
4. Who are the experts in process, planning and practice?
5. Who are the mentors others seek out for advice?
6. Who are the innovators? Are ideas shared and acted upon?

Roldan Vera and Schupp (2006) describe SNA as "a methodology used to explain social change", which, along with the above applications, presents it as an attractive option for analyzing the emergence of rooftop agriculture as civic-led practice. When viewing RUA as an innovation (being a key characteristic of a CFN) in the area of urban agriculture, it is valuable to observe the interactions amongst actors to determine how to they are exchanging information about this new practice. Using elements of SNA theory as a basis for a social network assessment allows the main objectives (Section 1, Page 3) of this research to be realized. As this research is

intended to be only a preliminary inventory of actors in the newly emerging RUA network, SNA's mathematically-derived visualizations (sociograms) representing weighted connections are not included as a part of this work.

A second step to the review of interviews transcriptions for both groups consisted of compiling the names of local actors who were mentioned in the interviews in order to form a master list of actors (individuals, groups or organizations). Each interview participant identified other organizations, individuals, institutions, and projects and so these actors were specifically linked to that participant as their connections. This formed the initial basis of the network inventory portion of this work. During the SNA process, only names of individuals who participated in interviews and gave their permission were included. If names of individuals were provided by participants, but those identified were not participants themselves, their names were substituted with their organizational or project affiliation to ensure that their identities remained confidential. This step was taken as no permission was sought from these individuals to have their names included in the research.

From the final network actor inventory, these network actors (thirty-three in total for the broader network) were then entered into table format to illustrate which network actors were named by the various participants. This visual representation allowed for insights to be drawn about the awareness and interactions (in the case of the Practitioners) within the network (Section 4.5).

3.3.1   Practitioner Case Study Social Network Assessment Process

Once the overall network inventory was completed, practitioner connections were reviewed once again to highlight actors that had been accessed during project establishment, rather than those whom the practitioners were simply aware of. This was accomplished by specific questions in the Practitioner interviews. The main objective of this process was to accomplish the second goal of this research (Section

1, page 3), being to identify to what extent practitioners are connected for the purpose of knowledge exchange.

3.3.2 Analysis as a Civic Food Network

This analysis included a review of the interview materials for both groups, as each presented unique perspectives that reflected the CFN characteristics presented by Renting *et al.* (2012) (Section 2.4). These six characteristics were used as the basis to explore the interview content, and through them, Toronto's RUA network. The six characteristics of a CFN were numbered, and these were applied as a coding system throughout the interview documents and then organized thematically.

4 Findings and Discussion

4.1 The Present State of Rooftop Urban Agriculture in Toronto

RUA is only a small piece of the greater urban agriculture food system that has emerged in Toronto, and is identified as a desirable new element of the local food system (GrowTO, 2012). Despite this, it has not yet been recognized to a significant degree at the municipal policy level and interviews reveal that there is little knowledge of the extent to which it is already happening. Figure 11 presents all known (non-private) RUA projects being undertaken currently in Toronto, with Table 5 showing more detail of these initiatives.
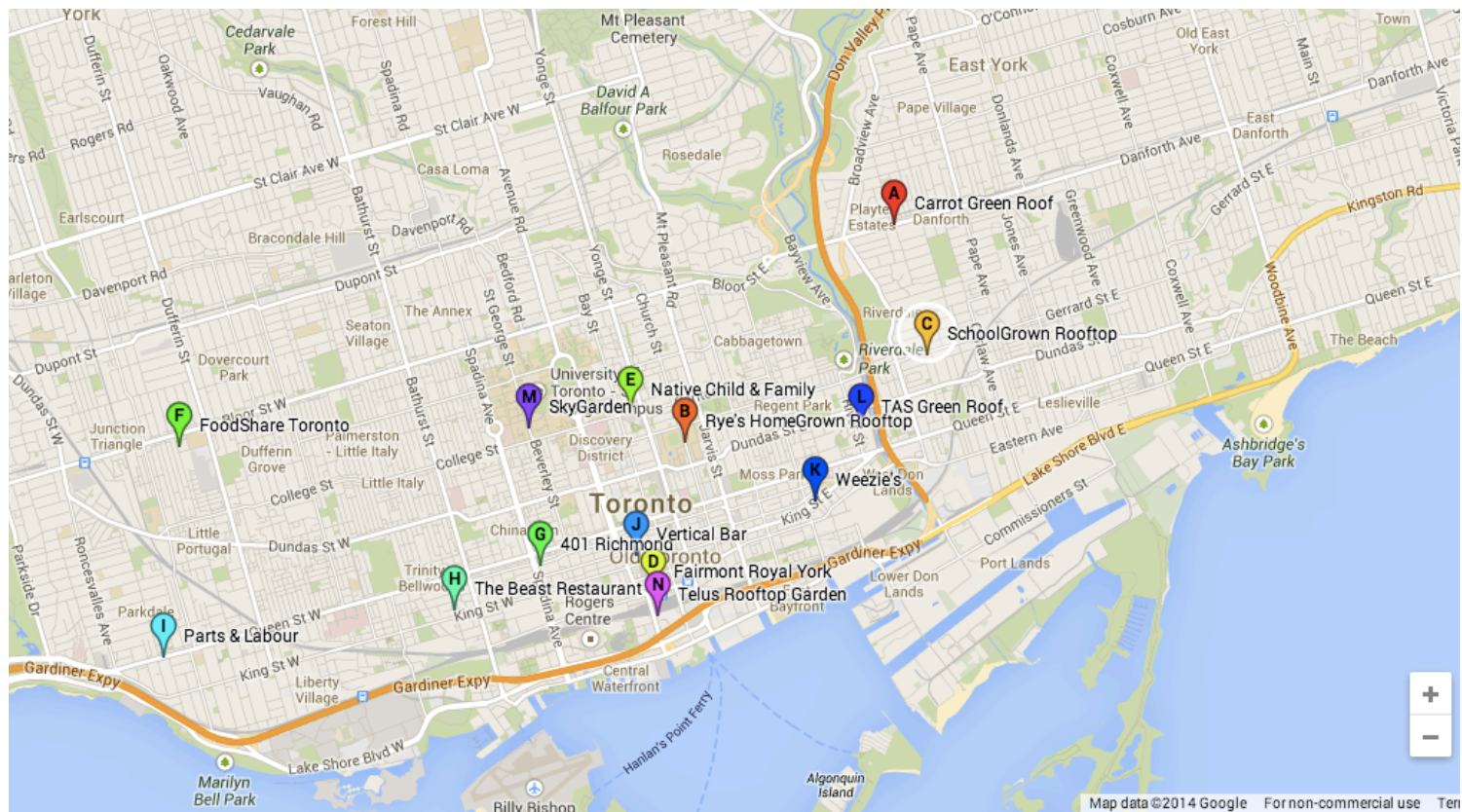
Figure 11: Inventory of Rooftop Urban Agriculture Projects in the Study Area

Figure 11 shows fourteen projects taking place in Toronto, of these, three were selected as case studies to collect more detailed information in order to give some representative indication of the experience of RUA establishment and network interactions taking place in the city. These three case studies (Carrot Green Roof, TAS green roof, and the Telus roof garden – A, L, and N in Figure 11, respectively) were selected based on the criteria discussed in Section 3.1.4. This map also shows the concentration of projects in Toronto's downtown core.

Table 5 provides additional details of the fourteen projects taking place in the city. Rooftop gardening methods, as well as organizational models indicate the range of project applications taking place. This suggests experimentation and a desire to make use of rooftop space. While there are a variety of production methods emerging for rooftop agriculture, Toronto's projects are primarily small container-based gardens, and to a lesser-extent, mixed and intensive food producing green roofs. The "Project" and "Primary Group" columns (indicating the main group that tends the rooftop) gives a preliminary view of actors that feature in this network, whether actively, or simply as independent and disconnected practitioners.

Table 5: Rooftop Urban Agriculture Inventory in Toronto

Rooftop Urban Agriculture Projects in Toronto - Inventory and Categorization				
Name of Project or Organization	**Location**	**Form of Rooftop Agriculture Activity**	**Organization Type**	**Primary Group Maintaining the Project**
Carrot Green Roof	348 Danforth Avenue	Mixed-Intensive; container	NFP in partnership with building owner	Carrot Common volunteers & many other groups (Cultivate T.O, University of Toronto, Guelph University)
Ryerson University Rooftop garden	299 Church Street (Ryerson University Engineering Building)	Intensive	Student-led group, in partnership with Academic Institution	Rye's HomeGrown
SchoolGrown Rooftop at Eastdale Collegiate	701 Gerrard Street E	Planter Boxes	NFP in partnership with Toronto District School Board	FoodShare
Fairmont Royal York Hotel/EPIC Restaurant	100 Front Street W	Planter Boxes	Hotel/Restaurant	Chef at EPIC Restaurant/FoodShare
Native Child and Family Services	30 College Street	Mixed-Intensive; container	NFP	Native Child and Family Services
Foodshare Toronto	90 Croatia Street	Planter Boxes	NFP in partnership with TDSB	FoodShare
401 Richmond	401 Richmond Street	Mixed-Intensive; container		
The Beast Restaurant	96 Tecumseth Street	Container	Restaurant	The Beast Restaurant
Parts & Labour Restaurant	1566 Queen Street W	Container	Restaurant	Parts & Labour Restaurant, employed gardener
Vertical Bar	100 King Street W		Restaurant	Vertical Bar
Weezie's	354 King Street W	Container	Restaurant	Weezie's
TAS Green Roof	7 Labatt Avenue	Planter Boxes	Corporate, in partnership with NFP	Cultivate Toronto
Sky Garden (University of Toronto)	35 St. George Street	Container	Student-led group, in partnership with Academic Institution	U of T researchers and students
Telus Green Roof	25 York Street	Planter Boxes	Corporate	Telus Green Team and hired farmer

4.2   Interviews - Group 1: Key Informants

Rooftop agriculture in Toronto, although only in its infancy, has emerged out of many years of efforts within urban agriculture and green roof policy development. All Key Informants have had some experience in one group or both, which has led to their knowledge of RUA. Individuals who participated in this group represent various local organizations and professional backgrounds, and were specifically chosen as non-practitioners, but still involved with RUA in some capacity.

Key informants for this research were:
- Dr. Wayne Roberts – Author and journalist; former Director of the TFPC
- Dr. Rod MacRae – Professor, York University
- Dr. Joe Nasr – Professor, Ryerson University; Co-author of "Carrot City" (2011)
- Annemarie Baynton – Eco-Roof Coordinator, Livegreen Eco-Roof Incentive Program, City of Toronto
- Debbie Field – Executive Director, Foodshare
- Dr. Charles Levkoe – Professor, University of Toronto
- Dr. Mark Gorgolewski – Professor, Ryerson University; Co-author of "Carrot City" (2011)
- Jane Welsh – Project Manager, Environmental Planning, City of Toronto
- Steven Peck – Founder, Green Roofs for Healthy Cities

These participants provided valuable information on the history of RUA development, as an extension of urban agriculture and green roof initiatives in Toronto, as well as the current stage of RUA's network establishment in the city, and various barriers. Based on the thematic analysis framework (Volpentesta, Ammirato, & Della Galla, 2013), several key themes emerged from these nine interviews:

1. Barriers;
2. Opportunities;
3. Network/key players;
4. Toronto's food system; and
5. Values.

These are presented in Table 6, based on the thematic network methodology outlined in Section 3.2. These are discussed in further detail below as they emerged from the interview process, and some topics overlap themes. The participants also provided the names of specific network actors (individuals and organizations) who are involved with RUA, discussed further in Section 4.5

Table 6: Thematic Analysis of Interview Content for Group 1 - Key Informants

Global Theme	Organizational Themes	Basic Themes
Thematic Analysis - Group 1: Key Informants		
Global Theme	**Organizational Themes**	**Basic Themes**
General lack of information & knowledge - Overall uncertainty about: current players, how RUA can fit within the city's policy framework, potential leadership, access to resources, how to address barriers, connecting stakeholders.	**Barriers**	Lack of access to social capital
		Lack of a plan for RUA (City of Toronto)
		Cost of establishment
		Structural limitations
		Interpersonal network conflict/Power imbalances among network actors
		RUA not a city priority
		Restrictive bylaws (Green Roof Bylaw)
		Lack of financial return as incentive for establishment of RUA
		Lack of awareness of RUA (Establishment process, network actors, policies, funding)
		Insurance coverage
	Opportunities	Urban Agriculture Action Plan/Grow TO
		Conferences for information sharing/collaboration (ie: Urban Agriculture Summit, Cities Alive)
		Partnerships amongst multiple and uncommon actors (City, academic institutions, building owners, developers, local food advocacy groups etc.)
		Creation of supportive policy mechanisms (funding, bylaws, zoning revisions)
		Leadership potential within existing groups: TUG, GRHC, FoodShare)
	Network/Key Players	Leadership potential within existing groups: TUG, GRHC, FoodShare)
		Identifying benefits: Social, Economic, Environmental
		Historic and present role of TFPC
		Academic institutions
		"A varied long term group with a sustained objective"
		Not cohesive; "piecemeal initiatives"
		Project-specific champions
	Food System	The need for a network
		Multiple and actors (City, academic institutions, building owners, developers, local food advocacy groups, industry associations, NFPs, advocates etc.)
		Connection between green roofs and urban Agriculture
		Shifting individual interests (urban agriculture practitioners moving to RUA)
		RUA as an urban agriculture practive, and therefore, as a part of the food system
		lack of responsibility over food mandate at the city level
	Values	Scale of RUA (overall implementation potential; individual-level: Self-provisioning or commercial)
		Desire for projects to be examples of what is possible for RUA
		Non-monetary objectives
		Educations, cultural connections
		Legitimacy of RUA
		Community Building

4.2.1 Barriers

In order to understand challenges being faced in RUA, during the interviews, Key Informants were asked to discuss what barriers they felt existed which were hindering RUA in Toronto. These are represented in Table 6, as they emerged from the Key Informant interviews. The most common barriers identified by the Key Informant group were funding and cost of establishment, structural and technical issues, interpersonal network issues, and the lack of supportive municipal policy structures for RUA.

Nearly all participants acknowledged the high cost of establishing a rooftop agriculture project as being a barrier. These costs, as referenced by the participants, may include preliminary structural assessments and the possible reinforcing of the roof to make it sufficiently load bearing, the purchase of growing and landscaping materials, transportation of materials onto the rooftop, safety installations and railings, irrigation infrastructure, and liability insurance. Since the RUA projects in Toronto are non-commercial, financial returns from produce sales are not a reliable or significant source of income to maintain projects. Access to rooftops and safety concerns were also mentioned as potential issues, particularly on buildings owned by a company or third party not involved with the rooftop project. Financing a costly project brings forth the question of access to funding sources. The Key Informant participants were unclear overall about possible sources of funding, with the exception of those who were City of Toronto employees.

The most significant issue that participants felt to be holding back RUA in the city was the lack of interest or support on the part of the municipal government. Notable barriers include the lack of specific policies, programs, funding mechanisms, and information targeting RUA as a practice. Where a relevant and potentially overlapping policy exists, that being the Green Roof Bylaw, it excludes RUA, and the

city has no plans to alter the policy to make it more inclusive of rooftop food production. The Grow TO Urban Agriculture Action Plan and the resulting Toronto Agricultural Program only includes RUA as a very small part of its scope, with no specific action plan for RUA on its own.

The Key Informants mostly identified Toronto's current policy environment as being restrictive to rooftop agriculture. While there are seemingly logical opportunities for RUA to fit within the policy frameworks, the most obvious option, being the green roofs bylaw, does not make reference to RUA or ways to produce food on rooftops. Notably, there is quite a lot of confusion surrounding what the bylaw allows and what it restricts, in terms of food production. The main restriction being the Green Roof Construction Standard requirement to have 80% of the available roof surface having full plant-coverage within three years of establishment (City of Toronto, Green Roof Construction Standard, 2009). While the Green Roofs bylaw is viewed as a significant restriction to RUA, many participants identified the city's relationship to urban agriculture as a main hindrance. While some find the interest that the City has in urban agriculture to be promising, most key informants agreed that it was not a significant priority for the city.

Several participants identified a lack of knowledge as an issue that is hindering RUA development in Toronto. This may be a lack of knowledge of the practice of RUA itself (including training, liability and insurance), or a lack of knowledge of available resources in order to establish rooftop projects. As an example, the language surrounding agriculture and food is completely absent from websites and documentation relating to the Green Roofs bylaw and the LiveGreen EcoRoof Incentive program. This lack of information was identified as a barrier for practitioners, as it is unclear to many whether food production on rooftops as a

practice is allowed. This lack of information was felt to have the potential to discourage practitioners, and sends a negative message about the City's level of support for RUA.

4.2.2   Opportunities

Many groups, projects, and individuals are recognizing the potential of rooftops as spaces for urban agriculture, creating a broader range of practitioners and project models. Looking ahead to the future of rooftop agriculture as an urban food production practice, Key Informants offered many suggestions for the development of RUA in Toronto. These included next steps and considerations that a new RUA network may benefit from, including organization, communication, and a place for RUA in municipal policy.

Key Informants were asked to share their views on whether Toronto's RUA efforts were perceived to be a cohesive network, and it was unanimously stated by all key informants that this was not the case. When asked about whether RUA would benefit from having its own formalized network, answers varied, although interestingly, participants with common professional or volunteer experience shared similar views. Academics who have had experience working with food groups, including the TFPC, reasoned against yet another stand-alone advocacy group. The rationale for this being that with every new group trying to establish its own unique identity, social capital gets stretched thin, reducing the efficacy of the initiative. Academic participants offered that one solution is to have the RUA effort housed under an already existing organization, while those working with not-for-profit food groups commonly suggested a stand-alone RUA group. The main options brought forward as possible umbrella organizations were the Toronto Urban Growers (TUG), Green Roofs for Healthy Cities, and FoodShare. These organizations appear to have some crossover interest, or even experience in RUA. TUG was felt to

be a logical option due to its role as an existing umbrella organization with an urban agriculture focus. However, concerns were raised over its broad mandate (being therefore not completely focused on RUA), and a perceived lack of cohesion within the organization. Considering the perception that GRHC has a key role and an interest in RUA, several of the participants suggested that a RUA network could be integrated into GRHC. Unfortunately, due to Steven Peck's admission that RUA is unlikely to become part of the organization's mandate in the near future, this seems improbable. Foodshare was also suggested, as its experience with the SchoolGrown Rooftop may provide FoodShare with particular insights about RUA establishment.

The need for communication and collaboration was expressed by all participants as a requirement for developing the RUA network in Toronto. Some suggested an online environment where practitioners and interested parties can share ideas and best practices about rooftop agriculture. Academic conferences such as the 2012 Urban Agriculture Summit were identified as being a valuable forum to bring together a range of participants and share information and ideas for RUA. Key Informants discussed the need to develop the RUA network through multiple connections among actors who wouldn't traditionally collaborate. An example provided by participants included connecting building owners and community groups. This would bring together those who own the space and those who have the expertise to farm it. One important actor mentioned often was the municipal government, through its various departments that have crossover to RUA. The City has an important opportunity to encourage RUA and break down barriers to its development (such as restrictive bylaws, zoning). In order to support RUA development, the municipal government must recognize itself as a network actor and stakeholder in RUA, and take appropriate steps to supporting initiatives. The

Toronto Food Policy Council has the potential to encourage RUA through the Grow TO Action Plan and the Toronto Agricultural Program.

According to participants, part of the development process of a RUA network includes having local champions to promote the practice and bring other actors together. RUA champions would be best positioned to understand the benefits of the practice, share knowledge and build the network. While Key Informants were not able to identify an overall RUA champion, several participants felt that project-specific champions were working to develop individual RUA projects. By connecting these small-scale champions, there is an opportunity for an overall RUA champion to emerge as a leader for this emerging network.

Participants noted that it was unlikely that the City of Toronto would lead the initiative to develop RUA, making a grassroots effort an essential step. An organized RUA network of practitioners and supporters could mobilize strategically to promote RUA to the city. While it was acknowledged that no such initiative currently exists, there is a place for an organized, determined, and cohesive network for RUA in the city. An example of an organized network that yielded results for policy development is GRHC, as it played a strong role in providing research and influencing the development of the Green Roof Bylaw. Over time an organized RUA movement may be able to parallel the experience of GRHC, by providing expertise on the subject and convincing councillors of its benefits.

Key Informants presented several suggestions regarding how to approach the development of support mechanisms for RUA in Toronto. These included creating a specific bylaw for RUA, or a complimentary bylaw to the Green Roof bylaw. Participants suggested that these could be written by academics within the RUA

network and presented to the City, as this could expedite implementation. The importance of financial resources provided by the City was emphasized, with possible sources being the Toronto Agricultural Program, the EcoRoof Incentive program, and Livegreen Toronto Grants. These approaches could also be applied in combination.

4.2.3   Network/Key Players

Based on participant interviews, the present state of the RUA network in Toronto is described variously as "lacking in cohesion," "disorganized," or as most indicated, simply non-existent. Some situated RUA within the larger context of urban agriculture, while some understood the development of RUA as being a new endeavour altogether. Unfortunately, many felt that the lack of a network is hindering the ability of RUA to represent itself to Toronto's municipal government and thereby, make itself a priority to decision makers. Key Informants felt that certain projects have generated a bit more awareness of RUA in the general public, but a systematic process of improving visibility of the community in a manner akin to a movement or coordinated effort is lacking.

Key Informants identified the City of Toronto, various community food groups, businesses, non-profits, academic institutions, individuals and RUA projects themselves as key players in the RUA network. Participants noted that interactions among people, governments, and companies result in inequalities of power, and issues of gender, race, and class often surface in civic networks. As a loose group, the RUA community appears to be in an early stage in its network development, discussed further in Section 4.5. Leadership opportunities in the network require local champions for RUA, and potential for existing organizations (GRHC, FoodShare, TUG, as discussed above) to support the RUA community. The TFPC was often cited

as a mechanism within the Municipal government that could play a key role in pushing the RUA agenda forward to City Council.

MacRae felt that the network potential largely depends on what scale of urban agriculture is taking place. In the current environment of small, individually-run projects, practitioners have the freedom to initiate new forms of rooftop gardening experiments. Looking at the current stage in network development and the nature of existing projects. This conversation of scale reflects Mandel's (2013) categorization of operational scales, being rooftop gardening, moving up to farming, and increasing further to the commercial scale rooftop agriculture. With these increases of scale come increases in complexity of policy needs, highlighting the important role of the City. Participants reflected that food advocacy groups often start out small, as is the current case with the RUA community, being in the early stages of its development. Interpersonal dynamics were identified as an element of network development that may play a role in the development of the RUA network.

4.2.4 Food System

Key Informants largely identified RUA as having emerged from the City's green roofs and urban agriculture communities. Urban agriculture in Toronto has been driven forward by the TFPC, and with the endorsement of the Grow TO Action Plan (GrowTO, 2012), RUA was placed within the context of urban agriculture. While RUA is only a small part of the plan, it has nonetheless been put forward as one element of Toronto's greater food system, even if only in a preliminary effort.

Participant opinions on the City's level of interest and support for urban agriculture varied from token interest for publicity, to a significant interest in supporting urban agriculture. Regardless of the actual level of support, RUA was felt to be one of many options for urban agriculture development in the city. For RUA to be presented to

the City as a viable urban agriculture option, participants felt that there needs to be more information on the social, economic, and environmental benefits of RUA. By identifying RUA's impact on food security, job creation, and how it could contribute to the local food system, practitioners would be able to make a stronger case for RUA, specific to the Toronto food system context.

RUA is being viewed as a new expression of urban agriculture, and while its full role may not yet be clear, food interest groups have been showing increased interest in RUA in recent years. With many people involved through their roles in academia, government, advocacy, as well as with leading organizations in the city, RUA is gradually gaining a higher profile. The 2012 Urban Agriculture Summit was organized by FoodShare, GRHC, and Ryerson University's Centre for Food Security, and so was immediately making a connection between urban agriculture, green roofs, and academic dialogue.

4.2.5 Values

Those projects which are established, including those highlighted in the case studies below, are often spoken of as having particular non-monetary objectives or intangibles as valued outcomes. Key Informants had less insight into the driving civic values of RUA relative to Practitioners (Section 4.3), but still identified the desire for projects to act as models to others, to educate, and bring together community. The scale of RUA projects was felt to represent goals, such as self-provisioning objectives or commercial aims, although no commercial-scale RUA ventures exist at this stage in Toronto. While financial return can be presented as a value, the small scale of RUA projects in Toronto made this less of a focus for these non-commercial efforts.

The concept of community was identified as a common motivation for RUA spaces, as will be illustrated further in Section 4.3, and was identified by most of the Key Informant participants. Objectives such as education (eg: using RUA projects as classrooms for food and gardening education), and cultural connection (eg: plants used in Aboriginal traditional medicines) were given as examples of how RUA can support particular social values. Bringing together community members, with RUA projects acting as social hubs, was expressed as one way to add legitimacy to the practice through increase public awareness.

4.2.6 Thematic Summary: Key Informants

As illustrated in Table 6, and discussed throughout the section above, these interviews revealed thirty-four basic themes that were categorized as they related to barriers, opportunities, network/key players, food system, and values of rooftop urban agriculture establishment in Toronto. These organizational themes reflect a pragmatic approach to the existing network. Table 6 shows that the greatest attention was given to issues, how to overcome them, how RUA can fit into the local food system, and who is involved. The values driving rooftop agriculture was less of a focus for this group than with the Practitioner group.

A systematic analysis of these themes revealed an underlying or "global" theme unifying the impressions expressed by the participants. This global theme was simply a pervasive uncertainty, throughout all current aspects of RUA in Toronto, as well as its direction going forward. The views of the Key Informants implied an overall lack of information and awareness of various key components, including funding options and municipal resources, of network actors and their roles, as well as clear opportunities for RUA in both policy and network development contexts. One clear example is the misconception about GRHC and their role in the network. While all parties (other than Steven Peck) agreed that GRHC would be a valuable

resource as an organization for RUA to be a part of (and believe it to be, currently), this belief is unfortunately incorrect. This simple misunderstanding is illustrative of a lack of communication among those involved with RUA, including practitioners, as is noted below.

Considering that those individuals selected for this work have experience and connections to RUA, this uncertainty and lack of consensus on many points is telling of the present state of RUA in Toronto. This impression reflects one point that all participants agreed upon, which is that the RUA network is lacking in cohesion, and therefore, its many components are lacking clarity.

4.3   Interviews - Group 2: Practitioners - Case Studies

Individuals who participated as Practitioners for the three case studies of RUA projects presented their own experiences of the process from the perspectives of not-for-profit community groups, building owners, and a volunteer group within a corporate environment. The three project case studies involved practitioner representatives from Carrot Green Roof, Telus Green Roof, and TAS Green Roof.

Practitioners who participated in this research were:
- Kimberly Curry – Designer, Carrot Green Roof
- Audrey Bayens and Sameer Parjwani – Telus employees and volunteers with the Telus Green Team; Telus Green Roof
- Emma Point – TAS, Community and Partnership Coordinator; TAS Green Roof
- Chris Wong – Co-Founder, Cultivate TO, TAS Green Roof

Table 7: Details of Rooftop Urban Agriculture Case Studies

	Carrot Green Roof	Telus Rooftop Garden	TAS Green Roof
Details of Case Study Projects - Rooftop Urban Agriculture in Toronto			
Year of Establishment	1996 (original design), redone with RUA during refoofing in 2011	2013, first growing season to be 2014	2013
Green Roof Model	Mixed-intensive	Planter Boxes	Planter boxes/ "Earth boxes"
Organizational Model	Corporate Partnership between Carrot Common Corporation (Commercial Enterprise) and Carrot Green Roof; other volunteer groups	Corporate Partnership between Telus (with its internal "Green Team"), Menkies, and a local farmer hired through Communities Growing Together	Corporate Partnership between TAS and Not-For-Profit Cultivate TO
Building Ownership	Carrot Common	Menkies	TAS
Key Objectives and Values	Education, event venue, community engagement	Employee health and wellness, gardening education	Creation of rooftop green space, showcasing development possibilities
Additional Rooftop Uses	Test garden plots	Anticipated community engagement	Increasing local food security through food donation
Development Goals	Illustrating RUA possibilities; "Carrot College"urban agriculture courses	Corporate influence for other Telus buildings	Anticipated increase in community and tenant engagement
Produce Uses	Donation - Seeds of Hope	Undecided	Donation - CRC 40 Oaks Community Food Centre
Number of staff/Volunteers	Unspecified due to multiple groups involved, including community members, building owners. All volunteer, no paid staff.	6 total (minimum): 3 Telus staff on "Green Team" (including corporate Sustainability Director), 1 Urban farmer (project-specific paid staff), 2 building contacts with Menkies, additional volunteers to be determined through summer months based on staff interest.	5 total: Emma Point (TAS Coordinator), 1 lead gardener and 3 others (all Cultivate TO volunteers)
Size	8,070 sq ft	1,000 sq ft	200 sq ft
Establishment Cost	Approx $300,000	Unspecified	Approx $5,000 (planter boxes only)
Funding Source	Livegreen EcoRoof Incentive grant; Carrot Common	Telus	Fundraising through the Centre for Social Innovation crowdfunding platform; TAS

Table 7 presents general details of the three project case studies featured in this research. This table acts as an overview of these initiatives and provides information on when the projects were established, the gardening model used, ownership and partnerships, as well as rooftop uses, staffing, and general cost/funding details.

Carrot Green Roof is owned by the Carrot Common Corporation. The garden exists as a community-focused initiative supported by Carrot Common as the building owner, and is entirely run by volunteers. Most of the produce grown is donated to Seeds of Hope, for people experiencing poverty. Various community groups use space on the roof in a shareholder's model, with some growing food for sale or for

community food baskets. This roof was funded in part by a LiveGreen Eco-Roof Incentive Program grant and can accommodate weights between 25lbs sq/ft in some areas, up to 50lbs sq/ft and 100lbs sq/ft in others. These varied soil depths allow for a mixed-intensive garden model.

Telus is a national telecommunications corporation. The Telus rooftop garden developed out of an existing garden space on Toronto's Telus headquarters building, owned by Menkie's Property Management. The original garden was used for ornamental drought-resistant plants, in a gravel substrate, and was converted to allow for food production. This project is run by a Telus employee volunteer group and a hired local urban farmer. The growing area is approximately 1000 sq/ft in raised beds.

TAS Design Build is a Toronto-based architecture firm. The TAS green roof was initiated on a building owned by the company and is farmed in partnership with Cultivate TO, a not-for-profit social enterprise. The materials costs for self-watering earth boxes were covered in part through an online public crowdsourcing campaign hosted through the Centre for Social Innovation in Toronto. The produce grown by Cultivate TO is used for community supported agriculture (CSA) baskets and donation. The TAS green roof has 200 sq/ft of growing space, comprised of seventy-two planter boxes.

Table 8 shows thirty basic themes that emerged from these practitioner case studies, revealing a significant focus on subjective perceptions (including civic values, desires, and intangible benefits and outcomes), rather than pragmatic network development themes that predominated the Key Informant discussions. The nature of these themes illustrates the beliefs and social ambitions that are driving reasons for these innovations taking place, and are essential for the

development of the practice and its network. The practitioners present the desire to share their values and experiences, and to collaborate with the community and other practitioners, which is essential to further network development (Volpentesta, Ammirato, & Della Galla, 2013). Due to the subjective and civic-values based content of the key themes for the practitioner case studies, some overlap occurs in the thematic discussions.

Key themes emerging from these three case studies included:

1. Barriers;
2. Network;
3. Values;
4. Legitimacy; and
5. Vision.

Table 8: Thematic Analysis from Case Study Interviews by Group 2: Practitioners

Thematic Analysis - Group 2: Practitioners		
Global Theme	**Organizational Themes**	**Basic Themes**
Significance of organizational model as an influence on the variability of projects, their development speed and process, and gardening model.	Barriers	Lack of a centralized information resource
		Lack of information on/examples of project models
		Costs
		Interpersonal conflict among participants
		Lack of awareness of the network, key players, resources, policies etc.
		Permissions
	Network	Partnerships
		Knowledge transfer: Projects seeking and seeking to provide resources
		Key organizations with overlapping interests
		No existing formalized network organization
		No cohesion among practitioners, key players
	Values	Relationship to food
		Showcasing the possibilities of RUA
		Community participation
		Education
		Local food security and serving vulnerable populations
		Intangible benefits: Social benefits
		Investigating economic potential of RUA
	Legitimacy	Academic involvement
		Measures of success
		Media Recognition
		Community Recognition
		Partnerships
		Acting as an information resource
	Vision	Acting as an information resource
		Showcasing the possibilities of RUA
		Increasing community participation
		Increasing education component within projects
		Increasing size of RUA (Overall implementation at city-scale, and of individual projects)
		Innovation

4.3.1 Barriers

Each case study project experienced difficulties during their implementations to varying degrees. Most typically relating to communication and interpersonal conflict, costs, and a lack of information resources.

As a community initiative, the Carrot Green Roof experienced a two-year delay in its development and implementation due to this large number of actors who could not agree on a common vision for the roof. The result was to not have any single unifying vision, but to instead represent an array of rooftop gardening expressions. While the project had the support of the Carrot Common Corporation as the building owner (financially, along with LiveGreen, and for the use of the space), it did not dictate a vision, but rather worked alongside community members, despite the conflicts.

The Telus roof faced a significant restriction in terms of communication due to corporate restrictions, which kept project organizers from reaching out to community groups or local government for information. The concern of exposing an unofficial plan to possible media attention, particularly for a well-known media corporation like Telus, was an issue. Telus' corporate structure also meant that the volunteer group spearheading the RUA project had to seek approvals from many stakeholders within the organization, often taking long periods of time to connect with the right person.

Cost of establishment was cited as an issue by both CGR and Telus, noting that the cost to hire professionals (landscape designers, engineers, architects, professional gardeners/farmers) was significant, as were materials, transportation and staffing. For this reason, both projects sought less costly in-house solutions, such as using volunteer labour, and reducing reliance on costly technology (such as irrigation

systems at CGR). Telus did choose to develop a budget to hire a local urban farmer through Communities Growing Together, a local community group, but this expense had to rationalized by the Telus volunteer green team in order to be justified by the company. The extent of cost being an issue was largely dependent on the organizational model of these projects. Being a community-based Not-For-Profit initiative, CGR had the most concern for costs, followed by the Telus green roof, which had to rationalize costs, but otherwise was fortunate to have many costs absorbed through the corporation and the real estate firm that owned the building. Uniquely, TAS owned the building that it used to establish its project, and so the costs of materials were a small investment, which was split between TAS and the crowd sourcing campaign through the Centre for Social innovation.

The projects expressed barriers due to a lack of available information on project models, organizational experiences (e.g.: corporate RUA initiatives), projects in climates similar to Toronto's, City policies and resources, local practitioners and experts, and funding resources. All three expressed a need for, and a desire to see, a centralized online information repository for RUA knowledge sharing, and each has chosen to take steps toward developing online resources.

Overall, despite the logistical and technical experiences, interpersonal issues among volunteers and community members were the key barrier to a smooth and efficient development process for CGR. Telus' greatest barrier during establishment was due to its corporate structure, simply because as a company, Telus did not want to publicize the project before it was fully approved. Those involved with the project were cut off from being able to interact with any local network players to gather information on rooftop agriculture.

Practitioners felt that RUA in Toronto was a diverse practice, but participants felt that either there was not a network to speak of, or at least not a cohesive network. Participants recognized that a coordinated RUA network could potentially affect policy change, making reference to the experience of GRHC and its role in encouraging the Green Roof Bylaw. The impacts that this lack of a network presented varied for each case, as each project relied on their own knowledge base and contacts to a different degree. Practitioners were all interested in playing some role in the development of the local RUA network, such as knowledge sharing, but were concerned about their capacity to do so. Like the Key Informant group, Practitioners identified TUG as one organization under which RUA could be housed, and also that FoodShare has played an important role in sharing food network information.

All of these projects involved partnerships, linking the building owners, volunteer groups, and other sources of knowledge, experience, or funding. Navigating these partnerships was noted above as having some inherent interpersonal difficulties; however, all three projects illustrate how bringing together varied stakeholders can produce a functional project, and reflect values of inclusivity and collaboration.

Access to the local community was significantly less for the corporate projects than for the CGR, an already established part of the community in its local area. For TAS and Telus, any community participation was envisioned as a desired end result once the gardens were completed, rather than throughout the process, like with Carrot Green Roof. As an example, CGR sought out information over a long period of time, and consulted primarily with local (unpaid) experts, individuals, and organizations to find out how to successfully set up an intensive food-producing roof, while keeping costs low. As a community effort, CGR welcomed food advocacy groups,

universities, community groups, and individuals to share and work the roof space. Obviously, having community as part of the garden's mandate meant that this project had large group of partners and participants.

Telus' green roof was driven by the vision of Audrey Bayens, who gained the support of a volunteer group (the Telus Green Team), management, and the building owner, Menkie's, in order to establish the project. This support included financial capital to hire a local farmer from Communities Growing Together. This project is an example of numerous and varied partnerships coming together to enable a RUA project in a corporate environment.

The TAS green roof is an example of a simple partnership between the company and not-for-profit organization, Cultivate Toronto. Due to the top-down nature of this project, the company offered the space to Cultivate TO, with Point acting as a liason between TAS management and Cultivate TO. TAS was in a position to help fund the project, which eliminated cost concerns. Once the project was set up, Cultivate TO took over the operations of the space, while keeping an open channel of communication to Point. Being an architecture firm, TAS had a fair understanding of the municipal bylaws in place and which city employees to contact for information surrounding food production and rooftops. As a partnership, TAS relied upon the experience of Cultivate TO as its primary information resource. Cultivate TO brought their existing knowledge, volunteer capacity, as well as food production and donation model to TAS. Having an experienced growing partner appears to be a benefit when setting up this type of project. In the case of Telus, there was an overall lack of awareness about how to present the project to management in a satisfactory way, and a local group with a track record of rooftop farming experience may have been able to help. Likewise, with CGR, an experienced guide with specific rooftop

gardening experience would have likely been helpful in focusing the effort, as the main issue appears to have been simply having too many people involved in the planning process.

Each project accessed information within their networks and partnerships to varying degrees. The Telus project was isolated due the imposed confidentiality required as a result of its corporate structure, having only accessed a single connection (the project's hired urban farmer through Communities Growing Together). Both TAS and CGR were aware of other organizations and municipal departments that are involved in urban agriculture and green roofs. Carrot Green Roof's community consultation process included the TFPC through some of its members, and utilized the city's LiveGreen Eco-Roof Incentive Program for funding. After a period of reduced involvement since the early stages of the CGR project, TUG was again becoming more involved with the rooftop. While representatives from TAS did not reach out to GRHC, they were aware of the organization, and GRHC has used the CGR space for events. This ongoing association between GRHC and CGR may be a key reason why many believe that GRHC is actively advocating for RUA in the city TAS connected with TUG, and the City of Toronto through the TFPC to find out about food donation, and the Department of Planning about the green roof bylaw. Both TAS and CGR were connected through their interactions with the TFPC and FoodShare, as will be discussed in the SNA section of this document.

4.3.3 Values

Within their respective organizational frameworks, these projects were conceived as a means of accomplishing various goals through utilizing rooftop space and activating its greater potential. While all three projects follow different organizational models, they all share common objectives and are driven by social

values, rather than profit-based values. While the production potential for all of the projects is quite modest, the projects are involved with the community through donating the food to local shelters (with the exception of Telus, which at the time of writing is determining what they will do with their first yield). All three projects identified intangible social benefits as priorities, such as community engagement, education, health and wellness, and local food security, albeit to varying degrees. However, all interview participants felt strongly about having their project represent an example of RUA in order to showcase the potential of this practice and inspire others. By presenting a range of garden styles, these projects hope to illustrate the range of options and the potential for experimentation within RUA.

TAS appeared to be more focused on food production than both CGR and Telus, and was identified by Emma Point as having a role in contributing to greater local food security. CGR and Telus acknowledged that food production was really not as important an outcome as the education and social benefits that the projects would generate. CGR identified community access and education as its main values, which were in line with Telus' rooftop goals. Both see the importance of using the garden space as an opportunity to educate on food and gardening related subjects, and to have people feel less intimidated about growing. Fostering a greater connection to nature and green space was a desired outcome expressed by both projects. Academic involvement was important for CGR, having the University of Toronto and the University of Guelph involved with test plots was viewed as a success, and Telus felt that having a university affiliation through graduate-level research would add legitimacy to the project. While TAS did not identify a specific interest in academic recognition, Point felt that media awareness of the roof, and the "Local Food Hero" award from the TFPC (recognizing leadership in the local food system) were accomplishments for the garden. For the TAS rooftop, community engagement was

not possible in the first year, but as a priority point for both Telus and TAS, the issues are being reviewed and addressed in an effort to reduce barriers to community access.

Each project felt that sharing their experiences and creating publically accessible resources about the projects was an important component of the initiative. None of the Practitioners felt that there was an existing RUA network in Toronto, and so documentation and knowledge sharing was identified as a valuable step, and an important responsibility for them as practitioners.

4.3.4 Legitimacy

CGR is working on developing an online information "hub", which will allow them to share their successes and failures, for all to see and learn from. This is important, Curry explained, because her team spent so much time seeking out information and felt that having a resource for others would be valuable. A part of the desire to showcase these projects is so that other practitioners will have information on the unique challenges that Toronto's climate poses for RUA. These three case studies noted that finding information on projects with climates similar to Toronto was very difficult.

TAS has been developing online blog about the project, and using the TAS green roof as an example, the team working on the project would like to create a calculation tool for small-scale producers to estimate the potential income from their produce sales. Based on the experience of the TAS project, it was felt that a resource for building owners could be useful, as this would address misconceptions about rooftop growing and community-based partnerships, and perhaps encourage more building owners to consider installing rooftop gardens. An issue was identified in

there being no online repository for RUA projects in the city to seek out for reference information. Similarly, Telus feels that creating a resource for other Telus buildings (including volunteer green teams and building owners) based on their experience would allow for a more streamlined implementation process for future RUA projects on Telus buildings. The Telus project had no corporate model to follow, and so creating an internal resource was identified as possible resource in encouraging other projects. The Telus rooftop garden has been promoted on the company's internal blog.

Links to academia were mentioned by GCR and Telus. CGR's partnerships with the University of Toronto and the University of Guelph are viewed as important links to RUA and green roofs research. Likewise, the volunteer team at Telus hopes that a graduate student from a local university may want to study the employee responses to the garden, as well as the experience of a food producing rooftop in a corporate environment. It is hoped that academic connections with reinforce benefits of RUA to corporate players, and that working with local academics and researchers may add legitimacy to the effort.

4.3.5   Vision

Overall, each project saw the potential for the growth of RUA, both in Toronto, and within their projects individually. The practitioners expressed their visions for how they could develop and meet a greater level of potential, including more community involvement, a greater education component, expansion of the size of the projects, and developing a means of sharing information about their respective rooftop experiences for the benefit of others. Specifically, as a group specializing in urban agriculture and with rooftop experience on both the CGR and the TAS green roof, Cultivate TO has noted an increased interest in their services specific to RUA.

Each project expressed a desire to act as models to illustrate the potential for RUA, and to make Toronto an environment that showcases the potential of green roofs in action. This included not only the technical aspects of the garden structure and food production, but also the organizational structures and relationships, such as between building owners and volunteer gardening groups. For example, Bayens felt that the interaction between Telus and Menkie's has the potential to set a precedent for rooftop agriculture projects on other corporate buildings.

Each project identified the important role in the local community that their projects play through food donation. While the volume of food production was not the primary focus of these projects, it was still a goal to be able to donate and contribute to the greater wellbeing of those in need in their communities. In addition to this was the desire to encourage additional benefits to the local community, including educational resources, space, a greater sense of community, connection, food awareness, and well-being.

4.3.6   Thematic Summary: Practitioners

Despite the common vision, values and objectives of these projects, the most significant cause of variation in their experiences was due to the model of the organization behind the RUA initiative. These differences impacted the speed of implementation, the number of participants involved, the complexity of development, the expression of RUA model as an outcome, and the level of community and network engagement.

As corporate efforts rather than community-based, TAS and Telus were able to establish quickly compared to the CGR. The difference between these two, however, was that TAS' initiative was a request from the company's upper management, making it a top-down effort, and Telus' garden was a volunteer-led, bottom-up effort

within the company. Telus' experience was felt to be slow at times due to the need to seek out corporate approvals within a large organization, sometimes taking months to get in contact with individuals for necessary approvals. Various stakeholders from outside the company also had to be consulted, adding a level of bureaucracy to the corporate due diligence that was necessary. TAS was able to make decisions quickly and have its project underway within three months of initial discussions. Having a full-time paid staff member to coordinate the project allowed the project to be set up efficiently, and with TAS as the building owner, no permissions were needed to establish the effort, other than from its insurers.

4.4 Toronto's Rooftop Urban Agriculture Community as a Civic Food Network

Preliminary analysis of Toronto's RUA network, as an extension of the city's urban agriculture community, indicated that it was a small, community-driven, localized food-producing initiative. Based on the literature surrounding food networks (as discussed above), RUA appeared to reflect the six main characteristics of a CFN as put forward by Renting, Schermer, and Rossi (2012), rather than its predecesor, the AFN. While AFNs have been linked to a desire to challenge or run counter to conventional food systems, Toronto's RUA community appears to be most accurately represented by the newer theoretical construct of the CFN, put forward by Renting *et al* (2012). Veen, Derkzen, and Wiskerke (2012) note that many AFNS have elements of politicalization and reflexivism in their agendas, although based on the interviews conducted for this research, these concepts appear to be absent from the dialogue. None of the interview participants made reference to political or "radical" motivations for practicing RUA. This network is more civic focused and values-driven, and for the reasons discussed below, is a good example of a CFN.

Using the six-point definition provided by Renting *et al.* (2012), the responses of both interview groups were examined in order to draw out responses that reflected qualities of the RUA community as a CFN. There was naturally some overlap in which defining traits some points fit under, and these will be noted throughout. Additionally, it serves to address the theme of innovation in the city first, as it is the local region and RUA as an emerging practice that is the key focus of this work, and it provides a basis for the remaining five characteristics.

1. **"Often cities are the starting point for food-system innovations associated with CFNs"**

Rooftop agriculture, as an innovation particularly suited to urban environments, due to the large and concentrated expanses of flat, unused roof space. Large-scale commercial RUA projects, such as Lufa Farms, the Brooklyn Grange, Gotham Greens among others, have been established in cities in recent years (Section 2.1). Increased establishment over the last decade implies growth in the development of RUA as an urban agriculture practice. Specifically in Toronto, RUA projects have been gaining in popularity in recent years, with some participants citing the Royal York Hotel's well-publicized rooftop garden (established in 1998) as a reason for this. This growing interest in RUA in Toronto also points to an increase in practitioners, and therefore its growth as a network.

Rooftop agriculture has proven to be very versatile in its applications (different growing methods, volunteer and donation models, and organization types developing projects), which suits the variety of rooftops in an urban landscape, as well as the city acting as a hub for innovation and knowledge transfer. The city is a place where many diverse actors can come together and share their experiences and

social capital. A city can act as a testing ground for new projects, policies and unique organizational partnerships, as will be discussed further in this section.

In Toronto, well-organized groups, such as the Toronto District School Board (TDSB), TFPC, GRHC, have created an environment where significant influence and innovation has been made possible. The TDSB has partnered with FoodShare for its SchoolGrown Rooftop project, and was mentioned by interview participants as having the power to influence other initiatives in the city. The TDSB's Environmental Policy and the development of its EcoSchools program (Toronto District School Board, n.d) show a strong motivation to take on a socially and environmentally active role in Toronto. Likewise, the TFPC is a key advocate of food system strategy within City Hall, and through the Grow TO report has committed to supporting RUA as one of many forms of urban agriculture in the city. GRHC acts as an advocacy group for green roofs, and through their research and influence, were successful in having the green roof bylaw passed in Toronto. All of these groups were perceived to have had an influence on RUA in Toronto, and illustrate the innovative potential led by organized and influential groups in cities. However, smaller groups and individuals can also offer significant contributions to the urban landscape, and foster collaboration in unique ways.

2. **"CFNs refer to new relationships that are developing between consumers and producers, who engaged together in new forms of food citizenship"**

While the RUA community is not perceived to be a cohesive network, the practice of rooftop agriculture is increasing, and new relationships are forming as a result in this early stage of network development. As Rod MacRae explains, food networks tend to start out small, and although the RUA network is only just emerging, it is

civil society driven and based on social values, and these are the primary indicators that RUA is an emerging CFN.

Urban agriculture overall is experiencing a resurgence as a popular urban activity (Steel, 2009), and so diverse gardening methods are making it possible for people to connect with gardening and how food is produced. RUA as a form of urban agriculture is allowing practitioners and community members to experience new methods of food production and community building through specific RUA projects. Illustrating new forms of food citizenship, the RUA projects studied within this research show community support through food donation to vulnerable local populations, or in the case of Telus, the possibility of doing this once the garden begins producing. These three projects are driven by community values and a charity model, rather than being predominantly income driven. An additional element of these three project models was education and community engagement, showing a desire to involve participants in new interactions with food and gardening, and driving a deeper sense of connection to food, nature, and community.

Although not a focus of this research due to an unfortunate lack of response from restaurant-based RUA practitioners, it became apparent that even smaller-scale restaurant initiatives have the potential to be a part of this emerging network. By connecting consumers with the food produced on location, restaurants connect with the community, raise the profile and awareness of local food production, and they have the potential to become allies and key players in the local rooftop urban agriculture community. The variety of organizational and project models (illustrated in Table 5) allows for a broad reach into community groups, with diverse interests, and across many parts of Toronto's downtown core. This affords RUA the potential to interact and engage on different levels, and to become an accessible urban greenspace.

3. **"CFNs … may also include new forms of cooperation between different local actors"**

This research has identified 33 actors, being for the purpose of this research either as informed individuals or practitioners in Toronto's RUA community. Among these are academic institutions, not-for-profit organizations, private businesses, corporate organizations, the City of Toronto itself, researchers, advocates, individuals and community groups.

The City of Toronto has many departments and initiatives that overlap to some degree with RUA, and as such can play a central and supporting role in the further development of RUA, similar to its work with the TFPC and GRHC. One example of cooperation amongst various actors is the case of the Grow TO report (GrowTO, 2012) (which includes references to rooftop agriculture development as a goal) being endorsed by City Council, and the resulting urban agriculture action plan. Within this initiative, civil society and food interest groups are working with the TFPC, the Department of Planning, and City Council, to create a functional initiative in support of urban agriculture, including RUA.

As institutional actors, academic institutions are producing student researchers who are also connecting with the City of Toronto and the greater RUA community. Through this, academics are putting a focus on the practice and sharing their findings with other academics and relevant city departments. One individual participant noted this important role that academics appear to be playing in the city's RUA efforts being actively involved in research alongside the developing RUA community and projects. Academic participation in the first season of the Telus garden was felt to be a means of adding legitimacy to the effort and help to pass along important findings and benefits to head office. Likewise, CGR has allowed the

University of Guelph and the University of Toronto to access plots for trials and experimentation on growing media and crops. Additionally, academic institutions themselves are providing space, as in the case of Rye's HomeGrown's rooftop garden on Ryerson University's engineering building, and the University of Toronto's Sky Garden.

Toronto's RUA projects themselves are primarily run by organizations, rather than private individuals (See Table 5), and as such may be positioned to better promote public knowledge of the practice, and increase community engagement. The three projects which were analyzed in this research show three very different methods of integrating partnerships, community and other stakeholders, and if these are any indication of the broader RUA network, there is great diversity and potential for unique cooperative ventures. For example, CGR has from its inception, engaged a great deal with its local community and Toronto food groups. As a result, it is a project that many people identify when asked about RUA projects in the city (as will be discussed further in Section 4.5). Uniquely, CGR drew upon the community in the planning, set up, and maintenance of the garden, and, rather than just having one group using the space, invited many local participants.

Telus was restricted in its ability to access the local RUA network, and information from municipal resources; however, as a volunteer group within a large corporation, the local Telus Green Team engaged the company, the building owner, and a local farmer and educator from a community food organization. With aims to engage the employees at the Toronto Telus headquarters, the green team is devising ways to develop two-way interactions and information sharing opportunities with the community. A large corporation like Telus may offer greater interaction with the public due to its corporate brand, as well as lend credibility to RUA as a practice, thereby increasing civic and corporate awareness. TAS' partnership with Cultivate

TO is a simple partnership, and is one that the company hopes to promote to other building owners, in an effort to encourage the role of businesses in local food security.

Community interactions such as these (with businesses, the municipal government, academic institutions, and not-for-profit groups) bring a diversity of viewpoints and experiences; the benefit of this is more social capital which helps to generate innovative ideas and approaches to solving problems, the downside is more conflict and potential delays.

4. **"CFNs are … showing the… importance of the role of civil society (and to some extent local and regional administrations) compared to market forces and the (national) state"**

As can be seen in the backgrounds of the research participants, those with an interest in RUA are typically people who have experience in green roofs and/or urban agriculture, and who have an interest in linking these for food production in unused urban spaces. Participants noted the value of an organized civil society organization (whether stand-alone or under the banner of a related group) to coordinate RUA's objectives, as well as put pressure on municipal government in order to implement supports. Civil society actors, project-specific champions, non-profits and local food advocacy groups have the opportunity to maximize social capital, based on the many shared social values that RUA enables, and act as a force for change at City Hall. Key Informants and Practitioners all identified a role for municipal government as a key actor in the development of RUA, in that it has the power to enable RUA through the creation of supportive policies, the creation of funding opportunities, and by removing particular policy barriers.

Toronto's RUA initiatives, as many participants pointed out, are predominantly non-

income generating. Typically, these projects are created to teach, serve the community in various ways, and yield intangible social benefits. While there are several projects in Toronto's downtown core, the sizes of these projects are mostly small-scale and low production; therefore, these gardens do not have sufficient quantities for the local market, let alone the broader supply. Through two of the three case studies in this research (CGR and TAS), it is important to note the important role that these small, low-production gardens can play in a community. The donation model of these gardens allows low-income and vulnerable populations to benefit from freshly grown, local produce, and through these efforts, these projects are improving local food security, outside of the greater market structure.

While the City of Toronto has plans to support urban agriculture, with occasional mention specifically to rooftop agriculture (City of Toronto Official Plan, 2007; Nasr, MacRae, & Kuhns, 2010; GrowTO, 2012), RUA is lacking targeted policies and plans for its specific development. RUA projects in Toronto are civil society initiatives, with little direct support from municipal government.

The three case study projects, while corporate supported, include civil society components to varying degrees, and have mixed partnership models. What is most impressive is that these volunteer and community-based endeavours are the result of either one individual, like Audrey Bayens at Telus, or a small group, presenting a vision of a rooftop project that was so appealing that it won over others. The passion and enthusiam that individuals have for small-scale, civic-focused food projects is what helps them convey the benefits to a larger group. In some cases, this can have a ripple effect in the community (CGR and TAS), or even throughout an large national corporation (Telus).

5. **"CFNs often embody different discourses, new knowledge and new symbolic frameworks, which are developed and shared through interaction amongst involved actors and which underpin new preferences and practices"**

The RUA projects taking place in Toronto are small and experimental in nature, and that they are not typically operating as for-profit ventures; therefore, are not likely to be presenting deliberate competition to the conventional food system (as is the defining trait of the AFN) to any meaningful degree. Being that RUA in Toronto sits largely outside the realm of profit-generating food-production activities, this allows for a certain degree of freedom for experimentation when considering the application of this innovation. Projects emerge from individual visions, and philosophies that address environmental and social values, along with intangible benefits that may emerge from specific projects. In Toronto, RUA projects appear to operate mostly on socially focused models, which allows RUA projects to interface with the community, donate food without the expectation of financial gain, and develop educational and training programs for the benefit of local groups. These social values and the resulting connections have been recognized in the GrowTO Urban Agriculture Action Plan, endorsed in 2013 by the City of Toronto: "Many community health centres, universities and churches, for example, have food gardens … on their rooftops … the produce from these gardens is often donated to local residents or used by community programs, thus forging links between institutions and the neighbourhood" (GrowTO, 2012).

Initiatives like these may be undertaken because a green space in the middle of an urban centre can attract people, engage their attention, and connect them to their local community. CGR has identified these factors as key reasons why it developed its garden, and provides an example of an uncommon rationale for a fairly

significant financial investment. The social return, in this case, justified the financial investment. This sentiment is echoed by TAS and Telus, who expressed the value of the intangible, and largely unknown, and immeasurable social benefits that are important drivers of their projects.

For each of the case studies, a key objective was to act as a guide, model, or inspiration to other projects. Sharing knowledge and experiences, as noted above, was very important to these projects, as they all recognized a lack of available information during their own establishment. Beyond dialogue between individual projects or website access, many participants identified conferences as forums for dialogue. Conferences have the potential to draw professionals from multiple disciplines and organizations, prompting collaboration from various groups. New conversations may emerge from partnerships involving the community, collaborations between the city and academic researchers, as well as an increase in public interest through increased press coverage of projects. These discourses include the community partnerships that simultaneously are a part of the creation of RUA, and also a result of it.

New creative frameworks and practices can emerge from the RUA initiatives themselves (for example, a volunteer model where produce is donated to community groups in need), or from other network actors. Considering the need for project funding, the City of Toronto (although not deliberately for RUA) has developed subsidy programs such as the Livegreen EcoRoof Incentive program grants (for projects which meet the criteria), and Livegreen Toronto Community Grants. Funding mechanisms, particularly those that are government supported, send a strong message that the city is in encouraging of innovative initiatives.

6. **"CFNs in many cases develop and build upon linkages with other new social movements and conceptual innovations related to different societal and economic spheres, ... in this regard, the development of new thinking and alternative practices around food often seems to represent an accessible area of experimentation, with the capacity to foster the further development of new discourses and forms of citizenship"**

As Renting *et al.* (2012) note, CFNs are often extensions of existing social movements and innovations, such as with urban agriculture and green roofs in the city, both becoming present within municipal dialogue since the 1990s and 2000s, respectively. Both groups have established groupings of people and organizations (GRHC, TFPC, TUG and others) providing momentum for their growth and development, and as one participant indicated, there is often crossover, particularly in food interest groups. This is represented within the sampling of Key Informants who participated in this research, all of whom have come to RUA through either green roofs or urban agriculture-related work or civic participation. There is potential for transfer of knowledge, practices and innovations amongst these groups, even informally, due the actors linking these movements. Jane Welsh from Toronto City Planning is an example of someone who works in the public service and has had involvement through that role in both the development of the green roofs bylaw and most recently, the urban agriculture plan.

All case study projects expressed the desire to show that range of possibility for RUA, including Debbie Field when speaking of the SchoolGrown Rooftop project. Various participants expressed the great diversity of rooftop growing that is possible, and all participants felt that sharing experiences and information would be beneficial to RUA practitioners and other stakeholders. The Carrot Green Roof

identifies experimentation as one of the main functions of its roof, and having community groups, universities, and individuals using the CGR plots for research and hands-on learning experience.

As an emerging player in Toronto's greater food system, RUA is one with multiple and varied connections. This creates a unique environment for collaboration amongst existing movements such as urban agriculture and green roofs groups, as well as within the RUA community. Figure 5, as an inventory of existing RUA projects in the city, shows the versatility of RUA, both in how it is applied as a physical garden on a rooftop space, as well as how it is created within an organization. Table 5 shows 14 RUA projects in Toronto's downtown core, and includes academic institutions, restaurants, corporations, and community-focused not-for-profit organizations. These projects utilize partnership combinations, often including a corporate or institutional partner to provide the space, and a volunteer group to maintain the growing space. The gardening model itself can vary, and may involve planter boxes, containers, intensive methods, or combinations of these. This versatility may be presented as an appealing feature to various actors and groups within the city, as experimentation with the different applications and models of RUA may have novelty and practicality when adjusted to different needs or spaces.

4.5 The Structure of the Local RUA Network

Through identifying Toronto's RUA efforts in terms of how the community (however disparate) embodies the principles of a civic food network, it becomes clear that RUA is driven by people who associate the practice with specific values. Being that this is a civic-driven effort, a social network assessment was used to better understand the links that actors have with one another. Information was collected during the initial RUA project inventory (See Figure 11, Table 5), in addition to both interview sets where participants shared details of individuals, projects and

organizations that they felt were key players or practitioners in the RUA community. Excel tables were used to illustrate the network connections of this small local group from the most connected actors, to those who are seemingly isolated from the network. Interview participants agreed that there is no formal or informal RUA network apparatus connecting the local rooftop agriculture community in Toronto. Tables 9 aims to reveal the community and how connected individual actors are, based on their awareness of one another. Interviews provided information about the key roles that actors are playing, and how particular key players may be able to contribute more effectively to the development of RUA in Toronto.

When asked about specific individuals who were local champions for RUA, some names were repeated, such as Steven Peck of GRHC, and members of Toronto Public Health and the TFPC. Interestingly, most participants who noted individuals as local champions pointed out people who were involved primarily with urban agriculture in the city, or with only one specific RUA project. No one individual or organization emerged as an overall champion for RUA in the city.

The City of Toronto was recognized as a key player for the development of RUA in the city, with several branches and departments identified as having potential roles. Key informants identified the Toronto Food Policy Council (being a part of Toronto Public Health), the Department of Planning, and LiveGreen Toronto as being important. Specific programs were also found to be relevant to RUA, such as the stormwater management and tower renewal programs initiatives, as well as the Toronto Agricultural Program, which has emerged from the 2012 GrowTO report. Notably, the Department of Planning has partnered with a U of T student researcher. This being said, participants agreed that the City of Toronto appeared to be largely

uninterested in the development of RUA, or that it did not recognize RUA as a policy development priority.

Five of the Key Informants interviewed for this research are academics involved with RUA to some degree, including Charles Levkoe, Joe Nasr, Mark Gorgolewski, and Rod MacRae. Conferences such as Cities Alive and the Urban Agriculture Summit (See Section 4.2.4) were noted as having brought together academics to discuss urban agriculture, and within that, RUA. The role of academics in this emerging practice is encouraging, and shows that there is growing interest in the practice.

Non-profit groups and local food advocacy groups were frequently mentioned in these interviews as having a connection to the practice of rooftop agriculture in Toronto, specifically FoodShare, TUG and GRHC. FoodShare was referred to several times because of its longstanding role in Toronto as a food advocacy group, as well as its role in establishing a RUA project at Eastdale Collegiate (Eastdale SchoolGrown Rooftop). The Toronto Urban Growers (TUG) group was also identified as a key organization, due to its aim of being a sort of umbrella organization to rally the many local urban agriculture groups together. Although, despite the objectives of TUG, its website presents no mention of rooftop food production (Toronto Urban Growers, n.d).

Green Roofs for Healthy Cities (GRHC) and its founder Steven Peck were cited by every participant (other than Peck himself) as being a key player in the RUA community. Because of the role that GRCH had in organizing the 2012 Urban Agriculture Summit at Ryerson, and its role in pushing forward the green roofs agenda, there is a strong perception that this organization is also acting as an

advocate for RUA. While all other participants held the belief that GRHC is an umbrella organization actively supporting RUA development, Peck himself dispels this. While many are under the impression that GRHC is a local champion for RUA, this is unfortunately not the case, and any hopes of GRHC taking on the RUA agenda under its already existing organization and network framework seems unlikely at this time.

4.5.1 The Broader RUA Network in Toronto

In order to deconstruct the network, actors are discussed in terms of their connections, as well as their role or affiliation and how it connects to the network. In certain cases, particular individuals have become synonymous with their organization or department and were referred to interchangeably by other actors during interviews (eg: GRHC and Steven Peck, FoodShare and Debbie Field, Jane Welsh and the Department of Planning).

Table 9 shows the connections of the 33 actors involved with RUA in Toronto, and allowed for conclusions to be drawn about the network, beyond the qualitative information gleaned from interviews. The table groups actors as "Academics" (including researchers and academic institutions), "City of Toronto" (public servants and departments), "Not-For-Profits" (Industry or community organizations), and "Practitioners" (organizations, institutions, and businesses hosting RUA initiatives). Academics were the best recognized actors in the local RUA network, while restaurant RUA initiatives were largely unknown to other actors and appeared to be disconnected to the broader network.

Table 9: Rooftop Urban Agriculture Network Connections in Toronto

Interview Participants		Joe Nasr	Charles Levkoe	Rod MacRae	Mark Gorgolewski	Wayne Roberts	University of Toronto, general	Ryerson University, general	Jane Welsh/ Planning	Annemarie Baynton/EcoRoof Incentive Program	City of Toronto: various	Toronto Food Policy Council	Steven Peck/GRHC	Debbie Field/ FoodShare	Toronto Urban Growers "TUG"	Kimberley Curry/ Carrot Green Roof	Emma Point/TAS Green Roof	Chris Wong/Cultivate TO	Audrey Bayens/Telus	Emma Point/TAS Green Roof	Rye's Homegrown Roof Garden	Toronto District School Board	Schoolgrown Rooftop	401 Richmond	Sky Garden	Access Alliance	Centre for Social Innovation	Fairmont Royal York Hotel	Native Child & Family Services	Communities Growing Together	The Beast Restaurant, Parts and Labour, Vertical, Weezie's
Academics	Joe Nasr						x		x		x		x		x	x			x		x							x			
	Charles Levkoe	x		x		x	x		x		x	x			x	x								x			x				
	Rod MacRae	x	x					x			x	x	x		x	x											x				
	Mark Gorgolewski							x			x	x	x	x		x						x	x								
	Wayne Roberts	x		x					x		x	x	x																		
City of Toronto	Jane Welsh/Planning Department									x	x	x	x			x								x	x						
	Annemarie Baynton/EcoRoof Incentive Program								x		x	x	x		x	x											x			x	
Not-For-Profits	Steven Peck/Green Roofs for Healthy Cities											x		x		x					x										
	Debbie Field/FoodShare										x	x											x	x							
Practitioners	Kimberley Curry/Carrot Green Roof						x			x		x	x		x				x								x				
	Emma Point/TAS Green Roof								x			x				x		x				x	x			x			x		
	Chris Wong/Cultivate TO (with TAS)												x			x													x		
	Audrey Bayens/Telus Green Roof	x													x							x	x							x	

4.5.1.1 Academics and academic institutions in the network:

Academics as a group were found to be the most connected within the network, and are prominently represented in Table 9. These individuals include: Joe Nasr, Charles Levkoe, Rod MacRae, Mark Gorgolewski, and Wayne Roberts. These researchers have been involved with urban agriculture and green roofs as their areas of study, as well as through civic participation in food advocacy. Their interest in RUA is illustrative of one participant's observation that often people with an interest in urban agriculture develop an interest in rooftop agriculture.

Due to their multiple roles as educators, researchers, activists and community organizers, academics were the most informed group, in terms of their awareness of the existence and roles other actors in the network (projects, people and organizations). Academics are often well known to other researchers in similar fields of study, as is the case in this work; but in Toronto, these academics share the common experience of grassroots-level social organizing in the food movement, as well as in-depth understanding of the food system. These individuals are uniquely positioned (as actors with high connectivity) to provide valuable guidance to the emerging network as it becomes broader and more defined over time. These academics could be identified, according to Krebs and Holley (2002), as "experts in process and planning", as well as having credibility due to their status making them individuals who may be sought out for information about the practice of RUA, and the network.

Reflecting Charles Levkoe's observation that academic research often lags behind an innovation, the development of RUA has seen academics involved early on in the development process. MacRae's research of Toronto's urban agriculture production potential (MacRae *et al*, 2010), as well as his work with Nasr and colleagues on "Scaling Up Urban Agriculture in Toronto" (Nasr, MacRae, & Kuhns, 2010), touched

upon RUA and led to a greater awareness of its practice. The GrowTO report (GrowTO, 2012) authored by Nasr and colleagues, expanded on the literature of urban agriculture in Toronto and RUA as an extension of urban agriculture practices. Gorgolewski, Komisar, and Nasr (2011) authored "Carrot City" which focused on different applications of urban agriculture, and included several rooftop projects, which further drew these researchers into this area of research. Network connections show that academics are keeping abreast of the practice as it emerges in the city. Chales Levkoe notes that the work that students are doing, particularly in collaboration with City of Toronto departments is creating a link between the municipal government, academic institutions, and practitioners. These connections are represented in Table 9 in the form of mentions of the academic institutions that these students represent. This work is raising awareness of RUA and reflects an interest in the practice. Nasr, Gorgolewski, MacRae, Roberts and Levkoe link to a large number of other actors in the RUA community, thus positioning them as connectors to facilitate introductions and knowledge exchange amongst the community.

Although mentioned less often in the interviews, universities themselves (specifically in this case, Ryerson University and the University of Toronto) have roles to play through promoting research, bringing together participants through conferences and forums for dialogue, and partnerships with academics and other local actors (such as municipal government and individual projects) for research.

4.5.1.2 Practitioners in the network:
Awareness of individual projects and their resulting connectivity within the network varied greatly (both with Key Informants and among other practitioners). The top three ranking projects are those that participated as case studies in this research, as these initiatives had an opportunity to reveal actors in the network

known to them, in addition to being known to other actors. Carrot Green Roof was the best-connected project, likely due to being one of the longest established RUA initiatives in the city, as well as the level of community involvement that it has had as the keystone of its mandate. Its aim of being a community hub, project model, and learning space gives CGR the potential to play a leadership role in the network, this will be discussed further below. CGR was known to Jane Welsh and Annemarie Baynton because it is one of a very small number of food producing rooftops that has received funding from the City's LiveGreen EcoRoof Incentive program.

The TAS Green Roof team was aware of several other actors in the local RUA network, although was not well known by others, likely because it is a new project (established in 2013). This project has had limited community interaction thus far, but has aims to expand on its civic mandate. Notably, the TAS green roof is benefiting from the experience that its partner, Cultivate TO, gained while working on the Carrot Green Roof during its first year of establishment.

The Telus green roof is weakly connected to the network. This is primarily due to the Telus green roof being isolated due to its lack of ability to reach out to other network actors during its establishment, and therefore having had less interaction with other RUA activities in the city.

These three projects have valuable contributions to make to the RUA network, as they have expressed through their interviews the desire to act as models for other projects and organizations to show what is possible. All three projects feel that their experiences, not only with the physical vegetated spaces themselves, but also as community groups, and organizations can illustrate RUA's versatility. It is important to note that Table 10 represents those connections that were contacted and utilized as resources for these projects during their establishment.

Table 10: Network Actors Accessed by Practitioners During Establishment

		Network Actors Accessed by Practitioners During Establishment		
		Toronto Food Policy	Debbie Field/ FoodShare	Communities Growing Together
Practitioners	Kimberley Curry/Carrot Green Roof	x	x	
	Emma Point/TAS Green Roof, with Cultivate TO	x	x	
	Audrey Bayens/Telus Green Roof			x

RUA projects that showed the fewest network connections were those that declined to participate in this research, as therefore did not share their network details. These projects included those hosted by academic institutions (Rye's Homegrown Roof Garden, Sky Garden, SchoolGrown Rooftop), or projects which had a broader social causes as their mandate, likely resulting in less of a focus on the RUA project itself (Access Alliance, Native Child and Family Services). 401 Richmond was mentioned, although participants indicated that they were uncertain about whether the rooftop was still being used for food production as it had been in the past.

The SchoolGrown Rooftop, at Eastdale Collegiate was specifically mentioned only a few times; however, FoodShare (which runs this project in partnership with the TDSB), along with its founder, Debbie Field, was mentioned more frequently. The SchoolGrown project in itself was referred to by other practitioners as a RUA model, and Field herself noted that this is a part of the project's goal. Some people identified Debbie Field and FoodShare (often synonymously used) in relation to the organizations' food mandate, rather than the RUA project. Through its partnership with FoodShare on the SchoolGrown Rooftop project, the TDSB was also mentioned as an actor. Some participants felt that being a large organization with influence at the municipal level that it may be able to play an important role in the RUA network through supporting a larger number of projects and showing the benefits and

applications of RUA. The three projects used as case studies in this research all revealed the benefits of shared values such as community building, education, and knowledge sharing with their local communities. Each case study expressed an interest in sharing their RUA experience for the benefit of other practitioners.

Practitioners and project-specific champions can play a leadership role as educators if they reach out and engage with the emerging RUA community, as this will facilitate connections and promote the practice. Practitioners would be the most natural engine to drive the development of an organized RUA network, as their experience would lend credibility as they advocate on behalf of the practice.

Restaurants were the most weakly linked group of practitioners. Surprisingly, despite the Fairmont Royal York having a long-established rooftop project, it was only mentioned once. Other restaurant projects identified in the initial RUA inventory (The Beast, Vertical, Parts and Labour, Weezie's) were not mentioned during the interviews, nor did any agree to participate in this research. The result of this is that restaurants RUA projects appear to be disconnected from the rest of the network. In order to encourage greater connectivity with RUA practitioners, and to illustrate the variation and versatility in RUA models, it is important for restaurant-based RUA projects to be informed about this community. By bringing restaurant projects into the network, productive exchanges may take place, and the network can develop a broader reach.

The concept of innovation is a theme that links CFNs (Renting, Schermer, & Rossi, 2012) and SNA (Krebs & Holley, 2002). Innovators in this network appear to be plentiful, as all RUA projects are innovative in their own way. Since the variability and the lack of collaboration, municipal support or direction effectively isolates projects, each project appears to have basically reinvented the wheel to create its

own model, both as a physical space, and in how the organization manages the project. Bringing practitioners and other actors together as a more cohesive network could provide a forum for experiences and models to be shared, and this isolation to be reduced.

4.5.1.3   The City in the network:

The City of Toronto has many interconnected departments, programs, and policies that are associated with RUA. The City was identified generally as being a very important actor in the current RUA community, but was specifically noted in interviews as having a role to play as RUA develops as a network and a practice. It is important to note that the City was recognized by all of the other best connected actors, showing a strong acknowledgement of its role in this network; however, it was also recognized as being the source of most barriers to RUA development in the city.

Participants identified connections to RUA through the Department of Planning/ Jane Welsh, the LiveGreen Eco-Roof Incentive program and Annemarie Baynton, the LiveGreen Community Grants program, the Green Roof Bylaw, the Urban Agriculture Action Plan, TFPC, the city's Official Plan, and the Stormwater Management and Tower Renewal programs. All of these have some overlapping relationship to RUA, as recognized by interview participants, and may have a role to play as the practice expands and is represented at the municipal level. Being aware of these connection points may provide the RUA network with a basis from which to frame RUA's benefits and contributions to the City.

Jane Welsh was recognized as having a central role in the RUA network, due to the overlapping connections that her role has had with green roofs and urban agriculture development in the city. Charles Levkoe expressed that having an ally in such a position within the public service would be a hugely beneficial tool for the

development of RUA, provided that person had the desire to be a champion for the practice. As an actor in a senior role within the municipal government, with responsibilities that link her to the multiple departments within the city government, Jane Welsh has shown an interest in rooftop agriculture, but is pragmatic about RUA being a focus for the city. She explains that RUA is currently not priority for the City, although she does state that having a more organized and cohesive network to represent the practice would be beneficial to bringing it to the City's attention.

Annemarie Baynton's role with the LiveGreen EcoRoof Incentive program presents a rare opportunity for funding for RUA projects, if they meet specific criteria. Funding was viewed as a barrier to RUA establishment, and so funding mechanisms are valuable to practitioners. Although very few of the city's RUA projects have received LiveGreen funding, this tool is a starting point for encouraging RUA development. While the role of the program is currently small, if the RUA network develops its capacity, this program may be one worth approaching in the future for practitioners to petition to expand its criteria, making funds more accessible.

Considering the multiple and overlapping connection points that the city has to RUA, this is not clearly acknowledged from the City's side. For example, the language surrounding agriculture and food is completely absent from websites and documentation relating to the Green Roofs bylaw and the LiveGreen EcoRoof Incentive program. This lack of information was identified as a barrier for practitioners, as it is unclear whether food production on rooftops as a practice is allowed. This lack of information was felt to have the potential to discourage practitioners, and, whether intentionally or not, sends a negative message from the City about its level of support for RUA.

The Toronto Food Policy Council exists in order to represent the City's food agenda, which recently, through the new Toronto Agricultural Program (based on the GrowTO report), includes a greater focus on urban agriculture and by extension, rooftop agriculture. The TFPC is recognized by most key players in the network as a food advocate for RUA to link itself with, and may be a valuable ally in supporting RUA.

These multiple connection points that RUA has with the city indicate either actors or efforts that have been involved with financing RUA, creating policies that impact RUA development (whether to encourage or restrict), or that have the potential to collaborate with RUA. Many participants identified ways in which the diverse benefits of RUA could meet particular municipal goals (including those listed in the GrowTO report, as well as common benefits shared with green roofs that could meet stormwater objectives, as examples). Also noted were ways in which practitioners and academics could connect the RUA network and collaborate with the City to facilitate greater support for the practice.

Unfortunately, the City was primarily looked upon as being the main barrier to RUA development in the City. If the City of Toronto recognizes itself as a key actor in the RUA network, and engages in collaboration, it may be possible for actors to find common ground and work as allies to build the capacity for RUA in the city. By exploring the benefits of RUA (economic, environmental, and social), and their connection points to municipal objectives, the Toronto could position itself as an innovative leader in urban agriculture. Through taking a food systems approach (MacRae & Donahue, 2013) in partnership with academics and the TFPC, the role of RUA may be revealed more clearly. As in the case of commissioned research for green roof benefits and application in Toronto (Doshi, *et al.* 2005), so too could the City support research into RUA's potential.

Departments and incentive programs have the potential to enable funding opportunities for rooftop agriculture (new programs, or expansion of existing ones), as cost was identified as a barrier to project establishment. Additionally, a restrictive policy environment could be lessened, as was discussed in depth in Section 4.2.2.

4.5.1.4 NFP orgs and food groups in the network:

Particular not-for-profit organizations were identified as being part of the RUA network based on their overlapping interests in either green roofs, or urban agriculture. GRHC, FoodShare, Cultivate TO, TUG, and the Centre for Social Innovation were identified as actors and are discussed below. Communities Growing Together, as a partner for the Telus green roof, appeared to have no online details for further research.

Green Roofs for Healthy Cities and its founder, Steven Peck were identified as being one important actor within the network, although this perception was incorrect, as noted by Peck himself. While Peck supports the idea of RUA, he explained that his organization has little focus on developing RUA capacity or representing the practice through his organization. In his interview, he explained that he does not intended for RUA to become a part of GRHC's mandate in the foreseeable future. Therefore, as an actor in the network, GRHC provides little potential for leadership. What the organization's position in the network does suggest is that GRHC is very well known for its advocacy work on green roofs, and people seem to make the assumption that this includes food producing ones.

Unfortunately, GRHC does not have an advocacy focus on RUA; however, if RUA actors made the concerted effort to develop and mobilize the network, GRHC could be a useful connection. It is likely that individuals outside the network are likely to make the assumption that GRHC has some involvement with RUA; therefore if there

was a RUA network, GRHC could act as a link. GRHC has also shown support for CGR through hosting lectures and educational events on the rooftop, and so additional collaborations could be developed in this way as the network develops. GRHC could connect with projects to showcase the variety of green roof application in Toronto, with RUA being an example.

Foodshare and its founder, Debbie Field were identified as having an important role in urban agriculture, local food security, and RUA. Considering FoodShare's partnership with the TDSP in developing the SchoolGrown Rooftop, as well as the nature of FoodShare as an active and multi-faceted food advocacy organization in the city, this organization has leadership potential for the network. According to one Key Informant, FoodShare could act as an "incubator" to house RUA as it emerges, and provide a well-connected resource, as well as one with RUA interest and an existing track record of project success. As a large organization (relative to other not-for-profit RUA practitioners), FoodShare has a great deal of social capital that could supply guidance and support as the actors convene and work to build an organized and deliberate group.

Cultivate TO was involved with the CGR, and then partnered with TAS to manage their green roof. Having been involved with two different rooftops makes Cultivate TO experienced professionals in Toronto's RUA network. Co-founder Chris Wong explained that due to increasing interest in RUA, the organization sees potential for the organization's mandate to expand in order to fill this demand. It is possible that as an urban farming group with RUA experience, that Cultivate TO could promote itself as a local RUA practitioner and be the first group to carve out a niche as mobile practitioners to fill the needs of business and building owners. While Cultivate TO does not appear to have any network leadership ambitions, it may have an important role within the network as a group with hands on experience and

knowledge to share. Also, the relationship that Cultivate TO developed with the Centre for Social Innovation is important to recognize as an interesting civic partnership and initiative to enable small local projects. While CSI is not focused on RUA, having funding mechanisms in place to encourage such efforts may indicate the potential for partnership with this group as a means of overcoming the oft-mentioned funding barrier.

Toronto Urban Growers (TUG) was proposed by many actors as a potential group under which RUA could be housed as an emerging group. TUG identifies itself as being an umbrella organization for urban agriculture in the city, and so would logically include RUA, although mention of RUA is absent from the group's website (Toronto Urban Growers, n.d). TUG was noted in the interviews as a potential candidate to bring together RUA practitioners and actors, although it was also identified as lacking cohesion itself, due to the many different urban agriculture interests and projects being represented by TUG. More information on TUG's network would likely be a helpful tool to determine how it could support RUA as a network.

4.5.1.5   General Social Network overview:

Participants agreed that there is no organized RUA network, either formally or informally, even at a small level in the city. This being acknowledged, the network inventory shows that as a small community involved in a fairly specialized innovation, which a number of actors appear to share connections that could be developed. Key informants and practitioners provide some indication of the presence of diverse and skilled actors, but the social capital within this network appears to be under-utilized due to weak cohesion. Based on the interviews, the connections most commonly indicate general awareness of others in the network, rather than collaboration and interaction.

110

Unfortunately, the degree of connectivity shown in Table 9 does not indicate a level of participation or leadership activity performed by an actor, making these contributions harder to identify from the visual representations. Returning to the interview content to address this, it does not appear that there is a true leader in this group, since the actual level of communication and engagement among actors, even practitioners, appears to be low. Practitioners appear to be focused primarily on their own projects, with no partnerships between projects being mentioned. The interview participants from all three case studies in this research expressed the desire and intention to share their knowledge and experiences through creation online resources, but no solid plans to actually connect with other actors, organize, collaborate or mobilize were expressed. CGR expressed a lack of capacity as a reason for not reaching out and sharing information with other network actors. No other actors in this study appeared to have any leadership aspirations for the development of RUA as a network; however, several suggestions were made regarding existing organizations that may be able to house RUA as an effort.

Academic institutions are conducting research on RUA in the city as an active effort to bring attention to the practice, which is a form of leadership in knowledge sharing; however, in terms of active collaboration, their role is unclear and dependent on individuals. Potential leaders, however, based on their values and existing experience, would appear to be the Carrot Green Roof, Cultivate TO, and FoodShare. These not-for-profit community groups are active practitioners, which are all connected to each other through their experiences with RUA projects. All three groups are eager to see the growth of RUA as a practice in Toronto, and have explicitly expressed their desire to be involved as practitioners and educators as the number of projects increase. Unfortunately, none of these groups, nor any other actors, expressed specific plans or actions that they have in mind to lead this expansion. At the current time, there is no dialogue taking place to formally organize

the network, nor to take on this initiative. Particular types of RUA initiatives appear to be functioning separately from the rest of the network, such as restaurant RUA initiatives. With the exception of the long-established Royal York hotel rooftop, no other restaurant projects were mentioned by Key Informants or Practitioners indicating a lack of knowledge or interaction with these in the network.

Considering the number of projects taking place in the city, and that the majority of these have not indicated any active interactions with others, frames RUA as a small, and fragmented group. Therefore, in order to begin strengthening ties within this community, the leadership gap needs to be filled. This could be achieved through housing RUA under an existing urban agriculture organization or community group, an individual RUA project, or the leadership of a project-specific champion, as mentioned by Key Informants. The City of Toronto was identified as being a central actor in the RUA community, due to the many departments and programs that have links to RUA (eg: through urban agriculture, stormwater management, green roofs). If RUA became a City priority, the municipal government could act as a supporter and central actor in RUA development in Toronto. City-supported programs could address many of the barriers noted by Key Informants and Practitioners, such as a lack of funding, and a lack of information resources available for RUA implementation in Toronto.

Volpentesta, Ammirato, and Della Galla (2013) present four stages of network development for short-supply chain food networks: networking, coordination, cooperation and collaboration. Networking for the RUA community would require bringing together known actors to sharing their experiences with the practice, and through this the group will become more aware of what activities are taking place in their local area. Coordination of RUA actors would require a commitment to formalizing the group and its communications. As a values driven CFN with multiple

and diverse actors, the cooperation stage would allow for values to be translated in to goals for the RUA network, and the social capital of the group would be channeled based on individual strength into more directed actions for the benefit of the group. The fourth and final network stage is collaboration where shared values drive specific network goals, and decisions are made collectively by network actors. With consideration to these four stages, RUA in Toronto appears to be in a pre-network development stage.

The RUA community in Toronto could be considered a network that does not yet know that it is a network. It is a community with shared experiences, interests, challenges, and practices, but is not in any way organized. This is a group of individual actors who are all linked, but function independently, thereby missing out on the potential benefits that they could reap by connecting with one another. Additionally, as individual actors, there is no capacity to generate broad recognition and build momentum for the practice by legitimizing it through an organized network.

The global themes revealed through the thematic analysis of the participant interviews show the pragmatic approach of Key Informants, along with the values and community-driven enthusiasm of the Practitioners. These traits offer two important elements needed to collaborate, organize, and drive a network in its developing stages. By applying the key skills of each group, these actors could work together to engage the city as an actor in support of RUA. The municipal government has the greatest capacity to enable RUA through its multiple departments, programs, and policies as connection points.

4.5.2   Practitioner Connections: Case Study Focus

While the three practitioner case studies were a part of the broader network through two-way awareness of other actors, the number of actors that they specifically sought out for knowledge exchange during their establishment shows a smaller group. Of the three projects, CGR had the most connections, followed by TAS, both of them being connected through their interactions with FoodShare and the TFPC. The Telus green roof was completely isolated from the other two projects, with only a single actor accessed during establishment, as a hired urban farmer from Communities Growing Together.

These weak links show a need to build connections amongst practitioners and resources that would be beneficial to new projects in their early stages of establishment. Communicating with other practitioners to understand the roles that other actors play is a necessary first step to accessing the social capital for network development.

5 Conclusions

In order to determine the extent of Toronto's rooftop urban agriculture community, a project inventory and semi-structured interviews were utilized to reveal a small social network group comprising a total of thirty-three actors. Of these, sixteen were food producing rooftop projects. Actors included academics, public servants, not-for-profit organizations, corporate organizations, and other institutions. The level of involvement and roles of these individuals and groups vary, but cohesion within the network is low, as most actors, while typically being aware of others, are not actively seeking out other actors for information or to collaborate.

To determine how and to what extent practitioners were accessing knowledge and experience, three projects were selected as case studies in order to find out how many sources were drawn upon for expertise during project establishment. These three projects varied in size, organizational model, and level of network access, although they shared common values relating to community engagement, intangible social benefits (such as health and well-being), food security, and education. These case studies, along with the overall inventory of RUA projects in the city reveal that the development processes, and key motivations driving these projects are as diverse as the projects themselves.

The huge variation in RUA projects presents several potential challenges, for example, costs, difficultly in creating policies and programs for RUA that would cover the range of project models (from container gardens, to greenhouses, to hydroponic operations, to intensive green roofs, and beyond), a lack of experience with this practice for insurance providers, as well as hesitation from building owners and the uninitiated, among other reasons. However, this variability provides

versatility, and the ability to create RUA solutions that can be adapted to the unique shapes and sizes of rooftop spaces found in an urban environment.

Interviews revealed many themes, including perceived barriers to RUA development, opportunities (which linked to the many benefits resulting from the practice), overall perception of the network, and driving values. The basic and organizing themes of both groups differed slightly; however, the overall global themes illustrated two very different perspectives for the Key Informants and the Practitioners. Key Informants (being academics, public servants, and leaders of not-for-profit organizations) revealed a pervasive uncertainly about many aspects of the network, such as where the practice can fit in at the municipal level, unresolved barriers, unknown opportunities, and a weak or non-existent network. In the three case studies, Practitioners all highlighted the organizational or corporate model (eg: not-for-profit community organization, private firm, corporation) as the most significant influence on their projects, including speed of establishment, decision making capacity and approvals, access to resources, and the gardening model itself (eg: container, raised beds, intensive). Not surprisingly, Practitioners identified applied and practical issues, while non-practitioners were more theoretical in their views of the network.

This pragmatic view taken by Key Informants contrasts with the focus on values, community development, and desire to spread the vision of RUA held by Practitioners. As actors within the same network, as practitioners and non-practitioners with a wide range of social capital based out of varied professional, academic, and civic engagement experience, these perspectives may bring an important balance to the network as it develops. The combination of pragmatism and community organizing experience offered by Key Informants, and enthusiasm

116

and practical RUA experience may prove valuable in the network development process, as well as interactions with municipal policy makers. Roep and Wiskerke, (2012) clearly articulate the potential benefits of just such a relationship: "Initiators of new food supply chains usually lack the required experience and expertise for continuous evaluation and reflection... [h]ere external advisors can come in and offer additional support to practitioners by jointly evaluating and reflecting on their practices and by mirroring themselves against other initiatives, ultimately to be better equipped to decide on how to proceed." The experience that academics and other Key Informants may bring to the network could serve as a complimentary skillset to those of the Practitioners.

Interestingly, the overall Key Informant theme of "uncertainty" within the network is already being addressed by the Practitioners who participated in this research, as each of these projects is, at the time of writing of this report, in the process of creating accessible online resources to share information. While this information may take a slightly different viewpoint for each (practical challenges experienced by CGR presented in an online learning hub, the building owner's perspective from TAS on a blog, or an internal Telus reference document for other buildings considering RUA), all share the common desire to share their experiences for the benefit of other prospective practitioners. This is a very encouraging sign, as practitioners are taking the initiative to target issues themselves, rather than expecting the City or other organizations to do it for them, as well as acting on the shared value of knowledge sharing. This desire to share information and reach out to others in the community is illustrative of an emerging movement.

Through exploration of the RUA network through its network actors, this research sought to determine if Toronto's rooftop urban agriculture community reflected characteristics of a civic food network, as proposed as a new food network theory by

Renting, Schermer and Rossi (2012). Interviews revealed that all six characteristics of a CFN were reflected by the participants as elements of the RUA network. The focus on civic values, sharing information about this new innovation, its practice and its benefits, connecting with varied and uncommon actors in partnerships, new food citizenship models (such as volunteer-grown produce for donation), and connections to other existing social movements are all indicative of a civic food network.

In Toronto, this small RUA community appears to be a network without realizing it, or, perhaps more accurately at this stage, a pre-network. This is a small group of individuals and projects, sharing some awareness of other actors, along with common values and hopes for RUA as a practice. According to Volpenestra, Amirato and Della Galla (2013), these qualities set the stage for the first "networking" stage of network development. This pre-network needs leadership, and the various actors need to come together and start the networking process in order to become aware of the existing actors and projects making up the RUA community.

6   Recommendations

6.1   The RUA Network: Enhancing Connections and Communication

The above social network assessment provides information regarding possible roles that specific actors or similar groups have the capacity to contribute to the development of a RUA network. Gaps and barriers emerged throughout the research that indicated areas where particular actions could improve the opportunities for the RUA network, and the practice of rooftop food production in the city. Based on these, recommendations were developed focusing on the key issues of communication and leadership, where actions could be taken to improve the network at this present stage in its development. In addition to this, considering the

place of the City of Toronto as an actor in the RUA network, recommendations were developed from a municipal standpoint that would reduce barriers for RUA.

6.1.1 Communication:

Participants agreed that communication amongst the RUA community is important in order to strengthen connections and share information. A suggestion offered by several participants included creating an online repository of information about RUA in Toronto. It is recommended that the RUA community, including practitioners of RUA projects, as well as non-practitioners, collaborate to create a single online knowledge hub about local RUA projects, models, contacts, and should act as a link with other local urban agriculture groups, such as TUG. It is recommended that the RUA community foster and engage in partnerships with community groups and corporate building owners in order to showcase the versatility of rooftop food production through the many unique and innovative project models in the city.

6.1.2 Leadership:

With consideration to the stage of network development (being in a pre-network stage), a catalyst in the form of a RUA champion or leader is needed to bring together network actors and initiate the first stage of network development (networking), and to begin the process of either forming a legitimate RUA organization in the city, or organizing the group under an existing organization, particularly within the urban agriculture movement. Toronto has been very progressive on both its urban agriculture and green roof agendas, yet because rooftop agriculture is such a young development in the city, it is still restricted by the "organizational silos" (MacRae & Donahue, 2013) of both groups, and has not found an entry point into either one to any significant degree. Actors involved in these two communities would be well-positioned to encourage the integration of RUA into urban agriculture and green roof dialogue.

Academics and academic institutions have the ability through research initiatives and conferences to foster collaborative partnerships and share knowledge, and so should consciously cultivate opportunities for these within the RUA community, and amongst the network actors presented herein.

6.2   RUA in Municipal Policy

Bearing in mind the language of social values that are common to civic food networks, Psarikidou and Szerszynski (2012) concede that these are difficult to identify and measure, and therefore are difficult to translate into policy. This may present itself in the future as a barrier for policy development as RUA emerges in the city as a more common practice in need of stronger municipal support. RUA faces municipal barriers in the forms of lack of available information for practitioners, lack of financial support, restrictive bylaws, and simply, by not being a city priority.

A possible way to address the above issue is by making use of the academic social capital within the RUA network and conducting research with presents the many benefits of rooftop agriculture, from social, environmental, and economic perspectives. This mirrors the approach taken in order to overcome a lack of information surrounding green roofs prior to the implementation of the Green Roofs bylaw.

The Grow TO plan, being the basis for the new Toronto Agricultural Program currently in development, highlights six key priorities for urban agriculture in Toronto:

1. Link growers to land and space;
2. Strengthen education and training;
3. Increase visibility and promotion;
4. Add value to urban gardens;
5. Cultivate relationships;
6. Develop supportive policies.

These City-endorsed objectives provide an attractive framework to present the contributions of RUA to municipal decision makers, as a form of urban agriculture that would meet city goals.

In order to make information readily available for rooftop urban agriculture practitioners, the City should provide information on City websites that relate to RUA, such as the EcoRoof Incentive Program website (City of Toronto, LiveGReen EcoRoof Incentive Program, n.d), and City of Toronto Green Roof bylaw website (City of Toronto, Green Roofs, n.d). Neither of these websites have any information or wording at all relating to RUA, and this may cause frustration or confusion to practitioners who are interested in funding options, or simply to find out if RUA would be considered a green roof under the City's bylaw.

Leadership in academic research could take the form of a policy analysis to get an understanding of where RUA could fit into existing city objectives (such as stormwater management, tower renewal, the Official Plan, the Toronto Agriculture Program, and others). It is recommended that findings in any such research be

proposed according to structure of The Grow TO plan's six key priorities for urban agriculture in Toronto, as this would utilize the city's own structure to illustrate how RUA could meet the city's specific urban agriculture goals

As suggested by Rod MacRae, the creation of a draft policy for RUA, which address these above items, in addition to the goals of Official Plan, stormwater management, tower renewal, and others, could be presented to City council as a way to illustrate where and how RUA could fit in, and meet local goals.

Based on the observations from the three case studies regarding the complexity of the organizational model, the number of people involved in the project development, and decision making, top-down corporate implementations are the ideal model for a quick implementation, as there are fewer cost concerns, more efficient decision making, and set up. If the City were to decide that it wanted to initiate a RUA agenda and have it quickly implemented, this would be the ideal target for a policy focus. As Levkoe notes, the Green Roof bylaw is the "low hanging fruit" of policy creation because of its focus on new industrial builds, so too would this be a quick policy implementation that would result in more food producing roof tops in the city.

7   Challenges of this Research

Issues in this research stemmed primarily from the interview portion of the data collection process. Certain individuals who were considered to be key players within the RUA network did not respond to interview requests, or declined to participate. While this eliminated the information that these key people could have provided to the study, the nature of a social network analysis still allowed for some of these individuals to be included in the results, as their roles and involvement were noted by other participants. However, other actors/practitioners who have smaller scale operations (in particular, restaurants) and who did not respond to the request to participate in this research may potentially be more connected than this research reveals. This study does not have specific insights into restaurant participation in Toronto's RUA network, due to the lack of response from restaurants to the researcher's interview requests.

8 Further Research

Throughout the course of this work, many gaps and avenues for additional research were noted. As rooftop urban agriculture is a new practice, the potential for research and publication in general is great. Toronto as a case study in itself has potential for further exploration of RUA as a practice, as well as its network development.

Based on frequent mentions of TUG in this work, an analysis of this organization as possible umbrella for RUA could be interesting, although the greater role of TUG as a network actor overall may have broader appeal. TUG's role in bringing together the various food interest groups in Toronto was cited frequently, although it was noted by Charles Levkoe that the group was not representative of all food groups. The TUG network would be an interesting network case study.

As time goes on, and the RUA community and number of rooftop farming efforts increases, it may be valuable to place it and its contributions into the context of the greater local food system. By taking a food systems approach (MacRae & Donahue, 2013), information could be presented to the City of Toronto in order to illustrate the impacts that local rooftop food production has for residents, such as improved health and food security, as well as the food system implications, such as economic benefits generated through this practice, jobs created, among others. A food systems analysis may include analyzing market potential, as was expressed to be of interest by both Telus and TAS in their interviews. It may be of value to identify who would be interested in buying locally produced fruit and vegetables, including markets, restaurants, and food share programs, as well as the reasonable cost for these items, and the production potential in the city.

Production potential in the city of Toronto was addressed by MacRae *et al* (2010), in their study of whether Toronto could produce 10% of its food within its own boundaries. However, the calculations for available rooftop space were based on general estimates of flat roof space in the city (Doshi, *et al.* 2005). These estimates did not include a detailed analysis of the number of roofs that would have sufficient capacity for intensive rooftop food production, as the study focused primarily on extensive green roofs as the standard. Therefore, revisiting the original number presented by Doshi *et al.* (2005) with more specific consideration to food producing rooftops could offer a more realistic number from which to base food production calculations. With these new numbers, a follow-up study using the same approach as MacRae *et al.* (2010), and could present a clearer picture of the potential for rooftop food production in Toronto. Related questions could include: "how many rooftops could support this type of farming?", "where they are located?" and "what would grow best in the city's climate?"

This work has noted that much research has been presented on the economic and environmental benefits of extensive green roofs, but few have addressed the potential for intensive food producing green roofs. In line with the study of green roof potential in Toronto (Doshi, *et al.* 2005), it would be of interest to ascertain to what extent intensive RUA holds the same benefits as standard extensive green roofs (ie: stormwater management capacity, energy efficiency, reduction to the urban heat island effect), and what additional benefits it may hold, in line with urban agriculture (social benefits such as job creation, community building, food and farming education). Having this information would provide material that may be able to build the case for RUA in cities.

For RUA to be adopted into municipal policy by decision makers, it would be valuable to determine how policy development could be approached to build the

125

capacity of this new network. One Key Informant noted in his interview that policy makers may not be equipped with the knowledge of how to develop a RUA policy, particularly form a food systems perspective, taking the greater Toronto food system into consideration. It would be a valuable contribution to research, as well as the City of Toronto to have a thoroughly researched understanding of where RUA could fit into the city's policy objectives, and based on this, a draft policy to present to City council. With the research and policy work done, this may present a faster way to have RUA policy integrated into Toronto's urban agriculture and green roofs objectives.

Group 1: Key Informants – Interview Questions
Network-related questions:

1. What has been your experience within the rooftop urban agriculture industry in Toronto? How have you been involved?

2. Do you feel that the development of rooftop agriculture is viewed as a priority for the city of Toronto? And if so, through which policies or plans? (ie: local urban agriculture or food strategy, the Official city plan)?

3. In your experience, what individuals and organizations have been key players in the growth and development of rooftop urban agriculture in Toronto?

4. Is there a particular individual who is involved with rooftop agriculture in Toronto whom you would consider a local 'champion' for the cause?

5. Are you aware of any organizations that specifically represent the interests of the rooftop urban agriculture industry in Toronto? If so, please describe them:

6. What professional networks or associations are you aware of that may overlap with the cause of rooftop urban agriculture?

7. Have you participated in any discussions or collaboration efforts with local rooftop agriculture practitioners and municipal decision makers on the subject of RUA development in Toronto? If so in what capacity?

8. What organizations and branches of Toronto Municipal government have been involved in encouraging the development of rooftop agriculture?

9. Do you feel that as a new industry in Toronto, that the rooftop urban agriculture effort has built up a visible network (ie: to collaborate, coordinate

and share information – general exchange among practitioners and between practitioners and municipal decision makers?)

10. If yes, please describe your impressions of this network (how it works and what it does) (Cohesive? [dis]Organized? Etc.)

11. Do you feel that a formalized network (such as a committee or local advocacy group) would allow rooftop urban agriculture to represent itself as an industry at the municipal level, if so, what do you feel the outcomes of this would be?

City support questions:

12. Do you feel existing policies and programs (Green Roof Bylaw, Eco-Roof Incentive Program, Toronto Agricultural Program, Toronto Food Strategy – Others?) are working to build the capacity for rooftop urban agriculture development? If so, How?

13. How do you feel city policies/programs could work *with* Rooftop Urban Agriculture practitioners to enhance rooftop urban agriculture?

14. What do you feel, if anything, is limiting the development of rooftop urban agriculture in Toronto?

Toronto's Green Roof Bylaw:

15. To your knowledge, do you feel that the green roof bylaw and its associated construction standards has been developed in a way that *encourages* rooftop urban agriculture?

EcoRoof Incentive Program:

16. Do you know of any rooftop agriculture projects that have received funding through Toronto's EcoRoof Incentive Program?

17. Are you aware of other funding opportunities are made available to rooftop farmers through subsidy programs (either city-run or otherwise)?

Group 2: Practitioners – Interview Questions

Project-specific network-related questions:

1. Tell me about your rooftop urban agriculture project… (for-profit? Not-for-profit? Run or initiated by an organization or group? Why this type of business model?)

2. What is your role in this rooftop urban agriculture project?

3. Why did you choose to pursue Rooftop food production in Toronto, rather than 'at-grade' more traditional farming?

4. How many staff, and what types of staff are involved with this project (Part time, full time, volunteers, interns etc)?

5. Do you feel that rooftop farms are a form of urban agriculture that we can expect to increase? If so why?

6. What happens to the food that you produce? Where does it go? How is it used?

7. What is the role of your RUA project in your local community?

8. How do you feel that this particular project connects to the greater local food system in Toronto? (What role does it play?)

9. What difficulties or barriers have you faced throughout the development of this project? (Financial/Insurance? Municipal? Bureaucratic? Knowledge and Resources?)

10. Throughout the planning and development of your rooftop urban agriculture project, did you consult with any individuals in the following groups or organizations:

Toronto Food Policy Council   Yes   No

If so, who? _____

Green Roofs for Healthy Cities	Yes	No

If so, who? _____

Food Share	Yes	No

If so, who? _____

Other local food initiatives/interest groups:	Yes	No

If so, which one(s)? _____

Local Municipal Government	Yes	No

If so, who? Which Department? _____

Toronto's EcoRoof Incentive Program?	Yes	No

If so, who? _____

Local Engineers/Architects/designers?	Yes	No

Other?   _____

If so, who? _____

Any individuals in the City who have in the past set up their own extensive/intensive green roofs	Yes	No

If so, who? _____

Farmers?	Yes	No

If so, who? _____

Community Gardeners/ horticulturalists?	Yes	No

If so, who? _____

Members of private industry?	Yes	No

If so, who? _____

Not-For-Profit Organizations?	Yes	No

If so, who? _____

Any individuals from outside of Toronto?	Yes	No

If so, who? _____

11. Have there been any individuals or groups that you have been particularly connected with *inside the city*?

12. *Outside the city*?

13. Has any individual, group, or organization or resource been especially integral to the establishment of your project due to their contribution and expertise?

14. Generally speaking, how did you come to be involved with other individuals who are connected to rooftop urban agriculture and green roofs in Toronto? (Networking)

15. What information sources have you relied on at the different stages of your project development:

    Planning:

    Design:

    Sourcing of materials:

    Development/Construction:

    Establishment:

    Maturity:

    Other:

16. Do you communicate regularly with other rooftop urban agriculture practitioners in the city?

17. Have you been in communication with or worked directly with members of the municipal government on the subject of RUA? If so in what capacity?

18. Do you feel that as a new industry in Toronto, that the rooftop urban agriculture effort has built up a network to share information? (Two-Way exchange between practitioners and municipal decision makers?)

19. If yes, please describe your impressions of this network – (Cohesive? [dis]Organized? Etc.)

20. Do you feel that an organized network (such as a committee or group with regular meetings) would allow rooftop urban agriculture practitioners to represent itself and grow?

21. What do you feel are some benefits to sharing information and experience within the green roof community?

22. How do you personally reach out and seek or share information?

    Phone?

    Email?

    In-Person?

    Through a third-party?

    Internet?

Project-specific City support questions:

Toronto's Green Roof Bylaw:

23. Do you feel that the green roof bylaw and its associated construction standards has helped you in the design and development of your intensive green roof? How?

24. Do you feel that the bylaw has been developed in a way that encourages rooftop urban agriculture?

25. What do you feel is enabling or limiting rooftop urban agriculture development in Toronto?

EcoRoof Incentive Program (Are you familiar with the Eco-Roof Incentive Program?)

26. Did you receive any funding through Toronto's EcoRoof Incentive Program?

Ryerson University - Consent Agreement
Daphne Page – Master of Applied Science candidate

Research Project Title:
Analyzing Communication Networks in a Budding Industry: Rooftop Urban Agriculture Establishment in Toronto.

You are being asked to participate in a research study. Before you give your consent to be a volunteer, it is important that you read the following information and ask as many questions as necessary to be sure you understand what you will be asked to do.

Investigators: Daphne Page (M.A.Sc Candidate, Ryerson University), Supervisor: Dr. Mustafa Koc, Department of Sociology, Ryerson University.

Purpose of the Study: The purpose of this study is to complete an inventory of the current network surrounding rooftop urban agriculture in Toronto, and to obtain information on whether individuals or groups who are developing new rooftop garden projects in Toronto are utilizing existing networks of experienced individuals in the city to communicate best practices for development, such as policy information, incentive programs, methods, materials and expertise.

This research is funded by the Social Sciences and Humanities Research Council of Canada, and is for the completion of the degree of Master of Applied Science through the department of Environmental Applied Science and Management at Ryerson University.

Description of the Study:
Fourteen (14) individuals will be participating in this study. The study will consist of a series of questions in a semi-structured interviews format which will allow for additional discussion with the participant. There will be a separate interview questions for Group 1 and Group 2, based on their roles in the research as 'Practitioners' and 'Key Informants', respectively. You will participate in only one

interview, with no follow-up. The interview itself will last approximately one hour and a half, and can take place at either Ryerson University, in a private office in the Department of Sociology, or at your own office, as you prefer.

This research plan has been reviewed and approved by the Ryerson University Research Ethics Board. No demographic data will be collected. All research findings will be supplied to you in the form of the final thesis document upon its completion, at your request.

You, as a participant are being interviewed as part of Group ____ : _____.

Key Informants (Group 1): Ten (10) individuals will be affiliated with various groups that have connections to the green roof or rooftop urban agriculture industries in the city of Toronto, such as municipal employees, Toronto Food Policy Council members, non-profit organizations, activist organizations, researchers, etc. These individuals are being interviewed due to their expert-level knowledge pertaining to the green roofs and/or urban agriculture in the city, and because of their key role in a network associated with rooftop urban agriculture development.

These individuals will be asked questions relating to their role as experts within Toronto's rooftop urban agriculture network, their experiences with the rooftop urban agriculture industry, its growth and current state, as well as information about other individuals or organizations within the network that the interviewer should be aware of. This snowball method is intended to further generate a more complete inventory of network connections, and inform whether other individuals should be added as Key Informants to interview.

Practitioners (Group 2): Four (4) individuals will be interviewed based on their experience in developing a rooftop urban agriculture project. The interview will be conducted in a semi-structured manner, and each interview will represent a case study in order to determine their experience with regard to the rooftop urban agriculture network. Two rooftops will be newly established (in 2013), and one will be a longer established project (since 1998).

These individuals will be asked questions relating to their experience with their own rooftop urban agriculture project in the city and the communication networks that they are a part of, and have been in contact with and utilized throughout their experience.

134

Risks or Discomforts: You will be asked questions on a subject in which you have personal expertise and experience. It is unlikely that you will be at any risk beyond everyday normal levels, although individual discomfort may arise due to personal comfort levels within an interview format. It should be noted that there is no 'right' or 'wrong' answer to a question, as these are based your personal experiences. No long-term negative or lingering effects are likely or expected.

If you feel in anyway uncomfortable, you can inform the interviewer and discontinue the interview at any time, either temporarily or permanently. You may choose to skip any question which you are not comfortable answering.

Benefits of the Study:
Benefits of this research will include clarifying the role that existing communication networks play in the newly emerging rooftop urban agriculture industry. In-depth and up to date research on this subject has not yet been completed, so it is believed that this information will be useful in gauging the level and types of communication taking place among new rooftop urban agriculture practitioners and the various relevant networks in the city with experience in intensive food-producing green roof establishment. This information may be of use to rooftop urban agriculture enthusiasts who are seeing to establish their own project, and are unaware of the existing networks, tools and support systems in the city that may benefit them. This research may also be of interest to local green roof or local food advocates.

Individual interview subjects may feel a measure of satisfaction for having imparted their knowledge for the benefit of this research, I cannot guarantee, however, that you will receive any benefits from participating in this study.

Confidentiality: Notes from the interviews will be stored in a locked desk drawer in the Department of Sociology at Ryerson University, in the office of Dr. Mustafa Koc for a period of one year, and at that time will be destroyed.

Audio recordings will be taken by LiveScribe SmartPen and transferred to Dropbox, a secure online storage source, accessible only to the interviewer by password, and will be deleted after one year. The interview subject has the full right to not be audio recorded, if that is their preference.

Group 1: Key Informants: Your identity will be kept confidential, if desired.

Group 2: Practitioners: Your identity will be kept confidential, if desired, and, at your request, so too will the identity of your rooftop farm. However, please be aware

that your identity may be generally identifiable by the project that you are involved with, based on the description of the project, to those in the rooftop urban agriculture community in the city.

While you will not be able to edit the recording or the physical notes after transcription, you will be sent a copy of the transcription after the interview to review if requested, and you may request that a particular item be stricken from the record and not included in the final report.

Costs and/or Compensation for Participation: There are no costs associated with your participation in this study, other than your own transportation arrangements to the interview. There is no compensation for participation in this research.

Voluntary Nature of Participation: Participation in this study is voluntary. Your choice of whether or not to participate will not influence your future relations with Daphne Pawluczuk, Dr. Mustafa Koc, Ryerson University or the Social Sciences and Humanities Research Council of Canada. If you decide to participate, you are free to withdraw your consent and to stop your participation at any time without penalty or loss of benefits to which you are allowed.

At any particular point in the study, you may refuse to answer any particular question or stop participation altogether. Please inform the interviewer if at any point you would like to discontinue the interview.

Questions about the Study: If you have any questions about the research now, please ask. If you have questions later about the research, you may contact:

Daphne Page
Daphne.pawluczuk@ryerson.ca
Or   Dr. Mustafa Koc (Advisor), Department of Sociology,
Ryerson University
mkoc@ryerson.ca
Telephone Number: 416-979-5000 ext. 6210

If you have questions regarding your rights as a human subject and participant in this study, you may contact the Ryerson University Research Ethics Board for information:

> Research Ethics Board
> c/o Office of the Associate Vice President, Academic
> Ryerson University
> 350 Victoria Street
> Toronto, ON M5B 2K3
> 416-979-5042

<u>Agreement</u>:

Your signature below indicates that you have read the information in this agreement and have had a chance to ask any questions you have about the study. Your signature also indicates that you agree to be in the study **as a participant under Group ___ : _____,** and have been told that you can change your mind and withdraw your consent to participate at any time. You have been given a copy of this agreement. You have been told that by signing this consent agreement you are not giving up any of your legal rights.

_____
Name of Participant (please print)

_____   _____
Signature of Participant   Date

I, _____ , also give my consent to be audio recorded.
Name of Participant (please print)

_____   _____
Signature of Participant   Date

_____   _____
Signature of Investigator   Date

References

Alcoba, N. (2011, 11 08). *City may ease green roof rules on new buildings.* Retrieved 08 10, 2013, from National Post: http://news.nationalpost.com/2011/11/08/city-may-ease-green-roof-rules-on-new-buildings/

Aster, D., and Mecklinger, S. (2010). Toronto's Green Roof Construction Standard. *Cities Alive: 8th Annual Green Roof and Wall Conference.*

Attride-Sterling, J. (2001). Thematic networks: as analytic tool for qualitative research. *Qualitative Research , 1* (3), 385-405.

Baker, L. (2000, March/April). Warehouse rooftop supports urban agriculture. *Business , 22.2* (16).

Bastian, M., Heymann, S., and Jacomy, M. (2009). Gephi: an open source software for exploring and manipulating networks. . International AAAI Conference on Weblogs and Social Media.

Blay-Palmer, A. (2010). *Imagining Sustainable Food Systems: Theory and Practice .* (A. Blay-Palmer, Ed.) Ontario: Ashgate Publishing Limited.

Brown, L. (2013, December 26). School's rooftop farm sows 'urban agriculture': Eastdale Collegiate garden feeds locals, teaches students entrepreneurial skills. *Toronto Star* .

Brunori, G. (2007). *Local food and alternative food networks: a communication perspective.* Anthropology of Food (S2).

Burgan, M., and Winne, M. (2012). *Doing Food Policy Councils Right: A Guide to Development and Action.* Mark Winne and Associates.

Burt, R. S. (2005). *Brokerage and Closure : An Introduction to Social Capital.* Oxford, UK: Oxford University Press.

Campbell, M., and Gregor, F. (2002). *Mapping Social Relations: A Primer in Doing Institutional Geography.* Aurora, Ontario: Garamond Press.

Cantor, S. L. (2008). *Green Roofs in Sustainable Landscape Design.* New York, New York: W.W Norton and Company.

Carolan, B. V. (2014). *Social Network Analysis and Education: Theory, Methods and Applications.* Thousand Oaks, California. Sage Publishers.

Cascone, N. *City of Toronto Wise Use Guidelines.* City of Toronto Environmental Planning. April 2014. Toronto.

Cherven, K. (2013). *Network Graph Analysis and Visualization with Gephi.* Birmingham, UK. Packt Publishing.

City of Toronto. (2011, November 29). *Amendments to the Green Roof Bylaw for Industrial Buildings.* Retrieved June 1, 2013, from City of Toronto: http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2011.PG9.1
City of Toronto. (n.d). *EcoRoof Incentive Program*. City of Toronto. Retrieved 1 10, 2013, from http://www.toronto.ca/livegreen/greenbusiness_greenroofs_eco-roof.htm

City of Toronto. (2009). Green Roof Bylaw. *Toronto Municipal Code Chapter 492, Green Roofs* . Toronto, Ontario: City of Toronto.

City of Toronto Guidelines for Biodiverse Green Roofs. (n.d). Retrieved from https://www1.toronto.ca/City%20Of%20Toronto/City%20Planning/Zoning%20and%20Environment/Files/pdf/B/biodiversegreenroofs_2013.pdf

City of Toronto Official Plan. (2007). *City of Toronto Official Plan.* Retrieved April 7, 2013, from City of Toronto:

http://www1.toronto.ca/static_files/CityPlanning/PDF/chapters1_5_dec2010.pdf

City of Toronto, Green Roof Construction Standard. (2009). *Toronto Green Roof Construction Standard (Municipal Code Chapter 492, Green Roofs, Article IV. Toronto Bylaw 583-2009).* Retrieved January 1, 2013, from Toronto Green Roof Construction Standard: http://www.toronto.ca/greenroofs/construction-standards.htm

City of Toronto, Green Roof Construction Standard: Supplementary Guidelines. (n.d). *Toronto Green Roof Construction Standard, Supplementary Guidelines.* Retrieved from http://www1.toronto.ca/city_of_toronto/city_planning/zoning__environment/files/pdf/GreenRoof-supGuidelines.pdf

Cockrall-King, J. (2012). *Food and the City.* Amherst, NY, USA: Prometheus Books.

Coffey, A., and Atkinson, P. (1996). *Making Sense of Qualitative Data.* Cardiff, UK. Sage Publications.

Company behind rooftop lettuce farm on downtown Vancouver parkade goes bankrupt. (2014, January 25). Retrieved February 17, 2014, from The Province:

http://www.theprovince.com/business/Company+behind+rooftop+lettuce+farm+downtown+Vancouver+parkade+goes+bankrupt/9426732/story.html

Corey, S. (2013). *Enabling Urban Agriculture in Toronto: Diverse farming systems as thriving businesses and compatible land uses.* MRP, University of Toronto, Department of Planning, Toronto.

Creswell, J. W. (2003). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (2nd Edition ed.). Thousand Oaks, California: Sage Publications.

Currie, B. A., and Bass, B. (2010). *Using Green Roofs to Enhance Biodiversity in the City of Toronto.* Prepared for Toronto City Planning.

Daily Commercial News. (2013, May 21). *More Green Roofs Top Toronto Buildings.* . Retrieved May 23, 2013, from Daily Commercial News: http://www.dcnonl.com/article/id55350/--more-green-roofs-top-toronto-buildings

de la Salle, J., and Holland, M. (2010). *Agricultural Urbanism.* Winnipeg, Manitoba: Green Frigate Books.

de Nooy, W., Mrvar, A., and Batagelj, V. (2005). *Exploratory Network Analysis with Pajek.* The Edinburgh Building, Cambridge, UK: Cambridge University Press.

Despommier, D. (2010). *The Vertical Farm: Feeding the World in the 21st Century.* Thomas Dunne Books .

Doshi, H., and Peck, S. (2014). *Methods for Estimating Economic Public Benefits from Regional Implementation of Green Roof Technology.* Green Roofs for Healthy Cities.

141

Doshi, H., Banting, D., Li, J., Missios, P., Au, A., Currie, B. A., et al. (2005). *Report on the Environmental Benefits and Costs of Green Roof Technology for the City of Toronto.* Ryerson University. Toronto: Ryerson University.

Douwe van der Ploeg, J., and Renting, H. (2004). Behind the 'Redux': A Rejoinder to David Goodman. *Sociologia Ruralis , 44* (2), 234-242.

Dylan Aster, S. M. (2010). Toronto's Green Roof Construction Standard. *Cities Alive: 8th Annual Green Roof and Wall Conference, Vancouver 2010.* Green Roofs for Healthy Cities.

Earth Pledge. (2005). *Green Roofs: Ecological Design and Construction.* (S. Chrisman, Ed.) Atglen, Pennsylvania: Schiffer Publishing Ltd.

EcoDesign Resource Society (EDRS). (2013). *The Urban Farming Guidebook: Planning for the Business of Growing Food in BC's Towns and Cities.* Vancouver, BC. EcoDesign Resource Society (EDRS).

Elton, S. (2013). *Consumed: Food for a finite planet.* Toronto, Canada: Harper Collins. Erica Oberndorfer, B. R. (2007). Green Roofs as Urban Ecosystems: Ecological Structures, Functions, and Services. *BioScience , 57* (10), 823-833.

FAO. (n.d). *An Introduction to the Basic Concepts of Food Security.* Retrieved 01 7, 2014, from FAO: http://www.fao.org/docrep/013/al936e/al936e00.pdf

Foden Wilson, J. (2013). How Healthy is your Hospital. *Living Architecture Monitor, 15* (1).

FoodShare. (n.d). *FoodShare About Us.* Retrieved 12 01, 2013, from FoodShare: http://www.foodshare.net

FoodShare. (n.d). *FoodShare History*. Retrieved 05 23, 2013, from FoodShare: http://www.foodshare.net/history

Fosket, J., and Mamo, L. (2009). *Living Green: Communities that Sustain.* Gabriola Island, BC: New Society Publishers.

Friedmann, H. (2007). Scaling up: Bringing public institutions and food service corporations into the project for a local, sustainable food system in Ontario. *Agriculture and Human Values , 24*, 389-398.

Gail Lawlor, B. A. (2006). *Green Roofs: A Resource Manual for Municipal Policy Makers.* Canadian Mortgage and Housing Corporation (CMHC). CMHC.

Gaus, R. (2013, March 6). *The Farming Technique That Could Revolutionize the Way We Eat.* Retrieved from The Atlantic Cities: http://www.theatlanticcities.com/arts-and-lifestyle/2013/03/farming-technique-will-revolutionize-way-we-eat/4880/

Goodman, D. (2004). Rural Europe Redux? Reflections on Alternative Agro-Food Networks and Paradigm Change. *Sociologia Ruralis , 44* (1), 3-16.

Goodman, D., DuPuis, E. M., and Goodman, M. K. (2011). *Alternative Food Networks: Knowledge, Practice, and Politics.* Hoboken, NJ: Routledge.

Gorgolewski, M., Komisar, J., and Nasr, J. (2011). *Carrot City: Creating Places for Urban Agriculture.* New York, New York: The Monacelli Press.

Green Roofs for Healthy Cities. (2013). *Annual green roof industry survey for 2012.* Green Roofs for Healthy Cities. Toronto: Green Roofs for Healthy Cities.

Green Roofs for Healthy Cities. (2011). *Green Roof Design 101: Introductory Course* (2nd Edition ed.). Toronto, Ontario: Green Roofs for Healthy Cities and The Cardinal Group.

Green Roofs for Healthy Cities. (2013). *Green Roof Design and Installation.* Toronto, Ontario: Green Roofs for Healthy Cities and The Cardinal Group.

Green Roofs for Healthy Cities. (2008). *Green Roof Plants and Growing Media: Resource Manual.* Toronto, Ontario: Green Roofs for Healthy Cities.

Green Roofs for Healthy Cities. (n.d). *Green Roof Professional Accreditation*. Retrieved January 1, 2013, from Green Roofs for Healthy Cities: http://www.greenroofs.org/index.php/education/grpaccreditation

Green Roofs for Healthy Cities. (n.d.). *Green Roofs for Healthy Cities*. Retrieved January 01, 2013, from http://www.greenroofs.org/

GrowTO. (2012). *GrowTO: An Urban Agriculture Action Plan for Toronto.* Retrieved December 1, 2012, from Toronto Food Policy Council: http://tfpc.to/wordpress/wp-content/uploads/2012/08/GrowTO_ActionPlan_Oct161.pdf

HC Lanarc - Golder. (2012). *Urban Farming Guidebook: Planning for the business of Growing Food in BC's Towns and Cities.* Vancouver.

Health Nexus. (n.d). *Health Nexus*. Retrieved 02 01, 2014, from Health Nexus: http://en.healthnexus.ca/

Hodgson, K., Campbell, M. C., and Bailkey, M. (2011). *Urban Agriculture: Growing Healthy, Sustainable Places.* American Planning Association. Chicago: American Planning Association.

Hood, S. (2013, May 8). *Toronto's backyard bylaw isn't eggs-actly effective, and urban poultry lovers are crying fowl*. Retrieved April 7, 2014, from Yonge Street Media: http://www.yongestreetmedia.ca/features/backyardchickens05082013.aspx

IPCC . (2014). *"Climate Change 2014: Impacts, Adaptation, and Vulnerability. Working Group II Contribution to the IPCC 5th Assessment Report.* Intergovernmental Panel on Climate Change. Intergovernmental Panel on Climate Change (IPCC).

Jarosz, L. (2008). *The City in the Country: Growing Alternative Food Networks in Metopolitan Areas.* Journal of Rural Studies*, 24*, 231-244.

Kaill-Vinish, P. (2009). *Toronto's Green Roof Policy and Rooftop Food Production.* Retrieved from http://www.cip-icu.ca/_CMS/files/PC492%20-%20page%2039-41.pdf

Kalda, R., Schultz, P., Schwenger, S., and Nexus, H. (2011). *Network Mapping @ a glance.* Retrieved 01 15, 2014, from Health Nexus: http://www.hclinkontario.ca/images/Uploaded_files/2011/ataglance_NetworkMapping.pdf

Koc, M., MacRae, R., Desjardins, E., and Roberts, W. (2008). Getting Civil About Food: The Interactions Between Civil Society and the State to Advance Sustainable Food Systems in Canada. *Journal of Hunger and Environmental Nutrition, 2* (2-3).

145

Koc, M., MacRae, R., Mougeot, L., and Welsh, J. (Eds.). (1999). *For Hunger-Proof Cities: Sustainable Urban Food Systems.* Toronto, Ontario: International Development Research Centre (IDRC).

Kossinets, G., and Watts, D. (2006). Empirical Analysis of an Evolving Social Network. *Science , 311* (5757), 88-90.

Krebs, V., and Holley, J. (2002). *Building Smart Communities through Network Weaving.* Retrieved 01 15, 2014, from orgnet.com: http://www.orgnet.com/BuildingNetworks.pdf

Ladner, P. (2011). *The Urban Food Revolution.* Gabriola Island, BC: New Society Publishers.

Lang, T., Barling, D., and Caraher, M. (2009). *Food Policy: Integrating health, environment and society.* New York, New York, USA: Oxford University Press.

Lawlor, G., Currie, B. A., Doshi, H., and Wieditz, I. (2006). *Green Roofs: A Resource Manual for Municipal Policy Makers.* Canada Mortgage and Housing Corporation (CMHC). CMHC.

Livegreen Toronto. (2013). *City of Toronto Guidelines for Biodiverse Green Roofs.* Retrieved July 1, 2013, from City of Toronto: http://www.toronto.ca/greenroofs/pdf/biodiversegreenroofs_2013.pdf

Livegreen Toronto EcoRoof Incentive Program. (n.d). *EcoRoof Incentive Program*. (L. Toronto, and C. o. Toronto, Producers) Retrieved January 1, 2013, from City of Toronto: http://www.toronto.ca/livegreen/greenbusiness_greenroofs_eco-roof.htm

LiveGreen Toronto. (n.d). *Get Growing Toronto: A Guide to Growing Food in the City* . Retrieved March 01, 2014, from LiveGreen Toronto: http://www.toronto.ca/livegreen/pdf/get_growing.pdf

Lue, T; Koc, M. (1999). *Why worry about Y2K? Food security and emergency preparedness for the year 2000.* Toronto: Centre for Studies in Food Security, Ryerson University, Toronto.

Lufa Farms. (n.d). Retrieved 01 07, 2014, from Lufa Farms: http://lufa.com/en/corporate.html

MacRae, R. (2011). A Joined-Up Food Policy for Canada. . *Journal of Hunger and Environmental Nutrition , 6* (4), 424–457.

MacRae, R., and Donahue, K. (2013). *Municipal Food Policy Entrepreneurs.* Retrieved from CAPI - The Canadian Agri-Food Policy Institute: http://capi-icpa.ca/pdfs/2013/Municipal_Food_Policy_Entrepreneurs_Final_Report.pdf

MacRae, R., Gallant, E., Patel, S., Michalak, M., Bunch, M., and and Schaffner, S. (2010). Could Toronto Provide 10% of its Fresh Vegetable Requirements from within its own Boundaries? Matching Consumption Requirements with Growing Spaces. *Journal of Agriculture, Food Systems and Community Development , 1* (2), 105-127.

Mandel, L. (2013). *EAT UP: The Inside Scoop on Rooftop Agriculture.* Gabriola Island, BC: New Society Publishers.

Marketwire. (2012, July 31). *Viable Commercial Rooftop Agriculture Becoming a Reality.* Retrieved 02 15, 2014, from Business Insights: Global: http://bi.galegroup.com.ezproxy.lib.ryerson.ca/global/article/GALE%7CA2981068 92/717c9653a1a7358359f88858e3132f71?u=rpu_main

McAdam, R. (2012). *Digging the city.* Vancouver, BC: Rocky Mountain Books.

McCann, E. (2012). Assembling Urbanism: Following Policies and 'Studying Through' the Site and Situations of Policy Making. *Environment and Planning , 44*, 42-51.

Millstone, E., and Lang, T. (2008). *The Atlas of Food: Who Eats What, Where, and Why.* (C. L. Janet King, Ed.) Los Angeles, California: University of California Press.

Naiman, J. (2012). *How Societies Work: Class, Power, and Change* (5th Edition ed.). Black Point, NS: Fernwood Publishing.

Nasr, J., MacRae, R., and Kuhns, J. (2010). *Scaling up Urban Agriculture in Toronto: Building the Infrastructure.* The Metcalf Foundation. Toronto, ON: George Cedric Metcalf Charitable Foundation.

Nugent, R. A. (1999). Measuring the Sustainability of Urban Agriculture. In M. Koc, R. MacRae, L. J. Mougeot, and J. Welsh (Eds.), *For Hunger-Proof Cities: Sustainable*

Urban Food Systems (pp. 95-99). Toronto, ON: International Developmen Research Centre.

Oberndorfer, E., Lundholm, J., Bass, B., Coffman, R., Doshi, H., Dunnett, N., et al. (2007, November). Green Roofs as Urban Ecosystems: Ecological Structures, Functions, and Services. *BioScience* , 823-833.

OMAFRA. (n.d). *Overview of Beekeeping Regulations in Ontario*. Retrieved March 15, 2014, from Ontario Ministry of Agriculture and Food: http://www.omafra.gov.on.ca/english/food/inspection/bees/beekeepingregulation s.htm

Oppenheim, A. N. (1966). *Questionnaire Design and Attitude Measurement.* New York, New York: Basic Books Inc.

Owens, S., Petts, J., and Bulkeley, H. (2006). Boundary Work: Knowledge, policy and the urban environment. *Environment and Planning , 24*, 633-643.

Parkins, W., and Craig, G. (2009). Culture and the Politics of Alternative Food Networks. *Food Culture and Society An International Journal of Multidisciplinary Research , 12* (1), 77-103.

Patton, C. V., and Sawicki, D. S. (1993). *Basic Methods of Policy Analysis and Planning* (2nd Edition ed.). Eaglewood Cliffs, New Jersey: Prentice Hall.

Peck, J., and Theodore, N. (2010). Mobilizing Policy: Models, methods and mutations. *Geoforum , 41*, 169-174.

Peck, S. (2008). *Award Winning Green Roof Designs.* Toronto, Ontario: Schiffer Publishing, Ltd. .

Peck, S., and Kuhn, M. (n.d). *Design Guidelines for Green Roofs.* Ontario Association of Architects; Canadian Mortgage and Housing Corporation.

Peck, S., Callaghan, C., Bass, B., and Kuhn, M. (1999). *Greenbacks from Green Roofs: Forging a New Industry in Canada.* Canadian Mortgage and Housing Corporation.

Psarikidou, K., and Szerszynski, B. (2012). Growing the social: alternative agrofood networks and social sustainability in the urban ethical foodscape. *Sciece, Practice, and Policy , 8* (1), 30-37.

Renew Canada The Infrastructure Magazine. (2013, 05 13). Green Roofs Thrive in Toronto, Growing by 33%. *Renew Canada The Infrastructure Magazine .*

Renting, H., Schermer, M., and Rossi, A. (2012). Building Food Democracy: Exploring Civic Food Networks and Newly Emerging Forms fo Food Citizenship. *International Journal of Sociology, of Agriculture and Food , 19* (3), 289-307.

Roberts, W. (2008). *The No-Nonsense Guide to World Food.* Markham, ON: New Internationalist Publications Ltd.

Roep, D., and Wiskerke, J. (2012). On Governance, Embedding and Marketing: Reflections on the Construction of Alternative Sustainable Food Networks. *Journal of Agricultural Environmental Ethics , 25*, 205-221.

Roldan Vera, E., and Schupp, T. (2006). Network Analysis in Comparative Social Sciences. *Comparative Education , 42* (3), 405-429.

Rutherford, S. (2007). *The Green Infrastructure Guide: Issues, Implementation Strategies and Success Stories.* West Coast Environmental Law Research Foundation. Vancouver: West Coast Environmental Law Research Foundation.

Torrance, S; Bass. B. (2013). *City of Toronto Guidelines for Biodiverse Green Roofs.* In conjunction with Toronto City Planning Division, Toronto, ON.

Shiva, V. (2000). World in a grain of rice. *The Ecologist , 30* (9), 51.
Snodgrass, E. (2010). *The Green Roof Manual: A Professional Guide to Design, Installation, and Maintenance.* London, UK: Timber Press.

Steel, C. (2009). *Hungry City: How Food Shapes our Lives.* London, UK: Vintage Books.

Sustain. (2013). *Good Food For London: How London Boroughs can help secure a healthy and sustainable food future .* Sustain, London Food Link , London.

The Municipal Infrastructure Group Inc.; Schollen and Company Inc. (2011). *Stormwater Mangement and Feasibility Study.* City of Toronto Tower Renewal . Toronto: City of Toronto Tower Renewal Program.

Toronto District School Board . (n.d). *Toronto District School Board EcoSchools*. Retrieved March 15, 2014, from Toronto District School Board : http://www.tdsb.on.ca/AboutUs/Innovation/EcoSchools.aspx

Toronto Food Policy Council. (2012, November). Retrieved 01 5, 2013, from Toronto Food Policy Council: http://tfpc.to/news/scaling-up-urban-agriculture-in-toronto

Toronto Food Policy Council. (n.d). *Toronto Food Policy Council About.* Retrieved 12 1, 2013, from Toronto Food Policy Council: http://tfpc.to/about

Toronto Public Health. (2010). *Cultivating Food Connections: Toward a Healthy and Sustainable Food System for Toronto.* Toronto Public Health. Toronto: City of Toronto.

Toronto Urban Growers. (n.d). *Toronto Urban Growers (TUG)*. Retrieved January 1, 2014, from Toronto Urban Growers (TUG): http://torontourbangrowers.org/ (2012). *Toronto Municipal Code Chapter 492: Green Roofs.* Toronto: City of Toronto.

UNDP. (1996). *Urban Agriculture: Food, Jobs and Sustainable Cities.* New York, NY, USA: United Nations Development Program (UNDP).

Urban Agriculture Summit. (2012). *Urban Agriculture Summit: August 15-18, 2012, Toronto, Canada.* Toronto: FoodShare.

Van Den Hoonaard, D. K. (2012). *Qualitative Research in Action: A Canadian Primer.* Don Mills, Ontario: Oxford University Press Canada.

Veen, E. J., Derkzen, P., and Wiskerke, J. S. (2012). Motivations, Reflexivity and Food Provisioning in Alternative Food Networks: Case Studies in Two Medium-Seized Towns in the Netherlands. *International Journal of Sociology of Agriculture and Food, 19* (3), 365-382.

Volpentesta, A., Ammirato, S., and Della Galla, M. (2013). Classifying short agrifood supply chains under a knowledge and social learning perspective. *Rural Society , 22* (3), 217-229.

Walsh, D. (n.d). *Carrot Green Roof*. Retrieved 12 15, 2013, from Carrot Green Roof: http://carrotgreenroof.wordpress.com/about/

Watts, D., Ibery, B., and Maye, D. (2005). Making reconnections in agro-food geography: alternative systems of food provision. *Progress in Human Geography , 29* (1), 22-40.

Weis, T. (2007). *The Global Food Economy: The Battle for the Future of Farming.* Black Point, NS: Fernwood Publishing.

White, T. (n.d). Retrieved 01 15, 2014, from Spacing.ca: http://spacing.ca/vancouver/wp-content/uploads/sites/6/2013/03/TatianaWhite_TOGreenRoofPolicy.pdf