

Scaling Up or Selling Out?  
A Critical Appraisal of Current Developments in Vertical Farming

by

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## **Abstract**

This thesis engages with material on the forefront of the social and natural sciences as it appraises the practice of *vertical farming (VF)*. Proponents suggest VF can help ease the burden of converging food, ecological, and energy crises. The research uncovers counter-hegemonic discourses invoked by VF proponents, and analyses how actors navigate the dominant economy. Research focuses on case studies through material and discursive lenses. The results fill a niche in literature relating to alternative agriculture models, as they focus on a proposed solution to, rather than problems with agribusiness. This thesis contends with practical challenges to many normative assumptions, and exposes difficult questions which involve setting parameters, arbitrating compromise, and striking a balance between effective political action and pacification. This research elucidates intersections of power, production and resistance as they relate to important issues of the day. As such, the conclusions are both stimulating and relevant.

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## Preface

This project began some years ago, out of an interesting confluence of ideas and events. I had just been accepted into the Master of Arts program at the Institute of Political Economy, at Carleton University. I had also just begun to manage the design and construction of a sustainable student housing compound, located close to campus. As such, my general responsibilities converged around researching and implementing alternative (critical and sustainable) forms of social organization and economic development. However, a spark of inspiration came to me one afternoon, while practicing yoga on my lunch break at the building site. Enjoying the outdoors (despite my immediate urban construction surroundings), my mind flickered between thoughts of how to design the compound and what to research for my thesis. I acknowledged these questions, but refocused my mind on the present moment, reflecting on my yoga practice. Farhi (1999) succinctly describes the thought as:

the premise that suffering arises from a mistaken perception that we are separate. Whether we feel separate from human beings, or separate from the trees we walk under, the rocks we walk upon, or the creatures that walk, fly, swim and crawl around us, yoga insists that this separation is an illusion.<sup>1</sup>

I then realized I had one answer to both previous questions: I would focus my design *and* research on mitigating the widespread suffering associated with the status quo, by reconnecting people with each other *through* and *with* nature. After pondering and discussing this notion a bit further, it soon became apparent that in real terms, separation means capitalist alienation, and that the most perverted (and perhaps basic) form of disconnect of people from each other and nature stems from industrial agriculture. Theories of social nature

soon came to articulate the informal sentiments I felt that sunny afternoon. Conversing with other so-called ‘foodies,’ I felt unconvinced by what seemed to represent New Age ‘back-to-the-land’ fantasies of small-scale production. While I espoused the same values, I recognized the desperate need to scale up production in cities where, despite some rural retirement plans, the vast majority of humanity will live now and into the future. This longing for a possible middle ground led me to vertical farming as a site of study. I felt that it was worth trying to implement, but feared relying too much on technology and capital. Theories of co-optation and counter-hegemony soon came to articulate this personal dilemma. This thesis is therefore part of a dialectical process through which the intellectual has been informed by the material and spiritual, while engaging with emergent properties of the current political economy. Following the rich tradition of auto-ethnography, my intent is to ground the document in lived experience while making the material more accessible to those who may benefit from it. I hope you find it a useful and enjoyable read.

Salutations,

Austin Miller.

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“We are the dirt caught in the cracks of the neoliberal city from which will sprout the green resistance of the future.”

- Socio-environmental activist, Montebello, QC, 2007.

## **Chapter 1: Substantive Context**

This thesis engages with material found on the cutting edge of the social and natural sciences. Operating in line with Carleton University’s Strategic Plan, it seeks to affect change within communities to solve real world problems.<sup>2</sup> This project investigates the phenomenon known as *vertical farming* (VF). Proponents present it as a part of possible solutions to problems stemming from the emerging (and converging) global food, ecological, climate, and energy crises. This research seeks to uncover counter-hegemonic discourses invoked by VF proponents in order to determine whether such discourses exist, and if/how they are mediated by/through the dominant economy. It also seeks to determine if such counter-hegemonic discourses comprise an emerging VF movement and/or industry with broader, transformative implications. Counter-hegemonic discourses shall be defined, following Adkin (1992), as:

Critical of capitalist accumulation, of productivism, of science as domination of nature, of the prevailing ideologies of science and technocracy, of relations of subordination-domination (gender, racial, heterosexual), and of the institutions and social practices that underpin such relations, including the restricted nature of liberal democracy and the separation of the personal from the political, or the private from the public.<sup>3</sup>

Drawing on the concept of social nature, this research will also incorporate an analysis of the separation of environment and civilization into these criteria. In so doing, this thesis employs an innovative methodological and theoretical combination of political economy, political ecology, and Phronetic/auto-ethnographic approaches (the latter of these will be discussed in greater detail in Chapter 2). Also, while Adkin’s (1992) quote provides a

good initial point of departure, the concept of counter-hegemony shall be further unpacked in Chapter 2 as well.

This research focuses on important case studies and examines them through both material and discursive lenses. Primary data was obtained through site visits and in-depth, semi-structured interviews, and supplemented with secondary documentation. This research focuses primarily on a proposed solution to, rather than the problems with, global agribusiness. The analysis then evaluates the potential of the proposed solution by appraising the degree to which VF can be feasible materially, yet remain critical theoretically and politically. The answer exists somewhere in between, as everyone, even those most critical of the status quo, are bound to be complicit in hegemonic power at some point, to some extent. As a result, the discourses revealed here and the actions they relate to and promote, fall along a spectrum rather than into polarities. This thesis contends directly with this practical challenge to many normative assumptions found in counter-hegemonic movements. Subsequent difficult questions involve setting political parameters, arbitrating compromise, and attempting to strike a practical balance between effective political action and pacification. The results elucidate intersections of knowledge, power, production, and resistance related to some of the most pressing issues facing the world today. The conclusions are at once academically stimulating and pragmatically relevant.

Chapter 1 provides a thorough explanation of the development of the project. Section 1.1 introduces the subject area in broad terms, explaining the relevance of the research topic and how it fits into the larger global political economy. This includes a discussion of emerging movements and technologies and how they relate to critical

politics. It also briefly reviews the problems associated with the status quo with respect to capitalist agribusiness and its relation to socio-economic and environmental degradation. Section 1.2 reviews the relevant literature relating to these issues and highlights the important knowledge gaps this project seeks to fill, while Section 1.3 outlines the research questions.

### 1.1 Topic

In general terms, this project concerns the social, economic, political, and environmental problems associated with conventional, industrial agriculture. A combination of political economy and political ecology approaches will help politicize and analyze the material and discursive elements of VF as a part of possible alternatives (more on this in Chapter 2). Agriculture can be defined as: “[t]he science, art, and business of cultivating soil, producing crops, and raising livestock; farming.”<sup>4</sup> This definition most often refers to food; however, processes linked to other commodities, such as medicine, biofuels, and pulp and paper, are also included. Together, these encompass *agribusiness*, a sector that while often invisible to most of society, provides base products for more refined consumer items with seemingly little indication of (or relation to) where they came from. This sector influences far more than the commodified outputs listed above: in fact, it has contributed to massive global changes (discussed in more detail below), which in part have prompted some, such as Crutzen and Stoermer (2000) to label the current geological epoch as the Anthropocene.<sup>5</sup>

The definition of agriculture at hand also mentions soil and farming, the original metabolic relationship with which Marx credits the rest of modern society. In *Capital*

(Vol. III), Marx notes that agriculture is “above all, the basis of capitalist production.”<sup>6</sup>

For, if each individual were simply to work to provide their basic material needs, there would be no surplus value with which to create the other aspects of modern society.

History has witnessed the perversion of this fundamental bond through the exploitation of human and natural resources. Wallerstein (2011) notes that this exploitation process began in sixteenth century Europe with the alienation of peasants from the land (more about capitalist agriculture later).<sup>7</sup> However, change in the future of agriculture might redefine these relations yet again. Futures Studies scholar, Karen Hurley, notes that the future of the agri-food system is not frequently discussed, and she outlines the merits of examining this issue:

Those studying the future of food systems can provide a leadership role in looking past the negative trends, not assuming a singular linear path towards the future, and create preferred futures where the growing and preparation of food is celebrated and honoured as important work in the world. We can envision food secure communities and regions, where we do not rely on complex transportation networks to provide all of our food. We can support those who are brave enough to research and write about food in our futures. We can participate in envisioning communities where healthy, local food is made available to all, grown by farmers who are happy, healthy and honoured, and where no person goes hungry. And we can use positive examples from the world today to challenge those who say it cannot be done. It can be done, and we can help in making it happen.<sup>8</sup>

Analysts increasingly insist that the word *can*, as employed by Hurley above, will soon be replaced with the word *must*. Chief British Scientific Advisor, John Beddington, has warned that a food crisis will hit harder and faster than climate change (though clearly, they impact one another iteratively).<sup>9</sup> The issue of ‘peak oil’ is but another closely related and looming crisis, which will compound the negative ramifications of the other crises. The negative feedback loops caused by these crises acting upon one another have already been discussed and warned against (Battisti, 2009; Nelson et al, 2009, and others), such

as global warming and oil scarcity accelerating/intensifying the instability of the agricultural system.<sup>10</sup> Regrettably, the world may well face a scenario in which large-scale agribusiness turbulence from crop failures, extreme weather events, climate change, and bio/chemical contamination, combine with uneven patterns of demand/supply and a skyrocketing cost of fossil-fuel based production and distribution.<sup>11</sup> Rockstrom et al (2009) note that humanity has already broken through three critical earth system thresholds (biodiversity, climate change, nitrogen/phosphorous cycle), and is on track to breach the remaining six (ocean acidification, ozone depletion, freshwater, land use, aerosol loading, chemical pollution).<sup>12</sup> Even the Group of 20 recently (and for the first time!) convened a meeting of Agriculture Ministers to discuss some of the problems associated with the agri-food system.<sup>13</sup> Below, a synopsis of recent trends demonstrates (in broad strokes) the role of agriculture in this problematic process.

While regions and approaches vary considerably, agribusiness (broadly defined) involves the use of significant amounts of fresh water. *Embedded water* denotes (albeit somewhat crudely) the water required to produce a given product, such as the astounding 2400 liters it takes to produce a 150-gram hamburger.<sup>14</sup> Thus, agriculture accounts for up to 70 percent of global freshwater use.<sup>15</sup> Second, the average food product travels approximately 2800 km from seed to consumption, emitting huge amounts of greenhouse gases and other pollutants in the process, and making the agribusiness sector a major contributor to global warming.<sup>16</sup> In the European Union alone, agribusiness is responsible for 31 percent of total greenhouse gas emissions.<sup>17</sup> The agribusiness sector also generates significant amounts of other natural and synthetic waste: in the UK, for example, 6.7 million tons of edible food and 5.2 million tons of food packaging are wasted annually.<sup>18</sup>

Likewise, the sector releases large quantities of pesticides and fertilizers into air and water systems. Agri-business is responsible for 87 percent of ammonia emissions in the UK, while the Organization for Economic Cooperation and Development (OECD) reports that water pollution constitutes an important problem in its member states, including multiple *dead-zones* created by industrial agricultural run-off, as experienced in the Gulf of Mexico.<sup>19</sup>

Agribusiness has led to other serious concerns, such as the potentially deleterious health and biodiversity impacts of genetically modified food, and bacterial and hormonal contamination. Terrestrial biodiversity is also being destroyed, with farmland bird population declines being reported across OECD nations.<sup>20</sup> Capitalist agri-business also contributes to the devastation of global forests, wetlands, and other sensitive ecosystems and carbon sinks. For example, 87 percent of deforestation in Malaysia is the result of monoculture palm production, with the oil going to industrial food processing and manufacturing.<sup>21</sup> Moreover, marine ecosystems are also being devastated by aquabusiness (hereafter included in the term agribusiness), with predatory fish stocks at ten percent of pre-industrial levels.<sup>22</sup> The industrial fish farm response is not the answer, (and has in fact contributed to the problem), as every ton of large farmed species is fed up to three or four tons of fishmeal made from other, often wild, fish.<sup>23</sup> Such infrastructure is also harmful to coastal habitats.<sup>24</sup> The severity of these problems has contributed to the current biological epoch being referred to as the 'sixth great extinction.'<sup>25</sup> These aforementioned problems then lead to more traditional vulnerabilities associated with floods, pests, drought, and others worsened by an increasingly unpredictable climate and unstable ecosystems.

Many of the other vulnerabilities associated with agribusiness are preexisting and largely economic, arising out of the speculative and disjointed nature of global capitalist markets.<sup>26</sup> Deregulation combined with commercial integration has left food and agricultural products subject to devastating price shocks. For instance, in 2008 global food prices soared due to factors such as the increase in demand for corn from rising ethanol production. For example, forty percent of corn production in Canada now supports fuel production.<sup>27</sup> As one policy analyst observed, “[i]n effect, the price of oil is beginning to set the price of food.”<sup>28</sup> This connection also results directly from the dependence of agribusiness on energy intensive production and distribution. As a result, consumers (especially in developing nations) suffer. Holt-Gimenez (2009) notes that average global food prices in 2008 were 83 percent higher than those only three years previous; furthermore, 45 percent of that price hike occurred in the last nine months of this period.<sup>29</sup> It is no coincidence that such inflation occurred at a time when hundreds of billions of dollars worth of investment capital was bleeding out of financial markets and into commodities futures markets.<sup>30</sup> Subsequent capitalist speculation is often overlooked as a prime contributor to the resulting price increases as well. Of course, even before such turbulent distortions, global consumers were often spending over 50% of their income on food.<sup>31</sup> This ‘volatility’ is linked to enormous and increasing agribusiness profits, which spiked anywhere from 40 to 1200 percent during the 2008 shocks.<sup>32</sup>

While high prices hurt families around the world, Massicotte (2010), Geddes (2010), and others note how wholesale commodity price drops also often negatively impact farmers and other producers. As one researcher explains, “[f]armers are getting a little less every year and consumers pay more every year and the companies in the middle

take a bigger bite.”<sup>33</sup> As a result, family farmers find it difficult or impossible to thrive within the capitalist model, as more and more land and other productive assets become concentrated in fewer and larger multinational corporations.<sup>34</sup> In Canada, the solidification of the neoliberal model in the 1990’s corresponded to a rapid decline in the number of small-scale farmers, leading to more land being farmed by ever larger operations.<sup>35</sup> This amalgamating trend has led to increased urbanization rates globally, which in turn has concentrated and exacerbated current vulnerabilities, while also creating new ones.<sup>36</sup>

The current food system also contributes to serious public health impacts and vulnerabilities. The trend of putting profits before people has resulted in a significant portion of the world’s population suffering health problems and death due to various forms of malnutrition. Nearly one billion people around the world suffer from a lack of food, while roughly an equal amount of individuals simultaneously suffer from obesity.<sup>37</sup> This skewed food distribution and the resulting health problems have negative impacts on healthcare systems and other social services, reducing the resiliency and adaptive capacity of communities, and even entire countries. The neoliberal model (expanded upon below) suggests non-interventionist methods such as consumer education and product labeling in an effort to combat obesity in the West, for example. However, the industrial production of fatty foods continues to grow rapidly (31% between 1997 and 1999).<sup>38</sup> Clearly, there is a deeper problem at play that requires more radical solutions.

The current means of production and distribution have also led to individuals being disconnected from their families, peers, and nature. As food production, processing, distribution, and even meal preparation become outsourced and

commercialized, the alienation grows stronger. Home meal preparation in Canada dropped from 50 to 25 percent between 1992 and 2003 (compared to nearly 100 percent just a few decades prior).<sup>39</sup> This type of social disintegration facilitates and reflects much of the other aforementioned problems. Therefore, when searching for solutions to these issues, we must seek a foundation for resistance to the system that caused them.

Returning to pre-capitalist farming could limit exploitation, reconnect communities, and even prevent global warming, though it would surely condemn millions around the world to starvation. This understanding presents an interesting point of departure from common back-to-the-land sentiments: *Which initiatives can retain the scale and surplus value associated with modern agriculture and yet wrest control of it from 'big agribusiness'?*

While resisting neoliberal agribusiness is quite a task; the good news is that there are alternatives which present possible, though not perfect, solutions (as presented by their proponents) to many of the problems associated with agribusiness. One of the most intriguing examples of something new that may contribute to these solutions is *vertical farming* (VF). As may be the case with many new concepts, VF is but one way of articulating the practice. Others have referred to this phenomenon as *controlled environment agriculture*, *building integrated agriculture*, or have simply included it as a technical component within the larger phenomenon of *urban/civic agriculture*, or even more generally, local or alternative food production. While acknowledging the nuanced differences among such descriptions, semantic disputes defy the scope of this paper. Here, VF is viewed as a rare and slowly emerging phenomenon, stemming from a vibrant history of renewable technology.<sup>40</sup> It is important to note this history, and to remember that renewable and integrated technologies existed and thrived long before the triumph of

the status quo. This acknowledgement helps contest the inevitability of dominant technologies and the forms of socio-economic organization that produce and/or adhere to them. For VF, this contestation often means innovation in cultivation, and its incorporation into the built environment. Such developments are part of an adaptive process stretching back to the Hanging Gardens of Babylon, the 'soddies' of the Canadian Prairies, and to the multitude of greenhouses, growing walls, and green roofs found in contemporary society.

While there is no consensus defining VF, a good start might sound like this: *producing organic matter on multiple planes with a focus on sustainability and equity*. In essence, VF is a process through which organic matter may be produced, processed, and distributed in an efficient and sustainable way, with respect to factors such as energy, water, waste, space, and labour.<sup>41</sup> Such benefits are achieved through integrated growing techniques such as hydro, aero or aquaponics, coupled with renewable energy systems such as wind, solar, geothermal, and biomass/gas. These processes may be integrated into existing infrastructure or custom built, in order to cultivate all manner of crops (and even certain livestock) within closed-loop, symbiotic, and often indoor environments. Growing components are arranged vertically in various ways and usually located within urban spaces. These ideas also appear to be linked to critical views of dominant socio-economic and political norms associated with agribusiness. Such critiques relate to issues of scale, labour, health, equity, sustainability, ownership and decision-making with respect to the production and distribution of agricultural commodities, especially as they relate to food and energy.

VF, stripped to its core, can be reduced to a notion of adapting technology in order to increase efficiencies. Indeed, new technologies are usually employed by dominant political and economic interests more readily than by their critical subalterns. Yet, it appears that VF may represent more than simple definitions of the words comprising the name. Emergent properties associated with VF practice such as sustainability, health, democracy, and equity seem indeed to lend themselves to those critical of the global agri-food system. As VF agriculturalist, Will Allen (Growing Power), explains, “[o]ur mission is to support community food systems. Everybody, regardless of their economic means should have access to healthy, safe, affordable food that’s grown naturally...I don’t put up gardens with fences.”<sup>42</sup> Another proponent of modern VF is Colombia University professor of microbiology, Dickson Despommier. For this advocate, VF began as a rooftop garden project with his students, though he now observes that “it has grown into something now quite out of my control, it has blossomed into a concept”, adding that he is “a biologist swimming in very deep water right now.”<sup>43</sup> <sup>44</sup> These sentiments indicate the appreciation for the fact that what was once merely academic and technical has now become quite political. Despommier promotes the concept for reasons other than the pursuit of science or profit, namely, the environmental and social causes of seeking less pollution and cheaper food for everyone.<sup>45</sup>

In this way, VF may be studied as a point of convergence for global struggles around food security, and increasingly, food sovereignty as well.<sup>46</sup> This latter concept originated in the Global South and is attributed to la Via Campesina. The concept as defined by Food Secure Canada has six pillars: Focuses on Food for People, Values Food Providers, Localizes Food Systems, Puts Control Locally, Builds Knowledge and Skills,

Works with Nature. These pillars place VF within other global struggles as well, such as those concerning renewable energy, emergency planning, sustainable community economic development, social justice, public integration and education, and anti-imperialism, among others. Such linkages have already been demonstrated with respect to other forms of urban agriculture.<sup>47</sup> While the reality on the ground (and in the air) is constantly changing, preliminary secondary source research indicates that there are enough common attributes among the various examples and visions of VF to denote a political concept with critical potential and one worthy of further study. However, the question remains: *What are the implications of such a concept in practice?* Section 1.2 offers a more comprehensive review of the relevant literature.

## 1.2 Literature Review

There are multiple related, though relatively distinct, areas of research that may benefit from this critical study of VF. Indeed, there are material and theoretical gaps in much of the relevant literature that this thesis attempts to fill. First, this research will inform the anti-capitalist literature, given that the agricultural basis for resistance to capital is often overlooked. Second, this research will complement critical food studies literature, which does not always account for urban agriculture (UA), and rarely mentions VF. More importantly, when agriculture, UA, or VF is mentioned, the analyses are often uncritical of the larger political economy. Uncritical understandings of potential solutions to problems associated with agribusiness risk romanticizing alternate models and focusing on symptoms rather than roots of problems. This insight is important because new strategies must address root causes while developing truly alternate practices.

Noting the destructive capacity of such a system, attempts to set parameters on agribusiness have abounded for years. The post-war period in particular saw the rise of environmentalism and other critical discourses in resisting (or at least, reigning in and raising awareness of) such an unsustainable model (Leopold, 1949; Carson, 1962; Lovelock, 1979). Here again, a detailed global class analysis is beyond the scope of this study, though suffice it to recall that in the 1980's (when scientists were truly discovering just how damaging the model was), it experienced a powerful *neoliberal* resurgence.

Neoliberalism is defined by Harvey (2008) as:

[...] a theory of political economic practices that proposes that human well-being can best be advanced by liberating individual entrepreneurial freedoms and skills within an institutional framework characterized by strong private property rights, free markets, and free trade.<sup>48</sup>

In short, this represents a reassertion of crude (though advanced) capitalist ideals over the Keynesian model in particular (as well as other alternatives). This term is used loosely to describe current (unfettered) capitalist tendencies, as Chomsky (2005) notes: “the doctrine is centuries old, and would scandalize classical liberals.”<sup>49</sup> For an up to date and more precise chronology of the development of capitalism see Appleby (2010) and/or Chomsky (1999).<sup>50</sup>

In any case, wholly market-based trends have not always had thoroughly negative impacts on society. The current system has, after all, produced an abundance and variety of commodities, the likes of which the world has never seen. However, as noted above, this prosperity has been achieved by sacrificing social justice, public health, environmental sustainability, and economic stability. Such problems are symptoms of what Harvey (2008) refers to as a process of ‘accumulation by dispossession.’ This concept is related to Marx’s concept of ‘primitive accumulation’ (i.e., chasing peasants

from their tenure) whereby elite groups increase wealth not from economic growth, but from dispossessing nature and communities.<sup>51</sup> For many of those communities, species, and ecosystems dispossessed by such an accumulation strategy, the experience has been one of stagnating wages, increasing debt, disappearing natural services, and extinction.

Despite this majority biomass experience with the clear contradictions between neoliberal theory and practice (prosperity/crisis, growth/destruction, and free-market rhetoric/state interventionism), the ideology has seemed for some time, to be omnipotent and ubiquitous. The appearance of neoliberal infallibility even led some in mainstream political literature to claim “the end of history,” as capitalism became increasingly naturalized over pre-existing and alternative models.<sup>52</sup> This taking-for-granted of the dominant economic model has crept into even the most well-meaning discussions of the role of agribusiness in global environmental change (GEC) and possible responses to it (Sachs, 2000; Ofon, 2006; Pingali, 2001). In a world hitherto dominated by hard sciences, critical analyses of the structures and processes leading to socio-ecological disaster must begin to prompt serious discussions concerning alternatives to this system. Unfortunately, while passion is aplenty, and the need for change palpable, clear paths of action are not obvious. Peck (2009) observes there is a “dissensus, bordering on paralysis, around the question of the destination, and even the direction, of reform/transformation efforts.”<sup>53</sup>

Much of the recent anti-capitalist discourse surrounds the 2008 global recession, centering on how vulnerable it has (or has not) made neoliberalism. Such discussions (Patomaki 2009, Peck et al 2009, Sommer 2010, Morici 2010) focus on the depth and breadth of the crisis, the possibility of the so-called double-dip, and the point at which neoliberalism loses what is left of its credibility. This debate is problematic as it centers

on the possibility that the economy will recover, usher in a renewed faith in market dominance, and thus eschews the need for real alternatives.

Other debates, however, take for granted the unsustainable nature of capitalism, citing the most recent crisis as simply one more example in a litany of cases where the system proves corrupt and devastating for average people and the environment. These discussions (Drainville 2009, Panitch 2009, Andrews 2009) relate to the merits of various alternate ways of governing and organizing socio-economic processes. Such potential developments range from authoritarian conservatism, to armed socialist revolution, to anarchist or libertarian decentralization, to eco-localism. Both camps fail to truly engage in meaningful discussion of agricultural resistance. On the other hand, much of the relevant agricultural literature concerns the socio-economic and ecological problems associated with agribusiness, without adequate attention paid to capital or to possible solutions (Altieri 2008; Rosegrant 2009; Weis 2010). When agricultural resistance is discussed, it is often within the confines of peasant movements in the global South (Desmarais 2002) or international consumer movements such as *slow food* (Petrini 2007) or *fair-trade* (Raynolds 2002).

Organics is another alternative agricultural model, and one that has perhaps received the most academic attention to date (Rodale 1942; Belasco 1989; Ching 2008). Organics began as a radical departure from the status quo, complete with critical views of (and proposed solutions to) problems associated with conventional industrial agriculture. Today, a good deal of the literature describes how organic food production has been drastically transformed by and into the very agribusinesses it set out to replace. Guthman (2004) notes that the “sector itself is ‘industrializing’ and ‘globalizing’ at a rapid pace ...

rarely meets the ideal of ‘farming in nature’s image’ ... and ... has fallen woefully short of addressing the social justice issues that are often assumed to be part and parcel of organic farming.”<sup>54</sup> Pollan (2006) observes:

The organic movement, as it was once called, has come a remarkably long way in the last thirty years, to the point where it now looks considerably less like a movement than a big business. To the extent that the organic movement was conceived as a critique of industrial values, surely there comes a point when the process of industrialization will cost organic its soul.<sup>55</sup>

Such analyses are very useful in terms of structuring and informing this project and will be revisited when discussing co-optation in Chapter 2. Nevertheless, they do not relate their discussions to VF in particular (or even urban agriculture in general), and thus articulate by way of omission, a niche for this project.

Local food is another related literature that helps situate this research. Adams and Salois (2010) posit that the aforementioned co-optation of organics actually led, in part, to the rise of food localization movement. Thompson and Coskuner-Balli (2007) also note the same linkages between these distinct aspects of the larger struggle over the food system. However, while each mentions community supported agriculture (CSAs), farmers markets, and civic agriculture, precious little attention is paid to urban agriculture and certainly none to VF. Such discussions also pay insufficient attention to how localization may differ from organics or other alternative models, and how it can deal with pressures from dominant actors. Adams notes that “[r]esearch on how an alternative agricultural system based on local food can complement, or to some extent replace, the existing industrialized system is needed.”<sup>56</sup> In fact, Mitchell (2009) observes that ‘local’ is already being actively co-opted by conventional market players. While the analysis touches on agriculture, it focuses mainly on the struggle over symbols and branding

within broader 'buy local' campaigns. Once again, there is no significant analysis of UA or VF or much discussion of resistance to the co-optive pressure. Walsh-Dilley (2009) provides a case study of an exemplary fight for local control over food regulation, but not the actual food system. Meter (2008) argues that local food is great for community economic development, but Allen (2010) reminds us that dominant actors have and continue to shape relations with and between locales and therefore cautions against default positive assumptions about food localization. It is important to note that vigilance concerning co-optation must be aimed *within* as well as *outward* and *upward*, though again, no mention of UA or VF.

Despite the previous omissions, urban agriculture has been given a relatively fair share of academic and popular attention in recent years (Roberts, 2001; Wekerle, 2002; Toulan, 2005; Kaethler, 2006; Duchemin, 2009; Kachan, 2009). Unfortunately, very little has been said about vertical farming in particular or the pressures of co-optation that alternative food models continue to face writ large. Leading urban agriculture planners/scholars de la Salle and Holland (2010), in their *Handbook for Building Sustainable Food & Agricultural Systems in 21<sup>st</sup> Century Cities*, do appear to hold somewhat critical views. They state that their ideal vision of agricultural urbanism includes working "to institute market transformation that de-commodifies food," and where "the public sector invests in and regulates research and development of agri-food technologies for the public and environmental good."<sup>57</sup> However, they refrain from explicitly dealing with the hazards of co-optation so clearly evident in agribusiness today, stating: "we leave the debate between large and small organic production and all its associated discussions on embodied energy, emissions, economics, and the culture of

food to others.”<sup>58</sup> These types of omissions present an opportunity for this project to make a more critical contribution to the growing body of urban agriculture literature. As mentioned, even most discussions of UA do not engage with VF. While de la Salle and Holland (2010) acknowledge key concepts and components related to vertical farming (such as greenroofs and integrated infrastructure), they neglect to engage with the idea explicitly.

The analyses that do engage with the topic of VF have been less than critical. VF research projects heretofore have focused predominantly on science and design potential, such as the popular attention the concept has received in sources from *TreeHugger.com* to *The Economist*.<sup>59</sup> St. Martin’s Press recently published the first book on VF, *The Vertical Farm* (Despommier, 2010). The author seems to lament the negative impacts of capitalist agribusiness while simultaneously (and without irony) discussing how best to incorporate large-scale vertical farming into the dominant economy. Despommier writes:

I am not naïve enough to believe that the vertical farm will exist mainly for the benefit of the world’s underserved communities, although I certainly wish that this could be so; on the contrary, there is the real possibility that the first couple of vertical farms might end up benefiting the few (commercial growers) and not the many... Unfortunately, I am afraid I will not be able to do much about this, since the idea is already out in the public domain.<sup>60</sup>

This lack of critical academic treatment represents the lacuna in literature previously mentioned. This gap, combined with growing mainstream traction of the VF concept, is yet another reason that an investigation into the existence and potential compromise of critical discourses associated with VF is both timely and welcome. As one scholar and activist cautioned, “[critical] people like you and I have to get involved in this or else

[vertical farms] will all be owned by Kraft and General Mills.”<sup>61</sup> It is precisely this sort of practical concern that shapes this research project.

A wide though selective review of the relevant literature reveals important aspects of the general analysis wanting in various ways. These highlight important lessons for this thesis and outline areas of interest for future research. First, it is important for anti-capitalist research to engage more specifically with agriculture, and for agricultural studies to be more explicitly anti-capitalist. From this perspective, critical agricultural research must articulate the many problems associated with agribusiness, while also placing more emphasis on practical solutions. When writing about solutions, more attention must be paid to the threat of co-optation, though more importantly to possible responses to it. Discussions of solutions require more attention to urban settings and to vertical farming in particular. Other oversights common among most of the preceding examples include the possibilities of integrated secondary processing and the production of other agricultural commodities besides food. Finally, technology is often demonized, though rarely problematized in much of the critical agricultural literature (e.g., Scrinis, 2007). The following research questions engage directly with each of the aforementioned weaknesses in an attempt to provide the most comprehensive, academically robust and politically useful data possible.

### **1.3 Research Questions**

Much thought has gone into the formulation of the central research question for this project. The process began with the two primary goals of contributing to ongoing debates within the Academy and refining data in order to produce useful information for critical

movements on the ground. These goals led initially to numerous related sub-questions. First, was interest in the material conditions surrounding VF: Do recent developments in urban agriculture represent an emergent vertical farming movement and/or industry? Second, was interest in the potential for such conditions to be transformative: Are these material developments novel or just a different way of organizing big agribusiness? From here, there was interest in whether or not VF actors recognized such potential: Are critical discourses found among VF practitioners? Depending on the answer, this led to two more subsequent questions: If no, are there still benefits from a food sovereignty perspective? If yes, do VF practitioners face co-optive pressures politically, economically, and socially and are there unique or distinctive features of the movement that might mitigate such pressure? Finally, there was interest in the implications of previous answers: When is VF critical, when is it not, and is there a useful middle-ground? In the end, after much discussion such interests were woven into the following over-arching research question: *How is vertical farming being organized politically, materially and discursively among different social actors involved in its development at different scales in North America?* With this question in mind, the next chapter shall demonstrate how social science theory can assist in finding some answers.

“One touch of nature makes the whole world kin.”

-William Shakespeare: *Troilus and Cressida*, iii. 3.

## **Chapter 2: Conceptual Framework**

Vertical farming (VF) appears to have surpassed the proof of concept stage and is now expanding relatively swiftly in terms of cultural awareness and material achievements. VF is happening not only at the sites chosen as case studies for this research project, but also at numerous other locations around the world.<sup>62</sup> (For a more comprehensive list of vertical farming projects, please refer to Appendix 1.) Across cases, it appears that most proponents are trending in favor of, or are already actively scaling up the practice in various ways. Therefore, there is a need to critically examine VF as it develops in order to understand this process and to help prevent it from solidifying into problematic (unsustainable/uncritical) forms. A robust theoretical framework is required to guide the formation of research questions, the selection of cases, and the execution of data collection. In order to be useful, the project must be precise about what factors are being studied, under what conditions, and to what ends.

Chapter 2 presents the conceptual framework for this thesis. It highlights the epistemological and ontological stance of important theories and concepts, and positions the research in relation to central debates in the social sciences and beyond. First, it introduces two related disciplinary approaches that are central to this type of investigation: *political economy* and *political ecology*. Second, the key concepts integral to this specific project are introduced and defined: technology, co-optation, scale, and social nature. Discussions surrounding each tool will articulate how these concepts can

also help interpret data, frame new knowledge and ultimately contribute to positive socio-economic and political change.

## 2.1 Political Economy: Technology and Co-optation

Political economy (PE) is the predominant interdisciplinary field in which this project is situated. Groenewegen (1987) notes that the term “political economy” dates to the French economist Montchretien (1615), and that it was first employed in English literature by James Steuart (1761) in *An Inquiry into the Principles of Political Economy*.<sup>63</sup> Since then, this field of study has enjoyed a rich tradition of critical inquiry, from Marx (1848), to Bell (1978), to Harvey (2008). Arndt (1984) notes that PE was resurrected by the Radical Left in the 1960s with three foci: “an emphasis on distribution...; an emphasis on power relations between social classes as the main determinant of distribution; and a refusal to confine the subject to positive social science as contrasted with advocacy.”<sup>64</sup> However, even earlier, more conservative PE scholars such as Adam Smith and David Ricardo agreed that economies are value-laden, and would likely have eschewed contemporary sanitized versions of one-dimensional economics devoid of politics. Ordeshook (1990) notes that PE “is little more than the natural evolution of a paradigm that had previously integrated both disciplines but that economics refined in the first part of this century after shedding many of the encumbrances reality places on theorizing.”<sup>65</sup> Much of said encumbrances, which PE reintroduces and assists in analyzing, relate directly to the contradictions operating within capitalism (i.e., between theory and outcomes). Such contradictions often create problematic dualisms between the public and private spheres, genders, and ultimately

society and nature (as outlined earlier by Adkin; 1992). Political economy therefore provides a critical lens through which to conduct this research, as it places an emphasis on power as it relates to production (in this case, power relations within agribusiness, broadly defined). The path(s) VF will take is in large part dependent on the processes elucidated by key political economy concepts outlined below.

### *Technology*

This analysis requires a discussion of the role of technology, given the relatively technical nature of most VF projects. The nature of technology itself as well as the role it plays in society is a subject of serious debate within the social sciences. On this point, many radical and reactionary analyses alike often rely on a false trichotomy: the seemingly mutual exclusivity of economic prosperity, social justice and environmental sustainability. Paul Collier (2008) provides a glimpse into this binary, when speaking about the skeptical response small scale organic farming has received along with alternative systems more broadly:

[T]he romantics have portrayed the food crisis as demonstrating the failure of scientific commercial agriculture, which they have long found distasteful. In its place they advocate the return to organic small-scale farming—counting on abandoned technologies to feed a prospective world population of nine billion.<sup>66</sup>

However, there are more than two camps. This research seeks to investigate the possibility that there is another way—one that embraces technology, but also represents a more holistic approach to the economy, society, and the environment. VF, for example, appears to be both: *local organic* fused with *scientific/commercial* which appears to cover all three issues bases noted above.

Science and technology are commonly viewed simply as tools, best understood as ‘means to an end.’ While the neoliberal model employs means to a primarily profit-oriented end, the main goal of VF advocates seems to be ecological and public health. Such divergent motives render technology an important, though unclear variable. Heidegger (1954) famously cautioned against a strictly positive or neutral (instrumental) view of technology, as one that misses its ‘essence’ and ‘enframes’ humanity and nature, rendering them nothing more than a ‘standing reserve’ to be exploited by the system.<sup>67</sup> This rational-cultural stamping creates what Marcuse (1964) describes in *One Dimensional Man*, a society severely dominated and without much critical thought.<sup>68</sup> Recognizing the imperative to improve life and the inevitability of technology, Marcuse (1964) poses the question: “among the various possible and actual modes of organizing and utilizing the available resources, which ones offer the greatest chance of an optimal development?”<sup>69</sup> This research project seeks to determine to what extent VF can play a role in the answer to this question.

Ultimately, Heidegger does acknowledge that technology may hold promise for the “rise of the saving power.”<sup>70</sup> That is, the potential for technological achievements to eventually overcome the problems associated with technological processes. This positive line of argument has been taken up by those under the banner of ecological modernization (EM) such as Mol and Spaargaren (1992), among others (Huber, 2004; Sonnenfeld, 2000). Ultimately a neoliberal theory, EM stresses the importance of modernization and market forces in ecological recovery.<sup>71</sup> However, it appears as though technological

modernization will have to develop concurrently with political modernization for the theory to bear fruit. EM has met with resistance from more critical theorists such as Schnaiberg and Gould (1994) who question the sustainable capacity of capitalism full stop, regardless of technical or political changes. The *Treadmill of production* is one critique of EM used to describe the problematic path dependency which has emerged from the mixing of capital and technology, especially after World War II.<sup>72</sup> York and Rosa (2003) raise similar concerns, namely that EM does not address broader consumption patterns.<sup>73</sup> These are legitimate critiques, however human innovation and resourcefulness, regardless of how they are currently being exploited, are not simply confined to capitalism. This fact just might provide for certain progressive technological possibilities. Following Marxian understandings of the system creating its own gravediggers, certain technical developments emerging from capitalism can come to undermine it through dialectical tensions. One salient example is the internet, which first exclusively benefited military and financial institutions, though now is used to mobilize popular democratic revolutions, riots and vote mobs/robs (Crovitz, 2011; Halliday, 2011, and others). However, following Papic (2011) tools alone do not create meaningful social change. For this ‘saving power’ to develop, Heidegger argues that technical processes must be balanced with creative ones.<sup>74</sup> What Heidegger calls technicity (the dominance of modern rationality explained earlier) has to be transcended by creativity: “only poets and thinkers can speak a new world into being.”<sup>75</sup> In an effort to move the debate forward, Fisher and Freudenburg (2001), argue for “theoretical development to be carried out in

conjunction with empirical testing.”<sup>76</sup> This observation led to case study research involving varying degrees of technology being selected for this thesis in order to help determine the impact such technical influences have on other socio-economic and political aspects of VF projects.

Coming to VF research in this way can represent a more constructive means of dealing with current issues when compared to other more bifurcated approaches. Following Cohen (1998), this proposed research project seeks to evaluate the tensions between counter-hegemonic discourse and the emancipatory potential of technology as a matter of degrees, not absolutes. This highlights the limits of dualistic thinking and alters the research question surrounding technology from: Does technology have merit with respect to addressing socio-ecological issues? To: What are the conditions under which it might? Such conditions are contingent on multiple other factors, including culture. Below, a discussion of co-optation will help outline how these conditions are mediated by struggles within wider social relations of power.

### *Co-optation*

Perhaps most useful for this project is the notion of co-optation, which as mentioned previously, seems to have eluded many authors discussing local food, especially those studying urban agriculture and vertical farming. The notion of co-optation stems from Gramsci's (1971) analysis of what he referred to as *transformismo*, the process of incorporation and/or pacification of political opponents. This concept, in turn, is related to the broader notion of *hegemony*—defined by Gramsci (1971) as a dominant group's control of socio-economic structures as well as the cultures/ideology associated with

them. Influence on the latter allows dominant interests to present themselves as 'common sense' to the masses, even if such policies and practices trend against the people's general material interests.<sup>77</sup> This deception allows elite groups to govern at a distance and without (much) force or coercion, though threats of violence are omnipresent. Brodie (1996) posits that "changing public expectations about citizenship entitlements, the collective provision of social needs, and the efficacy of the welfare state has been a critical victory for neoliberalism."<sup>78</sup> The popular explosion of the highly profitable and yet equally unhealthy food system (within the larger neoliberal ideological resurgence) provides a recent and relevant example of this. However, Larner (2000) cautions that dominant neoliberal ideology is multi-vocal, contradictory and thus advises that an increasingly nuanced understanding of its complexity will afford a better chance of advancing social goals.<sup>79</sup> Gramsci (as cited in Hall, 1982) emphasizes that struggle often arises at this juncture because like neoliberalism, "common sense is not something rigid and immobile, but is continually transforming itself."<sup>80</sup> This occurs because as Fiske (1992) notes: "Consent must be constantly won and re-won, for people's material social experience constantly reminds them of the disadvantages of subordination and thus poses a threat to the dominant class."<sup>81</sup> Such contestation produces opportunities for the creation of new counter-hegemonic social identities and political subjectivities. This understanding has led to certain cases being chosen for this thesis due to their proximity to economically depressed regions where such struggles are ongoing, and where hardships are felt most acutely.

This struggle to keep popular ideology out of step with economic realities presents opportunities for resistance to coalitions of dominant interests, or what Gramsci

refers to as historical blocs.<sup>82</sup> If a constellation of other factors (social, temporal, financial) allows such resistance efforts to flourish, they may come to constitute a counter-hegemonic movement, which if successful, may in fact come to influence or replace a historic bloc. In essence, co-optation is the process by which threatened elite groups attempt to marginalize such resistance in political and civil society. It is important to understand this process when choosing VF as a site of study, insofar as it appears to be an emerging movement which could form part of counter-hegemonic resistance efforts. This potential growth means that VF in turn, may soon/already experience co-optive pressures. Therefore, understanding processes of co-optation is important in the execution of this research in order to ensure the correct questions are posed to the appropriate actors, and that the analysis of the data is framed with sufficient context. Following Gramsci's sentiments, the VF phenomenon will be interrogated overall for its basis in subordination as well as its implications for emancipation. Emancipation is likely to come from counter-hegemonic movements or blocs, and in this case, counter-hegemonic broadly aligns with anti-capitalist sentiments.

In general terms, co-optation most often relates to formal political movements. The term has been defined more recently by Bertocci (2001) as a process between two conflicting groups, whereby the more powerful group decreases its potential upheaval at the hands of the threatening group by creating a third, more benign group to ease the pressure.<sup>83</sup> However, much of the more contemporary literature on this 'war of position' refers to subversive imagery or symbols more than partisan politics (though they are, of course, related). Frank (1997) in *The Conquest of Cool* records how corporate sectors have appropriated important aspects of 1960's counter-culture over the years, from music

to menswear. However, Frank also argues that capitalism should not be viewed as a monolithic force in hegemony and resistance: “It is more than a little odd that, in this age of nuance and negotiated readings, we lack a serious history of co-optation, one that understands corporate thought as something other than a cartoon.”<sup>84</sup> Instead of acting as a purely hostile co-optive force, Frank notes that certain fractions of capital appropriated symbols of resistance because they actually identified with the counter-culture of the time: “Like the young insurgents, people in more advanced reaches of the American corporate world deplored conformity, distrusted routine and encouraged resistance to established power.”<sup>85</sup> While the radical nature of any form of large capitalist enterprise is hard to understate, this account is a worthy reminder for anyone looking to be effective on the ground, to see beyond abstracted dichotomies in this type of analysis. Thus, one of the goals of this research is to determine (however crudely) which fractions of capital may be threatened by, as well as those that may be beneficiaries of, VF.

Boyd’s (1994) study of political themes in rap/hip-hop music and culture underscores the tensions and possibilities in this aspect of counter-culture.<sup>86</sup> He traces changes from radical politics from the likes of *Public Enemy* to the apolitical gangster rap of *Dr. Dre*. He notes that the cliché, urban, macho, materialistic image of rap in popular culture represents the co-opted and commercialized leftovers of an original and explicit class, race and gender analysis that emerged out of the American inner city. Over time, as a market for this form of expression emerged, it was sanitized, repackaged and sold to the masses. However, Boyd notes that “the commodifying impulses of the music industry have opened a space for selling cultural products, which in their very construction undermine the structure distributing them.”<sup>87</sup> Again, Boyd acknowledges the previous

tensions outlined by Frank (1997), or what West (1990) refers to as the ‘inescapable double bind’ of being simultaneously radical and co-opted.<sup>88</sup> This double bind presents the opportunity for VF proponents to use aspects of co-optation to further their aims. In the context of VF, this possibility has led to a research question regarding the compromises involved in doing so. In the end, Boyd suggests that on balance it is better to have tried to change things and only partially succeeded, than not to have tried at all. While these sentiments may hold true for forms of cultural expression, the experience of political movements on the ground can be different.

While most of the previous examples have dealt with symbols, others refer to co-optation within actual social movements. In *The Revolution Will Not Be Funded*, a collection of essays edited by INCITE! (2007), contributors speak to the ‘elephant in the room’ they refer to as the Non-Profit Industrial Complex. This complex is defined as “a system of funding relationships that intimately ties the interests of the capitalist class into the financial survival and sustainability of the organizations of so-called civil society.”<sup>89</sup> Of primary concern are the cuts to social services resulting from neoliberal dismantling of the welfare state that have left gaping holes in society which progressive NGOs have rushed in to fill. Ahn (2007) notes that this process has distracted large segments of the Left, which then affords the Right more freedom to develop think tanks and lobby groups that remain relatively unopposed, strengthening the cycle of class domination. Furthermore, wealthy families and corporations receive tax breaks for establishing or donating to philanthropic foundations. This process allows them to retain increasing amounts of private wealth while diverting billions of dollars of would-be public funding away from programs. Of course, this phenomenon also then allows for a select grouping

of individuals to control the funds they allocate to specific causes.<sup>90</sup> Radical groups are passed over, generally in favor of groups with similar mandates but with less threatening rhetoric, goals or tactics. In fact, in order for a non-profit to receive charitable status, they cannot be involved in political lobbying or advocacy work! And since all environmental and social justice issues are inherently political, this is an ongoing challenge. The result is clear: critical groups often choose fundable issues and resources, which ultimately serves to pacify or de-radicalize them. Almeida (2007) argues that due to these burdens, organizations have lost touch with the constituencies they are supposed to support, and instead focus too much energy on securing funding. Several essays call for a return to community-based fundraising, which is noted to have many co-benefits beyond the money. Finally, Kivel (2007) argues that service provision can be useful in cementing grassroots relationships, but it is important to never give up advocating for the reintroduction of said services back into the public sphere. These insights have led to research questions pertaining to the challenges faced by VF actors concerning the tensions associated with charity/funding and services/advocacy.

Coy and Hedeem's (2005) study of community legal institutions in North America has produced a more specific model of co-optation that relates directly to alternative systems and their interaction with dominant institutions.<sup>91</sup> This model outlines four key stages in the process of co-optation: engagement, appropriation of language/partial inclusion, assimilation of leadership/transformation of goals, and regulation. The authors caution that small events or decisions that seem inconsequential may actually be part of a disempowering co-opting process when taken as a whole, or viewed in a broader context. Conversely, they also cite Kriesberg (2003) who emphasizes the potential positive

outcomes of such a process including: policy changes, power sharing, and increases in resources/legitimacy. These are important nuanced insights that will provide a framework for analyzing and coding participant responses, from VF movement leaders in particular.

More closely related to this VF project is Campbell's (2001) study of co-optation of sustainable agriculture in California.<sup>92</sup> Campbell's purpose is "to illuminate the organizational tensions and challenges inherent in this type of strategic discernment."<sup>93</sup> From here, he builds on Coy and Hedeem's (2005) previous point, arguing that: "it is relatively easy to see the pitfalls of parochialism and capitulation when they are considered in abstract terms. It is much harder for leaders of movement organizations to discern their dangers in the midst of everyday struggles."<sup>94</sup> He maintains that to be effective, groups must seek legitimacy, which involves compromises with diverse partners. Campbell sees co-optation as an inescapable process to be planned for, rather than an obstacle to be avoided. Following Gorz (1967), he notes that movements face the choice between 'reformist reforms and non-reformist reforms.' The task in this scenario is to choose options that are most advantageous now, but which are least damaging over the long term. The importance of this strategic balance leads to questions regarding current long term goals and strategies within VF case studies—to be compared to the original intents of the same groups.

Evans and Boyte (1986) note the possibility exists to collaborate with unlikely allies based on shared goals rather than common motives. The danger is that such arguments which are attractive in terms of values of democracy or inclusion, can veil the possible risks involved in adopting such a collaborationist approach. Dye and Zeigler (1987) caution that collaboration can bring movement leadership too close to the system

they are attempting to influence, thereby constraining their actions or rendering their efforts less effective.<sup>95</sup> Another risk is that dominant actors may engage with critical issues, but only superficially, which can remove the political urgency from an issue without dealing with the actual problem. It is assumed that VF will reflect and reinforce such larger dynamics. This potential eventuality has led to research questions regarding VF proponents' involvement with or awareness of the larger political process associated with their actions. While it is hopeful, more research is needed before one can fully embrace Campbell's (2001) assertion that "social and political movements retain a significant freedom to craft middle range strategies that adapt to political circumstances while retaining attachments to core values and constituencies."<sup>96</sup>

The previous readings on co-optation have proven very useful in preparing this project, though some important considerations remain undeveloped. First, it is important to note that co-optation is not always necessarily a primary threat. Some technology, messages and groups fail on their own due to internal limitations; while others are crushed directly with force or become targets of hostile takeovers. Likewise, co-optation does not have to be a deliberate act by dominant interests; insofar as it can result from indirect features of existing structures and system inertia, or simply, a subaltern's new or unconscious desire to join the dominant sphere. Thus, the dynamics of Capitalism, (i.e., competition, alienation, and commodity fetishism) will be revisited below, with specific attention paid to the organics and fair trade movements (Guthman, 2008; Fridell, 2007) vis-à-vis current developments in VF. Also, none of the aforementioned cases deal specifically with alternate models of material production which may mediate the process of co-optation in different ways. This omission has resulted in a research focus on the

productive capacity and methods of VF cases, and the research question of whether or not immediate physical connection to production can act as a bulwark against co-optation. The materiality of VF appears to offer something different than other alternative food models in this regard. Hall (1986) notes that dominant ideologies become 'common sense' because most people are concerned with immediate circumstances rather than fundamental processes, and thus miss the connection between their plight and the system they help to perpetuate. An analytical regime that links VF's capacity to provide technical/material/economic processes related to daily needs to the structural production/distribution aspects of the larger system holds the most potential. Might this human-system interface connect the proverbial dots required for increased consciousness and action? Mann and Dickinson's (1978) study of capitalism's inability to penetrate certain family farms seems to suggest it might be possible.<sup>97</sup> Below, a discussion of Political Ecology will help provide important insights to this end.

## 2.2 Political Ecology: Scale & Social Nature

Political ecology stems in large part directly from political economy, sharing the desire to begin analyses with the productive activities of individuals rather than abstractions.

Speaking in the first issue of the *Journal of Political Ecology*, Greenberg and Park (1994) define the field as:

[An] historical outgrowth of the central questions asked by the social sciences about the relations between human society, viewed in its bio-cultural-political complexity, and a significantly humanized nature. It develops the common ground where various disciplines intersect.<sup>98</sup>

Political ecology is useful in so far as it shares many of the critical views of political economy, while incorporating others from cultural ecology as well as

human geography and critical sociology/anthropology. Armed with this critical analysis, it helps this project focus on bringing nature into the discussion of seemingly unrelated issues of industrial production and wealth distribution. Paul Robbins (2004) defines this aspect of the field as “empirical, research based explorations to explain linkages in the condition and change of social and environmental systems, with explicit consideration of relations of power.”<sup>99</sup> This approach assists in contextualizing VF within the historical development of capitalist agribusiness, and in gauging the similarities and differences between VF and other forms of resistance. While clearly subordinate within the larger economy, VF represents an example of the aforementioned changes in social and environmental systems that may be appropriated by dominant interests, retain critical components, and/or take on new forms. Again, the path(s) VF will take is in large part dependent on the processes elucidated by key political ecology concepts outlined below.

### *Scale*

Scale is another important concept for this thesis, and has contributed to the selection of the central research question. Keil and Mahon (2009) define scale in a political context as “one form of spatialization of political economies that has its own contradictions and dynamics but is also articulated with other related spatialities such as topologies, places, territories, and levels (of government).”<sup>100</sup> Lefebvre (1969) spoke of an “explosion of social spaces” under late capitalism, while Brenner (2009) notes that, “space is always being produced and transformed under capitalism; it is never fixed, static or pre-

given.”<sup>101</sup> Brenner (2009) argues that any neoliberal restructuring “is rooted in crisis and competitive conflict between the old and the new, between an ‘inherited’ and a ‘projected’ order.”<sup>102</sup> Therefore, rather than viewing different scalar units (local, urban, regional, national, global) as fixed or pre-given, these configurations can be understood as being produced by socio-economic forces, and thus, able to be reshaped and contested.

In order to discover or understand new possibilities for resistance, this research escapes the ‘territorial trap’ (Agnew 1994) of nation-state centric analysis found in many political projects. This understanding is helpful for a project that explicitly adheres to the call to *think globally and act locally*, in so far as VF has the potential to mitigate global issues through distinctly local changes. Scale helps problematize the distinct (or not?) features of the urban landscape in which each VF case is located. Castells (1977) argues that the urban ‘spatial unit’ can be defined only by its social function, that is, its role in the reproduction of labour-power.<sup>103</sup> Saunders (1986) disagrees, maintaining that the processes found at the urban scale are not exclusive to this level. Harvey (1982) conceptualizes somewhat of a middle ground, wherein the urban is an integral aspect of the geographical foundation for international capital accumulation. As such, the city acts as the local point on an international circuit of labour, capital and products, which allows for ‘scalar flux,’ and thus potential changes in inter-scalar power relations.

Contemporary writers see an increasingly dynamic sense of scale; more as a relative process of co-constitution of spaces rather than any finite location.<sup>104</sup> This view is an important perspective for studying the predominately urban intervention of VF into the increasingly globalized and rural agribusiness sector. This reality has also led to research questions concerning the degree to which VF projects are linked to one another, and

involved in other networks. This notion of scale also produced research questions surrounding the nature of the expansion of the VF movement. These questions recognize the need to distinguish between those who advocate scaling VF through massive, central locations, and others, who promote scaling through decentralized diffusion of VF methods to multiple, smaller locations. Of course, scale relates to other important processes of space and place making as well, which are integral to the restructuring of social relations. Fundamental to the restructuring of neoliberal scalar relations and understandings of space and place, is society's interaction with nature. Below, this process is expanded upon through a discussion of social nature.

### *Social Nature*

Social nature (SN) is a conceptual tool developed to help inform theory and practice within political ecology. SN helps break down the barriers between the hitherto distinct domains of, as the name suggests, society and nature. It has emerged to a large extent from studies in geography (appropriately, a discipline itself constantly wrestling with the aforementioned human/physical dichotomy). When investigating issues related to VF, SN maintains that these topics are value laden, based on various histories and experiences, and are ultimately political. This ontology has led SN scholars such as Smith (1984) to state "nature is nothing if it is not social."<sup>105</sup> Braun and Castree (2001) note the epistemology of SN helps ask in-depth and textured questions such as "who constructs what nature(s), to what ends, and with what social and ecological effects?"<sup>106</sup> SN is often employed in one of two ways: 1) as a critique of positivist definitions of nature, and/or 2) to explain the production of space through the construction of nature.

Nature is commonly defined in three central ways: 1) “the essential quality or character of something”; 2) “the inherent force which directs either the world or humans or both”; 3) “the external, material world itself.”<sup>107</sup> Critical scholars (Proctor 2001, Gregory 2001, Barney 2009, Braun and Castree 2001, among others) have used SN as a tool within social constructivist approaches to critique non-social and purportedly objective definitions of nature. Proponents of SN maintain the social construction of nature exists at the conceptual, ethical and even material levels. It is important to note here that SN does not deny the existence of ‘nature(s)’ beyond humanity. Rather, SN takes the position that nature simply cannot be known outside of the constraints of subjective human perception.<sup>108</sup> As such, ‘nature’ is henceforth referred to in this paper with these contexts and contingencies acknowledged within common (and still largely useful) applications of the term. Also noteworthy, is the fact that this social construction is seen to apply to ‘human nature’ as well. This latter aspect aligns well with other varieties of critical theory which often challenge notions of static or inherent qualities as they may relate to race, gender or sexual orientation. In fact, groundbreaking research in neurobiology (Siegel 2001) notes that biological traits, chemical, and even genetic processes can develop out of social relations. Doidge (2009) makes a similar argument for neuroplasticity, challenging the notion of mental ‘hardwiring,’ for example.

This analysis contributes to this VF research in three significant and specific ways. First, SN simply helps situate an emerging VF phenomenon that has a tendency to create a sense of cognitive dissonance among those who first encounter it. SN helps problematize two commonly related and arguably flawed assumptions: that farms approximate nature, and that nature is separate from society (reinforcing, especially, the

urban/rural dichotomy). This analysis relates back to the traditional political economy understanding that modes of production influence cultural norms. It therefore comes as no surprise that cultural understandings of nature as separate from society are found in an economy that keeps agricultural production hidden from its populace. As mentioned, SN posits that it is not just ideas about nature, but also the material sphere that are socially constructed (often unbeknownst to most) by means of de/re-forestation of landscapes, damming/diverting rivers, dredging/filling shorelines, genetically modifying biological features, and many other activities. In turn, how nature is physically used is also shaped by socio-economic, political and technical forces. In fact, Parks Canada's Chief Ecosystems Scientist, Steven Woodley, explains "we have actually moved away from the idea of 'natural' or 'wilderness,' and we use a term called ecological integrity as our management endpoint."<sup>109</sup> This idea of management stems from the *Leopold Report* prepared for the U.S. National Park Service (1963), which suggested a goal of scientifically based park management as a way to "protect vignettes of primitive America."<sup>110</sup> It is now widely understood that such landscapes were not pristine but rather already developed by indigenous peoples for millennia. A SN understanding reveals unequal power relations involved in the production of nature, as well as places and individuals and communities found within them. This realization is empowering as it allows for the possible reconstruction of ideas and uses of nature along more equitable lines with respect to humanity and the environment.

Second, and perhaps more importantly, SN assists in theorizing the other traditional political economy concept of co-optation. The organics saga mentioned in the literature review presents a recent and related example that merits further discussion here.

From radical to reformist, this alternate system of agricultural production continues to frustrate scholars and activists alike. How could a movement with such good intentions and solid foundations get co-opted so easily and completely within a relatively short period of time? Responses from political economy suggest the structural power of capital to overpower, corrupt and incorporate adversaries as one answer, as documented by Fridell et al. (2008) in their study of corporate responses to the fair trade movement. Other responses might claim the common refrain in political economy that the nature of capitalist enterprise itself is to seek growth and wealth accumulation at the expense of other considerations. These factors are extremely important. However, a SN critique would add that the organic movement did not sufficiently challenge (neither discursively, nor materially) the idea that food comes from somewhere other than where it is consumed. Such a subtle oversight has allowed many organic farms to mimic the problematic aspects of conventional industrial operations, in large part because nobody ever hears about or sees them. Instead, industrial agribusinesses evoke a natural marketing narrative. Pollan (2006) refers to this narrative as the “Supermarket Pastoral,” an attempt to convey an image of what consumers imagine organic farming in ‘nature’ might be, complete with images of trees and grass and livestock with cute names. Castree (2005) posits that this process is part of an ongoing competition among various actors, all vying to have their knowledge-claims about nature accepted as Truth.<sup>111</sup> While there is no denying the so-called marketplace of ideas, SN is vulnerable here to accusations of relativism. In this case, agribusiness narratives are not just a different understanding of nature, but rather deliberate attempts to deceive and manipulate consumers. In any event, this insight is important insight if the goal is to ensure such a process is not repeated with

vertical farming, for instance. Thus, the need to focus this investigation on the transparency of production and distribution in local/urban agriculture, when assessing the critical potential of VF, becomes apparent.

Finally, SN helps challenge the beliefs that capitalism implicitly instills about human nature (i.e. that human beings are inherently competitive, rational, etc.) which are then used to justify the status quo. The SN argument that human nature is malleable means that through resistance, attitudes and behaviors can change, and that the future need not be bound to the status quo or to repeat the past. This understanding has led to a focus on the transformative potential of the community outreach and educational aspects of VF projects. This aspect is important because the dialectical relationship between these material and cultural changes might even accelerate the restructuring of communities and their natural surroundings. To determine if such optimism merits serious consideration, it is important to first critically examine this possibility within case studies to ensure the material reality does in fact align with the academic theory. Lessons can then be gleaned from the data which may benefit social science theory as well as the VF movement going forward. From here, in order to be prudent, precise and robust in the research, a rigorous research methodology and thorough methods for gathering the necessary data will be required.

“The philosophers have only interpreted the world, in various ways; the point is to change it.”<sup>112</sup> -Karl Marx (1845)

### **Chapter 3: Methodological Framework**

Flowing from a discussion of the theoretical and conceptual framework supporting this project, Chapter 3 focuses on the subsequent methodology and methods. Consciously or not, methodology is applied in the administration of all research. Generally, the more deliberate the approach to methodology, the more useful and reliable the data. This chapter will discuss ontological and epistemological stances derived from theory, which help translate abstract concepts into researchable problems. The discussion will outline the methodological approaches chosen to best account for the tensions arising from this research/reflexive process, and will outline the methods refined to execute this methodological selection (observation, interviews, analysis). Moving forward, this critical application of theory in research holds great importance for praxis, in hopes of revealing counter-hegemonic discourses within VF, and for disseminating the subjugated knowledges they rely on. As succinctly noted by Reinharz (1992): “‘basic’ research has political consequences and ‘action’ has theoretical implications.”<sup>113</sup> This dialectical relationship remains part of the over arching thrust of this thesis as it attempts to uncover issues, highlight alternatives, outline/appraise next steps, and acknowledge shortfalls within VF. After all, following Chevalier and Buckles (2009), the purpose of social analysis should be “to describe the characteristics and relationships of key stakeholders and to explore ways to resolve social problems and mobilize people strategically.”<sup>114</sup> The

following discussion will explain how this has been pursued, in this case, for a critical investigation into VF.

More specifically, Chapter 3 is organized as follows: Section 3.1 presents the ontological/epistemological approaches to this research. Section 3.2 presents the tensions related to issues such as positionality and reflexivity. Section 3.3 discusses the specific research models employed to mitigate the previous tensions and issues. Section 3.4 outlines the various research methods employed in obtaining primary and secondary data within the aforementioned models. This section then reviews the cases along with any benefits/tensions among them. Section 3.5 appraises the results moving forward, in juxtaposition with the original goals of the project. (See Appendix 2 for the initial research instrument.)

### **3.1 Critical/Dialectical Methodology**

This VF project demanded that the methodology (the philosophy and action related to the ability to know and gather knowledge) be agile enough to account for research into past events, current developments and future planning in the field. The methodology also needed to be comprehensive enough to assess favorable conditions for VF phenomena as well as the research activities themselves. Finally, the methodology had to help adequately identify key VF actors and factors and appraise their impacts on one another. Of course, there are factors that contribute to VF, and those who counteract it. Roles of various actors can be defined by actors themselves, by ‘experts,’ or by other stakeholders. Likewise, the methodology needed to be flexible enough to acknowledge that actors

enjoy varying (and changing) degrees of power, levels of legitimacy and represent varying clusters of interests.

The set of criteria outlined above lends itself to a critical and dialectical methodology (the dialectical aspects will be discussed further in Section 3.3). Critical, in this case, means challenging the solitary and dominant role of Enlightenment thought within the Academy. Isolated, replicable, objective observation and manipulation of variables is essential for technical achievements in science, however, the human experience in society injects values and perceptions into data. The human element demands that social science adopt more nuanced perspectives regarding what ideas, experiences, and opinions/beliefs/assertions count as knowledge, and thus proper approaches to knowledge creation. Hence, while there may be a capital 'R' reality external to human subjectivity, any useful information collection is inevitably mediated by various social factors. This ontological stance is consistent with the critical political ecology and political economy previously discussed. Central to such a critique is an analysis of power relations. For Marx, critical theory is "the self-clarification of the struggles and wishes of the age."<sup>15</sup> These critical claims to knowledge focus on making useful the heterogeneous nature of realities rather than universal Laws. It is important to note here that such a position does not devalue natural science in all cases. In fact, Hall et al. (2001) argue that flawed social science found in neoclassical economics has quite a bit to learn from physics, for example, concerning the biophysical foundation of the political economy.

The epistemological foundation for this process of inquiry follows the common practice within critical research of investigating the more particular, while working out

towards the more abstract. Marx (1973) argues: “The concrete is concrete because it is the concentration of many determinations, hence unity of the diverse.”<sup>116</sup> The concrete in this context were the case studies, and the conclusions drawn therefrom. The many determinations are the material details found in examples of VF practice, as well as the subjective perspectives of VF proponents and other actors. Analyzed together through this ascending method, it is possible to create (relatively) credible knowledge that may be refined and applied more generally. In fact, as discussed below, Flyvbjerg (2001) argues that this is *the* way to achieve credible research results.

Relating the critical method ever closer to this project, Brookfield (2005) explains how Foucault “begins by studying ‘infinitesimal mechanisms, which each have their own history, their own trajectory, their own techniques and tactics’ and then describes how these are co-opted ‘by ever more general mechanisms and forms of global domination.’”<sup>117</sup> This approach may seem at odds with itself, given that the methodology may appear to insist that understandings of reality are contingent; while simultaneously maintaining that such understandings may be extrapolated to wider applications. As Fitzsimmons (1989) concedes, “This deconstruction of received ontology is very difficult for us to achieve.”<sup>118</sup> The issue is perhaps best resolved by viewing nature, following Harvey (1985), as a concrete abstraction. ‘Nature’ may be fleeting, but in immediate human terms it is as real as it needs to be to impact current struggles.<sup>119</sup> This understanding relates back to political economic theory, which maintains that it is possible to criticize general laws while simultaneously intending to bring about general changes. This theoretical critique often concerns perfect market theories of neoclassical economics, which exclude issues of production in favour of exchange. Troubling the

unity of assumptions by broadening/deepening the research focus can illuminate unequal and harmful social relations between socio-economic classes and the environment, calling into question generalized outcomes. The search for this balance led to VF being chosen as a site of study for this project, given its apparent political role in production. Specific research models were then chosen to work with such understandings of reality and knowledge creation.

### **3.2 Methodological Tensions**

Any research model must address the crisis of representation that is brought to the social sciences through the critical theories previously examined. Steps taken to ensure reflexivity, accountability and transparency all helped ensure rigor in the collection and analysis of data for this project. These issues involved subjective ethical tensions related to identity and situatedness. In this case, potential ethical tensions and issues emerged from the author's active political involvement, the limited scope of the study, and the small number of cases. This process meant understanding the implications of my coming to this research as a relatively young, white, Canadian, low income, able-bodied, heterosexual male. Issues of reflexivity and reciprocity also developed from me acting as both a political activist and scholar working on sustainability and social justice issues. Here, reflecting on one's role and position is important in terms of illuminating *and* acting on problems. As May and Perry (2009) maintain, in order to achieve this balance, the researcher must have "a concern with the transformative potential of social scientific insights, based on an understanding of their historical roots, consequences and the contexts and cultures in which they are produced."<sup>120</sup> From there, Engelstad (2005) notes:

“taking the concept of situated knowledges seriously will open new possibilities of refiguring and reconfiguring what counts as knowledge.”<sup>121</sup> Haraway (1988) defines situated knowledges as a concept of embodied objectivity, (or partial and contested accounts of reality) in response to science discourse within feminism and to western enlightenment rationalism in general.<sup>122</sup> Being critically reflective can therefore help align positions with dispositions and lead to effective research and action. While I may not be able to be completely objective, I can at least now attempt to be situated within the research process.

Of course, meaningful reciprocity is also often developed in the course of the research itself. Oakley (1981) reminds us of the importance of this for qualitative research as “there can be no intimacy without reciprocity.”<sup>123</sup> Of course, intimacy is often the key to accessing important interviews. Transparency is also paramount to building any researcher-informant relationship, and so efforts were taken to inform each participant in this project of all academic, personal and political motives behind the thesis. In fact, a statement of positionality was provided to interested participants, while my intentions were declared again to each informant prior to commencing interviews. With respect to intimacy, other concerns around issues of accountability and transparency emerged out of my direct involvement in a small VF project that has undoubtedly helped to motivate and inform the research. Potential issues also arose out of the specific methods employed, such as the limited number of different individual perspectives that can be recorded using in-depth interview techniques, as well as inevitable bias in the creation of the research instrument to be used by them. Acknowledging these tensions, three related research models were selected: phronetic, action, and (auto) ethnographic.

This multifaceted research design helped account for the aforementioned issues that arose throughout the process; though despite all efforts, it is quite impossible to judge one's ultimate success through your own lens. Critical feedback on this process is most welcome.

### **3.3 Research Models: Phronesis, Action Research and Auto-ethnography**

The phronetic model popularized by Flyvbjerg (2001) is closely related to Aristotle's notion of Phronesis: a process of ethical and practical inquiry. Abizadeh (2002) argues that for Aristotle "character (*êthos*) and emotion (*pathos*) are constitutive features of the process of phronetic practical deliberation: in order to render a determinate action-specific judgment, practical deliberation cannot be simply reduced to logical demonstration (*apodeixis*)."<sup>124</sup> Flyvbjerg explains that such an approach grounds research in real world problems, interacts with stakeholders and other actors, and often results in direct action.<sup>125</sup> This approach recognizes that professional ethics and rigorous methodology *can* and indeed *should* work hand in hand with political action/advocacy. This claim is bolstered by an entire methodological literature beginning with Lewin (1946), which continues to grow to this day. Gilmore (1986) notes that this form of action research helps "contribute both to the practical concerns of people in an immediate problematic situation and to further the goals of social science simultaneously."<sup>126</sup> As such, this approach served to problematize and rationalize the political nature of this VF research.

In practice, this approach also helped inform and problematize potential prescriptive elements of the project's conclusions by beginning with the following four

central questions: Where are we going? Who gains and who loses, and by which mechanisms of power? Is this development desirable? And finally, what, if anything, should we do about it as scholars, activists, and citizens?<sup>127</sup> Building on the previous section, reflexive value analysis (in light of the data) was used to interpret answers to the research questions. Perhaps startling to some readers, Flyvbjerg argues that “the socially and historically conditioned context – and not the elusive universal grounding that is desired by certain scholars – constitutes the most effective bulwark against relativism and nihilism,” and therefore, the most reliable form of data collection and (relatively) credible knowledge creation.<sup>128</sup> This approach thereby integrates the ‘what is’ with the ‘what can be’ and in so doing, provides a positive outlet for what are often terribly depressing critical analyses of the global (neoliberal) agri-food system. The results of this VF research are not intended to be the final word from an ‘expert,’ but rather to serve as an educated contribution to an ongoing dialogue concerning some of the most important issues of our time.

As previously mentioned, such an iterative approach relates closely to other models referred to as Participatory Action Research and Community Based Research. Strand et al. (2003) define these models in the university context as “the systematic creation of knowledge that is done with and for the community for the purpose of addressing a community-identified need.”<sup>129</sup> This project is participatory in so far as VF community needs guided the research to focus on issues of co-optation and scale. The need for these foci became obvious after initial conversations with VF participants as well as secondary source research. VF proponents wished to expand their practice, but feared the consequences, and were unsure as to exactly how to go about doing so. This

project was therefore designed to help demystify the complicated dynamic of expanding in scope and scale. Nevertheless, it was difficult to integrate community participation throughout the process as much as would be preferred, given temporal and financial constraints on both sides. Therefore, it must be noted that this research will result inevitably in errors, omissions, and unattributed statements – limitations for which I take full responsibility.

It is also difficult when collaborating with certain communities not to be overly prescriptive concerning how the world ought to be, or what ought to be done given the research results. To this end, Strand et al. (2003) argue: “The measure of the value of community based research, in contrast [to more conventional models], is its potential to bring about social change.”<sup>130</sup> Therefore, while universal narratives are something to be generally avoided, (i.e. merit in acknowledging the fleeting and limited state of knowledge) we should still morally recognize the need to act generally regardless of this fact. This current research process was also dialogical in that initial results were discussed with participants. In this way, the line was blurred between researcher and subject, which created opportunities for social change through personal empowerment. This blurring process also led to the incorporation of another related research model.

Auto-ethnography (AE) takes the phronetic and community methods to a deeper personal level by harnessing the perspectives and experiences of the researcher. AE is defined by Roth (2005) as “a strategy to arrive at intersubjectivity thereby avoiding false claims of objectivity and failure prone inner (hyper) subjectivity.”<sup>131</sup> In essence, AE enables the social scientist to interpret broader social dynamics through personal experience and self-reflection mixed with ‘radical doubt’.<sup>132</sup> Consistent with the earlier

components, this aspect of the process operates on the dialectical understanding of political economy, whereby the individual forms, and is in turn formed by, society, and vice versa. This position allows personal experiences and values to be viewed as assets and tools, rather than simply as problems. In this way, researchers may be viewed as critically aware actors who are able to effect real change, instead of as simply dispassionate observers.<sup>133</sup> AE ensured rigorous data collection as well as useful knowledge creation by comparing and evaluating my personal experiences with the experiences of those being interviewed. Following Neilson (2009), AE is partly “a re-examination of self in nature.”<sup>134</sup> This acknowledgement meant that in this case, the experiences I had with VF need not be regarded as detached from the broader VF phenomena being studied. Neilson (2009) incorporates her personal perspectives into research through distinct text boxes inserted within and throughout the rest of the academic writing. She invites “the reader to let the textboxes disturb my assertions and their own assumptions while dancing through this narrative with me.”<sup>135</sup> Following Neilson, I have opted for a similar approach to the data analysis in the concluding chapter. This somewhat unique attempt assists with ongoing efforts concerning transparency, accountability, reflexivity within the research process and extending them into the appraisal of data.

### **3.4 Methods**

In developing this investigation of case studies, I have relied on organizational documents, informant interviews, participant observation, popular press, and academic literature. Once the aforementioned sources were reviewed in depth, participant

observation and interviews were used to supplement the secondary source data. This research was conducted through the juxtaposition of a finite number of case studies across scales. Crudely defined, prospective cases were initially categorized as small-scale, medium-scale, and large-scale depending on their size, productive capacity, and capital intensity. They would have been chosen so as to best form a somewhat representative sample, or to demonstrate what Flyvbjerg calls 'maximum variation.'<sup>136</sup> Unfortunately, this choice was untenable given that larger, more commercially oriented firms could not participate. This constraint forced me to focus on smaller, more radical operations. This development turned out to be fortuitous, following De Vries (1992) statement: "The most interesting case studies are not the illustrative but the deviant and (theoretically) compelling ones."<sup>137</sup>

The large-scale case study was to be Lufa Farms, a modern greenhouse built atop a commercial building in Montreal. This was presumed to be on the more 'corporate' end of the case study spectrum. Unfortunately, after initially agreeing to participate, repeated attempts to contact various individuals within the firm garnered zero interviews. Another large-scale option would be a similar project called Gotham Greens, located in New York City. Once again, despite early commitments, no interviews were ever allowed. While I was concerned by key actors avoiding or refusing to participate, such a dynamic contributes to the analysis just as an interview might have. Certainly, having a limited budget and compressed timeline did not ease the feeling of being vulnerable in this stage. These constraints also meant setting a timeframe for analysis, choosing artificial 'beginning' and 'end' points for data collection. In the end, Sweet Water Organics,

located in Milwaukee, was selected as the largest-scale case study with multiple actors willing/able to participate.

The medium-scale case is Growing Power, a community food centre in Milwaukee. While key actors were willing to participate, little formal interviewing transpired. I was however, able to conduct a rigorous site visit and speak with volunteers and participants in various capacities there. This case served to supplement/compliment the context surrounding the other cases' interviews.

The small-scale case study is the Plant, an abandoned meat packing plant located in Chicago that has recently been converted into an urban agri/aquaculture center. These cases were investigated by way of personal site visits to assess the scale and nature of the operation. Visits in person proved very important as they demonstrated my commitment given the amount of travel required. Personal visits also allowed for more intimate conversations and interviews. Visits further enabled efforts to document as much of the actual VF process as possible, including through the use of multimedia, mostly digital video recording and photography.

I also decided to conduct an in-depth, semi-structured interview my maternal grandmother, Pauline, who was raised on a subsistence family farm on Prince Edward Island throughout the Great Depression and World War II. Given that I was about to be interviewing individuals very much involved in modern, urban VF, I was looking for the opposite experience, a control variable of sorts to help understand varying experiences with food production, identities, nature and other factors. Pauline's experience and responses will supplement and juxtapose the data in important ways, as needed.

Transcripts from semi-structured interviews provided fodder from which to identify common names, words, phrases, and themes among participants, as well as the values that appear to underlie them. Efforts were made to speak with an executive/director, professional/technician, and employee or volunteer from each case, though this was not always possible. Some actors were simply too busy to meet, others submitted written responses, while others were willing but unable to find a mutually convenient time to talk. Interviews were conducted in accordance with questioning techniques informed by the qualitative research literature (Cicourel 1964; Kvale 1996; Palmer 1928; Patton 1987). This included establishing a rapport, maintaining control, avoiding academic jargon, sequencing open-ended and single-issue questions, probing answers, and pursuing live interpretation.<sup>138</sup> These factors all flowed quite simply from deep interpersonal dialogue. However, following Lindolf (2002), there were questions common to each participant in order to retain a relative level of consistency from interview to interview, in terms of data collection and discourse analysis.<sup>139</sup> Interviews were also digitally recorded and fully transcribed.

The approach to discourse analysis delineated above often raises issues regarding the subjectivities of research objects. Often known as the ‘transparent account problem,’ it is difficult to determine if those being interviewed exist as external agents or are constructed through the discourse alone.<sup>140</sup> Following Doucet and Mauthner (2008), the approach for this thesis sits in the middle, “that is, there may well be something ‘beneath’ or ‘behind’ or outside narrative: nevertheless, all we can know is what is narrated by subjects, as well as our interpretation of their stories within the wider web of social and structural relations from which narrated subjects speak.”<sup>141</sup> Doucet and Mauthner’s

(2008) 'Listening Guide' for recorded interviews was adopted as part of the response to this problem. It argues for multiple readings of transcripts, with each pass looking for different aspects of the contexts, subjectivities, and implications.

Another, more practical issue regarding interview subjects related to the ethics process, specifically concerning the Informed Consent Form. In short, informants were unable/uncomfortable signing the form for various reasons, which in turn made me uncomfortable pressing the issue further. I question if this aspect of the ethics process (as currently formulated) is appropriate for grassroots activists who are often critical of institutions, and of formalities such as Informed Consent forms, that they see as unnecessary and/or intrusive? I also question if it is appropriate for those less-educated participants who may be confused or intimidated by the requirement to read and sign-off on fine print akin to a legal contract? Ballamingie and Johnson (2011) note similar issues that have come to the fore when conducting research with subjects from other cultures.<sup>142</sup> Also, in the context of this research project, one elderly participant could not read nor sign the document, on account of their being visually impaired. Finally, the promise of anonymity established in the ethics process was difficult in two ways. First, in terms of writing, it was difficult to track and place into prose, what turned into a series of coded pseudonyms. Second, guaranteeing anonymity was quite difficult in this case given the small sample group of cases and the level of pre-existing communication among the VF actors themselves, and the fact that they did not appear to be concerned with remaining anonymous in the first place.

### 3.5 Moving Forward

In the end, all research is inherently biased and incomplete, and the results from this project are no different. Findings here shall therefore have to be corroborated by further studies, involving a different set of social actors, as both informants and researchers.

After all, this thesis is simply a narrative, a story describing (however precisely) a point in space and time and told from a social intersection of class, nationality, race, gender, and ability (amongst other axes of social differentiation). The story is about a messy convergence of phenomena associated with food sovereignty, global economic development, climate change, urban planning, social democracy, public education, basic social service delivery, hydroponics, aquaculture, and private enterprise. This mix made for a complex research process from beginning to end. All reasonable efforts have been taken into account for imbalances therein, because, as Thomas King (cited in Neilson 2009) astutely observed: “stories [are] medicine, that a story told one way could cure, that the same story told another way could injure.”<sup>143</sup> Moving on to the analysis of the data, I am careful not to inadvertently misrepresent or hinder the movement I am both working with academically and a part of personally.

“In wildness is the preservation of the world.”

- Henry David Thoreau (1862)

## **Chapter 4: Political Ecology of Vertical Farming – Constructing Nature**

Having outlined the conceptual framework for this project and having explained how the research was conducted within it, this chapter now applies such theoretical insights to the primary data. To begin, Chapter 4 will analyze the data through a political ecology lens. Recall that political ecology is an established approach to the analysis of (rather than a comprehensive theory of) the metabolic relationship between society and environment. This chapter engages primarily with the discursive element of the project’s central research question: *How is VF being organized discursively at different scales in North America?* This engagement politicizes the form of urban/indoor ecology that is integral to VF. The resulting analysis demonstrates how the qualitative and other data sets interact with and respond to existing academic literature and other secondary sources. The discussion also draws on key observations from site visits and subsequent interactions with VF participants in the field. This approach is important as it illuminates numerous and often subtle manifestations of the ways in which various actors frame their actions and identify with VF concepts and praxis. These complex and even contradictory relationships can help provide possible answers to different aspects of the research question. In turn, these findings will likely also have implications for Chapter 5 which deals with more material elements of the data, and for the future of VF in general.

Section 4.1 will begin by briefly documenting the nature of the VF projects examined in this research project. Section 4.2 begins the analysis by revisiting the

concept of social nature and articulating the broader context relating to the themes emerging from the data. Section 4.3 then discusses the key findings relating to *critical discourses* associated with VF. Section 4.4 builds on the previous section, discussing findings relating to the *counter-hegemonic* potential of VF. Sections 4.3 and 4.4 each highlight the ways in which the aforementioned themes intersect, converge, challenge and build upon each other, ongoing debates within the social sciences, and society writ large. Finally, Section 4.5 concludes by outlining some of the implications of this chapter's analysis for the following chapter, as well as for VF moving forward.

#### **4.1 Case Descriptions**

As mentioned in Chapter 3, choosing cases was relatively simple, however finding associated proponents who were willing and able to participate proved somewhat more difficult. In the end, this study involved two primary cases with other projects, sources and experiences supplementing them. Initially, this project intended to observe similarities and differences between small-, medium-, and large-scale VF projects. This approach changed for numerous reasons. First, it proved nearly impossible to coordinate with the larger cases in order to arrange formal interviews. Certain site visits were possible with these larger cases, and I even managed to enjoy informal conversations with key actors, but to my dismay, no in-depth questioning. Second, upon further consideration, it became evident that investigating the simple differences between cases operating at various scales would produce only spurious correlations. Alternatively, identifying pressures acting on the smaller cases and coming to understand how they are

navigating the system would be much more enlightening, and so the research proceeded accordingly.

In each case, plants (food crops) are grown in raised beds, often directly above fish tanks in re-circulating aquaponics systems. Each case is also in the process of expanding their operations with a distinct focus on scaling up the VF elements of their projects. Below, the following sections will discuss how this scaling up process impacts other aspects of the analysis. For a diagram depicting how such closed-loop systems operate, please see Appendix 3.

#### **4.1.1 The Plant Vertical Farm**

First, I visited The Plant Vertical Farm in Chicago, IL. The project is located in the old Peer Foods meat packing plant within the south side Stock Yards neighborhood. The building is a massive structure, including nearly 100,000 square feet of industrial space. Much of the infrastructure is food grade. Built in the late 19<sup>th</sup> century, the building is made of brick of varying sizes, with large pillars and numerous large windows, passageways and machinery. The Plant is a multifaceted complex with diverse activities now being pursued on site. Though still under construction, the site is already home to numerous outdoor gardens and hoop houses located in former parking lots. More relevant to this research, inside there are numerous grow rooms, aquaponics systems and fish breeding areas. I was fortunate to receive a guided tour of the facility, including a presentation on the technical and business plans, and I spoke to numerous volunteers and participants. I also interviewed John Edel, the founding director of the project.

Figure 1: The Plant Vertical Farm (formerly Peer Foods factory),Chicago, IL

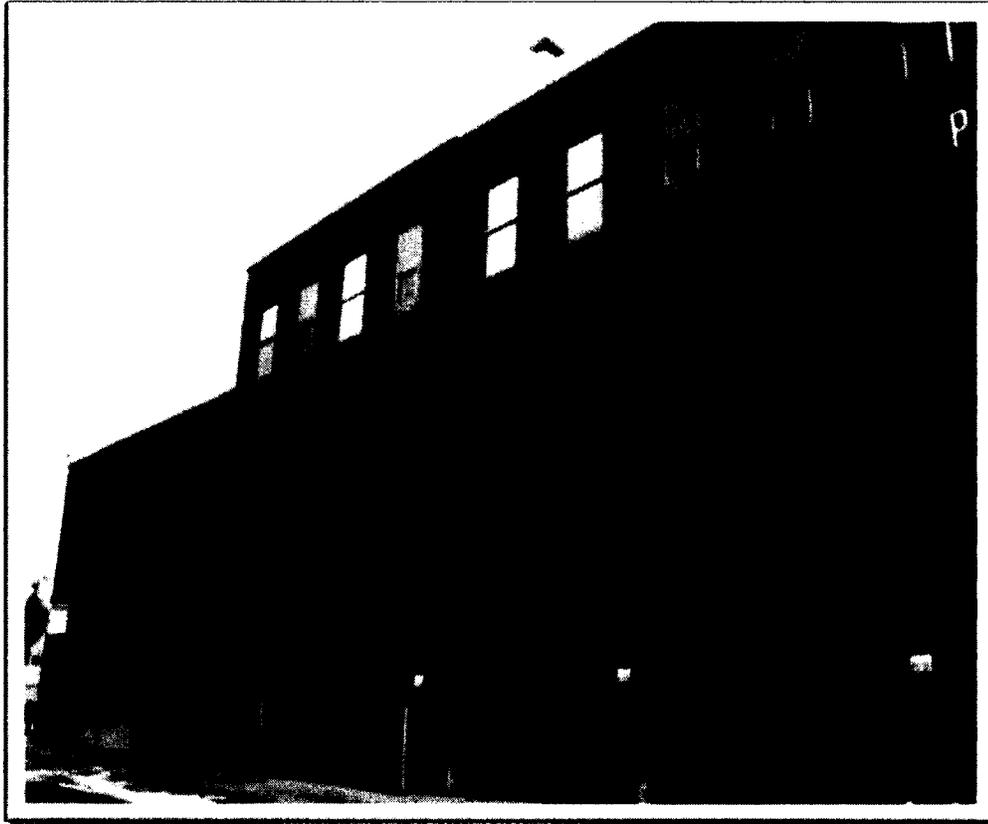


Figure 2: Fish tanks and bio-filters (part of aquaponics system) at The Plant.

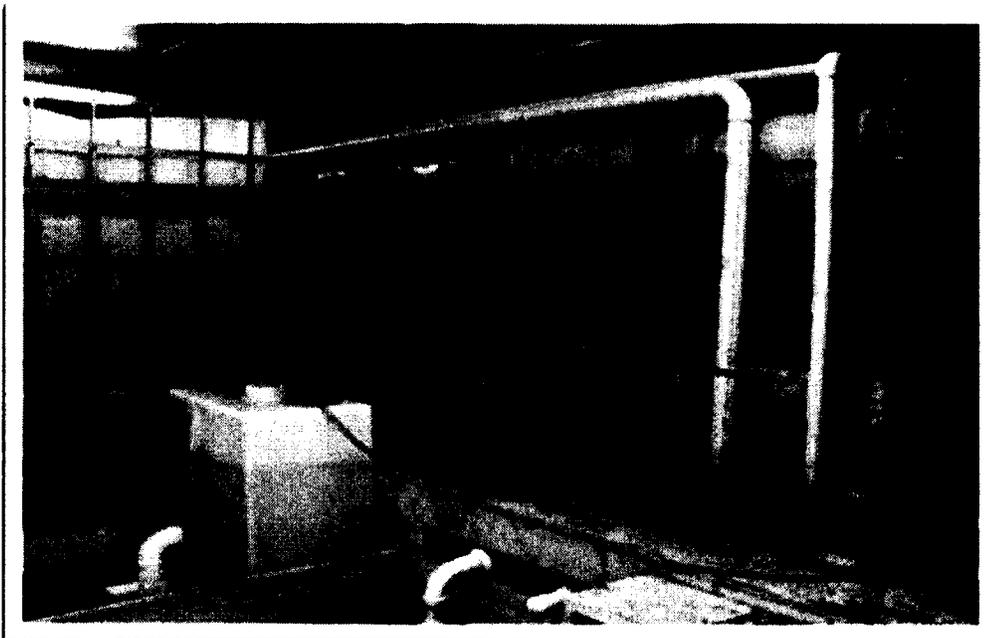
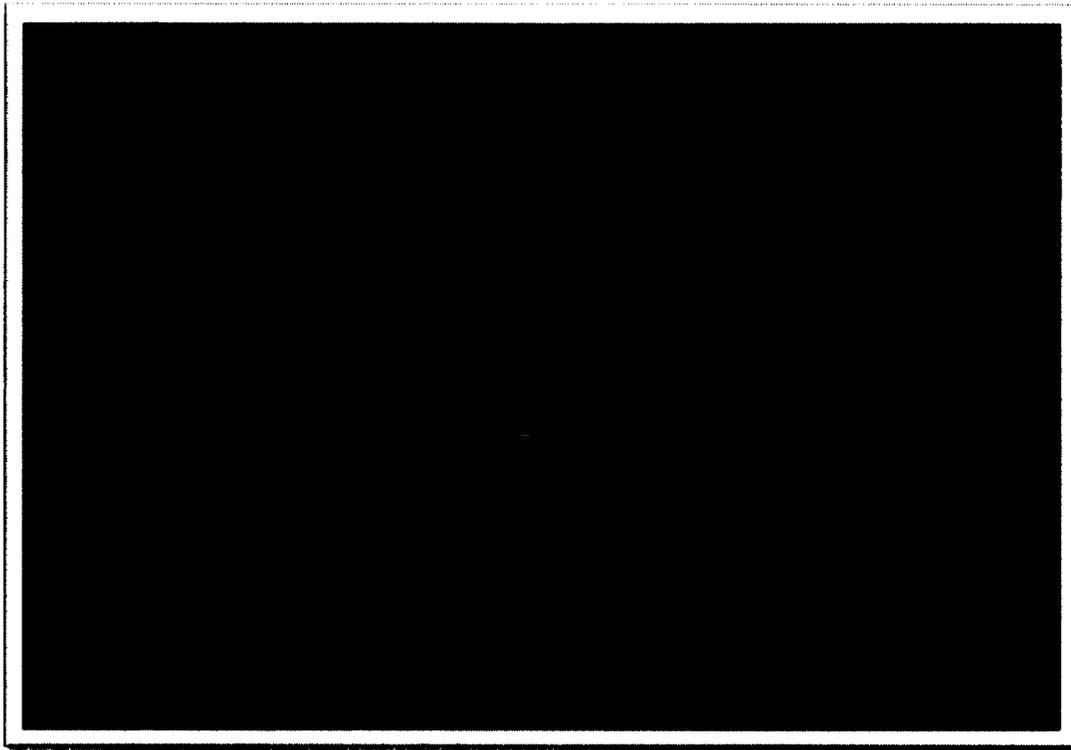


Figure 3: Aquaponics Plant Beds (limited spectrum LED light) at The Plant, Chicago, IL



#### **4.1.2 Sweet Water Organics**

Next, I visited Sweet Water Organics (SWO), in Milwaukee, Wisconsin. This project is located in an old train yard within the Bay View neighborhood, a former industrial quarter. SWO is located within a (relatively) smaller structure than the Plant, at roughly 10,000 square feet. Also still under construction, SWO has outdoor greenhouses, and plans for another greenhouse growing system on the roof. Inside, there are numerous multi-tiered growing areas stacked above in-ground fish tanks (made in retrofitted train car mechanic pits). Once again, I enjoyed an extensive tour of the facilities. I interviewed two prominent actors (employees/volunteers) Dave and Jesse, as well as James Godsil, another founding director.

Figure 4: Primary Production Site, Sweet Water Organics, Milwaukee, WI



Figure 5: Multiple vertical aquaponics systems, Sweet Water Organics.



### 4.1.3 Growing Power

A supplementary case (and one worthy of future research) is Growing Power (GP), a community food centre in the Silver Spring neighborhood in Milwaukee. Growing Power involves many conventional aspects of urban farming, and is in the process of expanding the vertical nature of many aspects of its production. There are multiple greenhouses with fishponds and raised, multi-tiered growing areas. While I participated in a comprehensive tour and was able to speak with numerous actors, including founding director Will Allen, I was unable to coordinate formal interviews with them. As mentioned, this was a positive development because GP does not align with the other cases in two primary ways. First, GP is well established and currently functions more as conventional urban farm than strictly a vertical farm. Second, GP is in the process of building a new and large vertical farm, though they have not begun construction. Conducting interviews after the new vertical farm building is complete would be a great next step in beginning further research to appraise the material conditions and attitudes of larger scale producers. In the meantime, my experience with GP as it exists today will supplement the analysis.

Figure 6: Main Entrance, Growing Power, Milwaukee, WI

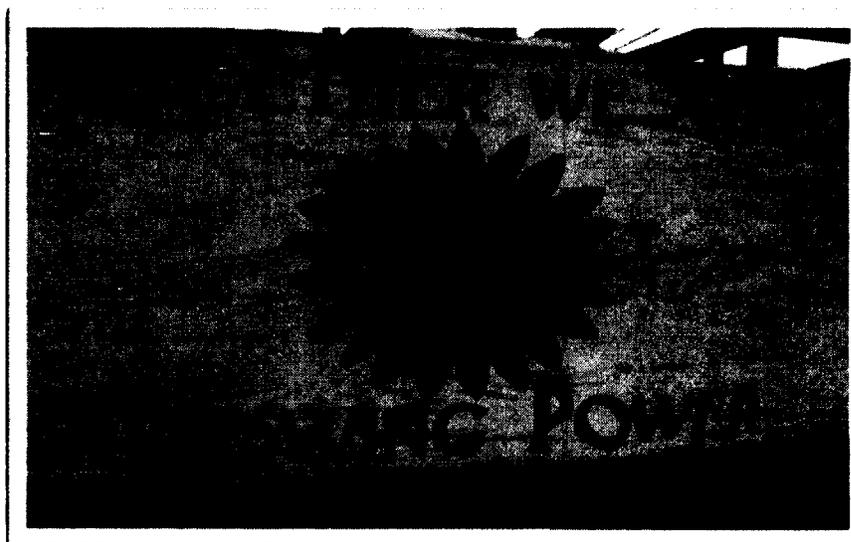
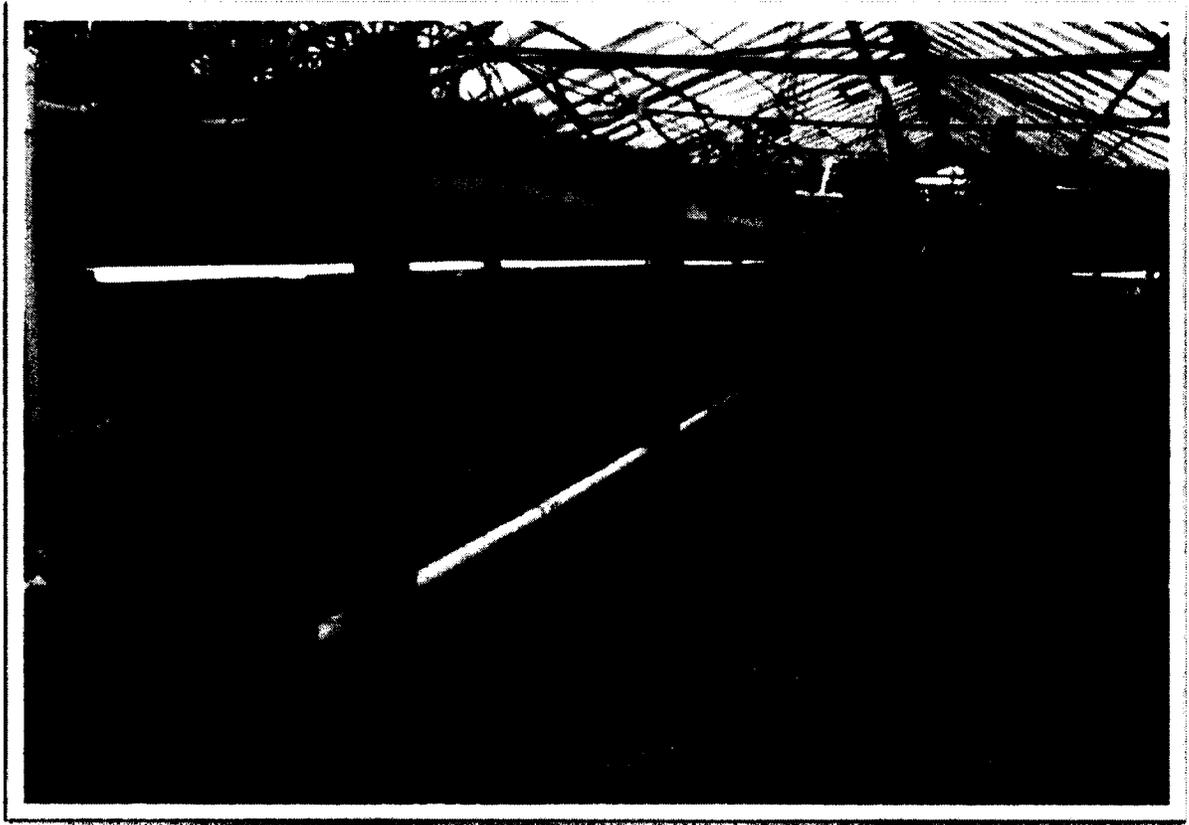


Figure 7: Vertical aquaponics systems at Growing Power, Milwaukee, WI



Recall that by way of embarking on field work, I also conducted an in-depth, semi-structured interview my maternal grandmother, Pauline, who was raised on a subsistence family farm on Prince Edward Island throughout the Depression and World War II. Given that I was about to be interviewing individuals very much involved in modern, urban VF, I was looking for the opposite experience, a control variable of sorts to help understand varying experiences with food production, identities, and other factors. Pauline's experience and responses will supplement and juxtapose the data as needed.

## 4.2 Social Nature - Constructing nature, framing technology

Perhaps unsurprisingly, the central theme emerging from the data that may be related to political ecology discourse is socially (and in this case, also materially) constructed nature. Related to this, are important sub-themes: namely, the broader critical discourses associated with these VF enterprises and the fast-paced and evolving political movement linked to the projects themselves. Within political ecology, the concept of social nature (SN) greatly assists in the analysis of this data in several different ways. Recall from Chapter 2, that different social actors frame the social and material construction of 'nature' in their own unique ways, and to varying political effect. There are numerous ways in which 'nature' is constructed in contemporary society. Nature is commonly defined in three central ways: first, as "the essential quality or character of something"; second, as "the inherent force which directs either the world or humans or both"; and third, as "the external, material world itself."<sup>144</sup> Each of the preceding understandings of nature relate directly to this research.

When discussing nature as the 'environment,' it is important to understand that SN literature posits that it is not simply the false binary between nature and society – a dualism that is inherently socially constructed. Many physical elements of nature are socially constructed as well, and largely go unnoticed. To wit, recall the comments presented in Chapter 2 from the Parks Canada official regarding deliberate ecosystem creation and management. The VF actors I spoke to are clearly very aware of the ways in which they are literally (re)constructing nature through VF. For example, Jesse from SWO explains that both the fish and produce mentioned in Section 4.1 are equally important, "because it is a re-circulating system, a simulated ecosystem, so each one

depends on the other.”<sup>145</sup> Other actors share a similarly pragmatic view of their indoor urban ecology, as demonstrated below.

As mentioned, SN assists in revealing the ways in which the concept of a wild and distinct ‘nature’ itself is socially constructed. Contemporary citizens often take this society-nature binary as preordained, though the prevalence of this construction has not always been as strong as it is today. For example, Pauline’s past experience was about as close to ‘nature’ as possible. Her diet included ‘wild’ elements such as geese, rabbits, mushrooms, and staples such as fish, berries, herbs, medicinal plants, and more. These elements existed alongside livestock (cows, pigs, chickens) and crops (carrots, beets, apples). Interestingly, when asked about the difference between the farm and ‘nature’ she immediately corrected the very premise of the question: “Well, we didn’t think about it that way,” she responded.<sup>146</sup> She goes on to explain: “you have to get your mind back to where we were. We didn’t know about the ‘environment,’ we ate off of the land: that’s the whole thing.”<sup>147</sup>

Of course, much has changed in North America since the days of subsistence family farms. Within contemporary North American society, there exists a widespread disconnect from the natural food systems mentioned above. A simple yet troubling example is that there are now many school children who cannot identify common fruits and vegetables in the classroom.<sup>148</sup> This reality is not surprising given the state of the contemporary consumer economy, wherein commercially processed food and drink products claim to deliver multiple servings of fruits and vegetables in the form of a bar or a bottle. This reality is problematic for various reasons. The development of such social abstractions, and the subsequent disconnections from fundamental processes, are

symptoms of larger economic processes, which as discussed in Chapter 1, result in much larger socio-economic and ecological problems associated with capitalism.

SN allows for an understanding of how humans have been disconnected not just from nature, but also from each other. These binaries (nature-society and collective-individual) are problematic, in so far as they allow for numerous harmful practices to be externalized, which then leads to various forms of socio-economic and ecological damage. Alienation from production, and therefore from humans and environment, leads to externalities because of fragmented roles in production, diminished agency over process, reduced awareness of harmful results, and perceived limitations of alternatives. In short, Vivas (2011) succinctly describes this understanding: “Agribusiness exists because we humans have forgotten that we are part of nature and nature is part of us.”<sup>149</sup> Interestingly, this malleable understanding of wild and human nature implies the possibility to reverse this historic process. A reverse construction could have the potential to reconnect individuals to one another, as well as to the biophysical systems that sustain them. This reconnection may then lead to more equitable and sustainable practices, politics and ultimately more progressive and inclusive societies writ large. Such a reconnection does not imply eliminating social constructs, rather following Castree (2009) simply presenting a compelling counter-narrative, a re-construction of a new social nature.

The idea of reconnecting people to ‘nature’ builds on similar sentiments within the broader UA literature:

By reconnecting with the land, through gardening, we can reconnect with each other – forming communities of place around shared community gardens, and communities of interest, around a common commitment to growing things of usefulness and beauty.<sup>150</sup>

Though plausible, existing literature is mute or unclear about what role (if any) VF might play in this important reversal.<sup>151</sup> When asked about the importance of VF reconnecting people with ‘nature’, John from The Plant states: “Oh absolutely, and not just VF, any kind of urban agriculture is really important for that reason, to reintroduce people to where their food comes from, make them care about where their food comes from and about what the results of that food being raised are.”<sup>152</sup> Such conditions of possibility appear to stem from the materiality of the VF systems themselves in that VF may reintegrate fragmented production cycles, provide for increased agency and awareness of processes, allow for direct experience with fundamental elements of production, and offer a stake in the outcomes. (Such potential benefits shall be discussed in more detail below).

Relating to these VF (eco)systems, Jesse from SWO notes: “Another thing that we grow here, that we don’t sell, is bacteria, which ties the two [fish & plants] together.”<sup>153</sup> Jesse adds that this symbiosis provides superior filtration for the water compared to other synthetic methods. Other co-benefits are reported to include reduced energy, feed, space, and water. This point regarding symbiotic relationships relates directly to Pollan’s (2008) discussion with natural farmer Joel Salatin. Pollan (2008) notes that despite the numerous varieties of plants and animals raised on Salatin’s *Polyface* farm, Salatin himself asserts that he is actually a grass farmer. This statement recognizes how grasses (and the organisms within them) order the energy flow of the entire system.<sup>154</sup> There emerges a similar understanding of natural reciprocity and symbiosis associated with the bacteria in the water that mediate between various inputs-turned-outputs within the VF cases. Of course, Polyface is not a vertical farm, and despite

sharing respect for natural equilibrium, the differences between the two approaches have some commentators questioning the merit of VF as compared to more ‘natural’ approaches to farming.<sup>155</sup>

Despite the increasingly accepted merit of the SN claim that nature is socially constructed, the notion of conventional farming as ‘in nature,’ or conversely, of VF as somehow being ‘unnatural’ is a recurring theme in much of the critical secondary source data/popular literature. Discussions with colleagues and commentary on VF media demonstrate and affirm such skeptical sentiments to varying degrees. One example is Susie Dare, an American farmer from New Jersey who states: “growing things in a skyscraper is just totally unnatural. I can’t imagine anyone trying it or wanting to try it, or succeeding in it, or buying the produce from it.”<sup>156</sup> Aligned with this position, numerous scholars and activists advocate for traditional small-scale organic farming, in lieu of what they view as more technological approaches.<sup>157</sup> A recent United Nations study, *Agroecology and the Right to Food (2011)*, confirms the need for small-scale organic food production, though notably, the study also mentions hydroponics and other alternatives as part of the solution.<sup>158</sup> A SN analysis (an understanding of the ways in which nature is constructed and contested) allows us to drill down past the superficial dichotomy of whether or not VF is natural. An important observation is that once this mental hurdle is overcome, current incarnations of VF can actually be defined as small-scale organic (more on the issue of scale in Chapter 5).

Proponents of VF have also responded to their critics on their own terms. Despommier (2010) notes that even within uncritical conceptions of nature as separate from humans, farming of any kind is not ‘natural.’ Since the beginning of domesticated

agriculture, humans have been clearing land (cutting, burning trees), diverting water sources, selectively breeding plants and animals among other unnatural practices.<sup>159</sup> This observation is not meant to denounce such practices, but rather to highlight the arbitrary distinction some commentators create between ‘natural’ and ‘unnatural’ farming. In fact, human constructions and interventions in nature for the purpose of agriculture can certainly benefit local ecosystems. Consider Veta La Palma, a Spanish aquaculture business in the south of Spain. Located in an area that had been destroyed by ranching, a synthetic wetland ecosystem has been subsequently built that produces so much fish and other wildlife that it has actually become a bird sanctuary.<sup>160</sup> Thus, even a degraded ecosystem can be somewhat restored, or in this case, re-purposed and re-imagined, in ways that achieve multiple co-benefits: greater ecological integrity and food production.

The previous debate concerning farming and nature also appears, in part, to centre on the use of technology. There are those who assert the need for technology in any realistic approach to food systems (Borrell 2011; de Janvry 2000; Larkins 2008), and as we have seen, there are those who see technology as the cause of problems associated with food systems in the first place.<sup>161</sup> As mentioned earlier by Adkin (1992), the former instrumental view of technology is related to uncritical thinking and deference to hegemonic Western positivist doctrine. Recall that Heidegger (1954) argues that such an uncritical position leads to *enframing* nature, which ultimately leads to humans becoming a *standing reserve* for technology as well. In more accessible terms, this implies that a faith in (or reliance upon) technology may result in co-optation, exploitation, and certainly altered thoughts and behavior. As Maslow (1966) eloquently stated: “I suppose

it is tempting, if the only tool you have is a hammer, to treat everything as if it were a nail.”<sup>162</sup>

Conversely, James from SWO is proud of what he calls “bio-mimicry innovations inspired by nature.”<sup>163</sup> John quips: “plants don’t care what floor they are on, or if there are columns.”<sup>164</sup> In fact, proponents of the Dutch VF *PlantLab* argue that indoor environments can be superior to other more conventional/natural growing conditions; they even refer to their process as the emancipation of plants in a ‘plant paradise.’<sup>165</sup> Interestingly, participants offered neither a sense of dominating nature, nor of being dominated by technology. Rather, homage and respect is apparent for the underlying biophysical relationships involved in the hybrid tech-nature process. This holistic and respectful blending of natural processes and the human built environment exists in other sectors as well, such as the similar *Living Machine* system developed for wastewater treatment.<sup>166</sup> This finding calls into question some of the negative commentary surrounding the use of technology in food systems.

Following this challenge, as noted in Chapter 2, Heidegger (1954) also allows for the *saving power* to arise when science is balanced with art and culture. Mudd (2000) explains: “the saving power that arises through art and within the danger of modern technology must be a power to bring humans back into their essence.”<sup>167</sup> Indeed, site visits uncovered a great degree of art and culture that was associated with or integrated into the productive elements of the projects. Of course, art in this case means much more than painting, poems or sculpture (though all were found to be associated with the various VF projects).

Figure 8: Industrial art, The Plant, Chicago, IL

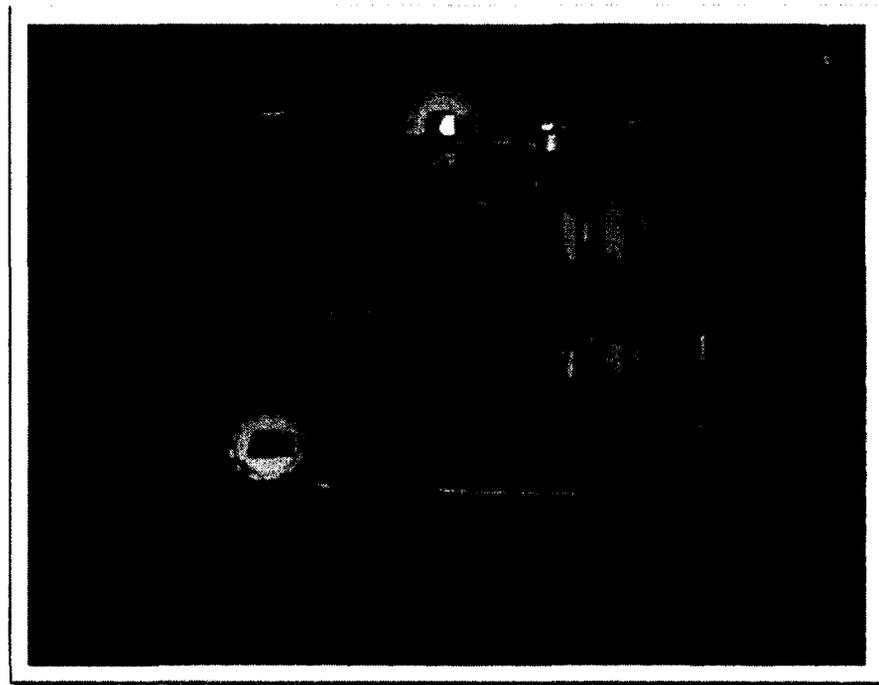


Figure 9: Fish mural, Sweet Water Organics, Milwaukee, WI

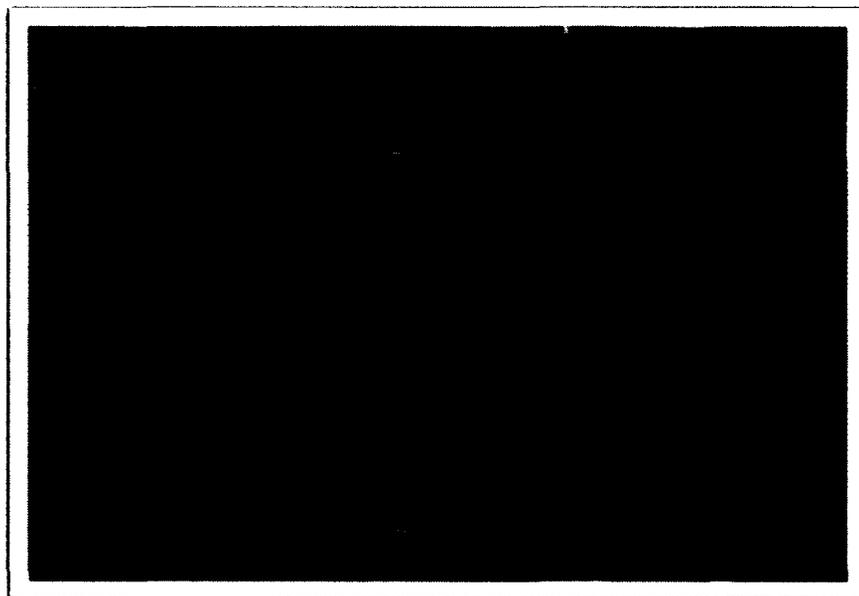


Figure 10: Plant mural, Sweet Water Organics, Milwaukee, WI



Figure 11: Community/visitor mural, Growing Power, Milwaukee, WI



Rather, the point is that such creative thinking for the sake of beauty instead of function, alters perspectives on the entire project. Such non-instrumental thinking proffers meaning to otherwise technical processes, and as mentioned, a reverence for the inextricably linked eco-technical-human relations involved in VF. This finding builds on, and advances current debates regarding the use and meaning of technology. Indeed, rather than being altered by technology, VF actors see the technology involved as central elements to a better future.

James from SWO asserts that: “organic engineering systems in urban agriculture architecture will be key to the coming *Good Boom*.”<sup>168</sup> The *Good Boom* refers to a recent publication from Booth (2010) which outlines the benefits and transformative potential of urban compact living, including food production.<sup>169</sup> One element of this philosophy of interest in this SN analysis is the possibility of re-wilding. Mentioned in Chapter 1, this concept revolves around the notion that left to their own devices, ecosystems can repair themselves. Though agriculture is but one of many competing land-uses, Booth notes if we wish to protect biodiversity “we will have to give back to nature some of our exploited spaces.”<sup>170</sup> This proposition has been used as another justification for VF, in that taking some of the burden of food production off of the land can provide the opportunity for ecosystems to regenerate. This re-wilding process is occurring regardless of VF, though aspects of the idea remain controversial.<sup>171</sup> Given that nearly half of the planet’s land is devoted to agriculture (and this footprint is growing), findings from this and future VF research can certainly contribute to the re-wilding debate and help facilitate the renewal of areas in proximity to VF and hitherto damaged by conventional agriculture.<sup>172</sup>

However, in SN terms, the idea of returning to a 'natural' state of wilderness is problematic, as ecosystems are dynamic and in continuous flux. Thus, referring to a 'natural state' is arbitrary and human-centric in the sense that such ideas often reference the stage of development a system was in prior to human contact, (understood in the conservation community in North America to be prior to the year 1492).<sup>173</sup> Besides being Eurocentric at best, (as mentioned, humans have been altering ecosystems for millennia), this goal of restoring 'pre-contact' ecosystems is also therefore a moving and elusive target. In fact, there are still accounts of un-contacted tribes in numerous regions of the world who have yet to even engage with let alone adopt the nature/human divisions of Western Modernity.<sup>174</sup> Conversely, it is undeniable that there are integrated biophysical world systems which may resume or regenerate autonomously, were humans to stop interfering with them so acrimoniously and on such massive scales.<sup>175</sup> Proponents argue that VF has the potential to assist in easing such healing processes. This potential raises the possibility that certain constructions of nature are healthier than others, just as there are varying forms of technological applications (such as the infamous relationship between swords and ploughshares, for example).

Another important finding is that the technology involved in these VF cases in particular, is intentionally kept simple for various reasons. Pragmatically, such simplicity is important because of the mix of old infrastructure involved in the industrial reuse aspects of each project. Simplicity is also important in order for systems to be replicable across communities (discussed in further detail in Chapter 5). It is important to note that all respondents eschewed the large, high-tech towers that often first come to mind when the VF concept is discussed in popular and secondary sources, and which are certainly

being pursued by many groups (i.e., Valcent Industries, VerticalFarm.com). This difference in attitudes concerning scale (which are articulated in greater detail in Chapter 5), corresponds to, and may even stem from, critical discourses found to be emerging out of the cases. Such critical discourses are identified and analyzed below.

#### 4.3 Critical Discourses, Political Issues

A political ecology lens also directs attention to how actors frame their actions and politicize VF. As noted in the literature review, for some public proponents, broader political issues remain the motivation for pursuing VF (notably, Despommier 2010). Confirming one of this study's initial hypotheses, all interviewees revealed and elaborated upon critical political perspectives associated with the VF projects. These revelations highlight numerous political issues associated with the VF projects. For example, John is a long time 'preservationist' (of heritage sites, old industrial communities) who sees VF as "a logical way" to reuse vacant industrial structures. James also has political experience in adaptive reuse of vacant industrial structures and has been active in the civil rights and peace movements.<sup>176</sup> For other actors, the VF projects are related to broader political issues through community partners or other networks. Naturally, there are those who are less political than others: "I'm here to build stuff," said one volunteer.<sup>177</sup> However, John notes that everyone does not have to grasp everything at once: "There's lots of people that get it [the VF concept] right off and understand all sorts of things or they might just get a piece of it and that's cool too... because if everybody can find one little slice of it that's interesting then that's all that matters."<sup>178</sup> In fact, this is precisely (In my organizing experience) how many individuals become politicized in

other movements. Jesse confirms the potential for growing tensions: “I believe that as the [VF] industry grows, politics will become a major, huge part of this movement.”<sup>179</sup>

Within the catchall phrase ‘critical discourse,’ fall issues concerning sustainability, equity, and democracy. Such issues are evident in each VF project studied, and are discussed in greater detail below. John explains: “[VF] makes sense for a lot of reasons: creating jobs locally, reducing energy consumption; all those things.”<sup>180</sup> These extra-production interests have spurred organizations to take additional political actions, such as pursuing land trust holdings, providing basic service delivery, and engaging in charitable work. Each project is also involved in advocacy and policy work clearly aimed at impacting the political decisions that shape the food system. This is an important finding, insofar as there appears to be a desire for structural change. James notes Sweet Water has a “focus on multiple bottom lines e.g. ecology and equity,” (more on this hybrid model in Chapter 5).<sup>181</sup>

Reducing transportation is another issue that interviewees mentioned numerous times when articulating the benefits of VF. Localizing some food production is a motivation for these actors, in an effort to reduce costs, pollution and other externalities. Speaking to the issue of food miles (the distance produce/products have travelled from the farm to the fridge, and the ecological footprint associated with it), John remarks: “garlic is a weed, like it’s hard to eradicate...why is it coming from China?”<sup>182</sup> Indeed, VF proponents argue that much wasteful transport (such as fresh produce being sent on transatlantic journeys in refrigerated 747 jetliners) could be reduced with the help of VF. This challenges some, such as Mariola (2007), who argue that local food would not significantly reduce transport related externalities associated with agriculture.<sup>183</sup> While

critics are correct in citing that regional food systems must still rely on fossil fuelled distribution over (relatively) large distances, VF holds the potential to reduce distribution to a human scale (i.e., site of consumption at home or within walking distance from work, etc).

Furthermore, while VF is perhaps most useful in advanced urban environments, VF is even being promoted by some in the context of both national security and international development. James notes his intent to “help advance aquaponics for our armed forces personal health and for a more civilized means of nation building.”<sup>184</sup> Other secondary sources note the ability for compact VF systems to be airlifted into refugee camps, for example.<sup>185</sup> Such possible applications are hard to ignore given the recent famine in Somalia, and the millions of other food-insecure individuals who have been living in camps and informal settlements around the world for decades. Jobs and community economic development are also cited as motivations for VF, though this is discussed within the context of scale and co-optation in Chapter 5.

Interestingly, within the secondary literature, proponents of VF allude to its potential to generate energy, produce medicine and forestry products.<sup>186</sup> However, in the context of this research, respondents related their VF projects solely to *food* production. For example, James concisely defines vertical farming as: “producing food on multiple planes.”<sup>187</sup> Food is important given the quite urgent status of many problems associated with agribusiness, as conveyed in Chapter 1. Of course, food also underpins virtually every other socio-economic issue associated with critical politics. VF can also help rectify current deficiencies in alternate food regimes. First, VF can incorporate secondary processing of produce more easily (given the infrastructure associated with integrated

ecological systems) in a vacant building than a community garden in a vacant lot, for example. Second, VF infrastructure allows for significant organic and low impact protein (fish) production through aquaponics systems, whereas conventional UA (despite rapidly increasing demand for protein) relies on vegan/vegetarianism and infinitesimally scaled animal husbandry (where infrastructure, neighbours and by-laws even allow for such things).

Related to food, *health* emerges as a major concern and appears to be connected to the materiality of the local. Noting her local diet on the farm, Pauline states: “I think that is why we were reasonably healthy: it’s good food!”<sup>188</sup> These sentiments align with and build upon existing literature, as proponents of local food systems and UA have been arguing this point for some time.<sup>189</sup> VF is no different, as Jesse states that SWO is “focused on producing local, fresh, healthy produce for the community.”<sup>190</sup> It is important to note that *freshness* is a key factor within the understanding of ‘healthy.’ Warden (2011) in an ethnography of a local food establishment, notes that ‘freshness’ emerges as a central aspect of contemporary individual identity construction. This finding is interesting given that this type of alternative/niche food consumption could as easily be primarily framed as something else, such as ‘local,’ ‘organic,’ ‘vegetarian,’ or ‘green.’ Warden (2011) notes: “Fresh is a particularly powerful qualifier of food. However, as long as it remains simply a personal project relating only to health, it cannot form the basis of radical collective action.”<sup>191</sup> This is a useful insight insofar as the importance of freshness can become a rejection of capitalist industrial agribusiness.

Allen (2010) maintains that this rejection exists, at least for local food, asserting: “Interest in food-system localization is a reaction to the destructive, disempowering and

alienating effects of large-scale political economic forces.”<sup>192</sup> VF may provide an alternative to such forces by producing extremely local, and thus inherently fresh, food. In fact, there are already plans to incorporate VF into off-the-vine restaurants and grocery stores.<sup>193</sup> These projects allow for catching fresh fish and picking produce directly from ripe plants, a process that would revolutionize the way consumers view food. John builds on this discussion, noting that VF allows people “to discern quality... which will ultimately lead to healthier people.”<sup>194</sup> Such sentiments have spurred recent growth in the popularity of *locavore* diets, slow food, and other movements. VF projects have been able to use this public interest to draw attention to the health benefits and to the rest of the aforementioned political issues associated with VF. In taking advantage of media attention, one goal is clear: to help turn existing critical political discourse into a counter-hegemonic movement.

#### **4.4 A Counter-Hegemonic Aquaponics?**

For critical politics to be successful, the message has to become a movement. Following McLuhan (1961), the medium is often the message.<sup>195</sup> In this case, VF is the medium and the importance of local, healthy, participatory, sustainable and affordable food systems is the message. VF projects have certainly been subject to intense media attention within the last couple of years.<sup>196</sup> Many participants report having to filter incoming phone calls due to a daily barrage of requests for information and interviews (from media, academics, etc.). The VF actors certainly embrace the attention, as they wish to go ‘mainstream.’ James frames the goal as: “awakening the active citizens of America and Europe to the possibilities of urban agriculture and aquaponics.”<sup>197</sup> The hope is that this promoting and

remolding of 'wild nature' may also have implications for 'human nature,' insofar that changing ones experience and perception of food can have ripple effects regarding perspectives on other fundamental socio-economic processes, community, etc. James' goal is to "inspire the democratization and simplification of aquaponics for self-reliance in the context of community building."<sup>198</sup> In other words, he hopes to use VF to change the way people feel, think and act up to three times per day (by reconnecting individuals to community and ecology as they eat).

Close association with these deeply political issues regarding equity and sustainability demonstrates that, at the very least, VF relates to the growing local food movement in general, and to the UA movement in particular. However, given the '100 mile' diet is still an elusive standard, it is clear that much more has to be done to achieve a community-based food system. VF may provide the opportunity to further increase yields within urban agriculture while drastically reducing such food miles well below even regional food system limits. If the goal is truly local food production, it is important to note that Pauline recalls that almost everything her family consumed was sourced within their one 100-acre parcel of forest, orchard and pasture. Even external secondary processing of goods (at a flour mill and wool loom) came only from within (approximately) four miles.<sup>199</sup> Dave presents this possibility of localization as a central inspiration for VF: "What I would really like to see is more locally produced and consumed food so that the pool of resources that we draw on gets tightened up a lot more, and I would like to see people more, the public in general, living a bit more closely to the resources that sustain them."<sup>200</sup> However, it is not clear if many local food movement participants/advocates would identify with VF. Certainly, discussions with activists and

colleagues suggest they may not – a finding that might prove an excellent point of departure for future research.

Some VF actors describe VF as a movement unto itself. Jesse reports: “I would define it most definitely as a movement, everybody who comes through here coins it a movement, the layperson comes through here and says ‘wow this is really a movement, I want to be part of this,’ so that word comes up all the time.”<sup>201</sup> Local food or urban agriculture sub-movement or not, Dave notes that there might be something novel about VF, in that it may have more potential than simple regional food production-distribution:

As it grows, and I have been giving this some thought only as recently as the last couple of days, if it can be proven that these are not only sustainable but efficient and if they can be replicated easily and transferable to the layperson then you may be able to go as far as to call it a revolution, because of the potential it has with more of the economically struggling communities in different parts of the city here and elsewhere.<sup>202</sup>

Certainly, these case study projects have formed partnerships and networks with other VF projects (including one another) and other counter-hegemonic movements. James served on the Board of Directors for Growing Power for years, while a volunteer at SWO is now collaborating on control systems with an engineering student working at the Plant. These groups also work with schools, churches, and community organizations on reducing poverty and racism through out-reach programs and skills development. Like other political projects within movements, these VF projects are sustained by volunteers committed to the cause(s). John explains: “Almost everyone volunteers. Volunteers come learn a whole lot of stuff, and be part of a crazy project; there is nothing official about it.”<sup>203</sup> Every volunteer encountered on site visits had one reason (or more) for why they feel being a part of such a VF project is important. Volunteer 1 responded: “I want better food on the planet,” while Volunteer 2 added: “Save the fish before they die out in the

ocean.”<sup>204</sup> Another interesting observation was that much of the volunteer work relates to education programs at various academic institutions. As such, the projects have a youthful motivation and energy that is often the engine at the forefront of most movements.<sup>205</sup> Being a largely young movement (in terms of history and demographics) also means that much of the technical development and social organization within these projects is experimental and subject to intensive research and development activities. The resulting uncertainty regarding the material aspects of VF (and the research question) will be considered next in Chapter 5.

#### **4.5 Implications**

This chapter has highlighted how VF actors are framing their actions and identifying with VF, and how these findings interact with existing literature. Numerous political goals are clear (alter food system to be more sustainable and equitable, and by extension create jobs and a sense of community) and signs of a counter-hegemonic movement are obvious (organizational linkages, relating actions to larger struggles, attracting volunteers, etc). This discussion builds on existing social movement literature by focusing on inspiring volunteers on the ground through demonstrating the potential for these VF developments to change aspects of any future food system. The analysis pushes the materiality of other food issues forward in that organic, local, fresh, and sustainable food can now likely be incorporated into one process. Challenging much of the discourse around local food, and building on studies of urban agriculture, findings suggest that VF means more than regional food: With VF, the 100 mile diet can become the 100 meter diet. Also, it is clear that ‘local’ in this case includes all aspects of production including ownership and

meaningful employment, not just retail. This finding speaks to a gap in critical political discourses concerning the relation of resistance to neoliberal hegemony and the need for control of community food production (as opposed to altering fiscal or social behavior, for example).

Building on the concept of social nature, it appears that VF may also help overcome hurdles in urban agriculture and other building-integrated growth systems regarding perspectives on what is 'natural.' Pragmatically, the chapter builds on urban agriculture's potential as a viable component of potential eco-local productive capacity by highlighting projects with a focus on industrial reuse, secondary processing and distribution components, and protein production. The latter prospect, (of integrating urban protein production) is a practical aspect that much alternative food literature has met with suggested mass lifestyle changes rather than proactive/pragmatic alternatives. With an emphasis on replication, community, and control of production, the VF actors also recognize the democratic imperative in mass social change.

Despite real achievements and even larger goals and potential, the material basis for much of the critical discourse is simply not secure. As VF develops, there exists the potential for social change, but also the real possibility of co-optation or marginalization. Having just examined how actors are framing their projects and constructing meaning and identities around VF, the following chapter will discuss in more detail how the projects are being organized/administered materially. The analysis will then articulate how VF actors are navigating the dominant economy and adapting (or not) to numerous co-optive pressures.

“The market is godless. The city divine. The marriage of market and city is a supremely human endeavour, not given to succeed if it serves a few, not condemned to fail if it serves all.”

-William Sell, VF Activist, Milwaukee<sup>206</sup>

## **Chapter 5: Political Economy of Vertical Farming**

In Chapter 5, this second phase of data analysis will adopt a political economy lens.

Political economy is a longstanding and varied theoretical tradition focused broadly on wealth creation (economics) and distribution (politics). In dealing with the material side of the research question (how is VF being organized materially at different scales in North America?), this chapter politicizes the economic aspects of VF. Building on Chapter 4, this chapter also demonstrates how the qualitative transcripts and other data sets interact with and respond to other discussions within existing academic literature and other secondary sources. The analysis will also draw on key observations from site visits and subsequent interactions with participants in the field. This approach illuminates various important and often subtle manifestations of the ways in which co-optive pressure (pressure to conform to dominant socio-economic and politico-cultural norms) is experienced by VF actors, and how these actors navigate the dominant economy in hopes of countering the hegemonic neoliberal (food) system. The results provide possible answers to multiple aspects of the research. In turn, such insights have implications for the future of VF in general.

Section 5.1 will begin by briefly reviewing the connections between Chapter 4 and Chapter 5. Section 5.2 will build upon the earlier analysis by articulating some additional themes emerging from the data that relate to political economy; namely, scale and community. Section 5.3 will then discuss subsequent themes of resistance and co-

optation. Sections 5.2 and 5.3 will discuss the ways in which such themes intersect, converge, challenge and/or build upon each other, ongoing debates within the social sciences, and society writ large. Finally, Section 5.4 will outline some of the implications of this analysis for these cases and for VF in general.

### **5.1 Social Nature to Social movement?**

While social engagement with nature certainly creates the physical conditions of production, the previous chapter focused primarily on an analysis of the discursive components of VF. This step was a deliberate attempt to locate (if any) the political issues and critical discourse within the projects. The affirmative results (i.e., the existence of critical political discourse) then have particular impacts on the material elements of the analysis in this chapter. Had the participants not been as counter-hegemonic as they claimed to be, the research process would have taken a different path. Research questions would have changed, along with the analysis of the responses in this chapter.

In light of the fact that each case appears to be associated with a larger movement(s), this implies the need to grow socially and materially. This reality (the need to grow in various capacities) shifts the focus from a discussion on counter-hegemony in Chapter 4 to one of scale in this chapter. Likewise, the various ways in which responses in Chapter 4 indicate how VF interacts with a social nature analysis, impact directly on processes of co-optation in this chapter as well. Of course, such distinctions, be they between chapters or sections are meant to facilitate the articulation of a somewhat logical (dare I say linear) narrative out of what truly is a complicated, evolving and circular phenomenon. This abstracted approach allows for a rigorous interrogation of the data

from different conceptual and theoretical perspectives. The divergent themes and related analysis will be reassembled in the concluding chapter.

## 5.2 Strength in Numbers

### *Scale*

Another central theme emerging from the data that relates to political economy is *scale*.

This concept has been the subject of much discussion in political economy in recent years. As mentioned in Chapter 2, Keil and Mahon (2009) argue that this concept must be (re)integrated into political economy research and discourse.<sup>207</sup> This reintegration will expand academic and activist foci from traditional state-centric redistributive ambitions, to global circuits of local (re)appropriation of resources and production. Scale is a core concept for this research and this theme intervenes in this analysis in numerous ways. First, scale relates to the previous chapter. For the discrete political aspects of VF to effect broader societal change, (i.e., for the practice to become a movement), VF must be scaled spatially in various ways. Similarly, scale impacts the debate touched upon in Chapter 4 between proponents of technical versus natural farming as well as the size/scope of VF projects themselves. Third, scale impacts processes of co-optation (to be discussed in the next section) in terms of (contradictorily) producing vulnerabilities for ‘capture’ by the dominant system, while creating a sense of space and place in communities as potential bulwarks against such potential eventualities (discussed in more detail in Section 5.3).

Interestingly, and perhaps not surprisingly, there is agreement among participants in the case research and secondary sources that scaling is a positive development in VF.

This consensus stems from a broad recognition of VF's current prototype stage of development. Within the cases, VF proponents acknowledge the need to scale in order to effect change. There is even a sense of proselytizing evident in many of the discussions as demonstrated by numerous responses below.

Scale allows actors to situate their actions in relation to other larger and simultaneous neoliberal processes. Paasi (2004) explains:

The current discourse on scale is part of an effort to make sense of the asymmetries, conflicts and confrontations of the globalizing world, characterized by changes in capitalist development, communication, mobility, governance/regulation and knowledge frameworks.<sup>208</sup>

In other words, these VF actors are living the late Rene Dubos's call to 'think globally, act locally.'<sup>209</sup> In fact, James explains that SWO is part of "a newly mobilized movement...the local-global creatives."<sup>210</sup> The process of *jumping scale* (moving between or operating at multiple scales, without regard for conventional and incremental spatial concepts) allows actors to be more effective against what has become highly mobile capital. This possibility arises from recognizing the power-contingent and fleeting nature of hitherto seemingly fixed scalar categories.<sup>211</sup>

These actors are answering Glasman's (2010) more recent charge: "We have forgotten how to organize and pursue the common good at the local places."<sup>212</sup> This scalar critique places the local scale, and specifically the urban space, at the centre of political analysis and action within larger struggles to build a new (social)nature. James outlines the basic incremental plan to operate in different locales: "first focus on local, then regional, then national and international."<sup>213</sup> Importantly, this refined focus challenges existing literature by framing the urban question as part of the solution, instead of simply being a source of angst with respect to the future of global food

systems.<sup>214</sup> This expansion presupposes growth in both material infrastructure and organizational capacity. This growth is part of the change wherein Guthman (2004) highlights a potential increase in vulnerability to co-optation.<sup>215</sup> Fortunately, these VF actors appear to have a nuanced understanding of scale; and as demonstrated in Chapter 4, a critical perspective on the political economy.

Within the VF community (broadly defined), there appear to be two distinct (though not necessarily mutually exclusive) visions of the path local expansion should take. First, vertical scaling involves growing the farms themselves into larger structures – towers often associated with magnificent architecture and mass production. Second, horizontal scaling involves expanding VF production through the replication and diffusion of smaller-scale, home-based units or neighborhood installations. Within the cases studied for this project, each participant articulates a preference for the latter, smaller/wider path of development. James notes that smaller scaled VF is: “much more interesting to imagine than a gargantuan tower celebrating the architect more than the community.”<sup>216</sup> This difference in visions of project scale appears to also correspond somewhat to the critical discourses discussed in Chapter 4 (with the smaller cases appearing to be more critical than the larger operations). Of course, both scale and critical discourses exist as processes on a spectrum. However, for the purpose of this analysis, it was useful to create the distinction between VF and critical VF. This distinction is an important finding as this fact was not apparent from popular and secondary sources. This distinction will be useful again when discussing co-optation in Section 5.2.

Nevertheless, even the relatively small and critical VF projects (however isolated and experimental) are in the process of scaling up rapidly. Dave notes: “What we are

doing here is taking a system that was set up at a medium scale and in some ways exploding it to a much larger scale.”<sup>217</sup> As for VF scale in general, John says:

I see it happening in small amounts in lots of buildings. I think it makes a lot of sense to put in an apartment building or factory or office building or whatever, like ‘yeah, the third floor, that’s where the plants grow.’ So I think it is easily scalable up to very, very large facilities that would be more commercial, but I think that it makes a lot of sense to do it on the smaller scale too, much like a community garden but year ‘round and maybe managed by the condo association...<sup>218</sup>

The idea of owner-operated systems or any other form of community control is obvious and important for numerous reasons. The next section discusses how the concept of community relates to more than just the scale of VF projects.

### *Community*

Community is one of the central themes found within the data that relates to a scalar analysis in particular, and to political economy in general. Following Lord Glasman (2010), successful critical political economy must: “constrain the logic of capitalism, and subordinate it to the imperatives of the human community.”<sup>219</sup> Therefore, this theme also has implications for the larger, subsequent discussion about co-optation and social change below. Of course, community is a term that has numerous meanings and implications. This concept is commonly defined as a localized grouping of households, though as mentioned in Chapter 1, those from capital and working classes, who happen to live in the same part of town, will not always share common interests. Following Cohen (1985), community is also a symbolic framework for sharing and acting on common issues, not necessarily based on geography.<sup>220</sup> From the data, it is evident that local communities are significant contributors to the VF projects, while symbolic communities are motivations

for the VF concept in the first place. Dave highlights simply that through SWO, he is hoping to help create: “communities that are a little bit tighter.”<sup>221</sup> In fact, many of the participants have a history of community involvement. As mentioned, John is passionate about preserving old industrial communities in Chicago, and has already created another functional adaptive reuse restoration project there. James also founded a community restoration alliance, and was Board President of a community development corporation in Milwaukee.<sup>222</sup>

Indeed, community economic development, skills training and job creation are all central aspects of the three VF projects studied. Developments like these can bring commerce into the community through eco-industrial tourism and other economic activities (discussed more in the next section on hybridity). For James, this process is partially based upon a start-up theory he calls “Asset Based Sequential Community and Economic Development.”<sup>223</sup> James explains that SWO founders “believed that harnessing the resources available to them in pursuit of a vision that was ‘in the grain’ of the needs of the time.” James further explains the results of this effort “would set in motion an ‘auto-catalytic’ or sustainable process that would bring new partners with new resource sets, who would bring yet more partners with yet more resources, in a ‘virtuous cycle’ of evolution and growth.”<sup>224</sup> Also known as ABCD, this development model allows for stable, meaningful development because it is based on tangible results and community strengths.<sup>225</sup> Related to the dialectical theory discussed in Chapter 3, this approach has the potential to identify and take advantage of world historical-material tendencies emerging from the current economy.

Many indications suggest that the world is moving into a new, biological age, in which VF could play a significant role. Food systems are being received with increasing scrutiny and are thus becoming more politicized, especially for those in social justice struggles. Wallerstein (2011) explains why, noting: “the eyes of the downtrodden are more acute about the reality of the present.”<sup>226</sup> However, Chomsky (2002) cautions that the ruling élite are catching on:

The main reason why public spending in biological sciences has been rapidly increasing is that intelligent right-wingers understand that the cutting edge of the economy relies on these public initiatives. A huge increase is scheduled under the pretext of ‘bioterror,’ just as the public was deluded into paying for the new [information] economy under the pretext that the Russians are coming.<sup>227</sup>

This connection is important in that cutting-edge community developments, as with social movements more generally, are typically situated “ahead of the curve” (or at least not behind it!) in relation to capital and the material foundation of a continually evolving society. How else might neoliberalism be challenged, if not from an equal footing within the world-historical moment? A discussion of this co-optation/resistance process continues in the next section.

### **5.3 Food Fight**

#### *Co-optation*

Regardless of how aligned community economic development is with world-historical material developments (namely, the current transition from the ‘information’ to the ‘biological’ economy), a key observation from site visits is that the communities surrounding these VF projects are in need of basic stimulus. Job creation has been mentioned, but for community economic development (CED) to be transformative or

empowering there needs to be more than basic wages. Following Loxley (2007): “CED is not only about addressing poverty alleviation or providing services to marginalized groups, it is about promoting an alternative way of operating economically, socially, and politically.”<sup>228</sup> Critical VF actors share the same dilemma as other political movements, in that they seek large-scale impacts through counter-cultural processes. As projects seek broader public support and appeal, they become increasingly vulnerable to dominant economic and political interests, in terms of being suppressed because they represent a threat, appropriated because they represent an opportunity for profit accumulation, or simply incorporated into the status quo by market forces.

As previously noted, each of these projects seeks to accomplish this emancipatory transformation by bringing their version of VF in to the ‘mainstream.’ Organizational growth is being pursued by eliciting significant media exposure, organizing ongoing public tours of facilities, and by simply demonstrating the viability of alternate modes of production, distribution, retail and service provision. Certainly, given the pressures of the market-based economy in which they are situated, these actors do recognize a need to make the projects financially independent. Dave pragmatically explains: “our goal obviously is to be self-sustaining.”<sup>229</sup> Within this process, as outlined in Chapter 2, there appear to be multiple co-optive forces which may be acting on these VF projects to varying degrees.

In relation to these cases, there are four primary forms of possible co-optive pressures (though such pressures are not guaranteed to succeed and are not necessarily mutually exclusive or exhaustive). The first is forced, or explicit and direct pressure from investors. This co-optive pressure increases if there are instances of interlocking Boards

of Directors (i.e. one or more members sitting on Boards of two or more firms) in affected industries. Burt (1980) notes: “The presence of directorate ties on a large scale within an economy is evidence of an integrated economic elite.”<sup>230</sup> Such class cohesion, which exists in North America, facilitates comprehensive co-optive pressures across sectors.<sup>231</sup> As discussed below, this pressure appears to exist though at very low levels of intensity. Interestingly, social and political networks can also benefit from and potentially defend against co-optive pressure by adopting the very same practice of interlocking, and some have.<sup>232</sup>

Another aspect of this direct co-optation is corporate appropriation of symbols and practices of alternate models. As mentioned in Chapter 2, this has occurred with organics and fair trade. Jaffee (2009) reminds us that activists in such movements complain “that their respective standards had been ‘sold out’ to corporate interests whose real intent was to render them toothless.”<sup>233</sup> Jaffee (2009) continues: “advocates for socially just and ecologically sound food systems can aim to learn from their creeping defeats, and design structures to protect their ever-provisional victories and render them less amenable to further accumulation.”<sup>234</sup> This thesis research builds on this recommendation, in that with respect to VF, the product is the holistic practice [not just certain isolated elements, such as location, trade, or the presence (or not) of harmful inputs]. This difference in alternative models makes disingenuous corporate replication difficult (without drastically misleading consumers). For instance, corporations may not include the educational or other community empowerment aspects of critical VF. However by virtue VF’s inherent process, co-opting interests would be hard pressed not

to engage in relatively more local (awareness), healthy (freshness), and sustainable (less water, transport) production – even under a politically diluted model.

The third form of co-optive pressure is situational, stemming from internal dynamics of capitalism. As discussed in relation to organics and fair trade, projects can get reluctantly (or unwittingly) assimilated materially – either incorporated into or restricted by the larger neoliberal project via loans, regulation, laws, and business or cultural norms (such as competition driving prices). Only with the passing of time (and more research) will the impacts of this element on VF projects become clear. Currently, it appears that a mixture of novelty and niche market forces are sheltering VF from larger economic forces. At this point, the degree to which such co-optive pressures are acting on VF cases is inconclusive given the fairly recent development and small scale of the projects.

The fourth co-optive pressure is social and is closely related to number three. My experience with colleagues/opponents in radical political organizing has demonstrated that as one's position within the economy/society changes, there is a potential to lose empathy with subalterns or to start believing in the potential of the market to aid further political/material success. However, an important finding is that actors within the cases studied appear to be entirely and authentically rooted within the working class. Many donate their time and money to participate by virtue of their aforementioned political motivations. Therefore, while this pressure may develop at some point in the future, its impacts are not obvious at this time. Again, more research is needed (in the form of longitudinal studies) in order to make a determination on this point.

Of course, movements can avoid such eventualities entirely by opting out of scaling or other socio-economic processes. However, their impacts might then remain marginal at best. Being suppressed or ignored is also a real possibility. As noted by Mokyr (1997), over time: “new technologies have failed and opportunities have been missed despite their ostensible economic superiority.”<sup>235</sup> The suppression of electric automobile technology is but one recent and salient example.<sup>236</sup> Therefore, as mentioned in Chapter 1, as the VF concept and technologies continue to spread, critical analysis must address *when* co-optation exists and *how to respond* to it, rather than *if* co-optation is happening.

In order for VF projects to operate effectively within the dominant economy, proponents of each case study have opted for social enterprise or hybrid business models.<sup>237</sup> For example, Jesse notes that SWO is: “the name we use for an entity comprised of two organizations.”<sup>238</sup> These VF projects also act as Business Incubators, providing resources (including physical space and expertise) to activist entrepreneurs in order to build capacity, both within the local community and larger movements. Some of the other small businesses activities being incubated include: composting, contracting, consulting, and retailing, with the potential for many more. Perhaps these VF actors are internalizing market logic, but this pragmatic arrangement is deliberate for the opposite reason: these branches actually hedge against some of the less profitable (read: socially progressive) aspects of the projects – an adaptive strategy often employed in the non-profit sector. When asked what philosophical compromises general market dynamics have necessitated, John responds: “I wish I didn’t have to charge rent.”<sup>239</sup> This is a surprisingly minor compromise, given the size of the operation. Attempts to get around

conventional market processes include operating as much as possible through the alternative, barter economy – involving non-monetary material and labour exchange arrangements with other individuals and firms within the community. This complex approach to business practice stems from the social enterprise orientation of the projects.

The hybrid business models include the business incubators and eco-tourism previously mentioned, but also in-house intellectual property services, events hosting, and branded promotional products. These aspects are offered in addition to the primary production and sale of various types of fish and varieties of fruits, vegetables and herbs. Moreover, such seemingly disparate activities are being integrated as much as possible into the social aspects of the projects. There is a multi-use community centre at SWO, while The Plant has a community kitchen and meeting areas.<sup>240</sup> In the case of The Plant, the secondary businesses also directly provide inputs (feed, energy, and/or revenue) to the VF portion. For example, the farm side is producing hops for a microbrewery on site, while the brewery's used mash cycles back into a bio-digester that feeds and powers the farm. The notion of 'public good' is apparent in all aspects of the projects, despite still being complicit to a certain degree in macro-economic relationships (taxes, loans, wages, insurance, asset purchasing, etc.). Nonetheless, there are other aspects of the operations designed to impact the larger system as well.

Public education is a large part of their social enterprise model. There is a strong focus on vocational training and food literacy, both of which are key components in community capacity building. Much of the educational work is academic as well. SWO recently hosted what they claim to be the first North American conference on aquaponics, while James describes the project as "a multifaceted 21<sup>st</sup> century school without

walls.”<sup>241</sup> John notes a similar situation at The Plant, stating: “It’s hard to know where the line gets drawn.”<sup>242</sup> This practice builds on literature speaking to the problems associated with conventional classrooms and the benefits of integrating natural processes into learning. Neilson (2009) states: “being inside the classroom hinders the process of understanding and disrupting power dynamics” because it “de-contextualizes the learning process.”<sup>243</sup> Learning through exposure to natural environments (even those that are engineered tech-natural hybrids) can facilitate a process of “becoming reconnected to complex, multiple perceptions, and lived realities of the environment [and] reviving a state of being within one’s own body, being fully within relationships, ecosystems and systems of spirituality.”<sup>244</sup> This focus on education offers a response to Groulx (1981), who laments: “serious deficiencies in theories of reproduction, the most important of which, is the refusal to posit a form of critique that demonstrates the theoretical and practical importance of counter-hegemonic struggles both within and outside the sphere of schooling.”<sup>245</sup> The possibility and implications of participation with (and reconnection to) natural processes through education will be developed further when discussing resistance, below.

Another important finding is that the political aspects of these socially/ecologically hybrid operations tend to be less profitable or even represent positive costs (and thus financial liabilities) to the business. Given the experimental nature of much of the process, research and development (R&D) is a very important and expensive aspect of VF at the moment. The importance of R&D has emerged as an important sub-theme from the research. John links R&D to scale: “We have a lot of learning to do before any really big projects can happen, a lot of learning.”<sup>246</sup> Jesse

provides an example: “We are looking for a regular fish harvest, right now our fish harvests are irregular; our vegetable harvests are regular.”<sup>247</sup> Dave adds: “Different nutrient loads and things are something that needs to be dealt with in ways that these systems are not handling. It may be more advantageous to go with an ebb/flow system [with timers, control programs] versus constant flow [pumped recirculation] that we have right now.”<sup>248</sup>

The experimental uncertainties associated with these projects stem from the fact that this type of VF remains quite a novel endeavour. Indeed, much of the media attention and organizational documents report that these projects are ‘firsts.’ Certainly, a key observation is that the projects are evolving rapidly. To this point, John makes a distinction between the technology and the way it is implemented (i.e., the object and the social relations associated with its use/production). He states: “Aquaponics and VF per se are not new; people have been doing it for fifty years easily.”<sup>249</sup> Secondary sources confirm that *hydroponicums* (hydroponic food production systems) have been in operation for many decades around the world, though typically used to grow feed for livestock.<sup>250</sup> It appears as though hydroponics towers were also built by the Soviet Union in Armenia, possibly as part of a space research program.<sup>251</sup> That said, John adds: “there is definitely something new about the way we are doing it.”<sup>252</sup> James confirms these sentiments, defining SWO as: “the world’s first commercial urban aquaponics fish vegetable farm in an historic factory building selling to local markets.”<sup>253</sup> While these actors may take of advantage of this earned knowledge value through consulting or other business ventures, these are balanced by a clear commitment to public education and outreach to those who cannot afford to pay. James also emphasizes the sheer speed of VF

development; referring to SWO's proposed outdoor VF greenhouse model, he reports:

"The narrow proof of concept has a good chance of arriving for these systems in the 12 months following their expected rolling out sometime in the middle months of 2011."<sup>254</sup>

Speaking to this compressed timeline, Dave cautions:

Things are growing pretty darn fast, just personally speaking, I'm not sure if it would be good for the company to grow at a faster rate. We have learned a lot from the incremental growth that we have had so far and if we had grown any faster, I'm not sure that some of those things would have been realized before the next step had been taken.<sup>255</sup>

This prudent attitude affirms Coy and Hedeem's (2005) caution, discussed in Chapter 2, that small decisions might lead to unintended consequences.

The importance of control over the development process speaks to the observed importance of *citizen science*; the notion of taking R&D out of elite laboratories and into basements, backyards, and in these critical VF cases, abandoned/underutilized buildings. James defines SWO itself "as a science lab."<sup>256</sup> The atmosphere in all cases is akin to that described by Madrigal (2011) when discussing the initial development of green technology at the turn of the 20<sup>th</sup> century.<sup>257</sup> The grassroots research within these critical VF cases relates to their goal to democratize the technology and relates to the 'open source' movement (with respect to art, entertainment, information, programming) and others defending against the commercialization of research in particular.<sup>258</sup> A recent report on biotechnology from the group *Involve* summarizes the issue:

The power of technology is clear, but its governance is not. Who or what makes these world-shaping decisions? In whose interests are they made? These are the questions posed by a growing number of researchers, non-governmental organizations (NGOs), citizens, politicians, and scientists who seek to challenge the way that science and technology is governed, and to invent new ways to democratize the development of new technologies...there is a growing awareness in government and in society of the need to create a more constructive and trusting relationship between science and society.<sup>259</sup>

These insights are important to consider in the current context surrounding VF, as the larger labs/institutions are beginning to take part in the research. SWO is now the subject of a \$500, 000 National Science Foundation grant proposal from Milwaukee School of Engineering.<sup>260</sup> Clemson University has also recently received funding from the US Environmental Protection Agency to study the potential of VF.<sup>261</sup> One clear observation is that funding is definitely needed to advance these VF projects. However, John is cautious: “you know, with enough money thrown at it, you can do anything; which doesn’t prove anything.”<sup>262</sup> Indeed, federal funding has placed humans on the moon; yet, forty years later, civil society and even the private sector are barely catching up. If the political goal is to replicate or at least render such systems accessible and affordable (which it appears to be), then efficient methods must be developed that are not contingent on large amounts of capital, federal funding or otherwise. This resourceful and creative efficiency is the key to competing with and replacing the current hegemony. These creative tensions may provide the vehicle to move critical VF forward. Conversely, this process can lead to mission drift or a severance of the social aspects from the business completely.

Clearly, a central concern relates to the required balance between being effective and becoming co-opted. The challenge is for critical VF projects to strike that balance in

the face of the increasing pressures detailed above. Certainly VF is gaining attention from powerful actors within the economy. John reports: “yeah, it’s the hot new thing...I’ve gotten a lot of emails from big real estate developers lately.”<sup>263</sup> While increasing interest has facilitated the social aspects of VF (e.g., increased issue awareness, linking VF to wider political movements), this growth also increases the need for capital, and thus investors. And investors are often the harbinger of increasing co-optive pressure. Some of the funding can and will come from government conservation or community grants, or as mentioned, in the form of education or research funding. However, much of the balance remains to be accounted for. John reports: “lots of investors are interested, but I’m not interested in investors. Investors always want their money back, plus more.”<sup>264</sup> John notes that he wants to avoid the pressure “because you know they [investors] are always pushing you.”<sup>265</sup> These tensions have been felt firsthand by proponents of other cases. Dave notes: “With the upstart, there were initially people involved who are not involved now.”<sup>266</sup> Dave notes that for some: “it was started as a for-profit venture to make money, and it turned out that it took a little bit more than maybe some of the investors wanted.”<sup>267</sup> This highlights the need for ‘patient capital,’ at a time when Yilmazer (2011) notes that the *credit crunch* is already hurting small enterprises.<sup>268</sup>

Thus far, these VF projects have been financed by small investors (who by all indications are still awaiting returns), though there is an appreciation that larger players could be involved as well. Jesse shares this concern: “I believe that industrial agriculture is waiting in the wings because they are waiting to see if this will provide a challenge to their economic market.”<sup>269</sup> Jesse further reports that other sectors have already shown signs of threat:

[...] we have already seen it begin to pop up in the way we do composting. Waste Management is a large-scale composter here in Wisconsin, and they are opposed to small-scale sequestration of organic materials because it pulls away from their organic materials that they can use to produce methane gas and therefore garner profit.<sup>270</sup>

Looking into the future, Jesse continues: “Industrial agriculture, I don’t think they have launched a similar assault on our produce, but I think it will come into play and I think government regulations are going to play a big part in that, so I think that it is something that is on the horizon.”<sup>271</sup> At this point it is unclear what form such an assault might take, and therefore, how VF actors might be able to respond. Recall the role that government regulatory processes played in the co-optation of the organics sector. Guthman (2004) notes how regulations allowed large firms to strip all but the most fundamental aspects of what was a very political concept, appropriating only the technical aspects into existing structures of production, distribution and consumption.<sup>272</sup>

While government regulation has not yet come to fully encapsulate definitions of local, urban or vertical farming, politically sanitized and strictly technical versions of VF have begun to come online in recent years. Medium-scale operations are already underway which share very little with the smaller-scale, hybrid models detailed above, both in terms of vision and form. Nuvege, Terrashpere, GLT Inc., and other emerging VF firms appear to have less focus on community and more on technology, with an emphasis on production for profit (and, to be fair, on sustainability as well). While many VF projects are focused on fresh food for communities, patent applications have also been submitted for numerous large-scale industrial VF processes designed for more commodified processed food, fuel and forestry product crops (such as corn, soy, wheat, switch grass, bamboo and others).<sup>273</sup> Moreover, while many VF projects are based upon

principles of fundamentally 'natural' systems, some firms are beginning to commercialize the design and production of VF technical components as well.<sup>274</sup> Such commercially oriented VF firms can still reduce externalities associated with agriculture (significant water and transport savings, increase nutrition and freshness, and opportunity for better access/awareness) though they certainly do not challenge larger socio-economic dynamics of capitalism. This difference, as mentioned in the previous section, demands an analytical distinction between VF and critical VF. These differences prove useful for the discussion of resistance, below.

### *Resistance*

Resistance is a necessary and significant portion of any power dynamic and operates in dialectical tension with forms of domination.<sup>275</sup> Importantly, Heynen (2007) reminds the reader that within anti-capital and environmental movements: "Resistance is as complicated and constrained by contingencies as neoliberalism itself."<sup>276</sup> From my experience in counter-hegemonic movements, it is clear that resistance (like any social, political or military action) can manifest in various ways, in terms of genesis (where it is coming from), strategy (what it is targeting), and tactics (how it is executed). It is also important to note that while counter-hegemonic efforts are forms of resistance, not all resistance is inherently counter-hegemonic. Following Sites (2007):

Community organizations, for example, often fight employment losses, or wage cuts, or residential turnover that accompanies neighborhood gentrification. Yet many of these groups do not explicitly link the threats they face to the workings of neoliberal capitalism, nor do they necessarily connect their own actions to larger struggles.<sup>277</sup>

As previously alluded to, both forms of material and ideological resistance are found in the critical VF cases. Given the ongoing history of ‘good political intentions gone bad’ (such as the corporate co-optation of organics or fair trade), perhaps more important are the material conditions of praxis. With respect to critical VF, there appear to be multiple bulwarks against potential co-optation, material aspects of the practice that may be difficult to neoliberalize.

One important finding is that the critical VF actors are uncertain about defining their version of VF as an industry (they prefer to define their work as part of a movement, as discussed earlier). For example, John exclaims: “It’s a long way off from being an industry, that’s for sure.”<sup>278</sup> Part of the buffer, at least in the interim, is that much of this process is simply not very profitable. John frankly discusses the pragmatic economic challenges that VF faces:

It is really expensive to build these systems. Hardware you know. There are ways to do it for less but there are things you really cannot avoid that are just expensive. You have to pump oxygen into the water, you have to contain a lot of water somehow, and you have to buy expensive lights. So I think there are a lot of financial projections floating around out there that are totally wrong, too optimistic. Agriculture is probably the least profitable business you could be in with the smallest margins and highest risk...By the time you start changing any aspects of that, unless you are really making it way more efficient, it’s just going to end up not being financially viable, and so far, that is what everyone has found out that has been attempting it. There are other developers out there who think they are just going to build a big facility and start growing right now. There’s a guy who’s been here actually, has the whole thing planned out and all these projections about how rich he is going to get, ha ha, well I won’t be investing in [his] company. They don’t really realize, they’ve done the math but the math is wrong.<sup>279</sup>

Jesse delicately summarizes the point: “When we refer to it [VF] as an industry, it is usually preceded by the word ‘emerging,’ because it is not yet an established industry.”<sup>280</sup> It is not clear that larger-scale VF projects will have an easier experience,

(though construction on a larger VF in Manchester, England has recently begun, so opportunities for empirical comparisons will be available in the not-too-distant future) However, as long as energy derived from fossil fuels remains cheap, food prices remain high and tax and subsidy programs remain favorable to conventional processes, large agribusiness might simply avoid VF. Speaking about the potential for agribusinesses to appropriate the process, John continues, qualifying his previous points:

Well, they would have already done it, if it actually worked. It's not like ADM [Archer Daniels Midland] and those guys haven't looked at this, and they added it up and said 'this doesn't work.' They don't care about making jobs in the community, or local food, or any of that stuff... those aren't issues to them. So it works, but it's really hard.<sup>281</sup>

Fortunately, John admits: "Since I personally don't really care about getting rich doing this, it means I can divert whatever profits from the building side into maintaining the farm."<sup>282</sup> This type of commitment and foresight might just be effective in creating more stable bulwarks for resistance. While aspects of VF may be (relatively) expensive now, replication and scaling will reduce costs. Furthermore, VF may help usher in a new political economy, one that includes in its calculus of production all the truly expensive externalities hitherto excluded from conventional cost estimates. Of course, as mentioned in the previous sections, there exists the potential that agribusinesses may simply join the game late and poach the profitable aspects of the R&D completed as part of a larger goal by more critical players. However, somewhat unique discursive and material aspects of the VF process may hinder such attempts.

Scale (in terms of size, location, and networked relations) has an impact on co-optation, and can act as a buffer against it. When asked about the possibility of VF mission drift, Dave responds: "I think it depends on the direction that the growth takes;

whether it is in more centralized mega urban farms, somewhat like you see here, or even larger, or if it's more decentralized and operated at more of a neighborhood level."<sup>283</sup>

This challenges much existing literature, following Sites (2007): "A common problem is that theories of neoliberalism are not always well suited to examining the strategic possibilities for urban oppositional agency."<sup>284</sup> Certainly, urban environments have been sites of vigorous resistance, from the headquarters of NGOs in Ottawa, to protest marches in Seattle, to favela street battles in Rio de Janeiro. However, while delaying neoliberal reforms and poking holes in market ideology, few of these activities have been able to build the socio-economic, political and material capacity to significantly undermine or opt out of the dominant socio-economic order.

Critical VF has the potential to help on both fronts. Community-based VF allows for close proximity to production. John explains the value of proximity:

Local is important for a couple of reasons. If the food you eat comes from the farm across the street or wherever in your neighborhood, you'd say 'hey what are you spraying on my tomatoes? What is that?!' So that puts a lot of pressure on the people growing it not to do those things so I think that's really good.<sup>285</sup>

Pursuant to this preference for community-scaled VF projects, another important finding is that many respondents emphasized the need to make their VF systems replicable.

James notes the initial intent to: "inspire replications, large and small." Replication is essential for diffusion and democratization of the technology in an attempt to maximize the social impacts of it. A common theme in political economy, the issue can be defined as the imperative to control the means of production. Removing the means of production from international circuits of capital and placing it in the hands of working class communities would certainly be empowering. Such a development could also assist in the

transformation of the capitalist mode of production more generally, (reducing alienation, externalities and exchange relations).<sup>286</sup> Jesse expands on these sentiments:

[...] we are devoting ourselves to empowering and equipping people to become owners of this type of growing process, thereby if we equip designers and builders in every segment of the population, I think you are dealing then with such a mass of people which then comprises also this politics of your city or region, and therefore what we are doing is, our movement is going to become mainstream right, and I believe that the principles of the movement (inherently as an individual I need to believe this to keep myself motivated) every individual when they learn about urban farming takes it personally and personally wants to become part of urban farming and not simply a spectator or recipient which would then allow them to become passive to a certain politics and then become disempowered. So basically we have a goal of empowerment.<sup>287</sup>

In other words, replication can increase participation, which then, ideally, leads to: a) a (re)connection to fundamental bio-physical processes, and b) practical and political education. This process can reduce alienation, thereby empowering those who participate. Dave confirms this view: “Making these systems replicable and educating the populace is a major component of keeping things from being overly centralized.”<sup>288</sup> More importantly, this type of alternative education can actually combat neoliberal education, wherein following Hill (2003): “business values and interests are increasingly substituted for democratic accountability and the collective voice.”<sup>289</sup> Indeed, as Biko (1978) argues: “the most potent weapon in the hands of the oppressor is the mind of the oppressed”<sup>290</sup> Counter-hegemonic and grassroots education can (re)appropriate this weapon. James notes that by ‘educating and inspiring’ children in schools and people in communities, SWO will “‘profit’ from the good will and expanding web of competent and committed partners in the urban agriculture/aquaponics (r)evolution”<sup>291</sup> John agrees: “ultimately those people pay you back ten times in goodwill and other ways.”<sup>292</sup> At a time of globalizing individualism, solidarity within communities (whether it be a

movement or a revolution) is perhaps the most important form of resistance VF can provide for.

#### 5.4 Implications

This chapter has analyzed the data through a political economy lens, revealing findings associated with scale, community, resistance and co-optation. The investigation has identified the importance of a sense of ownership and participation in reconnecting with nature and neighbours. This process could have a profound impact on the development of VF. The need for capital and other external restraints could also mean that critical VF remains on the margins. Another possibility is that corporate actors will strip VF technology of radical political goals. However, while this development would still be more sustainable than the status quo, it would certainly not have the radical potential of other approaches. Even if the VF practice is appropriated, the capitalist domination of technology has been shown to be subject to resistance in other contexts. Consider the Internet as another example of immediately local action with global implications. Computer hacking groups such as *Anonymous*, *AntiSec* and others are constantly causing fairly serious issues for multinational corporations and government agencies alike. Such actions are explicit efforts to challenge neoliberal control of the information system.<sup>293</sup> For now, it appears that VF is sheltered from co-optation because the practice is simply not very profitable. Other buffers seem to exist as well, namely (re)connection with ecological processes through participation in food production, community development through collective or cooperative ownership, public education via tours and outreach. Moreover, certain material aspects of the practice itself that makes VF urban, local,

visible, and sustainable may also hinder outright co-optation. Only more time and ongoing research will determine exactly how all of these factors and actors will impact and intersect. Next, Chapter 6 will conclude by examining the interconnections between themes presented in the last two analysis chapters (in an effort to make sense and use of the data). Finally, Chapter 6 will discuss constraints on the execution of this project, (shortcomings in data collection and analysis) and therefore, also appraise potential avenues for future research.

Give someone a fish, you can feed them for today, teach them to fish, they can try again tomorrow. Give someone a VF system and they can eat fish (and vegetables) forever!  
- Aquaponics designer, Ottawa, 2011

## **Chapter 6: Co-optation if necessary, but not necessarily co-optation**

This research has contended directly with practical challenges to many normative assumptions found in counter-hegemonic movements today. Many difficult questions arise from the data that involve setting political parameters regarding issues of sustainability and equity, while arbitrating balance between society and nature, along with art and technology. This research has attempted to explore the tension between effective political action and resistance pacification within critical vertical farming. The resulting analysis has elucidated intersections of knowledge, power, production, and resistance related to some of the most pressing socio-economic and ecological issues facing the world today. Having analyzed primary and secondary source data through political economy and political ecology lenses, respectively, this chapter brings key findings together from both approaches. First, Chapter 6 will highlight important findings from Chapter 4 and Chapter 5, focusing on how such themes relate to one another in particular, and to VF moving forward in general. Often, themes converge and intersect, while some appear to be at odds with one other or existing literature. It is at this point that auto-ethnographic anecdotes from the author's experiences in counter-hegemonic political organizing, social enterprise, and critical VF research and development will help add texture and meaning to the juxtapositions.

Despite robust case study data and grounded personal reflections, it is important to note all findings are necessarily incomplete. Therefore, this chapter also reflects on constraints experienced throughout the research process. Constraints ranged from

material and conceptual, to temporal and professional limitations. The discussion will then appraise the data (knowledge gaps notwithstanding) in relation to the research question(s), and articulate possible implications stemming from the findings for academic and practical purposes more generally. Finally, in light of the possibilities and shortcomings exposed by the research, the chapter will end with suggestions for future research in terms of alternative theoretical frameworks and sites of investigation.

Section 6.1 begins by reviewing the key themes from the research, namely scale, community, and counter-hegemony. This section also brings insights from political ecology and political economy together by highlighting central findings from the analysis chapters. Such contributions include completing one of the first applications of critical theory to the practice of VF, documenting the difference between VF and critical VF, as well as highlighting the importance of citizen science to critical political discourses.

Section 6.2 outlines constraints faced in conducting the research, including a lack of finances, limited cases, limited access to actors, and a compressed timeline. Section 6.3 ends the chapter by outlining suggestions for future research, including the need for longitudinal case studies (as well as revisiting cases examined in this thesis), more in-depth analysis of financial arrangements of cases, the inclusion of larger-scale cases, and more focus on neo-Marxist analysis and social movement theory.

### **6.1 Emerging themes and key contributions**

This section weaves together the central themes emerging from the data. With examples from existing literature and insights from relevant personal experience, this discussion presents a narrative in response to the research questions. Though thoroughly

problematized, this is merely an incomplete intervention into multiple important debates within academia and activism. Recall that this research project set out to investigate the activities and discourses associated with phenomena associated with VF. As such, this research commenced with a simple question: *How is vertical farming being organized materially and discursively at various scales in North America?*

Of course, the motivations for the project were more complicated. They stemmed largely from political ideology, professional and academic obligations and other personal aspirations. These motivations culminated in three primary objectives. First, this research shed light on the empirical status of vertical farming. Second, it uncovered counter-hegemonic discourses within the material developments. Third, it appraised the utility and chance of vertical farming succeeding in its radical (read: emancipatory) political potential (as defined by its proponents).

It was important to conduct an environmental scan of the actors and course of development involved in VF. This initial step was required, given the relative novelty and uniqueness of the subject matter. Recall that less than two years ago, when the idea for research into VF was proposed to a master's research methods seminar, the majority of those present questioned the empirical status of VF. "Is it even happening?" they asked. Honestly, at the time, I was unsure. However, upon further investigation, it is clear that VF is not just happening, but is actually thriving at multiple sites around the world. This aspect of the research revealed one of the central themes of this paper – the fast-paced and experimental growth of these case studies and of VF in general. This theme spans the others (including scale, community, technology, nature, hybridity, resistance and co-optation) and will be discussed further below.

Another important insight is that while popular sources indicate that VF is a new phenomenon, upon closer inspection it is clear that similar concepts, technologies and related practices have been active for many decades. From Douglas' (1955) writings on hydroponic towers, to the New Alchemy Institute's (1971) bio-shelter and aquaponics research, evidently, while specific details or applications have changed slightly, a relatively long history of development is clear. This reality not only challenges popular conceptions of VF, but also begs the question: What has limited the success of this concept thus far, and what conditions currently exist which might make such subjugated knowledges successful now? Political ecology politicised the ecologies that are encapsulated by modern farming in order to find answers.

### *Critical and Political*

After confirming the material basis of VF, this research affirmed and described the existence of critical political discourses within the VF cases. The presence of these discourses proved important because the very limited amount of academic engagement with VF to this point has been largely technical in nature, with little attention paid to critical theoretical concerns. Certainly, it is one thing to determine that a phenomenon exists, but it is quite another to determine whether or not said phenomenon is a movement/industry with political/socio-economic implications. In fact, one of the central contributions of this research lies in the simple fact that it appears to be (one of) the only critical assessments of VF to emerge out of the social sciences thus far. An important finding from this critical theoretical treatment is that actors are indeed framing their

intents and actions in terms of critical political issues such as sustainability, equity, democracy, community economic development and more.

After having spent time with many of these VF actors personally, it is clear that we share many experiences in broader political struggles – from labour union organizing to protesting the war in Iraq. In fact, while I was visiting SWO in Milwaukee, I was invited to attend the people’s occupation of the Capital Building in Madison (though as discussed in Section 6.2, I was constrained by time and money, and thus despite wanting to attend, was unable to do so). Such critical political discourses appear to generally coalesce around the counter-hegemonic theme of anti-capitalist theory and action. Recall that capitalism has had a profound impact on the current state of agriculture. Lenin (1910) observes that by the turn of the twentieth century, capitalism had significantly introduced waged labour (as opposed to family-oriented or communal production) to the agricultural process, which also began to increase the size of farms.<sup>294</sup> In reducing farm relations to the level of commercial exchange, the change from *agriculture* to *agribusiness* was ushered in. One of the key themes emerging from the data is that the fundamental source of current socio-economic and ecological crises is the subsequent alienation of individuals (first from ecological equilibrium, then from each other) that emerged from this historic process of capitalist development. Advanced capitalism has turned an initial metabolic relationship between humans and their environment into one of industrial production. In turn, relations in society have become based on market transactions. However, an important contribution of the research is that conditions of possibility appear to be changing.

Proponents argue that opportunities have emerged from contradictions within the dominant socio-economic structure, that proponents of VF can take advantage of. To this end, a tentative finding is that there are elements of what can be considered a counter-hegemonic social movement or historic bloc present within and among these cases. Such characteristics include multiple organizations devoted to the cause(s), (local food, climate change, social justice) inter-organizational communication, public outreach and education, professional staff and volunteers, and broader political engagement. However, another observation is that to date the VF network remains quite small. It was not uncommon to meet the same visiting activists, journalists and academics at the various sites I toured as part of this research. Likewise, multiple colleagues of mine in academia and activism had either previously visited some of these same sites, or did so relatively soon after I did. At this point, it may be premature and inappropriate to define VF as a social movement, though it is clearly aligned with other counter-hegemonic impulses associated with local food and urban agriculture. Nevertheless, following Andree (2011) it is important to note that this Gramscian aspect of the analysis: “may be less about establishing a definitive description of when an historical bloc is or is not hegemonic than it is about bringing to light the complexity of the processes of coercion, consent, and resistance involved in large-scale social change.”<sup>295</sup> That said, the cases, actors and awareness associated with VF are all certainly growing in size, number and volume. The complex dynamics between these factors remain largely unclear, and therefore such aspects will be revisited in the discussion on future research. In the meantime, VF actors certainly have plans for an expanding movement. James from SWO exclaims: “Every

city deserves a Sweet Water! And within 20 years, every city on the planet will have one!”<sup>296</sup>

### *Constructive Critiques*

In order for any movement to effectively materialize, it must be scaled. Scaling involves increasing exposure to capital (through increasing demands for staff, infrastructure, real estate and other expensive factors) and thus direct and indirect co-optive pressures from dominant socio-economic processes and interests. Therefore, the third objective was to appraise the possibility that counter-hegemonic political aspirations might survive the scaling. Interestingly, resistance to VF is coming from certain actors within the alternative food movement itself. While searching critical literature and other progressive media for critical political discourses associated with VF, instead, there emerged numerous sentiments critical of VF itself. Certainly, skepticism of VF is another theme that emerged, and one that may contribute to the small size and limited growth of the VF movement noted above. An exemplar article from Thomas (2011) entitled: “*On Eco-Architecture and Urban Farming: Are you kidding me with your f-ing farm skyscraper?*” reports her “umbrage at the proposal to build rarified eco-structures that would be prohibitively expensive – and likely be enjoyed only by yuppies interested in taking their kids there for an educational weekend field trip.” Thomas (2011) continues her critique by asking: “What about the rest of us who live next to vacant lots full of trash and drug dealers and who stress the fuck out just thinking about how we're actually going to be able to afford fresh vegetables for dinner this week?”<sup>297</sup> Relating directly to this critique, another important finding is the importance that VF actors place on community economic

development. Indeed, it was clear from the moment I entered the communities in which these cases are located, that economic stimulus is in great demand there. In fact, on one occasion having just hailed a taxi from a site visit in Milwaukee, the driver was surprised to find me in his neighborhood. The driver assumed I was there in search of narcotics, and was astonished to learn that I had not yet been harassed and/or robbed.

The importance and benefit of VF potentially creating meaningful jobs within communities was at the fore of each discussion in each case. This sense of grassroots care for community was also evident throughout my interactions with many VF actors themselves, and went well beyond job creation. It is worth noting the hospitality I received during my time at these sites: from being offered a place to stay, to being given drives back to my hotel, to being invited to socialize over free beer and pizza, I speak for each case when I echo one volunteer's comment that: "It's a warm cheery place to come on a winter's day."<sup>298</sup> These acts from small social enterprises are noteworthy, especially as compared to my experience with other, wealthier organizations (which did not even respond to my e-mails!). More importantly, another finding is that multiple actors emphasized the desire to make VF systems replicable so as to remove the waged labour component from food production altogether, replacing it instead with household or community food production schemes – operated for and by members of the community. This relates to discussions of scale and potential buffers against cooptation discussed with respect to resistance, below.

The critique above also justly calls into question the role VF might play in the larger (alternative) food system. Here, VF is not meant by any one of the actors to entirely replace conventional farming (local, urban or otherwise). First, the individuals

involved with these VF cases were often found to be involved in other forms of agriculture, from rural farms to green rooftops to community gardens. Likewise, VF actors concede that there are numerous commodities that may be better off left to traditional single-plane farm applications. For example, John from the Plant states: “There are limits. There are some things that are probably best off grown in green fields way far away, like root vegetables, potatoes, that sort of stuff, that don’t make as much sense to grow in the city just because they do transport really, really well and they store really, really well.”<sup>299</sup> Even Despommier (2010), who advocates for much larger iterations of VF, acknowledges that wheat and other crops might remain outside.<sup>300</sup> In fact, the Alpha Farm in Manchester, England plans to become a food hub for the region, reconnecting people to farming and helping to expand community and backyard farming in the surrounding region.<sup>301</sup> In fact, the project has emerged, not from a corporate lab, but a popular cultural forum, the Manchester International Festival.

Another critique leveled at VF relates to how ‘un-natural’ it appears to be compared to alternatives such as rural, small-scale and organic farming. Of course, it is possible to live much closer to biophysical processes, though given the state of the contemporary economy, there are very few western scholars or activists alive today who have actually ever lived ‘naturally’ off of the land. Ironically, being involved in a back-to-the-land communal development project myself, I have developed a skeptical take on the feasibility of the widespread adoption of what I have come to view mostly as New Age, back-to-the-land fantasies. Pauline’s responses from her time on a subsistence farm corroborated my skepticism. When asked how she felt about some of my peers wishing to ‘go back’ to simpler ways, Pauline responded: “Well now, I don’t, I can’t agree that we

should go back, because you see the way we farmed was to support the family...all we did was survive.”<sup>302</sup> She adds, “I think we were so backward, when you stop and think about it.”<sup>303</sup> Pauline also expressed a clear sense of bitterness reflecting on the gendered division of labour often related to food production/preparation, the easing/reduction of which is often forgotten in critiques of the modern food system. Furthermore, with climate changing, relying solely on subsistence farming is an imprudent way to feed a rapidly growing and urbanizing population. The draw of this lifestyle is understandable, given the alienation from rural environments that individuals and entire communities experience day to day. However, the largely romantic vision of pastoral homesteading present in western scholarship and activism today is, following Fresco (2009), an insult to the millions of peasants around the world who currently remain impoverished under this model.<sup>304</sup> VF can help reduce alienation without necessitating a reduction in standards of living.

Following VF actors’ comments, the political ecology concept of social nature helps break down this false conception of a hard divide between urban and rural, humans and nature. When Marx was first writing about the horrors of urban industrialism, there was no consideration by authorities for the environment in general, let alone for nature in the city. While nature has always been constructed, over time, there has been an increasing influence of human affairs in biophysical processes. The concerted effort to build nature back into many cities has already created the conditions whereby ‘nature’ is socially constructed more than most citizens could ever imagine. In discussing this point with academic colleagues, they were surprised to learn, for example, that New York’s Central Park, with all of its rocks, trees and lakes, is actually an architectural creation.

Rossi (1989) notes that communities of freed slaves and poor workers were razed to create a park, with what its creators envisioned to be: “an uncorrupted countryside appearance.”<sup>305 306</sup> With a nuanced understanding of nature as socially constructed, it is easier to see that these VF cases are in fact small-scale organic farms that just happen to be located in buildings. From this understanding, an important contribution is that VF has the potential to reconnect communities to biophysical elements of food production, hence reducing the alienation of humans from nature and each other.

This research makes another related contribution on a political level, in that it attempts to reconcile the long-standing and ongoing tactical divide between poverty and environmental activists. Following Conn (2010), part of the downfall of radical progressive politics in the 1960’s was a “fight between New Left and Black Power ‘militants’ and back-to-the-land communards and environmentalists, between what we might call urban progressives and anti-urban progressives.”<sup>307</sup> This relates to what Keil (1994) refers to as “working class environmentalism,” which has a focus on ‘green’ production and job creation.<sup>308</sup> However, one shortcoming of this research remains the relative lack of engagement with VF’s implications for organized labour, beyond local job creation and economic development. This shortcoming remains an area of interest for future research.

### *Co-optation*

As mentioned, part of the basis for critiques of VF is the inherent reliance on ‘technology’ involved in the practice, which is said to corrupt understandings of nature and humanity. Dutch VF actor Meeuws (2011) responds to this concern: “We don’t mess

with mother nature. That's the thing we respect and learn a lot from."<sup>309</sup> In fact, technology is often critiqued, but rarely defined. It is not clear that a pump and lighting system in a VF is any more problematically technological than a tractor plowing a field on an organic farm, or the pencil writing this thesis, for example. Edgerton (2007) suggests: "Thinking about the use of things, rather than the strange world of technology, connects us directly with the world we know rather than the strange world in which 'technology' lives."<sup>310</sup> Of course, like most false dichotomies, reliance on technology actually exists along on a continuum. Certainly, some level of technical assistance is required in agriculture, no matter the form. Here, it is worth remembering Russell's (1929) comments: "With the introduction of agriculture, mankind entered upon a long period of meanness, misery, and madness, from which they are only now being freed by the beneficent operation of the machine."<sup>311</sup> Following Beckman (2000) is also important to recall that Heidegger's (1954) concern with technology was its essence (turning everything, even humans into standing reserves for industrial production), not technical implements, and that such an essence could be balanced with creative and holistic thinking.<sup>312</sup> Critical VF actors do not share the modernist sense of dominating nature with technology, but rather they remain inspired by underlying biophysical processes. Furthermore, this research reveals the prevalence of art, creativity and holistic thinking associated with the VF cases examined here and elsewhere.

Of course, not all VF cases are as entirely creative and holistic in their approach. VF cannot be viewed as a monolithic technology, practice, industry or movement. Indeed, all of the actors associated with VF face co-optive pressures but deal with them in varying ways. It is clear that there are at least two crude groupings of VF practices/actors,

differentiated by their approach to administering and scaling the practice. An important delineation can be made between what may be referred to as *technical* and *critical* variants of VF. With respect to scale, technical VF is based upon a notion of large, centralized VF towers intended for mass production of biomass. Critical VF appears to favor diffusion of smaller scale installations. With respect to administration, each variant is a positive development in terms of mitigating and/or adapting to symptoms of neoliberal pressures (leading to highly processed food which damages social relations, the environment and public health). Benefits of both types of VF include creating urban jobs, reducing environmental pollution, increasing food safety and food security. In practice, only the latter however, appears to have retained critical political stances on various issues necessary to challenge the system itself, such as equity, access, collective ownership and other broader issues. Like many potentially emancipatory technologies before it, VF appears to have already been stripped of its counter-hegemonic political facets by certain firms. Conversely, critical VF projects appear to involve aspects that directly challenge the neoliberal system as well as elements that may act as buffers to further co-optation.

### *Resistance*

This research investigated potential co-optive pressures and processes acting on VF, including how VF actors have framed and navigated the dominant system. One important finding is the resourcefulness and dynamism present in these cases as VF actors link to other counter-hegemonic struggles (around poverty, racism, and other issues). Interestingly, while the driving personalities behind the operations were middle-aged

professionals, much of the remaining staff, volunteers and other actors were all remarkably and predominantly young. As witnessed in other regions of late, a strong youth presence has contributed to a sense of new possibilities, and an energetic and passionate progressive political movement worldwide. When speaking of VF's role in the 'good food revolution' Jesse from SWO notes: "putting the R in brackets and people referring to it as the 'good food (R)evolution,' because the revolution itself is constantly evolving and taking on new parts and concepts."<sup>313</sup>

Specifically, these critical VF cases demonstrated a diverse focus on small business incubation, outreach and retail. Ballamingie and Johnson (2011) note: "Social entrepreneurial activities blur the traditional boundaries between the public, private and nonprofit sectors and emphasize hybrid models of for-profit and non-profit activities."<sup>314</sup> An important question has been how such blurring impacts critical missions, how complicit in problematic processes does it make the cases involved? I argue that the balance might be reduced to the percentage of the *social* in the enterprise's mission. It is worth noting that the term 'entrepreneur' originally stems from the meaning to 'undertake' – taking initiative and accepting risk, and does not necessarily have to mean exploit or even pursue profit as a primary goal. However, this research lacked direct engagement with the differences between Social Enterprise, Not-For Profit, and Non-Profit – certainly, another item for further inquiry. Of course, there is a chance that these actors are internalizing neoliberalism and simply replicating capitalist tendencies with a progressive twist. However, after listening to their comments, it is clear that they are simply working towards counter-hegemonic goals within economic constraints beyond their control.

In the context of critical VF, control of production is important, as the product is the practice. Community and individual proximity to and participation with food production appears to lead to public education, improved service delivery, increased and sustained economic development, and a sense of over-all community building. All of these traits lend themselves to empowerment at the individual and community levels. Moreover, critical VF has the potential to reconnect communities to both themselves and to nature by democratizing and simplifying the means of production for basic healthy food. Curiously, these cases appear to have little interest in producing other staples of a modern economy such as manufacturing fibers and fuel, which are possible in VF systems. The potential for additional production lines is an item for future research. The VF production process, which is inherently localized and integrated, also makes disingenuous replication difficult without drastically misleading consumers or distorting said process. Large-scale, corporate VF installations may not include the educational or outreach aspects of critical VF, but by their very nature they would be hard pressed not to engage in local, healthy, and sustainable production under even a politically or socially diluted business model.

Another important contribution to resistance efforts is the emphasis on replication of VF systems throughout and among communities, neighborhoods and households. This sense of democratizing the technology also relates to the current cases demonstrating the importance of citizen-science in general. Related to this grassroots research and development is a clear sense of empowerment, participation, and a fun, challenging workplace. Resistance, in these cases appears in the form of multiple bottom lines within social enterprise, notably equity and sustainability. This multifaceted mission is coupled

with understandings of multiple forms of capital, including spiritual, cultural as well as financial varieties. Ultimately, each of the aforementioned issues comes down to quality of life for workers and patrons, and the community at large. Once the farm is ready, John explains: “I couldn’t care less if I am getting paid at that point, because I am going to work in a fun place full of fun people who care about things, who care about what they are doing, and their impact on other things and who love food. That is such a strong and appealing thing that right now the money is flying out the door [due to ongoing construction and R&D, not losses], but that’s where I want to be.”<sup>315</sup>

Currently, a final buffer against large agribusiness interventions in VF lies in the lack of clarity around just how profitable (or unprofitable) the practice is. Investors may enter the market later on and after critical and meso-scale technical variants pave the way. However, personal experience suggests that this potential eventuality is quite some time away. By way of example, as part of this research I decided to test investors’ interest in the concept of VF. I recently entered a research innovation competition and was shortlisted by a panel of professors to have an opportunity to pitch a research idea with commercial applications. While academics and staff were quite impressed and intrigued with the VF concept, those from the business community were not. The corporate interests did not value the reduction of current externalities and therefore were not convinced that the end produce would be worth the requisite premium. Also, given the new/experimental nature of the practice, venture capitalists were uncomfortable with the idea of having their funds tied up for more than a few years. This experience is borne out by climate finance statistics that demonstrate investors’ unwillingness to invest in prevention, adaptation or mitigation initiatives around the world.<sup>316</sup> While this refusal to

accept overwhelming evidence on the part of those with resources to effect change is somewhat frustrating (being the cause of many global problems in the first place), it is also reassuring that there is time for subaltern groups to coordinate, gather resources and develop along alternate paths (new sources of capital, new forms of organizational models, new strategic goals). Finally, this research highlights the importance of agriculture in general, and food in particular, to anti-capital struggles in resisting the discursive and material elements of neoliberalism. A central lesson is that while critical actors (myself included) cannot accept capitalism, we also cannot conceivably defeat it at the moment. This reality means this doctrine of domination must be domesticated and tamed. In an era of unfettered neoliberalism, even simply reigning in some of the worst socio-economic and ecological tendencies is a difficult and noble cause. This conceptual contribution also relates to some of the practical contributions this research can make on the ground to alternative agriculture initiatives.

## **6.2 Lessons for the Local**

Another important contribution of this research is a number of practical insights that reveal how VF can strengthen current shortcomings in local food advocacy and urban agriculture praxis. In many ways, the VF means of production builds on numerous pillars of alternative food models, including localization, sustainability, fair trade, and organics. An interesting finding common to each of the cases has been the practice of aquaponics, and thus the inclusion of fish and other marine life production alongside (and integrated with) plant produce. Symbiotic production provides for numerous co-benefits that ultimately make the projects more sustainable. It also contends with the looming global

protein crisis, solutions for which UA has been relatively mute (besides unrealistic calls for mass lifestyle changes – namely, a shift towards vegan/vegetarianism).

VF also provides an option to micro-localize food production and distribution, and thus reduces the local food movement's dependence on fossil fuel. Andree (2009) reports: "One of the UK's largest food-box operations, Riverford Organics, puts a semi-truck on the road every 45 minutes, delivering fruits and vegetables directly to 100,000 customers in regional hubs."<sup>317</sup> This development is great news with respect organic eating habits. However, critics such as Mariola (2008) point out that these types of developments do not address larger energy concerns (or many other aspects of the status quo). VF can reduce the energy footprint of local food, while increasing yields and introducing full year stability to production. Controlled environments also allow for production of exotic produce (the production and transportation of which is a major ecological concern) and again, one that UA has only met with unrealistic suggestions of mass life-style changes (i.e., strictly seasonal, regional diets). Finally, VF cases are developing bio-digesters and other efficiencies that allow for heat and energy production (or use-reduction) in order to further offset their footprints.

Another central contribution from the research to alternate agriculture models is the potential for replicable VF systems to mitigate the impacts of harmful urban development and sprawl. Johnson and Ballamingie (2010) note: "Notwithstanding extensive critiques, the suburbs remain the predominant land use pattern for new developments and, as such, a critical environmental challenge."<sup>318</sup> Beyond being integrated into or built near apartment blocks and condominiums, household or neighborhood scale VF systems can allow the suburbs to finally become the miniature

peri-urban homesteads they were originally intended to be. Emergent properties of critical VF are in line with and build upon what Ballamingie and Johnson (2010) identify as part of the suburban solution: the Smart Growth Movement, the One Planet initiative, and programs such as LEED Neighborhood Development. Interestingly, this potential was foreseen decades ago when Douglas (1955), confidently looked “to that not far distant day when there will be a hydroponicum in every home, banishing want, bringing economic independence, and ensuring that the children of the future may grow up amid healthy surroundings, with clean, fresh food to eat.”<sup>319</sup> In fact, James from SWO feels this type of VF could be a model for “infill development with a ‘Sweet Water Village’ potential.”<sup>320</sup> Indeed, cities used to be developed where the food was. Today, as arable land is paved and water polluted, options must be pursued which bring food back to the city. However, farming is hard work, and the average citizen now and into the future is unlikely to be able or willing to spend long, hard days working the land, urban gardening or otherwise (unless their survival compels such effort). Alternatively, tending to a system with more variety and yields, and requiring labour inputs akin to a recreational swimming pool, is much more likely to experience widespread uptake while still reconnecting families to their food and communities.

Of course, cost will be a factor mitigating such widespread adoption, not simply as a buffer to corporate profits (and thus co-optation) but also as a barrier to entry for impoverished individuals and communities. As noted by participants, many aspects of VF can be expensive, and while some costs may be reduced, many are simply unavoidable. With respect to large scale VF (in new structures in particular) construction costs alone make the process capital intensive. Certainly, the more advanced and automated the

lighting, electrical, pumping, and control systems are, the more capital that is needed. This may explain why larger, more technical iterations appear to correspond to more commercial applications of VF.

Likewise, even critical VF has considerable costs associated with it. Costs can be driven down by using diverted waste stream building materials, depreciated real estate, volunteer labour, and other creative approaches. Another cost reduction strategy involves incorporating VF into existing infrastructure (where heat, electrical, building, financing and other costs can be shared or written off). In any case, even critical VF (especially in the short-term) will involve costs that will limit who can take advantage of the practice. Furthermore, those who are fortunate enough to be able to afford to experiment with critical VF may (due to debt-servicing, production, and overhead costs and competition in labour and retail markets) have to adapt how they act, what they produce and how much they sell it for, in ways they otherwise would not have done. This dynamic is compounded by the desire to engage in extracommercial activities (education, advocacy) which represent additional costs to an organization. However, the precise implications of these aforementioned interactions between capital and alternative production/political action ultimately remain unclear. Such a lack of clarity on such an important variable stems out of constraints on the length of the study and a lack of direct access to what is proprietary and sensitive information. Thus, the issue of prohibitive costs will no doubt form the basis of future doctoral research.

### 6.3 Constraints and Future Research

Methodologically, I felt relatively useless as an academic spectator to the VF process, (as opposed to the actors in these cases), even though I am very active in many related capacities. It felt odd to be on the other side of what, as part of grassroots political organizing is often referred to as *slackademia* and/or *sclacktivism* (i.e. talking about issues but rarely acting on them in any transformative way). Similar sentiments were obvious among the participants as well, as there was a clear perception concerning the relative lack of utility of talking and writing about VF as opposed to *doing* it. Indeed, there is something seriously flawed with current social science research when it involves such a long, expensive, and isolating process that results in such little immediate use-value for participants. Humanity is faced with multiple and looming existential threats, and simply making the minor observations and clever connections noted above is not what critical and progressive social science should be doing to address them. Truth and being have essentially been fragmented. Our relations with nature once intimate and metabolic have become mediated by industry while communities and families have become alienated by relations of exchange (academia included!). Empathy and compassion are required to overcome differing experiences with reality. A good start would be increased communication between disciplines in order to breakdown silos, especially between and amongst disciplines in the social and natural sciences. Finally, art (creativity, deeper meaning, and spiritual expression) must be integrated with science--work with life, so to speak. This reality deserves more attention in all future academic and activist projects. In the meantime, such constraints have left several specific items outstanding for future consideration.

Specifically, further research is needed to verify these current results and test them against other cases. Longitudinal studies are needed to track the evolution of the industry or movement at a macro level. There must be a focus on connections among VF projects as well as other political and commercial organizations. Government intervention has proven to be a central variable in alternate agriculture to date. Therefore, further inquiry must interrogate the possible benefits and hindrances government intervention might bring upon VF. Inquiry into municipal, provincial/state and federal government involvement (or lack thereof) is justified as well, along with relevant interactions among said levels of government. Moreover, a better understanding of how the planning sector (and other industries) is reacting to developments in VF is warranted as well.

In particular, more research is also needed to document changes at the level of firms and within individual projects. Future investigations should focus on financing arrangements and document changes in costs/profitability, mission statements, and other socio-economic indicators. Ironically, social enterprise appears in these cases to be in many ways less constrained than the non-profit or charity model. With the right inclination, perhaps firms might be able to be more radical in their goals, action and rhetoric? However, over time research must determine with more clarity which externalities associated with agribusiness are removed or mitigated by VF, while verifying if new problems arise out of the evolving practice of VF. Surely, VF-specific externalities will arise as the practice scales up.

Likewise, subsequent reviews must engage with technical developments in engineering, industrial ecology, and other fields related to VF, to determine with more

clarity precisely how the practice compares to other alternative models with respect to energy, water and microelement use. It will also be important to track other technical developments that may have social implications, such as the production of in-vitro meats, food printers and other new technologies. An extrapolation of the social nature analysis employed here allows for the possibility that as the movement grows, and challenges conventional dichotomous conceptions of nature and society, so too may it change the way humans conceive of themselves and others. Interdisciplinary connections should be sought between political ecology and those researching neuroplasticity and other socio-genetic relationships.

Another avenue of interest is an investigation into other future VF applications beyond fish and vegetables. Secondary sources note that such applications might include seafood, insects, algae, bamboo and other organisms to be used for food, fuel and manufacturing materials. VF will likely not fix international development issues, however research into how VF can help in emergencies and disaster relief is warranted. Moving forward, VF may provide a practical response to those advocating for a transformative resource-based economy. This potential is beyond the scope of this project and would therefore benefit from an ecological economics analysis as well, along with, studies on the implications VF has for post-industrial cities. A more fulsome discussion is needed concerning what VF has to offer for the process of urbanization and urban renewal in cities across the globe. It is interesting to imagine how VF might allow room for remaining rural communities to exist somewhat independently of the urban landscape many wish to escape. While the data have precious little to say on this, the implications of VF for governance, for alternative visions of a global circuit of autonomous cities, re-

wilding hinterlands and eco-localist settlements represent other interesting avenues for further research.

Only then, after this and other subsequent research is conducted and verified, will there be a better understanding of the emancipatory potential of critical VF. In the end, John from the Plant takes a pragmatic stance on his project: “I have to do something, everything is work, it might as well be something that is towards a goal.”<sup>321</sup> Likewise, James from SWO shares his vision: “Dare I dream of a three generation hamlet that is five stories high, on a bus route, near a river, or a lake, cafes and vibrant street scene, Jane Jacobs style, with vertical gardens of the kind you are growing [I had forwarded him pictures of some of my vertical garden projects], aquaponics systems, vermiculture, chickens, mushrooms, song and dance, great food, and express yourself with arts and crafts rooms to boot!”<sup>322</sup> Looking forward, it is appropriate to recall words from the past. On the future of VF, Douglas (1955) argued:

The only thing that is lacking is the energy and will on the part of some authorities to devote the necessary attention to these vital human needs. Then, indeed, the races of mankind could enter upon an era of peace, prosperity, and plenty.”<sup>323</sup>

After thoroughly and critically assessing aspects of VF practice as it currently exists, I cautiously share this sense of frustrated optimism. At the very least, the hype/controversy associated with VF is rapidly raising awareness about the importance of the future of global food system alternatives, vertical or otherwise. Therefore, I am currently engaged in further research and training in counter-hegemonic political organizing, as well as VF design. I also plan to return

to VF for a Ph.D focused on the knowledge gaps outlined above, once the various projects have had time to mature. In this case, the sky is certainly not the limit.

## Appendices

### Appendix 1: Additional Vertical Farming Designs

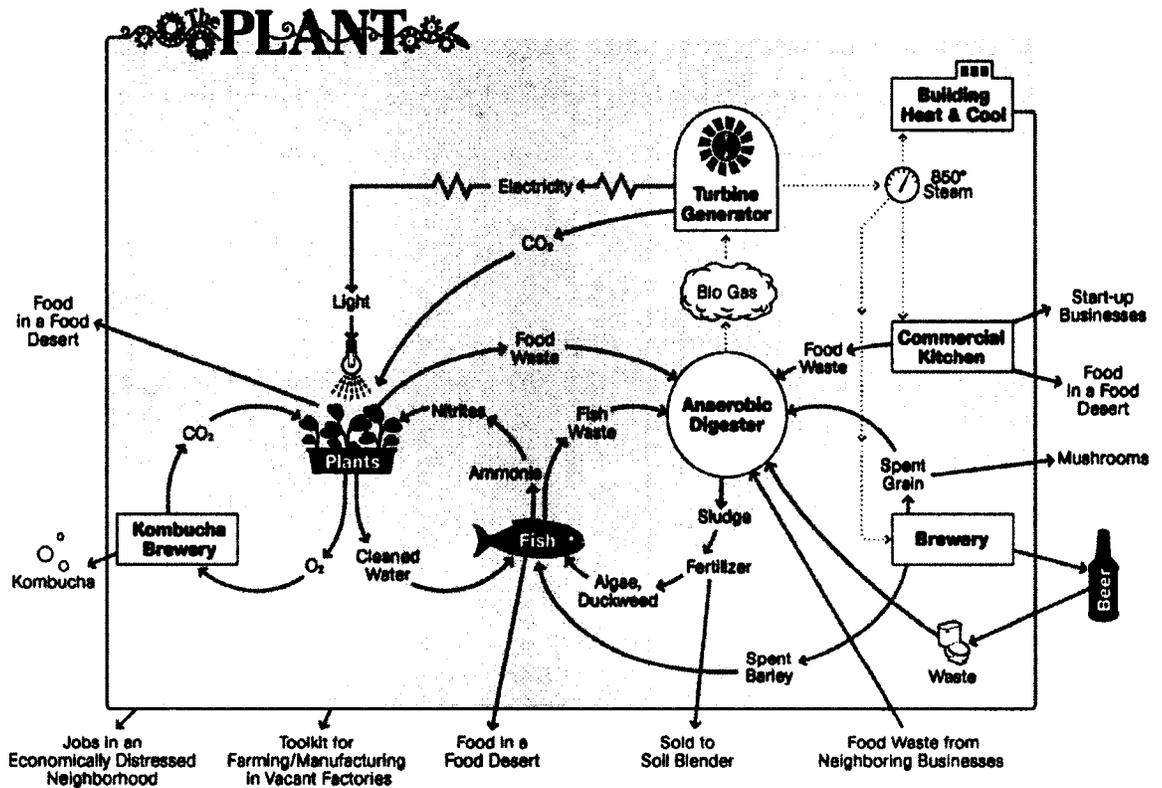
1. SOA Architects' (Paris) *The Living Tower*,  
<http://www.verticalfarm.com/designs?folder=510aa317-7750-4176-92b0-99f7e98cddb1>;
2. Technion's (Shapira, Israel) *Pla(n)tform*, [http://www.open-output.org/adi\\_r/project/8143](http://www.open-output.org/adi_r/project/8143);
3. Jung Min Nam's (New York) *Urban Farm, Urban Epicenter*,  
<http://www.verticalfarm.com/designs?folder=9818c0f3-4cf5-49fe-bba0-5e42df7cffff>;
4. Fluid Architecture's (Manchester) *Urban F@min*,  
[http://www.presidentsmedals.com/Project\\_Details.aspx?id=2498&dop=True&year=2009](http://www.presidentsmedals.com/Project_Details.aspx?id=2498&dop=True&year=2009);
5. Claudio Palavecino Llanos' (Chile) *Experimental Vertical Farm*,  
[http://www.presidentsmedals.com/Project\\_Details.aspx?id=2432&dop=True](http://www.presidentsmedals.com/Project_Details.aspx?id=2432&dop=True);
6. Blake Kurasek's (New York) *The Living Skyscraper*,  
<http://www.verticalfarm.com/designs?folder=fa7bdf4-03c5-49ed-b1aa-9911dd75d287>;
7. Andrew Kranis' (New York) *Farming the Z-Axis*,  
[http://images.suite101.com/655411\\_com\\_verticalfa.jpg](http://images.suite101.com/655411_com_verticalfa.jpg);
8. Gordon Graff's (Toronto) *SkyFarm*, [http://torontoist.com/2007/06/is\\_toronto\\_a\\_fu.php](http://torontoist.com/2007/06/is_toronto_a_fu.php);
9. Chris Jacobs' (Los Angeles) *Circular Farm*, <http://www.farmvertical.com/>;
10. Waimond Ip's (UK) *M602 Project*, [www.alchemicalnursery.org/.../82-waimond-ip-vertical-farm-comprehensive](http://www.alchemicalnursery.org/.../82-waimond-ip-vertical-farm-comprehensive);
11. Eric Ellingsen's (USA) *Pyramid Farm*, <http://www.verticalfarm.com/designs?folder=b9aa20a4-9c6a-4983-b3ad-390c4f1fa562>;
12. Oliver Foster's (Australia) *Type O2*, <http://odesign.com.au/Vertical-Farming.html>;
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<http://rathausartprojects.com/blog/2009/01/14/aberrant-agriculture-by-scott-johnson/>;
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<http://www.except.nl/consult/largescaleurbanagriculture/largescaleurbanagriculture1.html>;

17. Charlotte Avingnon's (Paris) *A Vertical Farm in Paris*, <http://webcoist.com/2010/01/13/3d-farming-26-vertical-farms-and-green-skyscrapers/4-charlotte-avignon-architect-vertical-farm-in-paris-concept/>;
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19. Mithun Architects' (Seattle) *Center for Urban Agriculture*, [http://mithun.com/projects/project\\_detail/center\\_for\\_urban\\_agriculture/](http://mithun.com/projects/project_detail/center_for_urban_agriculture/);
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23. J White Architecture's (New York) *Sky-Field*, <http://docs.rwu.edu/cgi/viewcontent.cgi?article=1040&context=archthese&sei-redir=1#search=%22Sky-Field%20vertical%20farm%22>;
24. Rahul Surin's (Dubai) *The Zabeel Park Project*, <http://www.aecworldxp.com/projects/alternative-solutions>.

## **Appendix 2: Initial Research Instrument**

- 1) Can you please introduce yourself, and if you are comfortable, provide some personal background information such as schooling, work experience and/or community/political involvement? Gender? Age? Race?
- 2) Can you please introduce your operation, including its form, function, purpose, history/stage of development? Profit/non-profit, social enterprise? Why/why not?
- 3) Would you define your project as being a part of the vertical farming sector/movement?
- 4) If yes, can you please define vertical farming more broadly? If no, what would you suggest would be a more appropriate definition/category within which you might fall?
- 5) What motivated you to begin this operation?
- 6) What/who did you look to for inspiration and assistance in the beginning?
- 7) What lessons have you learned/wish you had known previously?
- 8) What successes have you had/accomplishments worth noting?
- 9) What obstacles do you continue to face? What type of help could you use now?
- 10) What continues to motivate you? What are your current goals and how have they changed over time?
- 11) Is there anything I haven't asked about that you feel is worth mentioning?
- 12) Is there anyone else that has been involved, with whom I could talk?

Appendix 3: Closed-Loop System Potential (as designed by The Plant, Chicago, IL)



(Matt Bergstrom, 2011. <http://www.plantchicago.com/everything-but-the-squeal/>)

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1. Focuses on Food for People
  2. Values Food Providers
  3. Localizes Food Systems
  4. Puts Control Locally
  5. Builds Knowledge and Skills
  6. Works with Nature.

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