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The Sprouting Farms: *You Are What You Grow*

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Abstract: In 2017, the Singaporean government unveiled the Farm Transformation Map, a highly technology-driven initiative that intends to change its current, near-total dependence on imported food. The plan focuses on the prospect of high-productivity farming—in particular, integrated vertical, indoor, and intensive urban farming—as a possible solution to geopolitical uncertainty, intense urbanisation, and environmental degradation. What to farm (or not) and how to farm has long mediated social, cultural, political, and environmental relations. Following the stories of a few small- to medium-scale urban farms, including rooftop gardens, community farms, and organic farms, in this future-oriented city polis, this article explores the rise of urban farming through the politics of localism and the notion of care. How has localism, in some contexts, been reduced to a narrow sense of geographic location? What is being cared for in and through farming in urban locales? How might this type of farming transform and shape bio-cultural, social-technological relations within humans, and between humans and non-humans? More importantly, this article explores how urban agriculture might forge a kind of thick localism rooted in situated care as it carries out social missions, experimenting with and subverting the dominant imaginary of industrial farming.

Keywords: urban agriculture; environmental humanities; care; localism; more-than-human urbanism; Singapore

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1. Introduction

I started my journey into Singapore walking in a garden, a City in a Garden. Little did I know that inside this controlled and manicured environment, other things were sprouting—vegetable seeds were germinating, fruits were ripening, edible flowers gave colours to otherwise bland spaces. While many of the gardens are ornamental, even distinctively showy, others are becoming spaces of intense production. I had meals in various farm-to-table restaurants proudly featuring their locally sourced produce, something of a novelty in the island city polis, a global financial centre that imports 90 percent of its food. Yet it was not until I met Darren Tan, the head of education of Comcrop farm, and he brought me to the roof of a shopping complex on Orchard Road (the renowned mall-lined street in Singapore), that I realised that here, "local" means blocks away. The often empty rooftop was filled with lively greens peeking out from rows of racks, bathing under the blazing tropical sun. Unlike the usual colour composition of dark brown soil juxtaposed with green vegetables seen on farms, the hues here were cleaner and more metallic. The white multi-tiered racks were neat and sparkling, each row equipped with intricate looking pumping devices. There was no soil in sight; each plant was rooted in a square-shaped sponge sitting in a plastic net pot. Darren explained to me that Comcrop uses hydroponic growing methods, which means their produce is grown in a soilless environment, fed by a nutrient-rich solution. Opened in 2014, Comcrop is Singapore's first commercial rooftop farm, providing produce including various types of herbs and some leafy greens to nearby hotels and restaurants.

In addition to the rooftop spaces, I later found that food farms occupied other city gaps: office buildings, schools, housing estates, and even inside shipping containers. Some of the many farms are the labour of Edible Garden City, a pioneer of urban farming in Singapore.

As land for farming was too expensive to acquire in Singapore, when they started up in 2012, Edible Garden City utilised a range of unexpected and often neglected spaces of the city-space. Now, part of its work focuses on transforming these gaps of commercial and residential spaces into food forestry. Compared to Comcrop, Citizen Farm, Edible Garden City's head office and its urban farming division, had a much stronger earthy hue. As I walked around, I began to realise it was a large complex, comprising multiple farming sections. Plants were not arranged neatly; some were grown in pots of various sizes, and others in soil-beds, appearing to be at different stages of maturity. When I asked Darren Ho, the head farmer of Citizen Farm, about the seemingly less "organised" look of the farm, he laughed and explained that Citizen Farm hosts a community of farmers practising a variety of growing methods, from outdoor soil farming to indoor aquaponic farming, and cultivating mushrooms. Citizen Farm also conducts a range of workshops to support its grow-your-own-food movement. In short, it does not aim for a systematic and clean look, or a singular, streamlined, production process. The produce is mostly distributed to restaurants. Locals can also subscribe to receive its Citizen Box, consisting of a variety of vegetables.

The surge of interest in urban farming has been linked to the sudden global food price spike in 2008. This included staple foods such as rice and wheat and triggered wide panic and unrest (United Nations. Department of Economic and Social Affairs 2011). There are also growing concerns over biosecurity due to the rising number of incidents of food contamination. Although some experimental ways of growing food and community farms have attracted noticeable media attention, the Singapore government has released a much more resolute and planned model. During a parliamentary speech in 2017, Koh Poh Koon, Singapore Senior Minister of State for National Development, announced that "[F]arming will begin to resemble an industrialised production process, much like any other factory we have" (Hansard 2017). In a Facebook post, he (Koh 2017) wrote, "We cannot control the weather. But we can control how we want to manage the risks. I urge all our farmers to work together with government agencies to transform our farming sector into a more resilient and productive one". In the same year, the Agriculture and Veterinary Authority (AVA), a statutory board of the Singapore government, unveiled the Farm Transformation Map, a highly technological and productivity-driven plan focusing on the prospect of intense factory-style farming that may take "quantum leaps in productivity" through integrated vertical and indoor systems, automation, and robotics, operating on and occupying minimal human labour and space (Hansard).

At a time of rising environmental pollution, the intense effects of climate change and related price fluctuations that have been deeply felt by the farming industry (that partially caused these environmental issues), technoscience and intensive farming/fishery and food labs are positioned by the Singapore government as the best way to prepare, mitigate, and create a safe and controlled future foodscape (Hansard 2017). In 2019, the AVA announced an ambitious goal to produce 30 percent of the country's nutritional needs by 2030. This entailed an increase from less than 10 percent. Sky Greens, an automated nine-meter-tall, multi-storey vertical farm, is seen as an embodiment of the kind of intense farming that the state envisions. Panasonic Factory Solutions Asian Pacific, the Japanese electric giant's farming arm in Singapore, is another prominent player in the agrotechnological farming scene. By now, there are over 30 indoor vertical farms in Singapore, up from six in 2016. Locally produced food has become ever more attractive.

Although Singapore now imports most of its food, this has not always been the case. Until the 1980s, the country was self-sustaining in its supply, or close to it, in pigs, poultry, and eggs, despite limited land resources (Chou 2014, p. 225). As part of the aggressive urbanisation process and Singapore's river cleaning project, the *Kampongs* (villages in Malay) have been demolished; many farmers were forced to abandon their farms and move into public housing while farmland was converted for other development purposes (Turnbull 2009; Joshi et al. 2012). Only a small area was retained for farming, along with some local coastal fisheries. The newly released Farm Transformation Map

introduces another round of land reform. The government announced that they would free up some land for high-tech farming, agricultural research, and development. It would, however, concomitantly take back existing farming land for military purposes (Hansard 2015). Farmers who have persisted for decades must now compete with other new entrants in a bid for land in the new farming area. The Agri-Food and Veterinary Authority of Singapore (2018) states that the successful companies in the first tranche of land tender will incorporate productive and innovative farming systems, including automated greenhouses with data analytics and multi-storey farms using LED lights, robotics, and soilless cultivation systems.

What to farm (or not) and how to farm has long been the subject of social, cultural, political, and environmental relations. In exploring the emerging, complex, and conflicted terrain of urban farming, I am interested in how the new wave of growing and managing food shapes and is shaped by our mode of living. This article is not a general review of urban agriculture or alternative food networks which include, but are not limited to, rooftop farming, community gardening, guerrilla farming, and vertical farming.[1] Rather, it focuses on the stories of a few small- to medium-scale urban farms in Singapore, which is globally one of the most urbanised areas. How might a technological and productionist ethos shape the future of farming and reconfigure our relationship with the environment? As the state seeks to cast out "traditional" farming, which it deems inefficient, what might be lost in this process?

Provoked by these questions, this article explores the rise of urban farming through the politics of localism and the notion of care. In the first section, I examine and reveal the diverse forms of "the local" that have been evoked and deployed in urban farms, and with what consequences for whom. How has localism, in some contexts, been reduced to a narrow sense of geographic location? As the stories of various farms progress, I highlight that care is central to the thinking and making of localism. Drawing on feminist thinkers on care, such as María Puig de la Bellacasa and Annemarie Mol, I examine multifaceted modes of care enacted in various farming practices and ask what is being cared for in the process of farming? The last section argues that by performing a type of thick localism grounded in situated care, urban farming may enable us to make much needed room. In this context, farms are understood as carrying out social missions, experimenting with and subverting the dominant imaginary of industrial farming.

2. Where Is Your Food From?

To stroll in the supermarkets in Singapore is to witness globalisation in full motion: broccoli from Australia, potatoes grown in Dutch soil, leafy vegetables harvested in Malaysia or Thailand, fruits of various seasons and climates mingle happily. Although I am conscious of Singapore as a tropical country in South East Asia, my body becomes less attuned to my locality given the omnipresence of air-conditioning while the abundant produce seems to whisper, *there are no spatial or temporal limitations, everything is possible and available*. In STS researcher Erika Amethyst Szymanski's account, the American supermarket promulgates "a placeless food culture and [contributes] to the estrangement of humans from their environments by selling the same plastic-wrapped prechopped broccoli season after season" (Szymanski 2018, p. 56). Here, vegetables are not sliced, but they are nevertheless trapped in plastic packaging. The roots of some leafy greens are set in sponges to preserve their freshness. Locating local produce in the supermarket is a test of one's patience. Once found, the majority seem to be eggs, pre-packed salad leaves, a selection of

[1] There does not seem to be a definitive definition of urban agriculture. One definition I have seen often circulated is from Luc Mougeot: "UA is an industry located within (intra-urban) or on the fringe (peri-urban) of a town, a city or a metropolis, which grows or raises, processes and distributes a diversity of food and non-food products, (re-)using largely human and material resources, products and services found in and around that urban area, and in turn supplying human and material resources, products and services largely to that urban area" (Mougeot 2000, p. 11). It is important to note that urban farming is approached differently across regions. For a brief overview on urban agriculture in developed countries, see (Mok et al. 2014); for discussions in developing countries, see (Hamilton et al. 2014).

leafy vegetables, and fish, mostly selling at a higher price than imported varieties. Labels such as "Freshly Picked", "Freshest", "Locally Grown" are prominently displayed.

It is important to note that consumer demand for locally produced food varies in different urban contexts. For example, in some developed cities, local produce has helped to improve food accessibility and quality for low-income communities (McClintock 2010). In some developing countries, imported food is preferred, treated as a sign of progress. In the late 1980s, Singapore, in preparation for a complete phasing-out of local pig farms, ran a five-week national campaign aiming to change people's perceptions so they would accept imported frozen pork. In recent years, the rise in popularity of local produce in highly developed and wealthy Singapore (and many other cities) in part hinges on fear of these same foods when imported. In my interviews with some local farmers in Singapore, they shared the view that an increasing focus on both health and the environment has contributed to the rising demand for local food in Singapore.[2] In contrast to a sea of food from diverse sources that has travelled long distances, local produce in Singapore is heavily marketed as sustainably grown, pesticide-free, and hence safer, fresher, and better for the environment. Eating locally has become a growing trend, imbricated in a more sustainable lifestyle and a positioning that Anna Lavis, Emma-Jayne Abbots, and Luci Attala term as "eating-as-caring" for self-care, for loved ones, and caring for the environment (Lavis et al. 2016, p. 12).

In the traditional perception of localism, soil is understood as the connective tissue between human and the landscape. This connection has frequently taken a range of problematic, nationalistic forms (Bauman 1992; Heise 2008). In agricultural contexts, localism has also been linked to the notion of terroir, or provenance—the place of production. The definition of local produce is loosely defined by the AVA as "food that is grown within your locality and in line with accepted good practices".[3] One of the reasons that provenance or local food is highly regarded is in part due to the fact that "the ecological conditions implicated in production processes can be more easily discerned" (Morgan et al. 2008, p. 12). Many of these same values are also frequently associated with urban farming, which is often positioned as being quintessentially local. Whether it is vertical farming, futuristic plant factories, or soil-based farming, one of the most alluring aspects of urban produce is the locality of the production, which not only suggests freshness (due to the proximity to supermarkets or restaurants) but also appears to offer safety as the provenance of the product can be traced.

The rise of vertical and/or controlled indoor farming and hydroponics takes on a very different tone from food provenance, or terroir, and challenges the notion of localism. Some rooftop or vertical farms are sun-lit, but many operate in completely controlled environments, from using LED lights as sunlight to a range of other introduced resources. In these farms, unmoored produce is not rooted in local soil and the specificity of the environment in a traditional way. Rather, the goal is explicitly and deliberately to *overcome* locale and seasonality for year-long harvest. Notably, a high-technological local farm, Sustenir Agriculture, whose controlled environment "allows them to produce vegetables that have no exposure to chemicals, pesticides, pollutants and even dirt", managed to produce a variety of non-native crops including strawberries, an unusual food option for the local climate and environment (Singh 2016). The novelty of this "local" produce sparked positive responses among consumers, who did not seem to care in the least that the actual growing conditions have no association with the Singaporean environment.

My farm visit also revealed more nuances in this kind of urban localism; for example, seeds used on the farm are not necessarily sourced locally but from overseas. As one farmer explained to me, harvesting one's own seeds would add another three to four weeks onto

[2] Chong Nyet Chin, the director of food quality and safety of Singapore's NTUC FairPrice supermarket, points out that expanding disposable income, increasing health concerns, and consumer awareness are some of the drivers of local consumers wanting to "go for green, go for local and go for niche" (Ong 2019).

[3] The Singapore government food agency (SFA) replaced the Agri-Food and Veterinary Authority (AVA) in April 2019. https://www.sfa.gov.sg/food-farming/singapore-food-supply/supporting-local-produce (accessed on 14 December 2020).

the production cycle, as they have to wait for the plants to flower, then wait for the bees to come. The nutrients required for the plants are also very different at the stage of flowering and seed setting. It is understandable that start-up commercial farms need to optimise their productivity. Yet, this also demonstrates that the claim of locally grown can be an ambiguous statement, open for negotiation. To what extent is the produce grown locally? Which part of the farming process—seeding, growing or distribution, labour—needs to be local?

Urban agriculture is also heavily promoted for environmental benefits, such as reducing its carbon footprint as a result of reduced transportation and packaging (Orsini et al. 2017). According to Despommier (2010), an environmental science professor who popularised vertical farming, current farming practices are detrimental to the environment, as they use large amounts of fresh water, deplete the soil, and are reliant on fossil fuel. In contrast, a vertical farm in an urban setting would use less resources and is capable of producing crops all-year round and is immune to weather-related crop failure, providing ultimate control of food safety (Despommier). Vertical indoor farming in Singapore and many other cities has been positioned as a form of eco-modernised solution that is suitable for space-conscious and high-density areas. In the face of climate change, eco-modernists maintain that "technology, supported and accelerated by government investment, can allow humanity to simultaneously mitigate climate change, protect land, and relieve poverty" (Asafu-Adjaye et al. 2015, p. 24). Hence, many human activities, from urbanisation to farming, energy extraction, and seawater desalination, should be even more intensified (Asafu-Adjaye et al.)[4] Guided by the Farm Transformation Map, this focus on and belief in the efficiency of high-tech farming is a particular feature of what local food is coming to mean in Singapore.

However, some researchers question the simplistic proposition of local production being equivalent to sustainability. Wylie Goodman and Jennifer Minner challenge the value and environmental benefit of controlled environment farming, given its high energy consumption from using LED light and limited nutrients due to the small range of the produce (Goodman and Minner 2019). Others suggest that the distance that food travels is relatively insignificant in terms of reducing its carbon footprint, in part because most of food's carbon footprint comes from on-farm production and food preparation in factories and kitchens (Greear 2016, p. 110; Avetisyan et al. 2014).[5] Jake Greear argues against a narrow focus on carbon footprint analysis; rather, he suggests that the discussion of localism needs to be situated in a web of social, environmental, economic, and political issues (p. 111).

In urban geographer McClintock account (2010), the increasing interest in urban agriculture, particularly in the Global North, can be attributed to an attempt to repair urban dwellers' alienation from their food sources and the natural environment, caused by the development of capitalism and urbanisation.[6] For a country long dubbed an "air-conditioned nation" that relies on artificial cooling to overcome local climate (George 2000) and provide comfort for its residents, who live in high-rise housing and consume food grown hydroponically from sky-high racks, localism seems to have been reduced to mere

[4] In 2015, "An Ecomodernist Manifesto" was released by a collective of international, mostly US environmental thinkers (Asafu-Adjaye et al.). Using intentionally provocative language, the manifesto celebrates the age of the Anthropocene, in which humanity is taking full control. The types of technological intensifications advocated by eco-modernists (not limited in the manifesto) are rooted in a disregard for ecological limits—at least in the sense that they might readily be overcome. For a fuller discussion on this, please see a special edition in Environmental Humanities, volume 7, 2015.

[5] In their thoroughly analysed article, Avetisyan et al. focus on the greenhouse gas emissions "engendered during the production and transport of internationally traded food products" (p. 417). Based on their findings, they suggest that local production does not necessarily reduce transportation emissions; rather, the focus should be on the technologies of production, which contribute heavily to emissions.

[6] In the context of urban farming in North America, McClintock points to urban agriculture's "multi-functionality, from its attempts to overcome disruptions in ecological cycles to its ability to reclaim public space, re-embed food production and consumption with socio-cultural significance, and reconnect consumers with their food and the environment" (McClintock 2010, p, 3). It is important to pay attention to the specificity and situatedness of the form of farming practices and their associated benefits in different regions, e.g., food bank or farming as commoning do not really exist in Singapore and many other cities. See my insistence on a relational and situated care below.

geographical coordinates. What kind of environment do consumers of this produce connect with? What connections are possible with these various types of unmoored farming? More importantly, what type of localism would a more grounded farming enact? With these questions in mind, I travelled to Quan Fa Organic farm, one of the rare certified organic producers, and a rare open farm in Singapore.

I arrived early. Fabian, a second-generation farmer, was finishing up a farm tour for a group of disadvantaged children. Although the day was not much warmer than any of the others in Singapore, walking in an expansive open farm is a quite different encounter with heat in an otherwise air-conditioned country. I had earlier learnt that Quan Fa's land lease was not extended by the AVA. Fabian was quick to bring the topic up when we met. He told me that their tender for the land in the newly dedicated farming area was rejected by the AVA as their method of farming does not meet the requirement of productivity. The farm is likely to close when the current lease expires.

Compared to the hydroponic farms I had visited, with a limited range of produce, Quan Fa grows a vast variety of vegetables and fruits including choi-som, bok-choy, radish, bitter melon, sweet potato leaves, chili, various types of beans, mangos, and much more (see Figure 1). Fabian went on to say:

> Crop rotation is our main farming technique. Right now, we are growing lady's finger on this patch. Next month once all the harvest is gone, we will change to another crop. This is to benefit the soil and protect the environment... Farming to us is not just farming food that is safe, it is also to keep the soil clean and nourished. Our way of farming will not be able to meet the factory style farming requirement. In order to meet that level of production scale, we will have to change our farming method. The type of produce will also be limited.

With the farm's imminent closure on his mind, Fabian seemed flat as we started the conversation, but he soon regained his smile and liveliness as we walked among the vegetable patches, a few of which were grown just for fun. Fabian said he learnt how to farm from his uncle, who had been growing food and looking after the land since the 1990s. As we approached a field of sweet corn, he stopped and showed me some videos he took while the corn was flowering. "The sweet corns attract lots of bees. I am not a good photographer. If you were here last week, you would see how beautiful it was." But it was not just in the videos—bees and butterflies were buzzing and dancing around flowers of other plants as we were walking. I wonder about controlled-environment farming or farms that do not yield flowers so as it maintains shorter growth cycles and how they fail to provide a hospitable environment for wild pollinators and other non-humans in the city. In Quan Fa, *local* farming is a generational and multispecies effort and care, laboured and attended by bees, butterflies, soil, many invisible organisms, and humans.

I asked about the challenges the farm was facing in addition to the lack of endorsement from the government. Fabian told me that the increasingly stringent requirements preventing them from hiring foreign labour had become an issue: "We do weeding, and many other tasks manually. It is labour intensive . . . It is difficult to find locals who are willing to do this." Fabian was also candid about the price of their vegetables, which could be higher due to the operational cost in Singapore.

Although the government calls on consumers to support local produce, farms like Quan Fa, whose method of growing represents a kind of localism that aims to "make our ecological relationships visible and accountable" (Plumwood 2008, p. 140), are unwelcome. In her critique of bioregionalism, Val Plumwood (2008) warns against the danger of localism becoming a kind of atomism that disconnects us from broader environmental relationships. Having laboured in this area for 30 years and having held countless education tours, Quan Fa and its generational knowledge of farming is regarded as obsolete. In the case of the state's visioning of future farming, the superiority of *local* seems to depend on the advancement of technology, instead of the heritage or ecological environment of the produce.

Figure 1. A small section of Quan Fa. Author's own image.

As I continued my exploration of Singapore's urban farms, I found that under the banner of a reductive localism, other shoots were growing. The Edible Garden City (Citizen Farm), mentioned in the introduction to this article, demonstrates localism in other forms (see Figure 2). Having started from a community farm, a desire to reconnect is at the centre of its model. Walking around Citizen Farm, I saw people of various ages farming together. I learned from Darren that Edible Garden City does foodscaping, where they work with various sites to design specific and situated farming practices. But this farm space is an open space for urban residents to be in touch with nature and soil and encourages people to grow their own food. Darren said to me:

> We also collaborate with specific organisations to work with people with Autism or other mental disabilities. They will go through some training, then start to try out on the farm. This is a serious social mission of ours . . . What gives us great joy is when a part time trainee decides to be one of our full time farmers. We notice that their behaviour, their personality change as they settle in.

Edible Garden City also aims to address some thorny local environmental issues through farming. For example, it collects food waste from restaurants and accepts waste donations from residents. From soil-based and soilless farming, to opening up space for local community, and to incorporating local food waste into its growing loop through composting, Edible Garden City is less specific on the exact modes of farming, yet their interlaced practice demonstrates a kind of contextual, ongoing localism that "is thicker and more concrete than mere location" (Plumwood 2008, p. 144). This kind of *thick* localism involves working with and within the surroundings, and with other humans, attending to environmental issues in socially and culturally connected ways.

Figure 2. Citizen Farm, Edible Garden City's head office and its urban farming division. Author's own image.

During my visit and discussion with local farmers, one issue that was highlighted was the high set-up capital and expensive operating costs associated with farming in Singapore, which is often a factor in the price of the produce. The consumption of local produce has at times been criticised as contributing to food elitism or even leading to gentrification (West and Domingos 2012; Horst et al. 2017).[7] In Singapore and beyond, local produce is at the heart of premium farm-to-table concept restaurants and plays a significant role in many high-end hotels that promote sustainable, fresh, and seasonal cuisines. In their discussion of urban, indoor, and controlled farming, Kurt Benke and Bruce Tomkins point out that some kinds of produce are popular in vertical farming, not because of "any inherent limitations in crop types" but because they provide a "premium profit margin" (Benke and Tomkins 2017, p. 21).[8] In this light, it is important to ask who benefits from urban farming. Who has access to this food? Who is excluded from the scope of localism?

As I moved from one farm to another, it became clear that, in the context of urban farming, localism takes diverse forms and is subject to being enrolled, distorted, or redone. If localism represents an inextricable relation between produce and the surrounding environment, agrotechnological faming featuring unmoored food grown in a controlled environment may engender a kind of ambiguous and narrowed localism. On the other hand, some farming methods are more attuned to the produce, soil, and ecological envi-

[7] Urban agriculture and the notion of localism in food production varies across the regions and is associated with diverse kinds of imaginings. The cited texts here, linking to very different contexts, are some examples, which also show the complexity of the issue. For example, Harry West and Nuno Domingos write about the elitism of the Slow Food movement, while Horst et al. refer to the entanglement of urban agriculture and eco-gentrification.

[8] On this point, Benke and Tomkins are also drawing on the research of Despommier (2010) and Frazier (2017) report that traces the origin of the concept of vertical farming.

ronment, yet their possible reliance on affordable foreign labour may further complicate the issue of local. Localism can also be an ongoing process as it engages with local social issues. As we saw at Quan Fa, Citizen Farm, and other farms, these various contingent and highly constructed "locals" do different work, either connecting or disconnecting, caring for different things, and ultimately making or unmaking the future food network. In short, localism in urban farming is far from straightforward. Rather, it is a situated eco-entanglement of geographic location, the actors involved (humans and non-humans), and social relations, in which it is important to grasp what is local, and for whom.[9] But an ontological discussion on localism is not sufficient to unravel how the many interconnected elements are held together or pulled apart. I will now focus on the notion of care to further my exploration of the multifarious terrain of urban farming. Thinking with and through care is central to this discussion of the local.

3. Who Do You Care For?

As the dominant farming imaginary pushes for technological solutions and controlled intensive farming, a new vocabulary comes into operation. Both Darren and some other farmers I spoke to proudly and affectionately call themselves urban farmers. Sky Greens, seen by the state as the poster child of urban farming, attributes its success to engineering and technology, identifying itself as a solution-provider in agriculture. The state refers to modern farmers as "agri-technologists" or "agri-specialists" and farms as plant factories. These divergent exercises in naming in many ways shine some light on multifaceted modes of care enacted in farming: earthly, bodily, material, and technological.

For Quan Fa, composting and soil care is at the heart of its growing method. As Fabian and I passed through a hill-sized dirt pile, he told me that it was their "care" in the making:

> We primarily use vegetable waste for composting, mixed with a very small portion of brown waste, soil dust and coffee grounds. We don't add anything else to accelerate the process, or use machines to break them down with heat. Things naturally break down, with the help of bacteria, fungi, and all these organisms in the soil. It just takes some time . . . This pile will take about half a year to ripen. They actually last for quite a long time . . . There is so much our soil can offer . . .

In Singapore, although practising a sustainable farming model (such as pesticide-free, water-saving) is placed at the centre of the new wave of urban farms, very few seek organic certification. Organic certification is difficult to attain. Until recently, Singapore did not even have a certifying body. As such, Quan Fa obtained their certification from Thailand after a lengthy and stringent process. The Thai certification also requires ongoing monitoring, such as maintaining detailed records of seeding, harvesting, and crop rotation.

Sky Greens, the automatic multi-storeyed farm, demonstrates some of the complexity and contestations associated with organic certification in Singapore. Researcher Khoo Hong Meng previously argued that although Sky Greens composts and reuses organic waste, the vertical farm should not really be understood as organic:

> According to the US Department of Agriculture (n.d.), an organic farm is one that demonstrates ability to integrate cultural, biological, and mechanical practices that foster cycling of resources, promote ecological balance, and conserve biodiversity . . . It would be a challenge to incorporate diversity and balance ecology into the [SkyGreen's] A-GoGro towers. (Meng 2016, p. 7)

But Singapore has its way. In 2018, Singapore set up its own framework—the Singapore Standards for Organic Primary Produce, or SS 632, the world's first organic standard for produce grown in an urban and peri-urban environment (Singapore Standards Council 2019). In June 2019, Sky Greens became the very first local vertical farm in Singapore to

[9] My discussion of a thicker notion of the local (beyond location) is connected to an ongoing discussion in geography about how space is rendered meaningful as place. For further literature, see *Space and Place* (Tuan 1977), *The fate of place: A philosophical history* (Casey 2013).

be awarded the home organic certification.[10] The vegetables of Sky Greens are grown indoors in small plant boxes with soil-mix, grouped in a long, narrow trough elevated above the ground. According to *The Straits Times*, from 2017, Sky Greens began to produce only mini vegetables to avoid the use of pesticides. This means the vegetables at the farm are harvested when they are smaller, at between 21 and 24 days, as opposed to the usual 40 days, before insects appear (Begum 2019). Although Sky Greens does not use artificial lighting, SS 632 allows this farming method. Urban farms worldwide, including importers, exporters, and retailers, can apply for Singapore's SS 632 organic certification.[11]

While there have been heated debates on whether organic farming is more sustainable for the planet (and much depends on the specific forms of farming and certification standards), my interest lies in the modes of care that are enacted in the way food is grown and the way in which they may enrich or limit connections. If organic farming has been positioned as a particular kind of care to many people, Sky Greens, or Singapore's SS 632 in general, seems to represent and even encourage a selected, pragmatic version for urban farming. In the case of Quan Fa, the method of encouraging diverse crops, most of which go through a complete lifecycle grounded in a growing process that cares for and is cared for by other species, embodies a more relational care and thick localism. As Puig de la Bellacasa explains, care needs to maintain the possibility of a web of ecological relations "rather than only from their possible benefits to humans" (Puig de la Bellacasa 2015, p. 701). The endorsement of Sky Greens' method, with its compressed production cycle designed to avoid pesticide use and its overall limited engagement with a wider ecological system (inherent in the practice of vertical farming), signals a problematic paradigm shift in framing and the governing of care in farming.

Further, Puig de la Bellacasa argues that the drive for care within the productionist model "has mostly been for crops as *commodifiable produce*" and as relatively isolated objects of care (Puig de la Bellacasa 2015, p. 700, italic original). In an agricultural context, she proposes that to enact "interdependent care" is to grow not only food products but soil that cultivates a lively multi-species mode of life (p. 706). In the dominant forms of farming emerging in Singapore, including controlled farming environment and/or compressed growth cycle, there is an apparent lack of this kind of care for either soil or crop diversity. But in its place, there is *not simply* an absence of care. Rather, as we will see, there are novel means of care emerging here.

In anthropologist Sophie Chao (2018) work on oil palm in West Papua, she unravels a multiplicity of contested and ambivalent modes of care enacted in this unexpected space. In particular, she draws attention to the often disregarded care work practised by corporate actors, seen as money-monsters, and the scientists who are involved in the production of new varieties of oil palm. Drawing on Puig de la Bellacasa, Chao suggests a "nonidealized vision" of and even compromised care that "requires attending to conflicts and tensions inherent in the relational practices of knowing, thinking, and acting" (p. 443).[12] In Singapore, it is important to ask, what kinds of compromised or contested care have been performed and by whom? How is Singapore's version of food security nonetheless a form of care?

Notably, the care underpinning Singapore's pursuit for food security and safety is more than merely positioning crops as "*commodifiable produce*" that primarily prioritises profit (Puig de la Bellacasa 2015). Rather, what looms large is a paternalistic form of care

[10] The award ceremony was held on 11 June 2009, for full speech from Masagos Zulkifli, Minister for the Environment and Water Resources. https://www.mewr.gov.sg/ (accessed on 14 December 2020).

[11] See a very interesting discussion on vertical farming going organic (Moore 21 June 2019). Intriguingly, in a 2018 assessment of the financial viability of high-tech agriculture (plant factories with artificial lighting) for growing leafy vegetables in Singapore, researchers find that consumers are mostly willing to pay premium for safety and freshness, and specifically, for organic produce. Thus, researchers suggest that "an organic label . . . can enable local producers to sell their produce at a higher price". And, "Given the debates on considering plants grown in artificial environments as organic, an immediate imperative will be to look into organic certification approaches" for hydroponics and other non-soil farming practices (Montesclaros et al. 2018). It will be very interesting to follow the development of the Singaporean organic certification.

[12] See (Puig de la Bellacasa 2012). For compromised or even "regimes of violent-care", see (van Dooren 2014).

grounded in control over humans and natures as well as a taken for granted attitude of technological prowess and intensification as best practice. In the 2019 Global Food Security Index published by the Economist Intelligence Unit, Singapore is in fact ranked as the most food secure country in the world, scoring high on measures such as affordability, availability, and safety. In this case, the persistent anxiety of the state over food security seems to be strongly associated with a professed care for its people. As Aryn Martin, Natasha Myers, and Ana Viseu point out, "Practices of care are always shot through with asymmetrical power relations: . . . Who has the power to define what counts as care and how it should be administered?" (Martin et al. 2015, p. 627). Indeed, paternalist care then becomes a powerful rhetoric by the state to legitimise its actions. During Singapore's island-wide urbanisation, this kind of care was implemented through demolishing the *Kampongs*, described as unruly and unhygienic, and relocating farms and backyard trade industries along the Singapore River, whose "way of life" was identified as a source of pollution (Loh 2009; Tan et al. 2016). In the current wave of farm transformation, this strategy includes maximising production levels and casting out forms of farming or types of produce that do not comply, paving the way to enforce a technoscientific intensive way of farming. Although Singapore's pursuit for urban farming is not entirely driven by the productionist model of industrial farming critiqued by Puig de la Bellacasa, eco-modernist farming is nevertheless increasingly envisioned in the future as factories in which plants are manufactured in a standardised, universalised way of growing life.[13] They become a calculated resource while framed as "local" and "sustainable" produce.

Furthermore, a controlled and closed form of food production is proclaimed as providing increased security for the customer and benefitting the environment. A manager at a high-tech land-based vertical fish farm explained to me that farming fish in completely indoor controlled environments reduces the need to feed fish antibiotics. Their immune systems are therefore not compromised. Moreover, the productivity of a land-based fish farm is not weather-dependent or impacted by surging environmental issues such as algal blooms or plankton that cause mass fish kills. In this way, he told me, "Consumers are better cared for and feel more relaxed as they have our safer products". The AVA has also started to develop closed containment aquaculture systems that "isolate fish from the external environment" as a way for coastal fish farms to shield themselves from environmental pollution (Centre for Liveable Cities 2018). In addition, land-based or offshore fishery has been promoted as a more effective way to care for the environment in the sense that it does not pollute the sea as some traditional coastal fisheries may (Gunther 2018; Choy 2019). Geographer Benjamin Coles suggests that practices of consumption shaped by concerns about personal and family health, other people, and the environment, "'place' and 're-place' foods into a palatable imaginative geography of safe and, by extension, unsafe spaces and places" (Coles 2016, p. 154). Facing increasing uncertainties, these farming practices and the form of care enacted are animated by an intense "turning inward . . . as a response to an increasingly ugly and threatening public world" (Plumwood 2005, p. 4). This kind of inward-look care may set up a dangerous model that turns its back on environmental issues that are present in compromised systems.

Reflecting on these multifaceted and sometimes troubled modes of care, some of which emerge from intensified urbanisation and radical environmental change, I suggest that there is an increasing need to attend to a *situated* care, rather than a form of bio-regionalist care rooted in an isolated mode of localism and decoupling from nature. Here, I am drawing on Donna Haraway (1988) discussion of situated knowledges that (in part) is about taking account of and being accountable for the particular relationalities that we inhabit. In other words, it is to attend to partial and relational ways of knowing and caring

[13] Note that controlled, automated, and data-driven farming is connected to a bigger trend in agriculture. For further discussion, see 'Big Data in Smart Farming' (Wolfert et al. 2017) and 'A review of social science on digital agriculture, smart farming and agriculture 4.0' (Klerkx et al. 2019). For topics on indoor farming and (smart) plant factory, see (Kozai 2018).

(Haraway 1988).[14] The Edible Garden City model offers a glimpse of a kind of *situated care* that may cultivate a healthy robust environment in the middle of the city. Darren explained that, in addition to traditional ways of composting, they use vermicomposting and black soldier fly composting (in collaboration with another group of urban farmers). This practice introduces worms to forge a transformative relationship with food waste, food produce, and humans.[15] Further, a key thrust of Edible Garden City's ongoing commitment is its grow-your-own-food movement, which aims to inspire people to find a space in a confined environment to be closer to farming, plants, and soil, to encourage and actively push for participation not just on a specific day, or a weekend, but to continue this relational practice throughout everyday life. When we talked about the pressure of productivity and profitability, Darren said:

> We are not the most productive ones among the farms. Profits are important. But how to get the profit, and what do we do with the profit is another thing . . . In a large enterprise where it follows pure efficiency, one plus one always equals two. Here, it could be two, or three, or ten. There is room for kindness and collaboration and understanding. How have urban farms or grow-your-own-food placed social and environmental impact on people? . . . all these feelings need to be accounted for and put into consideration.

Darren's view on farming as relational care reminds me of Annemarie Mol's meditation on the continuity of care. In the context of medical science, she proposes the logic of care as an ongoing kind of care that challenges other market-based mechanisms that have a beginning and an end for enacting care and responsibility (Mol 2008, p. 18). Mol writes, "Care is not a transaction in which something is exchanged (a product against a price); but an interaction in which the action goes back and forth" (Mol 2008, p. 18). Constituting an assemblage of general outreach, community gatherings, and workshops, Edible Garden City's growing model that seeks to draw humans and non-humans together is a performative way of creating a network of local farming, offering and extending a relational and situated care that could intervene in the growing trend of regarding urban farming as a new mechanism of commodification.

Continuing my exploration of the agricultural carescape, I learnt more at Comcrop, whose hydroponic rooftop follows a more automated approach (see Figure 3). Darren shared with me his view on automation in farming and the essential care element that sustains it:

> In the past, farming relies a lot on farmer's experiences. The present farmers use censors and data tracking for similar information and to monitor the growth of the plants, but in a more precise and timely way . . . There has been lots of trial and error since the advent of our farm. This is a new area in Singapore. No one really has a script on how to grow, and what to grow. We test the water almost every day to ensure the right number of elements.

As I walked around the rooftop, sampling the herbs and some edible flowers, I noticed Darren would often run his fingers along the surface of the racks. "The devil is all in the details", he smiled and explained to me that there is lots of dirty work behind this neat and futuristic looking rooftop farm, "the hygiene of the racks and the farm is paramount. A lot of our work and time is going into maintenance, to make sure the frames are sanitised . . . If there is any sign of pest, we must identify it immediately." As Mol (2008) argues, technology is not static or opposed to care; rather, it is an integral part of caring in the process of growing and working along with other elements. In Comcrop and other indoor-controlled farming using a more technological and automated approach, farmers tend to their produce's wellbeing through data tracking and real-time monitoring. This testing and

[14] As Haraway writes, "it is precisely in the politics and epistemology of partial perspectives that the possibility of sustained, rational, objective inquiry rests" (p. 584).

[15] Edible Garden city works with Insectta on vemicomposting. On vermicomposting as practices of care, see (Abrahamsson and Bertoni 2014).

experimenting invokes a distant, virtual type of care in conjunction with the physical care that Darren described as "the dirty work".

Figure 3. A section of Comcrop farm. Author's own image.

As nutrient solutions replace the complicated soil environment, as controlled environments are preferred for precision and stability, the plants, now living in a lonelier place without an expansive soil environment to help regulate their health, become much more dependent on the grower and their attentiveness, as well as being more demanding and sensitive in the ways they are cared for. As Mol insists, "Do not just pay attention to what technologies are supposed to do, but also to what they happen to do, even if this is unexpected" (Mol 2008, p. 49). I read Mol's proposition of technology here as an experimental and relational mode of care. In the case of controlled farming, the use of technology for monitoring, tweaking, and adjusting becomes indispensable to the life and death of the plants. Looking through this lens, the idea of having a resilient farming practice that is disconnected from the environment in fact reimagines new forms of interdependency between technological care, the plants (or animals), and the grower. Much more work is needed on the social and ecological implication of these emerging forms of care.

The work of feminist scholars has demonstrated that care is never innocent; rather, it is "an ethically and politically charged *practice*", contested and situated (Puig de la Bellacasa 2011, p. 90, italic original). They have also taught us that technology is not necessarily a cold and externalised mechanism, but may function as an integrated part of the care process to produce and sustain a certain mode of life. From the bodily care for the environment, to an ongoing mode of care that may disrupt (to some extent) the entire commodification of urban farming as a process, to a kind of care that may encourage work in isolation, the carescape in farming is fraught with affect, tension, compromises, and the alluring promise of a healthier and more abundant food supply with less energy input. At the same time, a reduced version of localism embodied in various farms in part plays a role in allowing the promises of urban farming to be recruited by a techno-industrial-capitalist mode with its particular, narrow, forms of care. Ultimately, for urban farming to be a meaningful alternative to industrial farming, one that avoids a reductive localism, it needs to develop the sentiment of relational thinking and embed itself in ongoing expansive, *situated care* that does not stop with humans (many are focused on care for "consumers", while others

have a broader sense of care for the community), but rather also includes the land, soil, and a wider, more-than-human world.

4. What Future Are You Growing?

At the time I visited Comcrop, it was on track to open a much larger rooftop farming site in the suburb of Woodland (which has since opened). This enclosed greenhouse has a much higher level of productivity, thanks to its "pest control, light and shade control and automated growing systems" (Tay 2018). According to its CEO, the aspiration of Comcrop is to develop into a plant factory (Tay). Meanwhile, Edible Garden City continues on its multi-pronged path, working with a range of organisations to expand the possibilities of growing food in unexpected parts of the city and promoting the grow-your-own-food movement. They are also starting to explore more seriously the possible therapeutic benefits of urban farming. The mini vegetables of Sky Greens, now certified organic, are available at supermarkets, with an even higher price tag. The vertical farm has also expanded its farming technologies export business. On the other hand, I was delighted to learn that Quan Fa managed to find a smaller parcel of land to continue its farming operation, although they would temporarily need to reduce the variety of their produce. The handful of other more traditional farms face an uncertain future beyond 2021 as their leases expire (Whitehead 2019). The divergent paths which these farms are taking provide examples of the complexity of urban farming. As some continue to offer hope by opening up ways of practising farming as care, the question is, will others be enlisted as part of a more high-tech factory-style farming?

If some food movements such as slow food have been linked to the values of the past (Morgan et al. 2008, p. 13), technoscientific food production gestures powerfully to the future. Melinda Cooper reminds us that in anticipating a certain version of the future, our generalised alertness is transformed into "a real mobilizing force, compelling us to become the uncertain future we're most in thrall to" (Cooper 2006, p. 125). In Singapore's urban development turned future-making project (Yuen 2011), the Farm Transformation Map, the land reformation and a newly minted SS 632 organic framework have seen farming revived and swiftly integrated as part of an overarching imagining of a sustainable city—a future of agri-tech-capitalism that it has called forth.

However, to protect and care for the future of "certain forms of life" is to potentially "dispossess" others (Anderson 2010, p. 791). As vertical, intensive, and indoor farming becomes more and more dominant as a form of urban farming, positioned as a superior choice for biosecurity, an emerging economic solution, or a technological revolution to feed people (it is of course fundamental in many regions), other possibilities will be squeezed out in the process. Benke and Tomkins suggest that the prospect of fully automated urban farms may see funding for indoor-farming research compete with field hydrology and soil science (Benke and Tomkins 2017, p. 24). Singaporean Researcher Sanjay Warup maintains that care should be taken as farming moves from less sterile outdoor conditions to indoor conditions: "There will be a reduced load of bugs - or microbes. And the microbial exposure from the air and water and all around us help to improve our immunity as we grow up" (Wong 2017). Here, the imagery is of unmoored plants prevented from communication with soil as a medium. These plants cannot nurture a multitude of other organisms' wild pollinators while the vision of fish travelling between floors through tubes manifests a troubling way in which we attempt to pre-empt and/or prepare for a certain future.[16] In

[16] How hydroponic, vertical farming and indoor fishery may interrupt the social life of plants and fish is not in the scope of this article. Nevertheless, there is some lovely literature on the topic of the lively modes of life of plants; for example, Marder (2013) has written about the desire and livelihood of plants. For posthuman anthropology, see (Kohn 2013). Tsing (2015) has vividly revealed the complicated social life of the mushroom. Research has suggested that heavily cultivated plants have been "rendered 'deaf' and 'mute' through intensive agricultural practices and pesticide use" (Hustak and Myers 2012, p. 103; Paschold et al. 2006). But overall, there seems to be limited study on the cultural, social, and environmental impacts of commercial hydroponic farming or vertical indoor fishery on human and more-than-human communities. Of course, this is in part because some of these practices are emerging.

this future, a degraded environment is abandoned as much as possible to secure a safe, flourishing, and well-fed future for some humans.

As the new farming movement, particularly controlled farming, is posited as a triumph of technological advancement, as light-assisted farming modules pop up at various corners of the city as a symbol of freshness, it might be easy to lose sight of the fact that the rise of these eco-modernised urban farms is also the result of intense urbanisation, soil depletion, environmental pollution, population growth, and food injustice in many parts of the world. In other words, it is a set of approaches to farming that have been erected on the damage that we have done to the earth, a manifestation of disconnection from the environment, and for some, an urge to reconnect. Furthermore, like many efforts to secure resources from the impacts of climate change such as seawater desalination, these new methods can be themselves energy and capital intensive and thus contribute to climate change with their unevenly distributed environmental impact. This kind of vicious cycle needs to be considered here, too. Yet, in Singapore, despite the fact that its current heavy dependence on imported food is the legacy of its eradication of old villages and their associated farmland, urban farming is again seen as an isolated mechanical activity, a bio-infrastructure that can be readily reintroduced as an anthropocentric farming scheme policy, land control, and technology investment.

My intent here is not to dismiss urban farming; rather, I am genuinely excited by the possibility of this mode of growing that may improve social wellbeing and encourage the imagining of a city from a more-than-human dimension. What I wish to highlight is the growing trend to celebrate a certain kind of urban farming and/or pursue the state's imaginary of a manufacturing style farming future, that is proclaimed as local and sustainable, efficient, and stable without attending carefully to the many socio-environmental issues. This situation asks us to think critically about the concept of the local as it is being transformed and/or incorporated in the age of globalisation and climate change. Indeed, some versions of localism may become a kind of "atomism", as discussed above. That is to say, the kind of localism that is not interested in restoring what has been erased or repairing the rift ultimately promotes an attitude of isolation. Similarly, my ambivalence towards certain practices and narratives of vertical farming, along with some other technological approaches and their rhetoric of localism, is not that they are high-tech and therefore lack care or warmth. Rather, my concern centres on the particular forms of care enacted that refuse to recognise inter-dependency and interconnections. How might this emerging farming scape transform and shape biocultural–social–technological relations within humans, and between humans and non-humans? How might we use this opportunity to forge a practice that is more attuned to environmental connection, locally and beyond?

In this light, urban farming practices must be grounded in efforts to decentre human exceptionalism, as well as in a more expansive, *situated care* that includes diverse humans and non-humans. When examining urban agriculture, it is essential to focus on the kinds of relations that the processes of farming and their produce inhabit, sustain, open up, and close down. They need to be understood as not only attempts to overcome the constraints of space, or a new way to accumulate capital, but as a "political work" that is committed to focusing on existing issues rather than trying to find "an outside alternative" (Puig de la Bellacasa 2017, p. 11). As Darren from Citizen Farm explained succinctly that the rise of sustainable solutions in Singapore is great, yet there is a severe lacking in educations in the labour of growing food, nutrition, food wastage, and consumerism. Without these discussions, in his account, "what these solutions are really for is not really clear. All these are why, and how we design this space to be. We want to use different modes of farming to connect." The connections that the Edible Garden City, Quan Fa, and Comcrop and some urban farmers seek may not always be as precisely articulated or defined as the Farm Transformation Map. They may pay less attention to controlling or transcending the environment in their practices but there is more curiosity, patience, a strong level of commitment to be attuned to the environment, and much room and desire to learn and perhaps be transformed. Their sense of uncertainty is accompanied by an ongoing situated

care for a wider environment that may help to reimagine an alternative future and subvert a capitalist way of pressing forward and to interrupt the industrial farming rhythm that has caused devastating loss of many kinds.

Emerging from the cracks and gaps in an ultra-modern landscape, from garden to gardening, from a city in a garden to an edible city, from food waste to fertiliser, from living in a high-rise building to farming on the rooftop, the trajectory of farming in Singapore is neither a practice abstracted from the environment nor a planned unfolding. Instead, unmoored farms, thick localism, diverse modes of care, technological inter-dependency, and a pre-empted version of the future are all at stake. At the heart of this article is a call for a much more careful and patient examination of and a relational way of thinking about this movement of seeding, growing, and transforming. In engaging with or developing a new form of farming, it is equally essential to have clear definitions of such powerful terms as local, care, organic, and other expressions that matter to consumers (and producers). As we work our way through thinking and rethinking these terms and how they are embodied in practices, alternative ways of growing food, and growing with food, may open up, in and with an increasingly challenging environment. When growing things, it is important to ask how the process grows both us and a wider world.[17]

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