Transitioning without confrontation? Shared food growing niches and sustainable food transitions in Singapore

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A B S T R A C T

Following a series of global food crises and an increasing dependence on food imports, the Singaporean government has begun to support local food production as a means to improve the sustainability of its food regime. This extends to the development of state-led ventures which support shared food growing in the city. In parallel, informal citizens' groups are experimenting with collaborative forms of food provisioning. Both types of initiatives utilise Information and Communication Technologies (ICT) to facilitate their practices of shared growing and seek to reorient the current food regime onto a more sustainable pathway. Drawing on ethnographic research conducted with two initiatives representative of both organisational positions, this paper critically examines the efficacy of using a transitions thinking approach to assess their actual and potential contribution to the disruption of the food regime in Singapore. The paper first reviews existing approaches to transitions thinking in order to distil insights for examining shared food growing initiatives in Singapore as niche projects. The broader socio-cultural and political context of Singapore's food system and the food growing niche projects which are emerging within it are then delineated, followed by a strategic niche management (SNM) analysis of the two initiatives. Ultimately, the paper makes two linked contributions: firstly, it diversifies the empirical foundations and the sectoral and geographical reach of sustainability transitions research. Secondly, it provides space for critical reflection on transitions thinking when applied beyond the Western liberal democratic settings from which it emerged.

1. Introduction

"I remember my grandmother stayed in a traditional townhouse in Cairnhill. In the front, there was a rambutan where we always went climbing and plucking stuff. Behind, there was a huge mango tree with a bee hive. It was our playground to run up and down, and go back to the garden. And there we see our grandmother and her neighbours growing different fruits like mangosteen, jambuayer, starfruit, durian. She had herbs like pandan, lemongrass, kaffir lime, sand ginger, blue ginger. There you got the flavour of pomegranates."

(Participant, 1, C)

Few visitors to Singapore would recognise this reflection on childhood gleaning, foraging and growing in a city-state now dominated by the contemporary infrastructures of smart city. While Singapore is gaining recognition for its green initiatives, many are highly technological in focus and ecologically modern in articulation. This is exemplified by the SuperTree Grove within the Gardens by the Bay, where large metal tree-like structures are decked with more than 200 plant species and over 100, 000 individual plants. These vertical gardens are heralded for their green functions, including their ability to provide shade and harvest solar energy. However, while their cement core contains restaurants, few of the products served will have been grown in Singapore as it imports more than 90% of its food. Within just a few generations Singapore has transitioned from a village-based society to a bustling metropolis and patterns of food production and consumption have also altered radically as a result, raising sustainability concerns around dependency on food imports. This paper explores how grassroots initiatives which employ shared food growing approaches have emerged in Singapore in response to these concerns and are promoting a sustainability transition around food in order to: raise awareness around food; develop skills for growing food in order to reduce reliance on food imports; and build social networks through shared urban growing activities.

Shared food growing, that is sharing land, spaces, skills, produce and tools for food production, particularly that which is mediated by Information Communication Technologies (ICT) has gained visibility

internationally through attention to urban agriculture, food sharing platform economies and alternative food movements in recent years (Davies et al., 2017a; 2017b; Eizenberg, 2012; Staeheli et al., 2002). It includes diverse collective practices at a range of scales, from the household level, to community gardens, urban farms and even forms of guerrilla gardening. Claimed benefits of shared food growing include their contribution to food security through more diverse food systems and empowering communities to learn skills to grow their own food, gain access to land, and exercise their rights as citizens (Rut and Davies, 2018). However, little research has been conducted on these activities in Singapore to establish the veracity of such claims. Neo and Chua (2017:7) and Tan and Neo (2009) suggest urban greening activities in Singapore such as community gardens have always been a city-state priority and "means toward the end of building an inclusive community spirit and cocreating a greener Singapore, where the community that is envisioned in is reflective of the state's articulation". Thus, the perception of communal sites for sharing spaces, land, skills, produce and tools as a form of state-organized civic activism and community bonding offers an important starting point to further reflect on the socio-political capacity of the city-state and its citizens in niche building processes around food, community and nature.

In response, the goals of the paper are two-fold: (1) to document how actors are attending to food transitions through ICT-mediates shared food growing; and (2) to interrogate the SNM theoretical framework for understanding niche building processes in the context of Singapore. These goals are approached by first outlining the nature of Singapore's food system and then by reflecting on the current architecture of transitions and its implications for studying food transitions in Singapore. This is followed by an explanation of the methodological approach adopted and details of the two contrasting case studies which form the empirical material for the paper. A Multi-Level Perspective (MLP) reading of Singapore's food system is then conducted and a SNM analysis of two grassroots initiatives that focus on shared food growing. The paper concludes by highlighting the significance of social and political genealogies for both understanding past transitions and also shaping future transitions. We call for continued efforts to widen the body of empirically-informed research on attempts to reconfigure food systems onto more sustainable pathways beyond Western liberal democracies and to explore more carefully what place, power and politics mean for such reconfigurations. For instance, much of the existing transition literature assumes that niches can disrupt regimes if they adopt the right strategies and are adequately supported (Schot and Geels, 2008; Kemp et al., 1998), but what might constitute appropriate strategies and support for a niche in Singapore?

2. Background

Singapore is densely populated and relatively young city-state, having only been established in 1965, with a landmass of 710.2 sq. km and a population of 5.6 million which is projected to rise to 6.9 million by 2030. As a result of rapid population growth and urbanization, Singapore faces a range of sustainability challenges such as resource scarcity, which includes a shortage of land and water, as well as the dependency on imported food. To address some of its sustainability challenges, the Singaporean government has been steadily building their vision of Singapore as a City in a Garden (NParks, 2014; Tan et al., 2009), which has become a political mantra to "ensure efficient management of [natural] resources in maintaining tropical oasis" (NParks, 2008:1). However, this vision has been criticised for portraying "manicured parkland image derived from a colonialized, westernized subconscious … a reinvented topicality reminiscent of hotel-resort horticulture" (Geh and Sharp, 2008:183). This state promoted image of Singapore as efficient, tidy and controlled, has altered human-nature relationships, particularly affecting social and cultural values, urban lifestyles and practices such as growing food (Wong et al., 2008). In addition to environmental challenges, Singapore is also undergoing

social changes, including a weakening sense of cohesion and identity, referred to by both state and citizens as a loss of Kampong spirit (Lazaroo, 2017). Singaporeans remember Kampongs through activities such as communal cultivation of vegetables and fruits trees, rearing pigs and poultry, and engagement in informal food economies, such as hawking and food sharing (Xiong and Brownlee, 2018). Often laden with romantic nostalgia, there have been growing calls for a renewal of Kampong spirit in ways which are fit for the twenty-first century; essentially seeking to recreate a Kampong 2.0 (Yeo, 2016).

While many of these traditional forms of social interaction with nature, food and community have disappeared, the city-state has developed three national food provision strategies: increasing imports from around the world; vertical and indoor technology in farming; and the internationalization of food supplies by establishing agricultural farms overseas (MND, 2017; Singapore Food Security, 2014). However, concerns about the risk of global challenges, such as climate change, causing disruption to food supply, alongside state recognition of the negative implications emanating from a weakening sense of collective identity, have led the government to support greater experimentation with local and shared food production. Growing food has been considered by the government as a critical buffer against global supply shocks (Koh Poh Koon, 2017), a national duty to ensure that Singapore has food supply resilience (Wong, 2017) and provide a platform for community bonding that can better approach social sustainability problems (Koh Poh Koon, 2017).

Looking back at the history of food provision, in 1965 after gaining independence, 25% of land was used for agricultural purposes and Singapore was food self-sufficient (Deakin et al., 2016). However, from 1980 onwards there has been a shift from growing food on the land to relying on global food trade, with a focus on imports and technology in farming. It is estimated that less than 10% of the food consumed in Singapore qualifies as locally-produced according to the Agrarian and Veterinarian Agency (AVA). By 2014, only 1% of land was allocated for farming, most of which was located within the Kranji farmland and agro technology parks. The agrotechnology parks have a total land area of 1465 ha and circa 200 farms that produce livestock, eggs, milk, fish, vegetables, fruits, ornamental plants, birds and dogs (World Agriculture, 2017). In 2017, locally-farmed vegetables, fish and eggs contributed to just 8%, 8% and 26% respectively of Singaporeans' food consumption (AVA, 2017a, 2017b).

There are a number of factors that have contributed to the current food provision system. First, the city-state is known as an international hub for food trade. Its strategic geopolitical context has led to an influx of imported and inexpensive products, which has heightened citizens expectations for food to be diverse, convenient and accessible; a commodity. Three supermarkets chains, the NTUC Supermarket, the Cold Storage and the Sheng Siong Group control 83% of the domestic food market (Singapore Business Review, 2012). At the same time, traditional food ingredients that were once grown locally with indigenous herbs used in signature Singaporean dishes are increasingly hard to find and are becoming unfamiliar to new generations of Singaporeans.

Second, in Singapore land is not permanently zoned for agriculture and there is no official land allocation for food production. In 2015, the arable land was estimated at just 0.8% of total land area, and employment in agriculture dropped to its lowest level of 0.12% of total employment in 2017 (The Global Economy, 2018). While the land can be leased from the government from three to twenty years, the city-state priorities on housing and military services have led to the disappearance of much previously available farmland. In fact, in 2017 the only remaining farmland, referred to as farmers countryside by the Kranji Countryside Association (KCA)[1], was taken back by the government after 20 years of farming history. With a state-led vision that

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[1] Kranji Countryside Association (KCA) is a non-profit organization that promotes local agriculture, food security and sustainability in Singapore.

the future of farming should rely on technology, science and engineering (AVA, 2017a, 2017b) traditional soil based farmers find themselves in a weak position to compete for access to land with agro technology companies.

Third, economic and technical views on the future of food production have marginalised the social and the cultural dimensions of food. Indeed, the government's farm transformation map (AVA, 2017a, 2017b) envisages a further shift from traditional farming techniques to tech savvy agro-specialists, with a predicted upsurge in vertical farming, automation and robotics to increase farm productivity and overcome resource and land scarcity. This technologically-infused vision fits with wider narratives of Singapore as a smart city, but fails to acknowledge the socio-cultural dimensions of food, from growing to consumption. As mentioned by the head of Kranji countryside in a response to government plans to remove 62 farms from the farmland, "farming is not just production - there's heritage, culture and education. These intangible assets are very critical for nation building in Singapore. Knowing where your food comes from is something that every parent hopes every child (will) know" (Wong, 2017: para. 4).

Finally, grassroots initiatives interested in shared food growing activities have limited opportunities to access land. For, while the government has long been committed to developing a City in a Garden, with already 47% of Singapore covered in greenery (Singapore Green Plan, 2018), it has been argued that nature in Singapore "has been altered to a consumable form, a scientific sanctuary for observing and contemplating" (Kong and Yeoh, 1996:402), rather than enabling interactive practices such as community growing. In this context citizens find it increasingly difficult, if not impossible, to grow their own food. As mentioned in interviews with initiators of shared food growing activities: "Singapore [is about] high tech [farming] but there is so much green land that is only green land. It is not productive land, it is not communal land and it is not land that people are engaged with digging in soil, understanding the plants, meeting people eating" (*Participant, 3, C*).

To begin to address some of these challenges, the government responded by making land available for growing in underutilized spaces, such as rooftops, community gardens, and by leasing gardening allotments in public parks. In fact, by 2019, the city-state has planned to lease 1000 garden allotments in HortPark, suggesting a diversification of the food system may be imminent. The question is whether this diversification will enrich or disrupt the dominant food regime or whether these initiatives will only ever be demonstration examples of alternative food provisioning practices. Exploring the relationships between dominant regimes and emergent alternatives is the bread and butter of transitions approaches and the following section sets out the state of the art in the field.

3. The architecture of transitions thinking

In the literature, transitions are often referred to as a "gradual process of societal change in which society or an important sub-system of society structurally changes" (Avelino and Rotmans, 2009:19 in Kemp and Loorbach, 2006). In this sense, transitions are concerned with systematic changes and reconfigurations of "technology, policy, markets, consumer practices, infrastructure, cultural meaning and scientific knowledge" over time (Geels 2011: 24). In the last ten years, transitions studies have stimulated much debate about changes in complex systems such as energy and mobility (Shove and Walker, 2007; 2010; Lawhon and Murphy, 2012) through frameworks such as the Multi-Level Perspective (MLP) and the Strategic Niche Management (SNM) approach.

The MLP consists of three analytical levels (Table 1) - regimes (macro level) characterized as dominant socio-technical structures, which include set of institutionalized rules, practices, products, and technologies (Geels, 2011); an exogenous landscape (meso level), which influences the interplay between niche and regime, and is

associated with trends such as regulatory shifts, environmental disasters, or cultural trends (Hinrichs, 2014); and niches, described as loci for radical innovations. The interactions between these three levels, it is argued, drive socio-technical transitions (Geels, 2011; Smith et al., 2010). According to MLP, transitions involve dynamic shifts at the regime level and opportunities for structural changes. These can happen because of changes at the landscape level, for example by opening 'lock-ins' such as established technologies and rules known for creating negative environmental or social externalities, or by the growing influence of innovative niches, which can also destabilize regimes by unlocking potential for radical practices at the micro level by enabling new policies, practices and services. In both cases, transitions can take different pathways, and are influenced by different agencies, strategies, resources and interactions between actors (Farla et al., 2012). MLP is a useful framework to understand what factors might influence processes of change at different levels, and how levels interact through dominant and emergent political, social, environmental, economic and cultural practices. However, the framework has also received criticism for its geographical naiveté (Lawhon and Murphy, 2011), with concerns about whether MLP is "designed to travel" to other scales and socio-political contexts (Heiskanen et al., 2009 in Lawhon and Murphy, 2011: 363) and how place specificity shapes sustainability transitions (Heiskanen et al., 2009; Hansen and Coenen, 2015).

The niche is key in transition literature as it is directly linked to experiments, innovations and opportunities for change (Smith et al., 2010). It is argued that niche experiments operate in a protective space, which allows for transformative socio-technological practices to emerge (Smith and Stirling, 2008; Smith and Raven, 2012). The protection can help to create conditions for change, which if aligned with pressures from the landscape level may lead to changes within the dominant regime. Meanwhile, the concept of SNM has been developed as an approach to support policy makers and other actors in fostering experiments explicitly focused on sustainability transitions (Raven, 2012). Two major shortcomings of SNM have been identified by researchers; the limitation of focusing only on internal niche building processes and the overemphasis on technologies as novelties. To address these shortcomings, scholars have broadened the scope of SNM by linking it to external factors in niche-regime interactions and landscape shifts (Schot and Geels, 2008; Geels, 2010). Raven (2012) and others (Van den Bosch and Rotmans, 2008) have developed templates for assessing SNM, which include attention to external factors as well that influence how niche are incubated, protected and supported (or not). By mapping interactions between niche and regime, and by studying niche building processes in their totality, SNM has become characterised as a "useful addition to existing policy instruments that have neglected the value of experiments" (Schot and Geels, 2008: 548), which can also include socially-driven innovations and non-technological experiments. Socially-driven innovations are however challenging to traditional transition thinking as they may be "neither strategic nor managed" (Seyfang et al., 2014:41), and require more imaginative policy support and attention to socio-political context in order to scale up and stabilize.

Attending to external factors in niche building such as socio-political context, and the role of civil society actors in shaping sustainability transitions, has enriched SNM and accepting that innovations need not be solely technical has opened new research avenues (Monaghan 2009; Hielscher et al., 2012). Nonetheless, it remains that the reach of transitions thinking has been fairly delimited, with little attention to transitions beyond Western liberal democracies (although see: Swilling and Annecke, 2010; Broto, 2012; Mans, 2014; Huang et al., 2017) and to actors beyond public, private and research sectors only recently receiving more attention (Seyfang and Smith, 2007; van Welie and Romijn, 2018).

Transitions frameworks have also been applied unevenly across sectors. For example, in 2012, only 3% of empirical transition research focused on food systems (Markard et al., 2012). Although this is changing with food transitions increasingly being considered by a suite

Table 1
Definition of the landscape, regime and niche components of MLP: Sources (multiple).

Landscape	Regime	Niche
• Landscape is a physical environment that changes over time Landscape includes cultural, political, and economic conditions, that are shaping over long-terms developments and can lead to stress on the regime level Sources: Schot and Geels (2008)	• Regime is an established system that guides socio-technical practices • Regime is embedded in technological structures, and also in cultural, political, scientific, market and industrial dimensions Sources: Geels (2011:27)	• Niche is an isolated network of actors within a socio-technical system • Niche aims to compete with established regime and change dominant socio-technical practices • Niche characterized as grassroots are value-driven, focused on social needs and intrinsic benefits such as identity, self-expression, recognition, and belonging Sources: Kemp et al. (1998), Schot and Geels (2008), Smith and Seyfang (2013), Wolfram (2016)

of scholars interested in sustainability (see: Maye and Duncan, 2017; Devaney and Davies, 2017; Pascucci and Duncan, 2017; Kirwan et al., 2013; Bui et al., 2016), there remain questions regarding the appropriateness of MLP and SNM to identify novelties that often operate in the shadows of neoliberal food systems, such as shared growing and food sharing (Jehlicka and Danek, 2017; Grivins et al., 2017). Within this emerging body of food transitions research, niche building processes specifically have received limited attention, with a few notable exceptions. Smith (2006), for example, critically examines niche development processes with regards to the organic food markets in the UK. He outlines the plurality of possible outcomes in niche-regime interactions that may result either in appropriation of the niche by mainstream regime, or in its reconfiguration (Smith, 2006:455). This dialectical relationship between niche and regime was used as a departure point from which to reflect on what type of policy measures might be needed to support niches towards food sustainability transitions. Drawing out the significance of the social dimensions of food, Bui et al. (2016:102) conceptualize community farming projects in the UK as socio-technical niches that are "building new visions of farming and food issues and (re)defining the network of relevant actors". Similarly, White and Stirling (2013) employ the concept of niche to reflect on niche building processes for communal food growing practices in the UK. They suggest that the nature of civil society reduces the potential for structured 'outsider' governance strategies such as SNM (White and Stirling, 2013: 84).

To date, there have been few studies of sustainability transitions of any kind in the context of Singapore. In this sense, Singapore offers a novel geographical reality in which to extend consideration of MLP and SNM, and to assess the applicability of such transition tools in this understudied setting. Singaporean politics, societal values and environmental challenges differ greatly from Western countries where transition thinking has been predominantly employed. Addressing concerns of Hinrichs (2014) and Markard et al. (2012: 962) regarding how can scholars contribute to the debate on sustainability transitions in food systems, this paper provides a new perspective on niche building processes, and niche-regime interactions by reflecting on the role of place, power and politics in food system transitions. While recognising socio-political sensitivities and narratives, the paper looks specifically at socially-oriented, and collective forms of organization, and reflects on challenges of change in the food provision regimes using multi-method ethnographic analysis conducted with selected shared food growing initiatives in Singapore.

4. Methodology

This paper draws on research conducted examining the role of socially-driven, collective and collaborative practices around food that utilise ICT, termed shared food practices for brevity here (see Davies et al., 2017a; 2017b). The research included documentary analysis of policy reports and online analysis of ICT-mediated food sharing initiatives through their websites and social media networks. In addition, ethnographic research was conducted in Singapore. During this period,

60 semi-structured qualitative interviews and 40 engagements with people who share, including participant observation as a volunteer, participant and organizer of food sharing events, were conducted. Interviews were completed with founders and employees of food sharing initiatives as well as participants, volunteers, donors and beneficiaries. Face-to-face encounters with food sharing initiatives took place daily on their home-ground, including homes, gardens, farms and restaurants. Five informal interviews were conducted with representatives from the government concerning food security, safety, urban agriculture and development. Additional interviews were conducted with stakeholders from various food sharing networks, including community gardens, resident committees, zero waste organizations, environmental groups, and student organizations advocating for food waste reduction.

Interviews explored the history and evolution of food sharing initiatives, including attention to organizational models, motivations, and activities. The challenges and barriers that food sharing initiatives are facing were addressed, as well as their impact and sustainability potential. The role of ICT tools in shaping the food sharing activities was also interrogated. With agreement of interviewees, interviews were recorded, transcribed, and coded using the software program NVIVO to identify patterns, commonalities and divergences of experience in the data. Relationships between food sharing initiatives, and their respective histories, finances and operations, goals and motivations, and future plans were also illustrated. Additional coding was conducted for processes such as niche, learning, networks, and expectations. A number of direct quotes from the fieldwork are used in this paper to illustrate salient points.[2] The names of interviewees and initiatives have been anonymized and an identifier developed for each interviewee.[3]

Two initiatives form the empirical focus of this paper. Both initiatives were selected because of their use of ICT tools such as social media platforms, google maps and WhatsApp to organize their activities, disseminate their strategies and approaches to food as well as build public awareness around sustainable food practices in Singapore. The initiatives were both established by male and female Singaporeans, who are in their thirties and still living with their parents, some of them working multiple jobs or part-time. They self-identify as the millennial generation.

4.1. The Social Enterprise

The concept of the Social Enterprise was developed by a group of Singaporeans and non-nationals in 2014, many of whom had

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[2] In places these have been edited to provide clarity. Where this occurs, any additions are marked by square brackets surround added text i.e. [example].

[3] To maintain confidentiality with regard to interviewees, the following identifiers are used: Interviews with the Collective as denoted by the letter (C) and the Social Enterprise with the letters (SE). The role of individual interviewees is detailed at a general level e.g. Founder, Employee or Partecipant, and each seperate interview is given a unique interview number. For example, (Founder, 2, C) rapresents and interviews with one Founder of the Collective which is listed as interview 2 in the original data.

experienced collective farming overseas. Working with, and on, the land was a transformational experience for these individuals who on their return sought a more "self-sufficient lifestyle within a community" (*Employee, 1, SE*). As highlighted in the interview:

> "When I was working on different farms in Australia I lived on a couple of fully self-sufficient farms. [Farmers] grow food in food forests, they try to own solar power and they deal with their own waste disposal [...] This was inspirational sustainable lifestyle to me. Coming back to Singapore, I felt that this is what I wanted to do."
>
> (Employee, 1, SE)

The decision to adopt a Social Enterprise model was motivated by a vision to: "do something that was driving [the grow your own food] movement and not just a business that is revenue and profit driven" (*Founder, 1, SE*). To distinguish themselves from commercial farms, the Social Enterprise first focused on exploring edible landscaping, which included building edible gardens for privates, companies, restaurants, public institutions, and food education activities such as teaching gardening skills in schools and at pop-up community events. In the first two years of its activity, the Social Enterprise did not have their own physical space that they could use for meeting and shared food growing, and all the activities were based on part-time collaborations. However, its profile grew rapidly because of collaborations with established food venues, which gained them an extensive coverage in the local and international press, as a champion of grow your own food in land-scarce Singapore (Lee, 2016) and attracted more stakeholders interested in local food production. In 2016, the government leased land to the Social Enterprise to develop a community farming model that unlike other farms in Singapore, would be located within walking distance of HDB flats to make farming more accessible to the general public.

In 2017, the Social Enterprise set up a community farm, including twenty employees and a growing team of volunteers. The community farm focuses on using food growing technologies such as aquaponics and hydroponics for vegetables, edible flowers, mushrooms as well as an insect farm and a fish farm. Within Singapore's political context, the Social Enterprise and its community farm model can be considered as a small-scale sociotechnical experiment with strong backing from the government, which supports initiatives that work together to innovate, co-create and transform farming sector through technology (AVA, 2017a, 2017b). The technology aspect of the community farm aligns with the city-state mission to promote the new face of urban agriculture by increasing productivity, maximising land use and using technologies to support farming which can be scalable within congested urban environments (URA, 2018). The farm also has a social agenda which has developed around its social mission to extend practices of growing food in the city with others and employ vulnerable Singaporeans; essentially to build a more inclusive farming model and an active site for experiential engagement with food. As a result of this positioning the initiative, as a socio-technical experiment, provides a relatively protected environment as it directly engages with government priority areas around high-tech agricultural techniques and rekindling Kampong spirit.

4.2. The Collective

Similar to the Social Enterprise, the Collective emerged as a result of individuals traveling abroad, learning about farming, and participating in shared growing initiatives. One founder was especially inspired by a sense of openness and sharing when visiting a community garden in Perth:

> "I noticed that [the garden] was run by the residences for the residences and if you wanted some chilli, you could pick some chilli, etc. I was thinking about Singapore back then, and how Singaporean gardens are all locked up. There are only for a few people [...] I wanted to bring [this type of garden] to Singapore."
>
> (Founder, 1, C)

Upon her return from Australia, she started a community garden, which inspired her to learn about growing techniques from other food growers in Singapore. The community garden became a meeting space for those interested in urban farming, and in 2015 the Collective came alive with four founders interested in sustainability of local foodscapes. First, the Collective developed a google map of edibles in Singapore. By using crowdsourcing techniques such as google forms, information about food, growing practices, and food spaces in Singapore was gathered. The map was developed in an attempt to "help people to see what each other's [growing] and help with encouraging [sharing] knowledge about growing food in the city" (*Founder, 2, C*). As one founder said that "the mapping session actually caught the attention of the Ministry of National Development… we posted the event…then subsequently we were invited by the Taskforce on Urban Farming [to talk about our goals and activities]" (*Founder, 3, C*).

The Collective identifies itself as an informal and self-organized community group "composed of residents of Singapore, who have come together because of a shared interest in [their] local foodscape" and to share knowledge on "the landscape of food" (*Founder, 3, C*). Although, the founder's aspiration, amongst other ideas, is to establish a community supported agriculture based on partnership between local food growers and consumers, the Collective continue to function primarily as an online platform, that promotes knowledge and skills sharing about growing, healthy eating and waste reduction. The platform has circa 3000 followers, some of whom meet spontaneously to share plants, seeds, vegetables, compost, to share land for growing or to participate in shared food growing activities such community farming. Key activities include educational events such as workshops, exhibitions, gardens and farm visits.

In contrast to the Social Enterprise, the Collective has no clearly formulated goals beyond their online vision to "Grow food, cook well, eat well, live well". There is also an informality embedded in the structure of the Collective (which is entirely volunteer run) that has affected its chances of receiving government support:

> "When you talk to the Government everything has to be structured. You can't just say, I want to create a food forest, give me a piece of land. You need to give proper reasoning, understanding of what is the purpose? I think this is [why] we are probably not ready if you want to talk about engaging the Government with small groups [like the Collective]."
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> (Environment, 1, Policy)

Despite the lack of tangible support from the government, in contrast to that experienced by the Social Enterprise, the Collective has continued to grow in an informal way, with more people attending their events interested in discussions on "what the community could achieve to make [our] local food supply more resilient" (*Participant, 2, C*). In the following sections the experiences of these two experimental shared food growing initiatives will be examined using MLP and SNM frameworks.

5. Grassroots actions in food system transitions in Singapore: MLP and SNM analysis shared growing experiments

As discussed in Section 3, MLP suggests that system level change emerges when macro and micro pressures combine or align to destabilise the dominant regime. In turn, regime destabilisation creates windows of opportunity for new practices (Markard and Truffer, 2008; Geels, 2011). Building on the review of Singapore's food system conducted previously, MLP is used to deepen understanding of external factors that enable shared food growing niche (see Table 2). In Singapore, a key driver for change in the food systems has been identified as the global food crises post-2007, that led to a 12% increase in prices of Singapore's food imports (Deakin et al., 2016). This global scale landscape level event provided momentum for alternative food practices and new technologies, and with them new configuration of actors to challenge the status quo of the food provision regime. While the two case studies described in the Section 4 provide illustrative examples of

Table 2
Mapping Singapore's food landscape, regime, and niche.

Landscape	Regime	Niche
The landscape level in MLP is characterized by external trends and exogenous factors that might create opportunities for change. In Singapore, the landscapes pressures are manifested physically through ongoing trends of urbanizations and decreased availability of land through time; growing awareness of environmental issues amongst the populace, such as climate change and its implications on resource scarcity, as well as food waste generation; international food trends including vulnerability of global food supply due to food price volatility and 'nutrition transition' causing an increase in diet-related diseases such as diabetes and heart disease; as well as long-term political trends such as population growth, economic development as well as the lack of alternatives in mainstream politics. The landscape pressures in Singapore also reflect on the long-term socio-natural and cultural trends caused by transition from rural-like settlements to smart city-state. Kong and Yeoh (1996) suggest that the societal development in Singapore focused on economy and resource efficiency brought about reduction of natural habitat and led to a socio-natural dilemma: on the one hand, natural resources have been appropriated to satisfy needs of growing population; and on the other, various policies and civic actions were introduced to support constructed vision of 'City in a Garden' with new socially-defined understanding of human-nature relations. Moreover, cultural changes such as rapid globalisation resulted in ambiguity of cultural identity in Singaporean society, which has been affecting the sense of belonging and social cohesion known as Kampong spirit.	In the MLP, the elements that constitute the regime can be considered as dominant rules and polices, structures, values, practices and beliefs stabilized over time (Geels, 2010; Sterrenberg et al., 2013. These have been developed through state-led polices and strategies, which are focused on achieving food security and food safety in the face of land-scarcity and dependency on international food supply Thus, the current configuration of the food provision regime is highly stabilised through favourable import policies with one of the world's lowest tax on imported materials, which account for the influx of affordable and accessible foods; public funding schemes for support of economies of scale and farming technologies to maximise the outputs and intensify local food production; and practices and beliefs of convenience oriented consumers - who prioritize food affordability.	The niche level in MLP is characterized as locus of radical innovations (Smith et al., 2010). In Singapore niche emerge from a dynamic interplay of both thinking about the future food system, and doing things together to address novel approaches and new practices to overcome the challenges of import dependency and shortage of local food supplies. These include forms of collective food growing such as community farms and gardens, social and food entrepreneurship such as learning and sharing knowledge about do-it-yourself food growing systems and more commercially orientated food growing technologies to grow food on non-agricultural land and in tropical climate conditions such as vertical farming, aquaponics and hydroponics, climate controlled food growing containers It is also the case that niche development is being driven by circular thinking in food systems as opposed to the regime linear approaches to food production and waste management, and include innovative practice directed at food waste reuse and redistribution through community and commercial composting; permaculture food design strategies for closed loop urban farms; food redistribution initiatives such as food rescue groups, food sharing networks and community kitchens; and ground-up social movements including zero waste and grow your own.

Table 3
Niche actors in shared food growing and their key activities.

Niche actors in shared food growing in Singapore	Key activities
Community and Informal groups	Learning about urban farming skills and growing your own food; food growing for recreation, educational purposes or community building; need for an alternative approach to food systems; focus on social and environmental sustainability; exploring collaborations and connecting different actors in the food systems such as farmers, chefs, composters, food rescuers; rekindle Kampong spirit
Companies (For profit organizations)	Exploring market opportunities for locally produced food; experimenting with food growing technologies such as aquaponics, hydroponics and climate-controlled farms; influencing the government by offering solution to environmental problems such as food waste, food miles; lobbying for public support
Social Enterprises	Addressing social and environmental challenges; exploring new economic models (social economy); creating market opportunities for socially disadvantages; providing education services; community bonding activities; rekindle Kampong spirit and contribute to state-led City in a Garden vision
Public Authorities and Political Grassroots (known as Residents Committee (RCs))	Learning about new socio-technical practices; creating new economic and social opportunities for shared food growing niche; enhancing local food production targets; rekindle Kampong spirit and foster City in a Garden vision
Users (volunteers, consumers, prosumers)	Personal enjoyment for gardening; co-creating an inclusive community spirit and a greener Singapore; sharing knowledge, skills and interacting with others on how to grow and what to grow in Singapore; selling, and giving away home-grown produce; consuming home-grown produce; participating in outreach activities such as workshops; rekindle Kampong spirit

experimental niche projects, the fieldwork has also found that there are other multiple interconnected actors that share intrinsic benefits of growing together (see Table 3) (Seyfang and Smith, 2007). In fact, shared food growing has been often referred to as an emerging movement:

> "There's this ground-up movement for food. People are interested in urban farming or in just growing their own food [...] some of the vocabulary from ground-up movements does go into the Government when the people from these organisations start speaking to the Government."
>
> (Founder, 2, C)

As previously discussed, shared growing is not new to Singapore. It

was present in the pre-and post-independence period, when growing food with others was embedded in the social fabric of Kampongs. A quest for Kampong spirit is often articulated as a main motivational driver for Singaporeans to initiate or participate in shared food growing initiatives. Kampong spirit is also strongly emphasized in the state-led community growing initiative Community in Bloom[4], a nationwide gardening movement. However, in these state-owned and privately rented forms of community gardens, access to land is managed by

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[4] Community in Bloom is a network of community gardens which brings together residents through growing activities. According to the National Parks Board, there are 1000 community gardens, which are state owned and engage over 20,000 residents in community growing (NParks, 2016)

grassroots residence committees[5], which approve or reject citizen's request for access to land based on whether they comply with vision of City in a Garden and Kampong spirit. As mentioned by Ying (2015) and Tan and Neo (2009), citizen reliance on political intermediaries such as residence committees who control access to land and shape nature of citizen engagement leaves little room for experimentation.

However, although in Singapore experiments and social movements are legally restrained from creating "scandals, shocks, [and] protests" (Geels and Penna, 2015:69) to enact changes at the political and societal level, which are typically identified as necessary for transitions, the use of ICT and knowledge exchange around non-political grassroots interventions for food sustainability are opening up spaces for discussions of alternatives in ways which are harder to capture and control. In order to explore the capabilities of the two-shared food growing initiatives to disrupt the dominant regime in Singapore, SNM analysis is conducted in the following section, drawing on the frameworks developed by Raven (2012), Smith and Raven (2012), Schot and Geels (2008) and Kemp et al. (1998)

5.1. Articulating niches: A SNM analysis of shared food growing Singapore

Raven (2012:1) proposes a phased process for identifying "chances and hindrances" that niche projects, such as the Collective or the Social Enterprise, could face in their attempts to destabilise the unsustainable food system in Singapore. Further, Smith and Raven (2012) suggest that experiments are fuelled by narratives which can either empower a niche to become a radical innovation or remain competitive under the incumbent regime. To examine the fate of the shared food growing niche in Singapore, niche building processes are explored, giving attention to processes such as visions and expectations; social networks and learning.

5.1.1. Vision and expectations

In SNM, expectations are important for setting up a clear vision that is shared among many actors (Raven, 2012; Kemp et al., 1998). In case of the Social Enterprise, expectations are developed around their goal to create a network of community farms along the community supported agriculture model, to contribute towards local food security and empower disadvantage Singaporeans by "providing jobs for vulnerable populations" (*Employee, 2, SE*). Furthermore, the Social Enterprise seeks to export its farming model to neighbouring countries, fostering an open source social innovation model that is made in Singapore and diffused internationally:

"I feel that a way to scale fast [the community farm] the open sourcing is the best. Open sourcing the model to countries that are working with local urban farming institutions is potentially how we would like to spread. It needs to drive a movement again. It needs to be many people doing a model that is then proven and tested."

(Founder, 1, SE)

There are also expectations around the shared ownership of ideas, actions and space, often lacking in the corporate-led work culture in Singapore. This was illustrated through fieldwork conversations that identify the Social Enterprise as a "learning space for everyone" (*Employee, 5, SE*) where "[we] come together, share the resource, share experience, share conversations" (*Employee, 6, SE*). Key regime actors such as governmental agencies, view the Social Enterprise as an

exemplar of citizen action (albeit state-supported) that brings community together through shared growing and cultivates sustainable social relationships with a larger food community.

For the Collective, expectations have been forming organically through participation by a range of civil society actors. In the interviews, founders and participants expressed confidence in fostering a "space for gathering" for those who are interested in supporting "local growers, local farms, or those who grow food on their own … integrating food sustainability to local milieu" (*Participant, 3, C*). In its organic and decentralized structure expectations evolve through different methods for engaging people in knowledge sharing practices, such as garden visits, cooking together and sharing food related stories online. Despite the lack of a clear vision as mentioned in an interview with one of the founders, the Collective is being recognized amongst environmental groups as "one of the few organisations that looks into aspects of food sustainability research, activism or advocacy" (*Founder, 2, C*). However, such alignment is not always welcomed:

"I don't like to use the word 'activist' because the traditional definitions of activism are usually affiliated to confrontational politics […] basically illegal acts. Which I think in the context of Singapore is either not – what's the word to use? – it's clamped down by the Government, number one, not effective, and does not have any broad appeal by the public. So, in essence the public is not ready for confrontational politics"

(Founder, 2, C)

This negative perception of activism pervades public life in Singapore making it more difficult for the Collective to articulate their expectations, set up the shared vision and imagine a future of more radical actions for sustainable food transitions.

5.1.2. Network formation

Transition scholars stress the importance of the involvement of new actors in strengthening the capacity of niche building processes; often known as network formation (Smith and Raven, 2012; Schot and Geels, 2008; Kemp et al., 1998). In both the Social Enterprise and the Collective, network formation takes place through a snowball process. First, collaborations are initiated with informal groups and individuals interested in local food production, and then by deepening the engagement with networks of organisations, private companies and stakeholders, such as restaurants and hotels, social services including retirement homes, educational and community centres and governmental agencies.

For the Social Enterprise, network formation is key to scaling up productivity and fostering Kampong spirit. As mentioned by interviewees and experienced during participant observation, this networking is mostly directed upwards towards governmental agencies and established businesses:

"There's a lot of challenges […] finding space, finding people that want to help us. Not volunteers, but big people, like big brands here in Singapore. […] I think we've been working with the Government and we've been successfully helped with a few brands here, with a few companies here […]"

(Employee, 3, SE)

Networking upwards with big brands was enabled by a strategic partnership with a food and beverage company through which the Social Enterprise gained access to restaurants and businesses willing to share underutilized spaces for food growing purposes. Collaboration with social service organizations for people with disabilities led to a social entrepreneurship award, mentorship from established social impact foundation and further networking opportunities with social venture capital investors.

The Collective meanwhile has built its network with less strategic partnerships and more collaborative engagements with individuals and informal interest groups, such as community gardens, dumpster diving

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[5] The Residents' Committees (RCs) were introduced in 1978 to promote neighbourliness, racial harmony and community cohesiveness amongst residents within their respective RC zones in Housing and Development Board estates. Run by residents for residents, RCs also work closely with other grassroots organisations like the Citizens' Consultative Committees and various government agencies to improve the physical environment and safety of their respective precincts.

and zero waste communities. It focuses on networking horizontally to other interest-driven groups through participatory activities such as workshops, social gatherings, exhibitions and festivals. These are often discussion-based events with food acting as a social agent that brings Singaporeans with different ages, professions and cultural backgrounds together. Informal exchanges such as barter and gifting are part of the gatherings, in which plants and seed swaps are meant to empower participants to start collaborations around growing together and share spaces for food growing. The Collective has also developed strong bonds by networking through volunteering with important actors in the food sharing landscape such as the farming campus Ground Up initiative and the Food Bank. These actors are frequently mentioned in the interviews and user engagements in reference to shared values such as local sustainability, food waste reduction and sustainable lifestyles. The Collective has also been given attention through platforms that connect actors who work in broader environmental and social justice fields, such as Green Drinks Singapore and Nature Society.

5.1.3. Learning

According to Kemp et al. (1998) niches revolve around interactive learning processes aiming at improving everyday operations and strengthening network formation. Schot and Geels (2008) distinguish between first-order learning that is referred to accumulating facts, data and lessons, and second-order learning focused on alternative ways of valuing and supporting the niche. Given the fact that both initiatives have relatively underdeveloped and hybrid organizational models, the learning processes observed during the fieldwork were aligned primarily to first order learning. Learning happens via collective processes and is performed either via learning by doing (trial and error to solve problems as they arise) or learning with others (by interacting with partners and community).

In case of the Social Enterprise, learning has focused on setting social directions, developing technical aspects and new financial arrangements (Raven, 2012). For example, in order to access farming knowledge and to develop a social mission that aligns with the state narratives of Kampong spirit, the Social Enterprise spent considerable amount of time engaging with various partners. These included corporate-run food and beverage company that was able and willing to share office space and administrative support with the Social Enterprise; public institutions that work with the Social Enterprise to develop a work curriculum for young adults with disabilities; and other commercially orientated agriculture partners who are the main providers of aquaponics, climate controlled containers and hydroponics. The partners provide the growing systems while the Social Enterprise "can synchronise how the social side of things could benefit urban farming" (*Employee, 3, SE*). The interactions enabled the Social Enterprise to solidify the design of the farm and speed their productivity by launching weekly veggie bundles with a learning mission to teach Singaporean customer about the benefits of locally produced "fresh, healthy, safe, and organic" food (*Employee, 4, SE*). The benefits of learning for the Social Enterprise are explicitly articulated as "collective wisdom" and "sharing of alternatives" (*Employee, 5, SE*), but by interacting with commercial partners in the food growing scene, the Social Enterprise is also positioning itself at the forefront of innovative hi-tech agricultural projects that are part and parcel of the governments vision for the future development of the city-state.

For actors in the Collective, learning is focused on "new perspectives and new understandings" (*Founder, 1, C*), rather than strategically articulating end-learning goals. In this sense, new knowledge production is formed through everyday interaction amongst participants, and rising awareness about alternative practices of food growing, such as how to build do-it-yourself food growing systems in the space of the balcony. The collective learning is embedded in small-scale participatory experiments enhanced by the use of ICT tools such as Google maps and social media platforms. For example, WordPress and Facebook are used as learning conduits to virtually connect actors in the food chain that,

previously tended to work in the isolation. Online crowdsourcing maps of locally grown food, and compost exchanges give visibility to alternative food practices in Singapore and connect food growers and composters. As one interviewee commented, these small-scale experiments are "bringing people together through different aspects of food [such as food growing and food wastage]" (*Participant, 4, C*). ICT is an important tool for building this knowledge community (Bach and Stark, 2005) in which learning goes beyond the often-constrained understanding of civic space in Singapore (Sadoway, 2013).

Most importantly, the Collective sees learning as a space for reflexivity (Raven, 2012); to question, discuss, compare and think through sustainable alternatives to local foodscapes. Workshops, guided tours, and social gatherings organized by the Collective in which participants engage in the acts of questioning everyday food related habits around growing, eating, shopping, and wasting food:

> "[The Collective] is really about teaching people metacognitive skills to interact with each other but also to interact with the environment and to make sense of things, not just take everything for granted."

> (Founder, 2, C)

6. Benefits and limitations of SNM approach in Singapore: Transitions without confrontations?

The findings of the fieldwork presented in this paper are significant for transition tools such as SNM and scaling potential of shared food growing projects as a form of grassroots niche in nonWestern contexts (Wolfram, 2016). SNM was useful to highlight the social dimension as a driving force for niches to develop competences (MacCallum et al., 2009), articulate needs and soft skills while avoiding exclusion (Avelino, 2009), negotiate roles, identities and practices (Moulaert et al., 2009), and foster collaborative actions to develop shared expectations and reflective learning (Seyfang and Smith, 2007; Raven, 2012). The limitation of SNM is the lack of attention given to the exogenous factors such as place specificity, power and politics, which influence niche building processes and undermine SNM assumptions that experiments scale up in a linear way, following logical path (Hargreaves et al., 2013). Singapore's place specificity, shaped by sociopolitical narratives around activism in particular, highlight SNM's lack of attention to socio-political configurations in which niche projects develop.

Reflecting on the Social Enterprise and the Collective, both niche projects are far from what might be considered 'radical' experiments in other socio-political contexts, instead representing consensual attempts to incorporate alternatives within existing regimes. They are more likely to conform to the prevailing socio-political discourses i.e. City in a Garden and Kampong spirit 2.0, rather than calling for an "opening and re-configuring of the regime" (Smith and Raven, 2012:1033). However, such regime-alignments do not come without a compromise, and while the regime-aligned socio-political discourses are instrumental in strategically steering niche building processes, they are also constraining.

For the Social Enterprise, which is the only community farming project in the city-state which has been granted access to land without a competitive tender process, there were expectations that it would rekindle Kampong spirit through community activities. At the same time, the Social Enterprise is also expected to achieve quasi-commercial productivity standards to prove that the community farming model is a profitable investment for the authorities and commercial partners. Arguably, these expectations have steered the Social Enterprise to become a type of agri-entertainment service focused on activities of weekend-volunteerism. This has created the perception of a corporate-run farm that uses slogans of community farming as a way to advertise locally produced food for wealthy expat consumers. Government requirements to foster experiments that adhere to the dominant

narratives of eco-efficiency means that the Social Enterprise has given priority to commercial partners over forming connections with community actors. Consequently, the community farming model was unsuccessful in engaging with other non-commercial initiatives in the shared food growing niche. As a result, the Social Enterprise resembles more what Smith and Raven (2012:1033) consider to be a socially engineered experiment legitimized through state support and socio-political narratives, and seeking to become "competitive on conventional regime criteria".

The Collective, in contrast, has been formed through experiments involving neighbourhoods, households, institutions, and academics, all interested in developing a more radical food movement able to "stretch and transform regimes" (Smith and Raven, 2012:1030). While the co-operation of different actors is still a key factor for its niche building processes, it is the self-organization of citizens that shifts the action from strategic steering to collective reflexivity. This differentiates the Collective from other forms of community-driven initiatives in Singapore often associated with "activities that are deemed civic, cultured, and civilised" (Lee, 2002:102). As mentioned in the interview:

"Most things in Singapore can be done very effectively top-down because we have a very effective government machinery. For civil society organisations, this is a lost opportunity for any form of advocacy. Here, you always need political support, be it for climate change, be it for food resilience, be it for anything that you want to advocate for."

(Founder, 3, C)

A number of scholars have underlined that transitions are inherently political, and that niches are political spaces that "exercise innovative power collectively" (Avellino, 2017: 509; Avelino et al., 2016). However, there are different styles of politics and socio-political relations which can make it harder or easier for niches to change regimes. In Singapore, this collectively exercised innovative power can be seen as pulsing softly in the tissue of niches in an attempt to increase socio-political awareness; it is primarily a commensal act. On the one hand, regimes are more likely to remain unmodified while acting as a host to innovative niche practices, on the other, niches demonstrate structural and ideological flexibility to obtain support from and acceptance of regimes. In the long term, however, such commensalism can become a mutualistic relationship, in which a niche would co-exist within the status-quo, perhaps scaling up and out to become a key additional player in the regime. Or it might become a parasitic relationship in which the regime would benefit extensively from the niche without the niche having any impact on or influence over how wider transitions occur. As demonstrated by the case studies of the Collective and the Social Enterprise, in Singapore, niche-regime commensalism seeks to build sustainability transitions without confrontation and can be typified by a level of political control towards civil society actors and a lack of counter narratives (such as radical food activism) to the current regime.

Furthermore, socio-political narratives can either protect or exclude niche actors as well as influence their practices. While reflecting on the niche building processes of the Collective, innovation lies in the capacity to produce and share new narratives, sometimes ambiguous and utopian, that can create new civic spaces for radical change both on- and off-line. Thus, the questions of democratic interaction between political and societal structures is an important aspect of transitions in Singapore. However, exogenous factors can suppress sites of grassroots transitional potential (Markard et al.,2012), and radical change might well need strategic manoeuvring. In Singapore, collaborative activity enabled with ICT is creating a "space for the transition (…) from both the bottom-up and top-down, simultaneously" (Jurgilevich et al 2016:4), as it offers incubation spaces for confrontations to be safely voiced, engaged with and negotiated by diverse niche actors in shared food growing.

7. Conclusions

Responding to the calls for more productive links between research on food systems and sustainability transitions (Hinrichs, 2014), this paper contributes to transition studies around food systems by examining shared food growing niche activities in the specific socio-political context of Singapore. This research found that transition frameworks developed and primarily applied in Western contexts and market based innovations are relevant when interrogating grassroots sustainability transitions in Singapore. However, Singapore's unique socio-political context including its strong government presence presents significant challenges to developing radical socio-technical transitions that diverge from regime narratives. This was clear when examining the niche building processes of the Social Enterprise and the Collective and their differential capacities to gain policy and support of other niche actors to scale-up. Thus, the key transitions terms such as 'radical innovation' requires rethinking with respect to place, power, politics, when performing SNM analysis of grassroots niches. Ultimately, it has been argued that despite niche-regime commensalism, shared food growing can contribute to sustainability transitions in Singapore given its demonstrable ability to foster social innovation. However, questions are still outstanding: Can state-supported niches achieve the required level of transformation without radical deviation from current regimes and the potential confrontation that could demand? Also, will citizen-led projects be able to continue their self-organizing activities beyond the state through the mediating spaces of ICT? Answering these questions requires longitudinal research to build on the data developed in this paper, but to date there is reason to be optimistic that the relatively accessible and unpoliced spaces created by ICT have potential to foster innovation, radical or otherwise, and ultimately retain the potential to challenge regimes. So, while the paper has broadened the 'visibility fields' around sustainable food transitions (Spence and Rinaldi, 2014) in Singapore, further research is still needed to fully explore judgments about the sustainability credentials of niche activities that are made both by the state, citizens and by the initiatives themselves.

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