J Sociology Soc Anth, 9(2): 38-48 (2018)
DOI: 10.31901/24566764.2018/09.02.286

Community Gardens as Multipurpose, Technological Systems

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KEYWORDS Actor Network Theory. Behavioural Archaeology. Ethnography. Health. Social Entropy Theory. Sustainable Development Goals

ABSTRACT This paper introduces the notion of community gardens as multipurpose, technological systems with dynamic boundaries. It also strives to revise the notion of food security and health in regards to such systems. This is a cross-cultural project where twelve community gardens located in urban regions within three different countries were examined. This paper explores common tendencies rather than diversities or differences. The paper describes a behavioural chain that depends on various factors and affects various types of health. It is suggested that a community garden has the potential to serve as a link between the past and the present. While a community garden may provide food, it is suggested that it may also encourage social interactions, knowledge sharing, and relaxation. The cultivation of food occurs, but it may not always be the sole purpose.

INTRODUCTION

A community garden is a physical construct that encourages urban agriculture, citizen participation, cooperation, and social involvement. Community gardens as a mixture of material and social culture have been proven as crucial for health, both in terms of social well-being and in regards to food security. In effect, to summarise the literature, community gardens can be understood as unique societies or even as multipurpose, technological systems in their own rights. What motivates an individual to engage in community gardening? This is important to examine, especially in consideration of the UN Global Goals for Sustainable Development, like its Zero Hunger (#2) and Good Health and Well-being (#3). To understand whether community gardens can be a place for meeting these goals, we must consider their characteristics, performance, and the nature of their appeal. For the purposes of this study, home gardens and allotments are included in the definition of community gardens.

The aim of this paper is to encourage initial notions of community gardens as multipurpose, technological systems with dynamic boundaries. It also strives to revise the notion of food security and health in reference to such systems. The foci of relevance are on individual and collective actions rather than a consideration of the individuals' thoughts of actions. That is to say that this study refrains from discussing actors' intentions to instead focus on their actions. While the aim of the study is descriptive, it is also contextual in that it is striving to socially describe the nature of a community garden.

Technological Systems

To understand a community garden as a technological system, we need to define technology as a term and a concept and examine how it might play a social function as well. 'The rapidly growing literature on the nature of technological innovation and its relation to other activities is largely rubbish because so few of the relevant concrete facts have thus far been ascertained' (White 1962: 486). Apparently, according to White, in 1962, there was a lack of clear purpose regarding why a technological innovation should be used at all. Schiffer (2004) has noted a similar lack of comprehension 40 years later. Now, in 2018, we are more aware of technologies and the importance of their innovations, or perhaps, not.

Some people award a specific definition to 'system' (Betz 2012; Huber 1979; Shaw et al. 2018; Zeyringer et al. 2018) assuming that a system and technology are two distinct phenomena, which, however, interact. For instance, it has been suggested that a system uses or needs technology to perform its tasks (Shaw et al. 2018;

Zeyringer et al. 2018) Others would suggest the character of technology is not value-free but instead is social in nature (Noble 1986; Misa 1988; Drucker 1959; Schiffer 2002; Laitinen and Valo 2018). Winner clearly argued this when suggesting that technologies have politics. Technology has been understood as a process (Bleed 1997; Wei et al. 2017), and it has even been described as 'the selective adaptation of one or more of the processes and materials identified' to serve the social evolution of humans. This would represent a means to their ends, to which contemporary philosophers even refer to as the non-material as technology (Watson-Watt 1962: 386-387). Technology may be understood as the means of work and the means of human activity developing within a system of social production and social life. The means of work becomes technology only within a system of social production (Zvorikine 1962: 443). Schiffer (2002: 1148) touched upon this concept when he suggested that technology happens when people 'create variability and change in the human-made world of thing'. A similar notion of the term system has been suggested namely, that it is a process or even a series of combined processes (Cumming and Peterson 2017).

To socially express what happens in a community garden, we may redefine Krylov's (1986) definition of formal technology. Actually, Krylov recalls the sense of a whole system, not only primitive technology. For these purposes, therefore, technology is a technological system and represented by a T. A technological system has one set (A) that includes the material culture, and another set (F) that includes the social culture. What is important as well as crucial for T to be considered meaningful and even to become technology at all is the reciprocal nature of A and F. Without this relationship and connection, T would not be defined as a technological system. A and F contain a number of elements. The elements to be executed upon are named $\{a_0, a_1, \ldots, a_n,\}$ and the elements executing the operations are named $<F_1, F_2, \ldots F_m>$. In everyday life, we would refer to F as humans, individuals, and perhaps, members or organisations, depending on the level of analysis. Both of A and F have in certain contexts been referred to as dynamic actors with social or material capabilities or skills that either can position in concert, as is suggested in the actor network theory, for instance (Greenhalgh and Stones 2010; Dee et al. 2017). Also, they may demonstrate unequal power relations and illustrate the complexity of community gardening (Ghose and Pettygrove 2014a). Note that material culture can also be an actor as well. That is to say that a technological system (T) consists of two sets, namely $T = <A, F>$, which includes non-human actors (A) and human actors (F). One set holds elements $A = \{a_0, a_1, \ldots, a_n\}$. The other set includes the individuals conducting the operations $F = <F_1, F_2, \ldots F_m>$. The effect of an operation is named $F_i = F_i (x, \alpha) \rightarrow <y, \beta>$. The collection of elements is named $x_1, x_2, \ldots, x_s$, and the collection of the parameters of an operation and its result are named $\alpha = \alpha_1, \alpha_2, \ldots, \alpha_p$ and $\beta = \beta_1, \beta_2, \ldots, \beta_r$.

A notable difference with Kyrlov's definition and the one proposed here is that F does not exclusively execute technological operations onto A, but the case can also be reversed, which is an important distinction. Earlier, the researcher suggested a material culture could be an actor as well. Another difference that is important to emphasis is that while Krylov focused on elements of informational nature, the researcher address those aspects of a material nature.

From these set of rules, we can understand that a jointly crafted activity by two actors, one human (for example, a member) and one non-human (for example, a sugarcane press), results in several sub-activities, each with their own capability to yield further operations and results, and ultimately, consequences. These consequences can result in various social changes with immediate or long-term impacts. Sometimes, the consequences are a result of previous social changes as in a jointly crafted action performed by the actors. What we also can understand is that technology, as defined in this way, includes both social and material tools, preconditions, action, performance, results, and consequences. Therefore, it is reasonable to consider technology as technological systems with a variety of purposes. A technology alone is just a piece of something or anything that possesses no context and no use at all. The most interesting element in the context of community gardens is what happens when human actors manipulate technology and nature since humans systematically and purposefully manipulate nature and the material world with technology. Nature, in turn, inspires the development of more technology, which allows more nature to be manipulated (Betz 2012: 86; Roland 1992; Drucker 1959),

and the cycle repeats. Roland suggested that technology is 'the process of applying power by some technique through the medium of some tool or machine to alter some material in a useful way' (Roland 1992: 83). Roland also suggested that these components do not address technological change. Although the researcher would tend to agree, provided that we do not limit these components to physical material, the researcher will offer an alternative view of the two static components of tool/machine and materials than those that Roland discussed. Bleed (1997: 99) illustrated the manipulation of nature and its results or the action of "doing technology" as part of several activities within its related contents and results.

One way to enhance Bleed's explanation is to make clear the nature of the "technological system." This is because Bleed's related components included in the model can be referred to as a technological system with no clear boundaries. Why no clear boundaries? Bleed's model also included consequences from "doing technology." The question remains whether these consequences are part of or should be part of the system or not. The question may seem trivial since we might want to separate them in everyday life. For instance, we complete the actions or operation that we think we are supposed to do, and then, we move on. Such a thinking also means that we consider the rest of the actions as being someone else's responsibility. Let us say, we choose to employ certain technologies, systematically, such as a sugarcane press, to perform some of the necessary tasks. If we do not design the sugarcane press to handle or address either collateral causes activities, such as refilling, or environmental modification, such as hazards, we either need another technological system to address those additional issues, or we must decide to leave the situation as it is. This is also another way of thinking about a system's performance characteristics (Schiffer and Skibo 1987).

Health

Health has been suggested a 'state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity' (WHO 1946). The issues in the previous quotation aim to understand the term of health in its broadest sense. 'Health' is explained as how healthy the technological system is; for example, its ability to address issues within the environment or a society that might be foreseen after the designated tasks are performed would determine how healthy the technological system is considered to be. However, 'health' can also be discussed as the well-being and what these technological systems may do for a human actor's immediate or long-term state of health. Therefore, 'health' is a broad, complex concept and phenomenon, and we may want to explore the distinct levels at which it may be examined. Following Bailey's (1984) three-level measurement model, health at the conceptual level (X) could be empirically formulated as the occurrence of obesity among certain group of people (X') or the intake of a certain food among individuals. Using certain methods, we can then indicate the prevalence of health in a community garden (X''), which we understand as evidence of a social change. We may further suggest a social impact upon this social change, which will form an additional 'new piece of information' (Bailey 1984: 239).

To exemplify, consider the findings of Gatto (2012), whose study focused on nutritional education (X) among adolescents (X') . A certain number of adolescents participated in the education (X''), which is further likely to yield a particular social impact upon their health, for which we may want to assign triple prime (X'''); this is not illustrated in the figure. However, this would allow us to consider the social change, the change in attitude that resulted from the education, and its social impacts upon health (for example the better objective health that resulted from the consumption of more vegetables). However, there are also potential ecological modifications and social or political arrangements that result as well.

METHODOLOGY

Researchers posit various definitions of the term "ethnography", referring to it as a philosophical paradigm, approach, commitment, or a method (Atkinson and Hammersley 1994; Hallberg 2014; Rapp 2017). One view of ethnography is the writing about and studying of people, understanding culture as an integrated system with various elements (Angrosino 2007c; Majoor 2017; Roux et al. 2017). In this study, ethnography is understood to be a perspective with

methods and is characterised by "doing ethnography". This study recognises people's cultural values and behaviours that encourage them to do good (LeCompte and Schensul 2015). Conforming to an ethnographic perspective in this study meant implementing data collection techniques on the conditions at the local level and an understanding that this might have implications at the national level as well. It also meant a regard for the participants as collaborators and actors within the research. For this study, ethnography means having an interest in exploring the nature of the social phenomena at hand, including not only the human and non-human actors, but also the material and social culture that may have implications for the study. This study did not aim to test hypotheses about the phenomena (Atkinson and Hammersley 1994).

A cross-cultural project targeting the UN Sustainable Development Goals of the 2030 Agenda for Sustainable Development, including Goal number 2, Zero Hunger (UN 2017) was used as a soft case (Braa and Vidgen 1999) following the philosophy of ethnography and by using tools such as unfocused, focused, and direct observations, storytelling, open-ended discussions, and video (Jorgensen 1989; Angrosino 2007a; Angrosino 2007b). Twelve community gardens located in urban regions within Venezuela, Kenya, and Sweden were chosen using a convenience sampling (Fig. 1). Although these three countries are diverse in many respects, this paper aimed to examine common tendencies rather than diversities or differences. Regarding a community garden as a society the unit of analysis was at the macro level with implications at the other levels as well.

A community garden can be understood as a society in its own right. To illustrate this, Bailey's (1990a) social entropy theory (SET) can be used as an analytical model to describe the nature of a community garden and its appeal. Analogous with Bailey, this paper paid attention to three key elements, which are concrete system, empirical boundaries, and entropy. For Bailey, SET is a theory that can be employed to model a society. This model is in no way as complex as an actual society, as Bailey noted. Neither the simplification used in this paper nor the full model are sufficient to demonstrate the actual complexity. However, it is still possible to grasp an understanding of how the community gardens function 'on a day-to-day basis' in regards to macro- and micro-variables and their

Fig. 1. The community garden "Tillsammans" ("Together") in Mölndal, Sweden
Source: Author

interactions to form a better comprehension of the functioning whole (Bailey 1990b: 365-366) by means of the model. Explaining in detail the SET falls outside of the scope for this paper. One can refer to Bailey (1990a) for a more thorough description and definition.

The Nature and Appeal of a Community Garden

Space

In the same way that tools employed by archaeologists on certain sites have an 'orientation towards the human body (Edgeworth 2010: 139), a community garden as a sociotechnical construct is a conscious amplification of human capacities (Frankenfeld 1992). A community garden is a physical construct located in an urban environment, a space, when employing Bailey's (1990b) macro sociological perspective. It possesses several reciprocal, functional components, where material life and social life must ecologically coexist[2]. Although the literature is encouraging concerning the health benefits (X'') that result from community gardening, health concerns, which will be referred to as X''', such as those derived from contaminated soil or other activities, have also been noted (Ashrafzadeh et al. 2018; Laidlaw et al. 2018; Kim et al. 2014; Kessler 2013; Mikulec et al. 2013).

Paralleling the view of Ghose and Pettygrove (2014b), in the researcher's project, they understood these gardens as spaces that have the potential to counteract material and economic inequities and to provide green space access for inner-city residents, which have implications for the participants' well-being. Morckel (2015) empirically examined the perceived attractiveness of community gardens in comparison to that of vacant lots. Attractiveness as an empirical occurrence, when someone finds something attractive, can affect our stand (X''). Sometimes, various circumstances, such as how attractive an object is perceived to be, can be said to influence the overall state of health (X'''). Since community gardens in Morckel's study were perceived as more attractive than vacant lots, we may assume that a community garden has the potential to enhance the feeling of well-being among participants. This means that turning vacant lots into community gardens (X'') may have a positive social impact upon health again. Attractiveness and its effect upon health may therefore be described as the relation between X_1 and X_2 or between F and A assuming that attractiveness is part of material culture and this impacts upon the social culture. This view, to some degree, draws attention to Lillis' (2013) empirical objects. Lillis' empirical objects differ only slightly from the definition proposed by Ingeborgrud (2017). Ingeborgrud (2017) sees these empirical objects as actors that can be either physical, material culture, or mental objects, such as thoughts or intentions. To this, we should add that a human actor may also be understood as an empirical object (Kraus 2018). The concept of attractiveness does not physically occur. It is instead naturally occurring as a mental state; namely, a human actor perceives something to be attractive, which is propositional attitude and a mental state. This implies that the concept of cultural awareness is naturally occurring as a kind of knowledge (Pernu 2009; Langegger 2013). It also implies that the "something" still is a kind of material culture that blends with mental culture. What it also means is a shift from the material as the necessary focus of relevance to a blended interest in the social and mental culture and their relationship to the material culture (Ruttan 1988).

Outsiders extend the boundaries of the community gardens, which makes the determination of its actual space or boundaries a challenge. To this, we must add that the location at which the system has been constructed and developed indeed bears political significance, which is commonplace for the initiation and administration of super technologies (Kay 1994; Winner 1986).

Within these community gardens, members and sometimes even visitors interact and participate. Based on the researcher's study, often, these members and visitors come from a middle-class environment and have an agricultural tradition and/or consider gardening a secondary activity, not only meant for supplying food. They engage in gardening for sociocultural or ecological reasons or simply for relaxation.

In order to ensure a stable or organised, low entropy community garden or system, a leader is necessary (Subica et al. 2016; Cvejic et al. 2015; Lombard et al. 2014; Litt et al. 2011; Twiss et al. 2003). Although a garden is a system with physical boundaries, the members acknowledge other neighbouring systems as well and believe that their actions and sharing their knowledge bene-

fit society, making the boundaries more symbolic and social, too.

One of the members in the researcher's study narrates how she was searching for a plot in the city to keep her ancestors' agricultural tradition alive. A friend of hers recommended joining a community garden, and in so doing, she believes she found her inner self in a way again. The way in which this woman narrates the story draws attention to Schiffer's (2002) framework for studying instances of technological differentiation. It also draws attention to the socio-economic and political nature of this transfer (Hensengerth 2018). Schiffer's framework can be employed for understanding the functional components of the built environment and the interaction of sharing information and knowledge between social and material life. Schiffer focused on what happens when technologies are transferred from community to community within and among societies. Reich (2007) referred to the use of digital technology as a showcase for understanding archaeological or geographic scenes. In the researcher's study, the same technologies were used to attract people online to encourage a physical attendance.

Such a transference may be conducted by the gardeners, who are technological citizens who define the boundaries or spaces of the community gardens by their social effects and who govern themselves in regards to rights and responsibilities (Frankenfeld 1992). Once again, a leader is important. Embracing Frankenfeld's (1992: 462) 138-word definition of 'technological citizenship', we may suggest either that Frankenfeld complicates matters or that things bringing together non-human and human actors is indeed complex. In fact, we may be technological citizens of 'things' at the human scale or global scale or even somewhere in between.

Information, Knowledge, and Technology

In Bailey's writing, information and knowledge has a clear connection to technology. Technology is a basis for information and knowledge and vice versa. We often award information and communications technologies (ICT) a specific position by putting them in another category other than information technologies or the general term of technology in archaeological terms. These ICTs, like mobile devices and so-called smartphones and smartwatches, or less mobile devices, such as smart refrigerators or smart/intelligent homes[3], are for many of us more than a digital device. It is for many of us not a lifestyle, but it is in fact simply how we understand life.

Perhaps, we may refer to a community garden as a techno community, where human actors take part in activities 'that incorporate variants of a particular technology' (Schiffer 2002: 1149). In so doing, information and knowledge can be shared and exchanged. Also, this applies no matter whether we are referring to technologies in the broadest sense or in regards to particular ICTs.

A community garden is a multipurpose, technological system. Material objects are life since human and material culture have a concrete interaction, and both have lifecycles. Within a community garden, certain sub-systems are necessary for it to function, such as access to water (Parry et al. 2005; Puett et al. 2014; Harris et al. 2014; Twiss et al. 2003). There are, however, subsystems that may be unnecessary, yet still add value and even decrease the necessity of labour while also contributing to a sense of overall well-being. One example from the researcher's study is a "*chakki-chak*" (Fig. 2) from the Mi Conuco 86, which is located in the capital city of Caracas, Venezuela. A 'conuco' is a small plot of land devoted to the cultivation of food. Mi Conuco 86 started as a collective and has attracted members of the surrounding communities of all ages and walks of life.

A *chakki-chak* is a homemade sugarcane press or juice extraction system, which is a subsystem in this case, wherein stalks are crushed to retrieve the sugary juice. The system consists of housed components that interact in a specific way and can be either electrical or mechanical. The one pictured in Figure 2 is mechanical. The way in which the leader developed it and employs it confirmed Giampietro's statement (1997) that with technological choices in agriculture, the community leader likely had several choices to make concerning how to go about developing the system, in regards to quality, performance characteristics, and material, while still creating a product that conforms to his vision. His choice, however, is based on his experiences and knowledge in terms of history and geography. The leader also made a choice based on the necessary maintenance and lifecycle, which is referred to as its social and ecolog-

ical sustainability, among other things. Using this knowledge as a strategy, he had a feeling of how the sub-system's behaviour would interact with other surrounding materials. By discussing with the community leader, we can understand how important it is for him to have a dialogue not only with the members, but also about the materials and ecological objects available. Considering his experience, we may assume that he made a choice based on usability. We can understand some of his thinking or mental images on the conceptual level by looking empirically at the *chakki-chak* since it is mechanical and wooden, which means that it was built using available materials. By further scrutinising the process of developing the *chakki-chak*, we can describe the manufacturing process and grasp, at an empirical level, how healthy the development was for the engineer and for the other members that were directly or indirectly involved. What we cannot understand, regardless of looking at the sub-system or asking the developer, is the measured health effects, which are indicative either of direct or indirect social impacts.

This *chakki-chak* is used as a single purpose system. In contrast, the sugarcane bagasse has been used for various processes in other systems, such as in clay ceramics (Faria and Holanda 2013) suggesting that this community garden could use their sugarcane bagasse ashes in ceramics. Doing so would contribute to an alternative life cycle of the *chakki-chak*, as well as of the system of which it is a sub-system.

Thus, a wooden *chakki-chak*, or any sugarcane press for that matter, is an artificial or material construct (a_0) that depends on social culture and can serve a single purpose or several purposes. It is used because material culture, such as sugarcanes, exist, and social actors have come to understand the power of the juice while also wanting to maintain good health by decreasing the necessary labour to obtain it.

DISCUSSION

Behavioural Technological Chain and Level of Living

This paper has described a behavioural chain that depends on various factors, and one that affects all three types of health. Since human actors and social culture depend on technologies and each other, we can assume that the indicative level of health also depends on non-human actors or material culture. Empirical and theoretical studies show that a community garden must be seen as a complex physical construct that serves numerous purposes of which securing food is not its primary one. This also means that a community garden, per se, might not serve for meeting the SDG 2.

'Technology is not just a social construct. It is a complex system in which humans construct

Fig. 2. A 'homemade' sugarcane press, called a 'chakki-chak'
Source: Author

artifacts in a context shaped both by the interests of humans and by the underlying physical nature of their artifacts' (Giere 1993: 64). This citation, as well as this study, aimed to define "technology" as more than a primitive technology but indeed a social phenomenon. This study also stressed that material culture can be understood as non-human actors that interact with social actors, which are understood to be human actors. These two sets A and F influence and develop changes, and these changes are separately referred to as elements by $A = \{a_0, a_1, \ldots, a_n\}$ and the operations by $F = <F_1, F_2, \ldots F_m>$, although the name "operators" is misleading. Please also note that Krylov (1986) neither recognises the joint labour performed by the set A and F, nor does he make any distinction between intentional and unintentional joint labour performed by the two sets, which follows logically from omitting the former[4]. This is because they do technology (Bleed 1997) jointly with human actors. This also means that, in the researcher's case, the effect cannot be meant $F_i = F_i (x, \alpha) \rightarrow <y, \beta>$. It would be more fruitful to add the effect $A_i = A_i (x, \alpha) \rightarrow <y, \beta>$ and speak in terms of the sum of the A_i and F_i. In addition, we may also want to understand the sets as actions rather than sets of elements and operators. In addition, Krylov (1986) does not recognise the evolutionary paths of either A and F or of their elements and operators, which is critical in order to understand its performance and characteristics over time (Zhang et al. 2017). The way in which A and F needs to collaborate can be understood in a similar manner as the relationship between technology standardisation and technology development (Jiang et al. 2017). Both of which need to collaborate in concert to perform at its full potential.

Systems, such as a pottery vessel that is a piece of material culture, can be regarded as a technological system since its ability to hold water and its capability of manipulating nature makes it dynamic enough to be considered a technological system. A community garden can be figuratively spoken of as a 'pottery vessel with handles on either side' (Edgeworth 2010: 139), designed to facilitate both the intended actions of a human hand and the biological design or structure of the hand itself. If the design of the pottery vessel is shaped with the human in mind, the material is chosen with the content in mind. Of course, there has also been an 'interaction' between the material and the intended function. Figuratively, a community garden is designed to be purposeful rather than to use specific content. The content, such as the quality of the soil, and the rocks, is more involved than simply 'this happened to be available.' However, what is cultivated is due to neither design nor content; it is the result of a consideration of both, and in turn, this impacts health. We may therefore claim that neither F or A separately stress anything about "design", but their interaction does.

It is suggested that technological systems that could be described as serving a multipurpose, as the once herein, provide a link between the past and the present (Reich 2007; Reid et al. 1975; Roux et al. 2017). They teach us something about social culture and behaviour vis-a-vis the material culture they use or choose not to use.

According to Bailey, a spatial area S is an area that is bounded. From the researcher's study, we learnt that the boundaries are nevertheless unclear and that it would not be accurate to use a term such as boundary at all for that matter. We can also see a challenge with a separate categorisation of information (I) and technology (T). One reason is because in society, digital information and communications technology are cultural elements in their own rights. They are not only used to communicate with others, but they also represent who we are, what we stand for, and how we want other people to recognise us. We would therefore need to consider whether we need another category and symbol to represent these elements. As suggested elsewhere (Hallberg 2014), a limitation for the use of categorises is related to the world of culture. Nature is simply too complex to be strictly bound to either concepts or terms in a static way. We may reasonably ask how valid such a picture of society is and whether only one picture can be accurate. As with artificial systems in general, a community garden as a multipurpose, technological system needs to be capable of a flexible readjustment to handle various challenges dynamically (Krylov 1986).

While the level of entropy has not been specifically measured or calculated in this study, we can undoubtedly conclude that entropy is high in the studied community gardens. The lack of clear boundaries is one argument to support this statement. Also, the amount of freedom of choice

in how to use and how to set up the community gardens makes the use of them unpredictable. This also means that the term "organised" is vague. Mathematically and from the perspective of the non-human actors, we could probably argue that a community garden is a disorganised, physical construct. From the perspective of how the human actors employ such a vocabulary in everyday speech, however, we would rather suggest the contrary. Drawing from Weaver (1964: 13) we may suggest that "this situation is highly organised, we have the freedom to set out visions and policy and make choices according to our needs." For, in everyday life, we tend not to measure the degree of being able to organise mathematically or logically, but rather egocentrically. This is one of the reasons why the level of entropy will remain high and the level of being a place for food security may vary amongst community gardens.

Following Hodder (2011), the indicative level of health depends on what types of behavioural chains arise from this interactions between members, artefacts, and things that employ certain technologies both inside the community garden and outside of it. Whether we make use of material culture as intended, augment its characteristics (Kay 1994), redesign it (Schiffer 2002), or discard the original intended use altogether, we must also understand the point or stage in life at which a human actor started his/her journey (Zick et al. 2013).

CONCLUSION

The UN Goal number 2 for Sustainable Development reads zero hunger. Although the community gardens in this study have a realistic potential to increase the access to nutritive food, this study found it doubtful to suggest that they can serve as a means to end hunger and achieve food security. Providing improved nutrition and promoting sustainable agriculture is however a partial goal the community gardens met.

RECOMMENDATIONS

Implementing the use of community gardens as part of a governmental vision would probably be counterproductive. While the entropy would be lower it would cost in terms of social engagement and pleasure, not to mention the aesthetics. Perhaps, the leader, which the literature agrees on being important, should take responsible for moving towards a more inclusive direction. That is, for a community garden to meet the SDG number 2, it must be easier for people with diverse backgrounds to gain access and knowledge about the existence of a community garden and its capacity in terms of socio-economic factors and potential including securing food.

While we still understand these gardens as spaces that have the potential to counteract material and economic inequities and have positive impacts for the participants' well-being, a "for-all"-vision is still nothing but a vision.

Before measuring health, we must learn how the social actors employ, design, connect, and interlink aspects of the garden. In this way, we can cope more easily with technological developments where social and material life coexist and foster healthier behaviours without compromising native relics.

ACKNOWLEDGEMENTS

The researcher thanks all participants and collaborators of the study. The study was supported by the Swedish International Agricultural Network Initiative, SIANI.

NOTES

1 I am aware of this error, as it should have been X_1, X_2, X_3, … X_N. However, I want to examine the effects at the level of each individual group.
2 Although the term used is 'macro', Bailey's framework can be suitable for the study of events at various levels, provided they also have implications at a macro level.
3 It is somewhat fascinating that we credit them as smart and intelligent. Imagine what people generally think of human actors with the same intelligence.
4 I am aware that this might sound as if sets were homogeneous, which they were not, of course.

REFERENCES

Angrosino M 2007a. Data collection in the field. In: M Angrosino (Ed.): *Doing Ethnographic and Observational Research*. London: SAGE Publications Ltd, pp. 36-53.

Angrosino M 2007b. Focus on observation. In: M Angrosino (Ed.): *Doing Ethnographic and Observational Research.* London: SAGE Publications Ltd, pp. 54-67.

Angrosino M 2007c. Introduction: Ethnography and participant observation. In: M Angrosino (Ed.):

Doing Ethnographic and Observational Research. London: SAGE Publications Ltd, pp. 2-19.
Ashrafzadeh S, Lehto NJ, Oddy G, McLaren RG, Kang L, Dickinson NM, Robinson BH 2018. Heavy metals in suburban gardens and the implications of land-use change following a major earthquake. *Applied Geochemistry,* 1: 10-16.
Atkinson P, Hammersley M 1994. Ethnography and participant observation. *Handbook of Qualitative Research,* 1: 48-261.
Bailey KD 1984. A three-level measurement model. *Quality and Quantity,* 18: 225-245.
Bailey KD 1990a. *Social Entropy Theory.* Albany: SUNY Press.
Bailey KD 1990b. Social entropy theory: An overview. *Systems Practice,* 3: 365-382.
Betz F 2012. Societal dynamics. In: EG Carayannis (Ed.): *Innovation, Technology, and Knowledge Management.* New York: Springer.
Bleed P 1997. Content as variability, result as selection: Toward a behavioral definition of technology. *Archeological Papers of the American Anthropological Association,* 7: 95-104.
Braa K, Vidgen R 1999. Interpretation, intervention and reduction in the organizational laboratory: A framework for in-context information systems research. *Information and Organization,* 9: 25-47.
Cumming GS, Peterson GD 2017. Unifying research on social-ecological resilience and collapse. *Trends in Ecology and Evolution,* 32: 695-713.
Cvejiæ R, Železnikar Š, Nastran M, Rehberger V, Pintar M 2015. Urban agriculture as a tool for facilitated urban greening of sites in transition: A case study. *Urbani Izziv,* 26: 84-97.
Dee L, Allesina S, Bonn A, Eklöf A, Gaines S, Hines J, Thompson R 2017. Operationalizing network theory for ecosystem service assessments. *Trends in Ecology and Evolution,* 32: 118-130.
Drucker PF 1959. Work and tools. *Technology and Culture,* 1: 28-37.
Edgeworth M 2010. Beyond human proportions: Archaeology of the mega and the nano. *Archaeologies,* 66: 138-149.
Faria KC, Holanda JN 2013. Thermal study of clay ceramic pastes containing sugarcane bagasse ash waste. *Journal of Thermal Analysis and Calorimetry,* 114: 27-32.
Frankenfeld PJ 1992. Technological citizenship: A normative framework for risk studies. *Science, Technology and Human Values,* 17: 459-484.
Gatto NM 2012. LA sprouts: A garden-based nutrition intervention pilot program influences motivation and preferences for fruits and vegetables in Latino youth. *Journal of the Academy of Nutrition and Dietetics,* 112: 913-920.
Ghose R, Pettygrove M 2014a. Actors and networks in urban community garden development. *Geoforum,* 53: 93-103.
Ghose R, Pettygrove M 2014b. Urban community gardens as spaces of citizenship. *Antipode,* 46: 1092-1112.
Giampietro M 1997. Socio-economic pressure, demographic pressure, environmental loading and technological changes in agriculture. *Agriculture, Ecosystems and Environment,* 65: 201-229.
Giere RN 1993. Science and technology studies: Prospects for an enlightened postmodern synthesis. *Science, Technology and Human Values,* 18: 102-112.
Greenhalgh T, Stones R 2010. Theorising big IT programmes in healthcare: Strong structuration theory meets actor-network theory. *Social Science and Medicine,* 70: 1285-1294.
Hallberg D 2014. *Lifelong Learning: The Social Impact of Digital Villages as Community Resource Centres on Disadvantaged Women*. PhD Thesis, 178. Kista: Department of Computer and systems Sciences (DSV), Stockholm University.
Harris N, Minniss FR, Somerset S 2014. Refugees connecting with a new country through community food gardening. *International Journal of Environmental Research and Public Health,* 11: 9202-9216.
Hensengerth O 2018. South-South technology transfer: Who benefits? A case study of the Chinese-built Bui dam in Ghana. *Energy Policy,* 114: 499-507.
Hodder I 2011. Human-thing entanglement: Towards an integrated archaeological perspective. *Journal of the Royal Anthropological Institute,* 17: 154-177.
Huber J 1979. Limiting the system and reshaping lifestyles: Solving unemployment by social and technical innovations. *Technological Forecasting and Social Change,* 15: 37-54.
Ingeborgrud L 2017. Visions as trading zones: National and local approaches to improving urban sustainability. *Futures,* 96: 57-67.
Jiang H, Zhao S, Zhang S, Xu X 2017. The adaptive mechanism between technology standardization and technology development: An empirical study. *Technological Forecasting and Social Change,* In Press.
Jorgensen D 1989. Observing and gathering information. In: D Jorgensen (Ed.): *Participant Observation.* SAGE Publications Inc, pp. 82-96.
Kay WD 1994. Democracy and super technologies: The politics of the space shuttle and space station freedom. *Science, Technology and Human Values,* 19: 131-151.
Kessler R 2013. Urban gardening: Managing the risks of contaminated soil. *Environ Health Perspect,* 121: 326-333.
Kim BF, Poulsen MN, Margulies JD, Dix KL, Palmer AM, Nachman KE 2014. Urban community gardeners' knowledge and perceptions of soil contaminant risks. *PLoS ONE,* 9: 1-9.
Kraus KT 2018. The soul as the 'guiding idea'of psychology: Kant on scientific psychology, systematicity, and the idea of the soul. *Studies in History and Philosophy of Science Part A,* (In Press).
Krylov SM 1986. Formal technology and universal systems. *Cybernetics,* 22: 512-518.
Laidlaw MA, Alankarage DH, Reichman SM, Taylor MP, Ball AS 2018. Assessment of soil metal concentrations in residential and community vegetable gardens in Melbourne, Australia. *Chemosphere,* 199: 303-311.
Laitinen K, Valo M 2018. Meanings of communication technology in virtual team meetings: Framing technology-related interaction. *International Journal of Human-Computer Studies,* 111: 12-22.

Langegger S 2013. Emergent public space: Sustaining Chicano culture in North Denver. *Cities*, 35: 26-32.
LeCompte M, Schensul J 2015. Ethics and ethnography. In: M LeCompte, J Schensul (Eds.): *Ethics in Ethnography: A Mixed Methods Approach*. AltaMira Press, pp. 1-33.
Lillis T 2013. The socio-linguistics of writing in a global context: Objects, lenses, consequences. *Journal of Sociolinguistics*, 17: 415-439.
Litt J, Soobader MJ, Turbin MH, Buchenau M, Marshall J 2011. The influence of social involvement, neighborhood aesthetics, and community garden participation on fruit and vegetable consumption. *American Journal of Public Health*, 101: 1466-1473.
Lombard KA, Beresford SA, Ornelas IJ, Topaha C, Becenti T, Thomas D, Vela JG 2014. Healthy gardens/ healthy lives Navajo perceptions of growing food locally to prevent diabetes and cancer. *Health Promotion Practice*, 15: 221-231.
Majoor SJ 2017. Coping with ambiguity: An urban megaproject ethnography. *Progress in Planning*, 120: 1-28.
Mikulec P, Diduck AP, Froese B, Unger H, MacKenzie K 2013. Legal and policy barriers to community gardening in Winnipeg, Canada. *Canadian Journal of Urban Research*, 22: 69-89.
Misa TJ 1988. How machines make history, and how historians (and others) help them to do so. *Science, Technology, and Human Values*, 13: 308-331.
Morckel V 2015. Community gardens or vacant lots? Rethinking the attractiveness and seasonality of green land uses in distressed neighborhoods. *Urban Forestry and Urban Greening*, 14: 714-721.
Noble DF 1986. *Forces of Production: A Social History of Industrial Automation*. New York: OUP USA.
Parry DC, Glover TD, Shinew KJ 2005. Mary, mary quite contrary, how does your garden grow?: Examining gender roles and relations in community gardens. *Leisure Studies*, 24: 177-192.
Pernu TK 2009. Is knowledge a natural kind? *Philosophical Studies*, 142: 371-386.
Puett C, Salpéteur C, Lacroix E, Zimunya SD, Israël AD, Aït-Aïssa M 2014. Cost-effectiveness of community vegetable gardens for people living with HIV in Zimbabwe. *Cost Effectiveness and Resource Allocation*, 12: 1-15.
Rapp A 2017. Designing interactive systems through a game lens: An ethnographic approach. *Computers in Human Behavior*, 77: 455-468.
Reich N 2007. Archaeology. *Current Applications*, 48: 635.
Reid J, Schiffer M, Rathje W 1975. Behavioral archaeology: Four strategies. *American Anthropologist, New Series*, 77: 864-869.
Roland A 1992. Theories and models of technological change: Semantics and substance. *Science, Technology, and Human Values*, 17: 79-100.
Roux V, Bril B, Cauliez J, Goujon AL, Lara C, Manen C, Zangato E 2017. Persisting technological boundaries: Social interactions, cognitive correlations and polarization. *Journal of Anthropological Archaeology*, 48: 320-335.
Ruttan VW 1988. Cultural endowments and economic development: What can we learn from anthropology? *Economic Development and Cultural Change*, 36: S247-S271.
Schiffer MB 2002. Studying technological differentiation: The case of 18th century electrical technology. *American Anthropologist*, 104: 1148-1161.
Schiffer MB 2004. Studying technological change: A behavioral perspective. *World Archaeology*, 36: 579-585.
Schiffer MB, Skibo JM 1987. Theory and experiment in the study of technological change. *Current Anthropology*, 28: 592-622.
Shaw H, Ellis DA, Ziegler FV 2018. The Technology Integration Model (TIM): Predicting the continued use of technology. *Computers in Human Behavior*, 83: 204-214.
Subica AM, Grills CT, Villanueva S, Douglas JA 2016. Community organizing for healthier communities. *American Journal of Preventive Medicine*, 51: 916-925.
Twiss J, Dickinson J, Duma S, Kleinman T, Paulsen H, Rilveria L 2003. Community gardens: Lessons learned from California healthy cities and communities. *Journal Information*, 93: 1435-1438.
UN 2017. Goal 2: End Hunger, Achieve Food Security and Improved Nutrition and Promote Sustainable Agriculture. From <http://www.un.org/sustainabledevelopment/hunger/> (Retrieved on 30 January 2017).
Watson-Watt R 1962. Technology in the modern world. *Technology and Culture*, 385-393.
Weaver W 1964. Recent contributions to the mathematical theory of communication. In: C Shannon, W Weaver (Eds.): *A Mathematical Theory of Communication*. Urbana: The University of Illinois Press, pp. 1-28.
Wei Y, d'Errico F, Vanhaeren M, Peng F, Chen F, Gao X 2017. A technological and morphological study of late paleolithic ostrich eggshell beads from Shuidonggou, North China. *Journal of Archaeological Science*, 85: 83-104.
White L 1962. The act of invention: Causes, contexts, continuities and consequences. *Technology and Culture*, 3: 486-500.
WHO 1946. *Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference*. New York: WHO.
Winner L 1986. Do Artifcats have Politics? In: *The Whale and the Reactor: A Search for Limits in an Age of High Technology*. Chicago: University of Chicago Press, pp. 19-39.
Zeyringer M, Fais B, Keppo I, Price J 2018. The potential of marine energy technologies in the UK–Evaluation from a systems perspective. *Renewable Energy*, 115: 1281-1293.
Zhang G, McAdams DA, Shankar V, Darani MM 2017. Modeling the evolution of system technology performance when component and system technology performances interact: Commensalism and amensalism. *Technological Forecasting and Social Change*, 125: 116-124.
Zick C, Smith K, Kowaleski-Jones L, Uno C, Merrill B 2013. Harvesting more than vegetables: The potential weight control benefits of community gardening. *American Journal of Public Health*, 103: 1110-1015.
Zvorikine A 1962. Technology and the laws of its development. *Technology and Culture*, 3: 443-458.

Paper received for publication on August 2017
Paper accepted for publication on January 2018