# Diversity of Urban Agriculture in Britain: The relevance of some international experiences in improving resilience

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# Abstract

The research examines the relevance of lessons we can learn from international experiences of urban agriculture. This could mitigate the impact of a potential crisis in industrial food production systems through diversity in urban agriculture in Britain. As systems theory demonstrates, diversity in any system is of key significance for resilience. The case studies investigate St. Petersburg *dacha*s, Milwaukee Growing Power farm, Havana permaculture and finally 'guerrilla gardening' as a concept. The four case studies are chosen to explain the mitigating potential of rediversifying food production systems through urban agriculture. In the final chapter conclusions are drawn in parallel with discussion of potential application of aspects of the case study UA practices to London and other cities.

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# Introduction

There is growing concern among researchers, farmers and consumers about the negative impacts that the dominant food production system, industrial agriculture (IA), has on people and on the environment upon which it depends. Even more concerning, emerging evidence indicates that IA has both unforeseen impacts on climate change and is unlikely to meet the challenges of feeding the global population, predicted to grow to nine billion by 2050. (Figure 1)

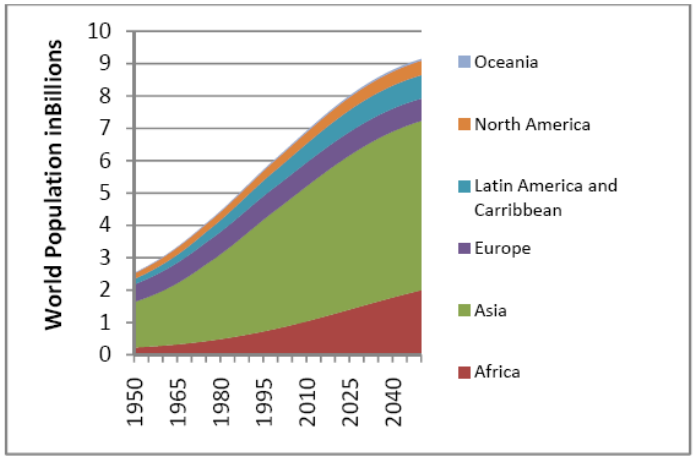



**Figure 1: World Population projections to 2050** Source: (UN Population Division, 2008)

Industrialised food production is inherently environmentally damaging; breaks the links between consumer, market and farmer; and despite successes in developing yield improvement has failed to feed the world's population. British agriculture and food production is overwhelmingly mono-crop and industrial. Despite this, a large proportion of food eaten in Britain is imported. Britain could strengthen diversity of food growing approaches; particularly growing food in urban areas to feed the country's largely urbanised population. Diversifying urban agriculture (UA) from the dominant form, (the allotment system) could provide a variety of alternatives to the industrial food system; and helps build resilience in the food production system. This research examines four case studies which suggest some alternative models of UA that could be introduced in London and replicated in British cities.

## 1.1 Barriers to urban agriculture

There are many barriers to urban agriculture (UA) for instance non-supportive urban *planning strategies*, competing uses for *urban land*, lack of information on potential growing *site locations*. From the economic point of view it is considered ridiculous to envisage growing food in cities. It seems common sense that food production belongs in the expansive rural areas; where modern industrialised farms can produce thousands of tonnes of food – cereals, fruit, vegetables, dairy, meat and transport these foods to the city. Urban land which can potentially accommodate multi storey commercial buildings, generating millions of pounds in rent yearly should not be set

aside for growing a few potatoes; at a value of hundreds of pounds a year. Health concerns are another barrier, urban areas, as producers of air, soil and water pollution are highly unsuitable places to grow vegetables and fruit for regular human consumption. Additionally, existing UA practices are often not ecologically or energy efficient, many allotment food producers use herbicides, pesticides and artificial fertilisers indiscriminately; resulting in negative ecosystem results and health outcomes.

However the next chapter will show that considered from an energy input point of view, UA is more efficient than industrialised farming. There is a place for food growing in cities, from small edge spaces to the peri urban area. There is potential through *permaculture and low input organic farming*; for urban dwellers to feed themselves, using UA to close the *nutrient cycle*. The necessary improvement in farming techniques can be effected through experimentation to gain high *productivity and healthy food* through *emergent and new UA* structures.

These obstacles and potentials are the focus of the four case studies undertaken in this dissertation research. The findings could be the road map for London and British cities to implement policy, planning and knowledge management strategies to improve the resilience of their systems of food production through diversity.

## 1.2 Research Question and Objectives

This research examines the relevance of lessons we can learn from international experiences of UA to reduce the impact of the lack of diversity in industrial food production systems on urban agriculture resilience in British cities. The four case studies are chosen to explain the mitigating potential of rediversifying food production systems through UA. In particular I address diversity, as diversity in a system is of key significance for resilience, although UA encompasses many issues including food production, city waste use, livelihoods, and social integration.

My research question is that of the relevance of international experiences in improving resilience through diversity of urban agriculture in Britain. Aspects of the research discuss the relationship between diversity and resilience in UA. Urban agriculture could provide a nucleus to challenge and replace the existing industrialised food production system, at least in part.

Allotment gardening (the dominant urban agriculture system in Britain) is not currently adequate to provide food for the city (Crouch and Ward, 1988, GLA, 2006b). Despite the important role allotments contributed to labourers yearly food and during the world wars, today's allotments are not numerous enough, do not produce enough and do not cover the diversity of institutional options needed to provide food sovereignty (Rosset et al., 2006 : 305). If the current food production system is vulnerable and allotments are not sufficient to feed our cities, a wide range of food production solutions are needed. Cities have historically played an important role in urban food

production; recent policy encourages urban agriculture for a variety of reasons, including food security, urban waste reduction and diffusion of social unrest.

Solutions to the current food vulnerability means diversifying city food production methods; both biologically (types of crops grown) and institutionally (kinds of organisations involved in food production and variety in agricultural systems). However rigorous research and development is lacking for urban agriculture (UA); Britain demonstrates limited knowledge of international experiences; theory and practice. This research therefore examines a range of international urban agriculture case studies to produce a non exhaustive examination of international practices which correlate to aspects of systems theory. The objective is to approach UA critically, to ground it analytically and in theory, as well as best practice, to advance understanding and breadth of knowledge.

This line of research goes beyond the challenges of central government policy and raises significant questions about the role of the city's entire population in its resilience. Following Lefebvre's suggestion (Lefebvre, 1996) that the city is not just property or space, but a task on which all its inhabitants participate; city dwellers are engaged in the task of inventing new ways of inhabiting the city and in doing so, make the city. This concept; that all city dwellers have the right to the city; that the city is a public good, not private; informs my position on planning challenges for cities. It means that all city dwellers are involved, all can play a part in creating the solution to a city's problems and provides a position from which environmental and food issues might be rethought in terms of civic practices rather than the traditional top down planning associated with government and state.

## 1.3 Personal interest and experience

Researching alternatives to commercial mechanised agriculture appeals to me on a personal level, as someone who has observed over the past thirty years the negative impact of the industrialised agribusiness system on the rural environment, on cities food supply, food quality and urban spaces. My rural childhood in Ireland was part of a large and cash poor family with seven children was that of frugality with resources, and the importance of diversity of food supply. It was a relatively oil free and frugal childhood; school was a daily six mile cycle each way and school holidays were spent at home. We rarely travelled.

From an early age as children we worked in the garden producing a large proportion of our food needs such as potatoes, spinach and beans. We picked fruit and also worked in the field turning hay by hand and windrowing with pitchforks. Winter tasks included gathering fuel for firewood (the only house heating method) and mucking out stables. All year round we managed a large flock of hens.

These experiences have shaped my family's views on use of resources. My parents have been involved in environmental issues for over forty years. My artist brother makes work about the oil thirst of modern American

farming methods. Another artist sister deals with the individual in the city. [1] More importantly the country experience taught that happiness is not necessarily connected to resource consumption. A lesson which has proven invaluable in deconstructing marketing messages which correlate greater happiness with more accumulation.

I also have experience of urban agriculture as a few years ago I initiated and was part of a self housing scheme in Dublin. The half acre proposed building site lay disused for a number of years before and during the self build initiative. The unused space was offered to interested gardeners, from office workers to a television garden presenter, who grew a variety of vegetables and flowers. The gardeners were self selected – the news of land for growing went out by word of mouth. It was interesting to see the initial enthusiasm followed by some failures. This experience highlighted the importance of agricultural skills, horticultural knowledge, ability to plan and design growing spaces and a supportive external environment.

## 1.4 Report structure

The introduction deals with the problem statement, along with my personal interest. The next chapter addresses the theoretical framework, investigating systems theory with a focus on diversity and resilience. A review of literature considers the problems with commercial agricultural food production systems and reviews allotments as the existing dominant British urban agriculture system. Explanation of the methodology of case study research is followed by a summary of the case study findings for four interesting UA situations; St. Petersburg *dachas*, Milwaukee Growing Power, Havana permaculture and finally 'guerrilla gardening' as a concept. The findings chapter analyses the information in relation to the theoretical framework. In the final chapter some conclusions are drawn along with discussion of the potential for application of aspects of the case study UA practices to London and other British cities (Figure 2).

| | **Issue** | **Case Study** |
|---|---|---|
| 1 | High productivity, use of urban wastes and social inclusion | Growing Power, Milwaukee -USA |
| 2 | Permaculture and State involvement | Cuba – Havana |
| 3 | Urban Planning/ Urban Design and Green Belt | St. Petersburg *dachas* - Russia |

[1] Their work can be viewed at www.johngerrard.net and www.joygerrard.net

| | | |
|---|---|---|
| 4 | Institutional experiment, emergent systems | Guerilla gardening - international |

**Figure 2: UA Case Study and issue**

The four case studies chosen have relevance in advancing, renewing or giving options for British urban agriculture. Each case study is a good example of an urban agriculture issue; particularly for the diversification of UA systems. The issues that are of particular interest, as they deal with specific stumbling blocks that exist in the British UA system are summarised below.

St Petersburg has a long tradition of urban dwellers' *dachas*; food producing allotments within a couple of hours travel from the city, including a hut for temporary and weekend living. Growing Power, a hyper productive city farm in a post industrial American city demonstrates high experimentation, productivity through the use of urban wastes and social inclusion. Havana, as a response to the Cuban oil crisis in the 1990s, developed highly productive organic and permaculture city food growing plots. The guerrilla gardening case study investigates the power of emergent systems and institutional experimentation by individuals and communities.

# 2 Theoretical Framework

This chapter introduces the theoretical framework, putting urban agriculture (UA) at the intersection of natural and social systems. The concepts of resilience and diversity, as applied to human and biological systems, are discussed. Systems theory is used to examine IA and UA, arguing that the aspects of IA which helped it develop short term success (hierarchical structure, high input of energy and monoculture) are the aspects which signal its lack of resilience as a system and may indicate imminent collapse.

UA has recently received increased interest in research and British government policy, and potentially has an important role in city food systems. However, to do this, UA needs to provide more versions and options to city populations than the popular British UA allotment system, which has to date received more attention and research. Reinstating biological diversity is necessary to undo environmental damage caused by industrial agriculture. Likewise for the human systems we need to initiate diversity in food production systems to rebuild the agricultural system. UA takes many forms worldwide, from Havana's organoponicos to Kerala's home gardens, to Chinese city aquaculture. Diversity is part of its strength and provides resilience. UA, a social-ecological activity, is fundamentally based in and reliant on the networks and relations of the environmental biological systems including micro-organisms, soil, water, plant photosynthesis (Figure 3).

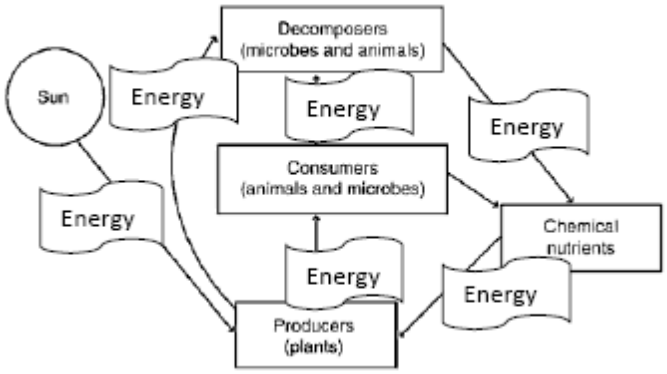



**Figure 3: Diagram of natural system – plants are primary producers.**

Adapted from (Pimentel and Pimentel, 2008 : 22)

UA is also part of human and institutional systems and activities of agriculture using knowledge to carry out farming practices. Breeding, agronomy, planting, harvesting and marketing are all part of social and institutional systems (Figure 4). The dynamic links between the ecosystem and the institutional systems give UA its resilience and ability to adapt to changing circumstances. Figure 4 illustrates the position of UA between the two systems and the importance of knowledge as a linking mechanism to apply practices and manage the ecosystem for yield. The diagram showing nesting of ecosystems within each other and the similar nesting of institutions occurs at different scales; illustrates

the necessity to design systems at different levels and scales. Both ecosystems and human systems have varying levels of resilience, generated by the amount of diversity in the system.

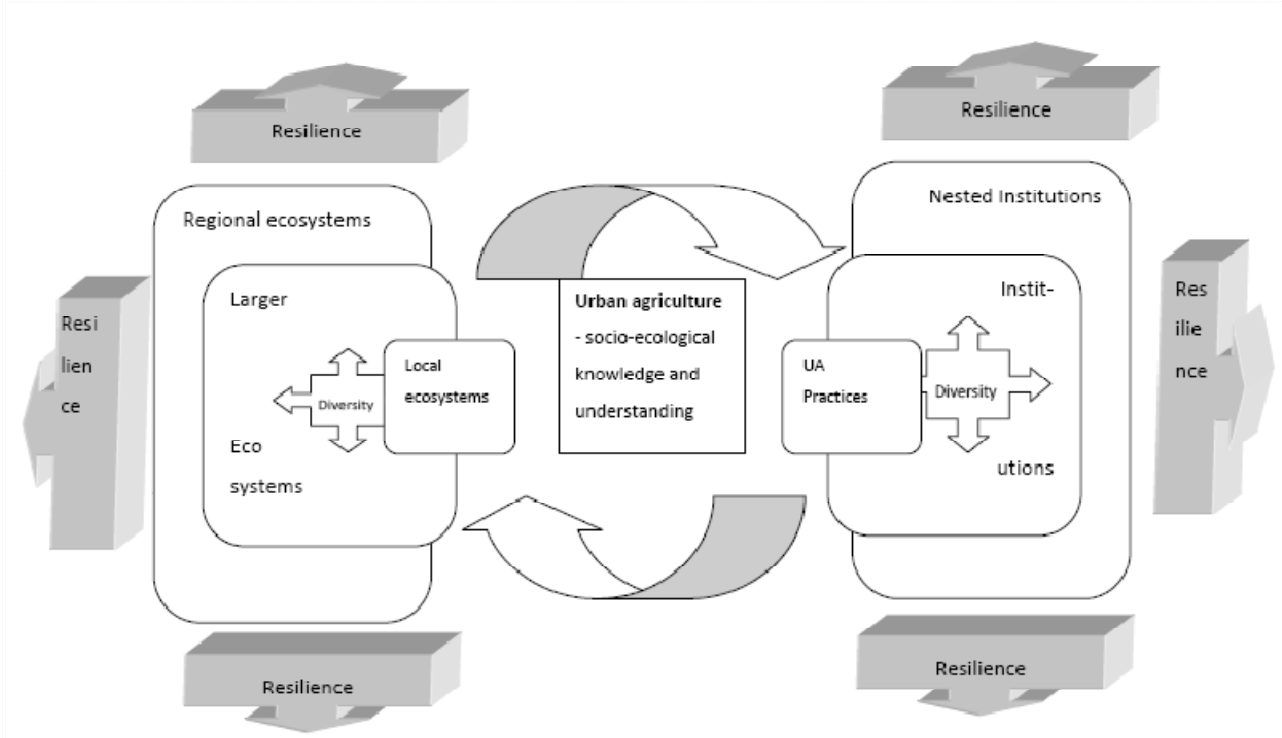



**Figure 4: Theoretical Framework: Dynamics of Urban Agriculture; a social-biological system**

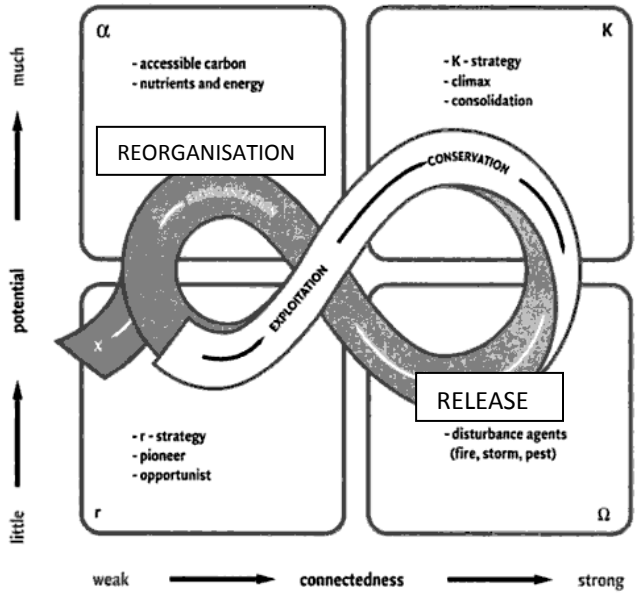
Adapted from (Berkes et al., 2003 : 21)

## 2.1 Resilience and Diversity

The key concepts of resilience and diversity are reviewed next, and applied to both human and natural systems. Are there are correlations or overlaps between the behaviour of complex ecosystems which can inform human systems? A number of theorists from biological and social science have concluded that it is possible to ascribe similar processes to human and natural systems. For instance ecosystems and human institutions undergo cyclic change, going from organisation, through collapse and into renewal (Adger, 2000, Brown, 2002, Gunderson, 2000, Nielsen, 2009, Ostergard et al., 2009, Thrush et al., 2009, Ulanowicz et al., 2009).

An influential publication by Holling has identified three properties which are applicable to ecosystems and human organisations: potential to change (or 'wealth'), connectedness of internal controls leading to rigidity or flexibility and adaptive capacity or resilience (Holling, 2001 : 394). These properties can determine the future behaviour of an economic system or a forest ecosystem, particularly in response to crisis. For example economic boom and bust cycles or forest fires in natural ecosystems. Four elements in an adaptive cycle are applicable to both human and natural systems; exploitation, conservation, release, and reorganization (Figure 5) corresponding to sustainability:

growth and stability, change and variety. The 'x' in Figure 5 shows the unstable point on the cycle where potential can leak, and the entire can flip into a less organised system, with less wealth. During the cycle resilience expands and contracts – during the 'back loop' cycle resilience is high and control is low; which can lead to experimentation and change. (Figure 6)




'Resilient social-ecological systems have the potential to sustain development by responding to and shaping change in a manner that does not lead to loss of future options. Resilient systems also provide capacity for renewal and innovation in the face of rapid transformation and crisis.'
(Berkes et al., 2003): cover

**Figure 5: Holling's diagram: systems cycle of change.** (Berkes et al., 2003 : 17)

Resilience can be defined as the potential for recovery from disturbance - engineering resilience (Thrush et al., 2009). Alternatively it can refer to ecological resilience, rapid transitions between thresholds to new equilibrium states (Limburg et al., 2002). Resilience therefore is an aspect of a system, as Holling describes, but it also provides a crucial ecological service, which insures against loss of important system functions when faced with stress. Measuring and testing resilience in an ecosystem is uncertain, as thresholds are only identified once they are crossed.

In *Navigating Social-Ecological Systems* Berkes argues the mutual influence of theory on practice, that emerging theory changes the practice of development (Berkes et al., 2003 : 55). Additionally, uncertainty and surprise, strategies and adaptation demonstrate the influence of social processes on ecological processes and vice versa. For example, societal responses to the uncertainties of ecosystem climate change have correlations in the adaptation of ecosystems to human interference. It is crucial to understand the dynamics of links among the ecosystem, knowledge about the system and how to navigate to encourage resilience and adaptation to change. The mistake that industrialised agriculture systems makes is the assumption of stability (as opposed to cycles of change). This

leads to attempting to manage out fluctuations, diversity and variability and has, after short term successes, resulted in eroding resilience.

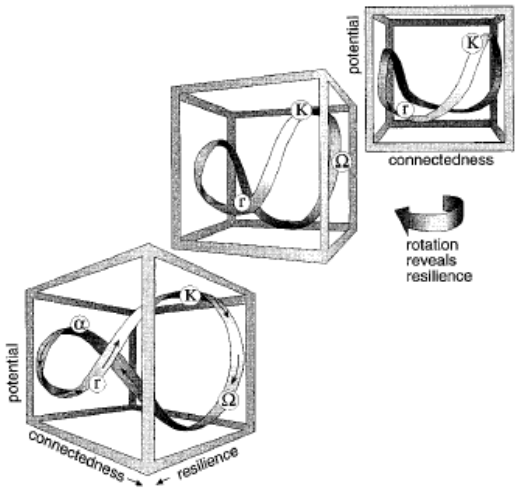



**Figure 6: Resilience as a dimension of the adaptive cycle** (Holling, 2001 : 395)

Adaptive cycles can fall into traps of either poverty or rigidity (Holling, 2001 : 402). Holling cites the 'poverty trap', an adaptive cycle collapses when potential and diversity have been destroyed through misuse or external force. An example of poverty trap is the American Dustbowl when soil erosion was caused by ploughing the prairie. Conversely the Soviet Union provides an example of the 'rigidity trap'- an overly rigid, controlling system with strong connectedness and potential but low creativity and change crossed a resilience threshold and collapsed suddenly.

So resilience is important to system survival, but what is the place of diversity? Diversity can be defined in population terms, but also in terms of diversity of flows in an ecosystem, the number and dynamics of links between populations (Ulanowicz et al., 2009). Diversity is also the reserve capacities in an ecosystem; this functional diversity builds resilience in systems. In a natural system, for instance the brain, the reserve capacity holds the inherent resilience; other parts will repair connections in case of damage. The importance of functional diversity to resilience in an eco and human system to change is highlighted here: *'resilience in some communities will be maintained by diversity within functional groups to ensure that the group encompasses a range of environmental response capabilities'* (Thrush et al., 2009) 3213.

The flaw in logic on which industrialised agriculture and classical economics are based is in considering reserve capacity and diversity as waste, something to be eliminated in the drive for profit, rather than a vital element in a systems sustainability and survival beyond the short term. These concepts of resilience and diversity are aligned with systems theory, which we examine below to link with theoretical framework diagrammed in Figure 4.

## 2.2 Systems Theory

'There is no wealth but life'
(Ruskin and Bryson, 1979)

Systems Theory, also dynamic systems theory, or complexity science, is a method of understanding how complex systems such as cells, animals, social systems, ecosystems, planet earth atmosphere and sun systems operate as an integrated whole and how they may develop in future. Systems knowledge is about networks and interdependent relations between things from small to large scale.[2] Unlike traditional science which breaks down an item to be studied into elements and examines individual parts to work out mechanistic natural laws, systems theory analyses the whole, with a focus on context. As systems theory looks at the whole, not the parts, it also recognises different scales or levels; and switches between them (e.g. a nest of ants in a tree in a wood on an island in an ecosystem). Systems theory recognises that the same understanding of a living organism, for example an eel, cannot be reached by dissecting a dead eel as opposed to studying the eel in its environment; eating, breathing and swimming to the Saragossa Sea to reproduce.

There is the possibility that systems theory, if generally accepted, may result in a general non-scientific cultural paradigm shift in how the world is viewed. Some disciplines have already incorporated it: biology, psychology, ecology, cybernetics, artificial intelligence, chaos theory and political ecology (Biersack and Greenberg, 2006, Capra, 1975, Capra, 1997).

Some of the criteria of systems thinking; or looking at the pattern of organization and structure; which are particularly relevant to the theoretical framework on urban agriculture are addressed here.

**Feedback** –in a causal link input is affected by output which either amplifies or reduces, an example is guitar feedback with amplification. Feedback allows a system to be self-balancing which allows systems to learn and self organise. This links with the Gaia theory that the earth itself (environment and organisms) is a living; organizing system regulating the atmosphere in a co-evolving relationship (Lovelock, 2000). Fluctuations in a system which are too great may tip the system into collapse or a completely different state. This is systems theory explanation, generally accepted, of climate change.[3].

Environmental modeling work started in the 1970s with potential scenarios of resource use, environment, population and economics (Meadows, 1974, Meadows, 2005) and continued with Costanza's investigation into the earth's carrying capacity, looking at variety of scenarios based over 30, 100 and 1000 years. Costanza records a 'great acceleration' (Costanza, 2007 :346) in negative global indicators. Human population growth, carbon dioxide

[2] Complexity is different from complicatedness; an interaction among the parts which are both known and knowable. Complexity is the relationship of unknowns, and requires a different kind of analysis.
[3] Excessive amounts of carbon, produced largely through burning fossil fuels, in the earth's atmosphere, pushing the system into overheating.

concentration in the atmosphere, global temperature, use of oil based fertiliser, marine stocks destroyed and species extinction have all exponentially grown. The concern is that some of these system changes could tip the world eco system over into an amplified feedback loop which may trigger unprecedented changes in the planet, and decimate the human population.

> '… all systems thinking is environmental thinking.'
>
> (Capra, 1997 :37)

As open systems operate they have a **constant flow of energy and exchange**, they are energetically open, but organizationally closed. The second law of thermodynamics states that *'any closed system will over time deteriorate in the direction of sameness or disorder without external input of energy'* (Dryzek 2005 : 34). This is borne out by the spontaneous trend in physical phenomena towards disorder. Entropy is a measure of disorder or dissipated energy, whereas exergy is the part of the energy which is useful for a system, for change and development (Dincer, 2002). Systems theory conforms to the second law, as energy destruction is irreversible and this introduces the concept of the arrow of time. However (Capra, 1997 :89) credits Prigogine with discovering in open systems that dissipation of energy is not only a source of order; it can lead to evolution and complexity which is additional order. This relationship of order and chaos means that: *'Natural selection may favour living systems ''at the edge of chaos'' because these may be best able to … adapt and evolve.*' (Capra, 1997 :198). New 'emergent' behaviour or patterns can emerge; only when the system is far from equilibrium; where the dissipation of energy in irreversible processes (for example chemical reactions) creates new forms (Capra, 1997, Holling, 2001).

### 2.2.1 Eco system and Social entropy

Biel makes an interesting link between systems theory analysis and capitalism's effect on the eco system and those economically poorer and socially weaker (Biel, 2006). He posits that the relationship between capitalism and its environment (physical and society) is one of exploitation and struggle, with capitalism gaining order from using poverty as a capitalist growth and accumulation fuel, and exporting disorder in the form of poverty and environmental degradation to the poor. Interestingly, Biel does not consider industrialisation itself as a major entropy problem, as traditional industrialisation recognises resource scarcity. It is capitalist accumulation which is specifically environmentally and socially degrading. There is a strong link to dependency theory – the centre or the rich northern countries can maintain order to the present at the expense of the periphery, by importing energy and exporting pollution. (Biel, 2008)

He critiques systems theory for not incorporating this exploitative element of society into its analysis of entropy and emergent systems. Sustainable development (and Biel sees this is a strength) does specifically link the social and the physical environment, allowing for natural and social resources to be considered capital. Therefore ecological and social entropy can be substituted, but possibly in a non capital accumulative way.

Co-opted emergence describes the process of channeling emergent social movements, such as grassroots commons regimes, or guerrilla gardening, into forms which assist the capitalist order (such as sustainable livelihoods) by providing low order and preventing complete collapse of the disordered social system, weakened by centuries of energy dissipation. Biel hopes for emergence which is strong enough to challenge the current dissipative and exploitative system. Examples of previous non-co opted emergent forms are the Diggers, (Reynolds, 2009) or guerrilla gardening (Tracey, 2007). These emergent forms are more likely to arise during the periodic crises which capitalism is liable to: the 1930s Great Depression, the Bretton Woods system collapse, the current financial crisis. Biel argues that capitalism is now so intensive that it is constantly on the brink of massive hazard and survives by using social fuel.

### 2.2.2 Systems Theory application to urban agriculture

The most interesting and evocative aspect of Bertalanffy's theory is its applicability to other branches of knowledge as a unifying framework. This transfer across disciplines has been established in the section on diversity and resilience, the theoretical framework linking ecosystems and human society and in Biel's linking society and environment as sources of energy.

> 'General system theory should be ... an important means of controlling and instigating the transfer of principles from one field to another... [however using criteria to] guard against superficial analogies.'
>
> (Bertalanffy, 1973)
>
> [quoted Capra, 1997: 49]

The basic principles of ecology are '*interdependence, recycling, partnership, flexibility, diversity, and, as a consequence of all those, sustainability*' (Capra, 1997 :295). The English Organic Movement recognised the systems nature of organic agriculture based holistically on the health of the soil:

*'A food-chain is not only a material circuit, but also an energy circuit. Soil fertility has been defined as the capacity of soil to receive, store and transmit energy.*' (Balfour, 1977)

However since industrial agriculture does not contribute naturally to the soil's nutrient requirements, (Figure 7) industrial agriculture needs ongoing large energy input to provide nutrients chemically.

However it is important to note the specificity of human systems, there are important differences from biological systems. The crucial aspects I would highlight are: humans have foresight, technology and knowledge. Foresight allows us to escape from the deterministic fate of environmental and societal collapse which systems theory might seem to condemn us, freeing human systems from a reactive response in visioning the future. Technology greatly amplifies the problems which humans can cause to the environment and their systems, but may assist in solutions. Finally, information - the principle of organisation of systems - can be communicated by humans, which is explored further in the next section.

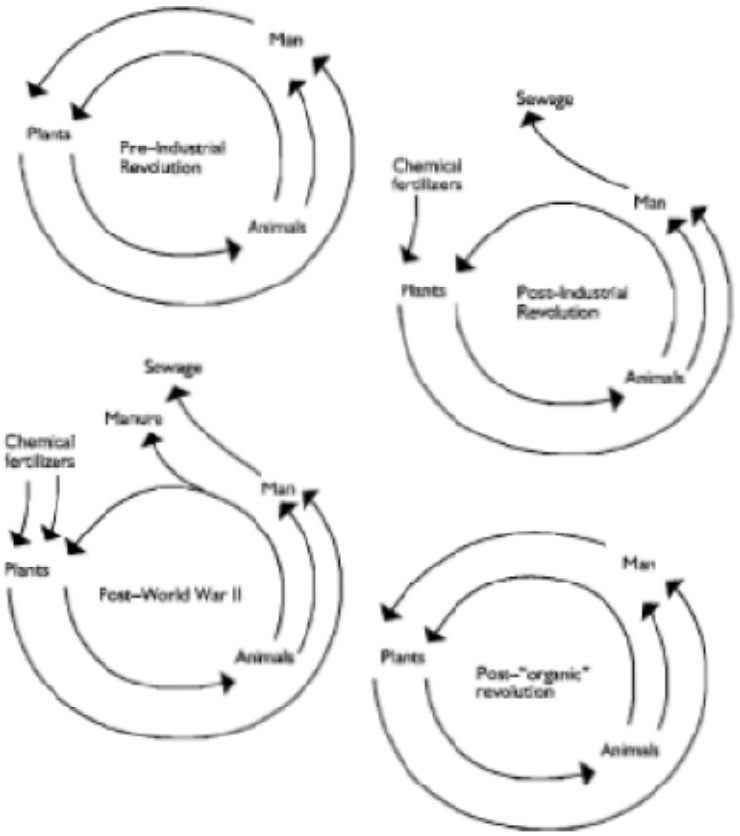



**Figure 7: Food growing and soil nutrient cycle evolution, pre and post chemical fertilisers.** (Smit et al., 1996 :13)

## 2.3 Knowledge structures

Key to a system learning, self organisation and resilience is memory, the accumulated experience of a system both ecological and social. Ecological memory covers life-history experience of the environmental fluctuations, social memory is the '*long-term communal understanding of the dynamics of environmental change and the transmission of the pertinent experience ... It captures the experience of change and successful adaptations*.' (Berkes et al., 2003 :21).

Traditional knowledge is place specific knowledge, designed to help local people derive a living from their environment. It is characterised by creativity, experimentation, constant evolution in new situations and strong links with the culture and social traditions of the people (Dinucci and Fre, 2003). In the contemporary development context the constraints on choice, including psychological and cognitive are explored in Dominating Knowledge (Apffel-Marglin and Marglin, 1990 : 9). The separation of agricultural knowledge from its epistemological context makes the traditional fabric of society obsolescent and vulnerable. The knowledge shift from traditional 'knowledge how' episteme with its community of equals or agrarian relations, to commercial hierarchical 'knowledge about' techne agriculture has resulted in social and economic vulnerability for farmers. '*…. a loss in knowledge is a curtailment in epistemological multiplicity and choice*.' (Apffel-Marglin and Marglin, 1990 : 206) Development means that co-operation for the farmers moves from being a value to a strategy, which makes co-operation risky and resisted, thus destroying an entire system of social ties and in the end wisdom.

If we consider wisdom is capacity to respond to every situation, including new situations, traditional agriculture's knowledge management system is part of developing wisdom and resilience. Conventional industrialised agriculture on the other hand homogenises the knowledge at the top and contributes to the pedagogy of the oppressed (Freire and Ramos, 1996). This research tries to show how to resist this hierarchical control of knowledge and its associated environmental and human system damage by exploring areas where experimentation is more diffuse and power not necessarily controlled from the top, for example urban agriculture, which is explored in the next section.

# 3 Literature Review

This chapter discusses the problem statement of Industrial Agriculture (IA) output and the history and current situation of the dominant Urban Agriculture form, allotments.

## 3.1 Problems with the current industrialised food system

Increased recognition of the problems associated with industrialised food systems comes from both sustainable agriculture researchers (Balfour, 1977, Dahlberg, 1979, Kiers et al., 2008, Pearson, 2007, Pretty, 2005, Pretty, 2008, Shiva, 2008, Wright, 2009) and organisations which are neutral towards or support major agribusiness systems (Chatham House, 2009, Chatham House et al., 2009, Steiner and Monsanto, 2008). This information demonstrates the need for additional research into the processes of food production, supply, distribution and waste disposal and alternatives to the existing industrialised system.

> 'Agriculture has been named a key player in the degradation of our natural resources. Whether it's soil erosion, habitat destruction, greenhouse gas emissions, pesticide sprayings or water use, agriculture can have a negative impact on our environment.'
>
> (Steiner and Monsanto, 2008)

The industrialised food production system currently, with approximately fifty million farmers engaged in large scale mono cropping techniques despite reported yields of up to nine tonnes of wheat per acre, and a record of producing food for billions of people has structural and output weaknesses summarised in the section that follows. Briefly they fall into categories of: environmental impact, human health and nutrition and economic implications. New challenges arising include climate change, population growth, the 2008/9 financial crisis, the dependence on cheap fossil fuels and finally problems arising from lack of diversity in agri-food production and distribution systems. See Appendix 1 for discussion of alternatives to industrial agriculture in the countryside.

### 3.1.1 Environment

The effect of industrial mechanised agriculture on the soil, particularly since the Green Revolution in the 1950s, has been a drastic reduction in soil quality, quantity and fertility, combated by ever increasing amounts of fertiliser. [4] (Figure 8)

The eco system is being pushed out of balance, resulting in constant soil erosion, destruction of the soil structure and associated lack of water and nutrient holding ability. Soil microorganisms and earthworms have drastic numbers and species decrease (Pretty, 2008, Kiers et al., 2008, Balfour, 1977). Water, a crucial element in extensive monocrop rice, maize and wheat is in shorter supply. Available fresh water is estimated at a quarter of 1960s levels (Beddington et al., 2009) with an ever increasing agricultural demand, as irrigation provides 40% of the world's crop yields currently (UNEP et al., 2009 :53).


**Figure 8: Vicious cycle of soil depletion** (Lal, 2004)

All agricultural systems must maintain soil fertility to replace the nutrients taken from the soil through crop harvesting. Industrial agriculture uses artificial fertiliser with nitrogen, phosphorus and potassium (NPK) which requires large inputs of oil based energy. In 2000 191 billion litres of diesel was used globally (Shiva, 2008 : 101). Farmers using traditional knowledge have developed a large range of technologies and knowledge systems to manage soil and water including agronomic (mulching, intercropping, crop rotation, manuring, irrigation), tillage practices (ridging, mounds, bunding, grass strips), agro forestry (productive trees planted with crops) and use of compost as soil fertiliser (Reij et al., 1996). Traditional agriculture practiced by an estimated 1.6 billion farmers is arguably characterised by a stewardship relation to the earth, adding fertility and potentially sustainable for continuous farming for long periods – up to four thousand years in India. (Conan et al., 2007) [5]

[4] '…globally 20,000–50,000 km2 of land are lost annually through land degradation, chiefly soil erosion, with losses 2–6 times higher in Africa, Latin America and Asia than in North America and Europe.' (UNEP 2009:40)

[5] However there are numerous documented cases of traditional agriculture inadvertently degrading the environment. See (Diamond 2005)

Mechanised agriculture, particularly prevalent in the past fifty years, can be described as an extractive industry, like mining, where resources in the form of crops are taken from the earth, using oil based fertiliser to force growth until the soil is destroyed and no further crop extraction can occur within a short period of time (Balfour, 1977, Dahlberg, 1979, IAASTD, 2008, Ostergard et al., 2009, Shiva, 2008, Uphoff, 2002, Conan et al., 2007)

### 3.1.2 Human health and nutrition

The long food chain established through agribusiness has had a negative effect on human nutrition and health. Food production processes mean that much of the offer in supermarkets contains highly processed food stuff, to the extent that they are no longer nutritious. The most common crops in food processing, maize and soybeans, are grown on fertile farmland but are treated as industrial commodities rather than food and processed to produce junk food – biscuits, burgers and food fillers. Battery farmed animals are subjected to increasing antibiotic use which impacts on health of animals and people with anti biotic resistant bacteria. (Lang and Heasman, 2004, Pollan, 2006, Pollan, 2008, Pond et al., 2009, Roberts, 2008, Steel, 2009). Additionally although there is excess food produced through this system, it does not reach the nine hundred and sixty three million people currently undernourished (UNEP et al., 2009 :7).

### 3.1.3 Economy

Extensive industrial farming produces artificially cheap food through government subsidies. Negative externalities are not currently included in consumer pricing but are passed on to society to pay for include oil run offs, pesticide poisoning, food scares and human/ animal disease transmission (such as CJD and avian flu). The system is also unprofitable for many farmers who are forced to accept increasingly lower harvest prices from large agri business. Thousands of farmers are driven out of business annually (IAASTD, 2008, Shiva, 2008). However monopolistic agri business is itself dependent on constant economic growth, if the economy falters this may cause these enormous vertically and horizontally integrated companies to collapse. A final economic vulnerability rests on the variable prices of food commodities including cereals, sugar, oils, dairy and meat which have driven up world food costs. Figure 9 shows food prices rising again towards the peaks of the 2008 global food crisis caused by a combination of extreme weather, biofuels grown on arable land, high oil prices and speculation (FAO, 2008b, UNEP et al., 2009 :12).

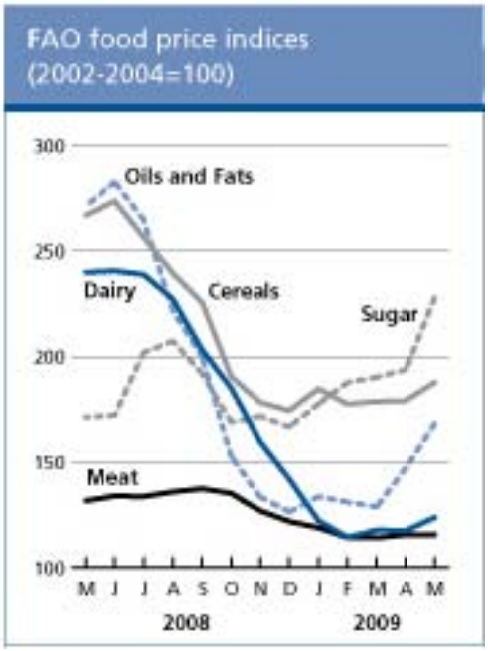



**Figure 9: World Food prices, tracked against oil.**

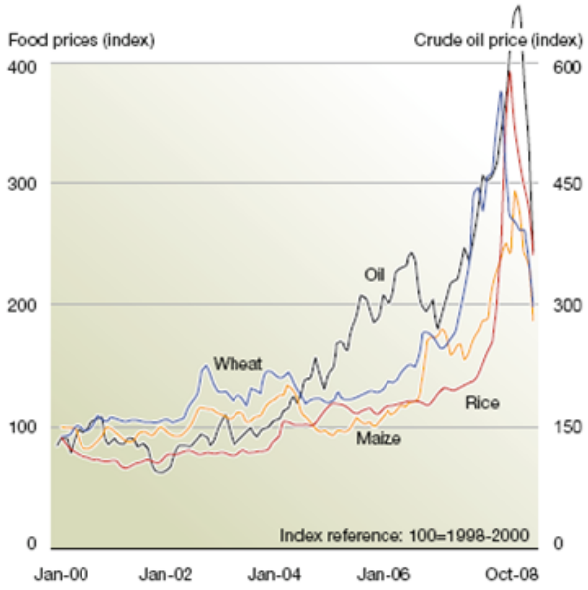



**Figure 3: Changes in commodity prices in relation to oil prices.** (Source: FAO, 2008; IMF, 2008).

(FAO, 2009, UNEP et al., 2009 : 13)

## 3.2 New Challenges

### 3.2.1 Climate Change

Drought, floods and storms are all human related climate change weather events and are very problematic for mono culture extensive farms. In addition, predictions on climate change's effect on agriculture show that arable areas closer to the equator will be less productive due to temperature rises and unpredictable weather events. Alterations in water availability and rain fall mean that current rain fed crops will need irrigation. Water shortages mean irrigation will not often be available. Additionally irrigation requires technology, energy and labour and causes soil salinity (Balfour, 1977, Dahlberg, 1979, Pretty, 2005, Pretty, 2008, Shiva, 2008, IPCC and Pachauri, 2008).

### 3.2.2 Financial crisis

The 2008/9 financial crisis has been described as the 'worst global economic contraction since the Great Depression' (Peston, 2009) and has affected the ability of poorer countries to buy food in international markets. However this crisis has shaken confidence in the wisdom of allowing markets to dictate policy, particularly in the area of food production and pricing which may allow emergent, beneficial change to the current system.

### 3.2.3 Fossil fuels

Modern agricultural practices are vulnerable in their need for fossil fuels. Oil and machinery have been substituted for people and knowledge. Oil provides fertiliser, pesticides, machinery for production, harvesting, and transport. Therefore agriculture is entirely reliant on constant access to cheap oil (Balfour, 1977, Shiva, 2008, Uphoff, 2002). The reliance on oil has led to waste and high input characterising the industrialised food system. Research has estimated the energy requirement for modern agriculture; at least ten calories of energy are required for every one calorie of food produced (Pimentel et al., 2000). Additionally WRAP, the UK recycling consultancy, estimates that one third of food, over sixteen million tonnes is thrown away uneaten each year in Britain (Ventour, 2008). [6]

If we were to design a food production system or systems from first principles of sustainable use of resources, efficiency and low input, with a yield to feed the world's population, the evidence above suggests the current industrialised system would not be chosen.

### 3.2.4 Population growth

With the world population still growing, [7] (FAO, 2008b) some researchers are concerned we have reached the limit of arable land. Others claim soil erosion, desertification and salinity from irrigation annually reduces existing available arable land (Balfour, 1977, FAO, 2008a, IAASTD, 2008, Pimentel et al., 2000, Shiva, 2008). Compounding this looming crisis, food production from the arable land existing is dependent on oil based fertilisers. By 2050 it is possible that the gap between food demand for the projected nine billion and food yield may be a significant percentage (UNEP et al., 2009).

[6] 6.7 million tonnes a year of food waste, most avoidable. 18 million tonnes of unnecessary carbon dioxide equivalent emissions a year; and £1 billion costs to local authorities to collect and dispose.

[7] An estimated 50 and 70 million people yearly will be added to the world population until the mid 2030s.

## 3.3 Diversity

### 3.3.1 Food production system

The current food production system has dramatically reduced agricultural biodiversity (agriobiodiversity) in animals, harvested and non harvested crops, species and micro-organisms in the eco system necessary for food production. Knowledge about maintaining and improving this diversity has also been lost (Figure 10 diversity loss since 1900s). Farmers have a crucial role in shaping and maintaining agriobiodiversity; its diminishment through industrialised production negatively affects the world's biodiversity and our food security (FAO, 2004).

'100 YEARS OF AGRICULTURAL CHANGE: SOME TRENDS AND FIGURES RELATED TO AGROBIODIVERSITY

* Since the 1900s, some 75 percent of plant genetic diversity has been lost as farmers worldwide have left their multiple local varieties and landraces for genetically uniform, high-yielding varieties.

* 30 percent of livestock breeds are at risk of extinction; six breeds are lost each month.

* Today, 75 percent of the world's food is generated from only 12 plants and five animal species.

* Of the 4 percent of the 250 000 to 300 000 known edible plant species, only 150 to 200 are used by humans. Only three – rice, maize and wheat – contribute nearly 60 percent of calories and proteins obtained by humans from plants.

* Animals provide some 30 percent of human requirements for food and agriculture and 12 percent of the world's population live almost entirely on products from ruminants.' (FAO, 2004 :3)

**Figure 10: FAO statistics on diversity loss** (FAO, 2004)

### 3.3.2 Land ownership

Land ownership is also heading towards less diversity. There is evidence of a 'land grab' in cash poor developing countries and an associated loss of important agriobiodiversity and knowledge of traditional systems of farming. Large corporations and countries are buying and leasing enormous tracts of potentially arable land in cash poor and struggling countries to ensure developed country's future food security. Since 2006 at least 2.5 million hectares in five countries studied (Ethiopia, Ghana, Madagascar, Mali and Sudan) have already been leased or bought (FAO et al., 2009 :41). There is emerging protest at this development. For instance a proposed further 1.3 million hectares lease to South Korea's Daewoo Corporation in the ecologically sensitive rain forest areas of Madagascar brought down the government (FAO et al., 2009, Chatham House, 2009, UNEP et al., 2009 : 46).

### 3.3.3 Food chain

The entire food chain is characterised by lessening diversity, for instance Britain's retail food market worth in 2008 £139.6 billion, has 95% of food shopping done in supermarkets (IGD, 2008, Policy Commission on the Future of Farming and Food, 2002). Current low global food reserves of only thirty eight days, down from one hundred plus, only exacerbates the food security issue.

Industrial agriculture is now showing reducing returns, requiring ever greater inputs of oil, fertiliser, land and energy and producing increasing entropy[8]. Assessing the problems of the industrialised food production system against peak oil and climate change issues, it is clear that we need to develop diverse and resilient food systems that are more in tune with the natural world and energy cycles (UNEP et al., 2009).

### 3.3.4 Where to start?

We need long term, strategic responses beyond the standard ideology that 'the markets will provide' and to realise that we cannot solve existing and new problems with the same thinking that produced the problems outlined above. There is no alternative to food however, unlike other products of the market system, and agriculture as a complex activity linking biological and human institutional systems needs particular attention. An additional complexity is that it is not possible to swop overnight from large scale industrialised agriculture to other forms of farming, such as small holdings with mixed farming, organic farming, or permaculture. This is due to the necessity for soil regeneration, and adjustment periods to initiate alternative systems. Developed countries have a greater proportion of industrialised agriculture and are likely to be more affected if sections of the industrialised agriculture system collapse suddenly, as happened in Cuba in the late 1980s.

### 3.3.5 Effect on city populations

The UK's Chief Scientific Advisor warns that by 2030 a combination of crises may occur triggered by the population growth to eight billion. With over half the world population urbanised, a predicted additional 50% over existing food requirements, water demand up by 30% and energy by 50% may lead to a 'perfect storm' which cannot be dealt with by the existing industrial agricultural system (Beddington et al., 2009). This gloomy Malthusian view is borne out by the UN prediction that instead of the large increases in agricultural yields required that:

> *'current scenarios of losses and constraints due to climate change and environmental degradation – with no policy change – suggest that production increases could fall to 0.87% towards 2030 and only 0.5% between 2030–2050'* (UNEP et al., 2009 :91).

[8] Entropy, in thermodynamic and systems theory is the amount of spent energy in a system. A high entropy producing system will reach equilibrium (stasis) sooner than low entropy.

However a crisis may come before 2030. For instance Argentina is one of the world's five top wheat exporters, but is likely to have to import wheat in 2010. [9]

The food supply of cities, particularly in developed countries such as Britain, is now considered vulnerable. Due to the interaction of global factors already discussed, such as agricultural commodity trade, freight and exchange rate variations, population growth, populations' transition from plant to meat eating, and limits to land, water and available labour. An additional vulnerability mentioned above relates to modern agriculture's reliance on energy from fossil fuels and its impact on anthropogenic climate change. Mitigating this through growing bio-fuels reduces arable land for food production. Local factors include extended food supply chains, Just-in-Time delivery to supermarkets means there is little stock held locally. Extended suburbs and industrial parks means there are few farms and food producers close to cities. Finally cities in the global North have populations who have come to expect a wide choice of cheap, exotic food.

### 3.3.6 Environmental limits

These potential global food access challenges are made all the more significant through the often wasteful and inefficient use of resources in contemporary societies. Our treatment of food is possibly the most obvious sign that we do not appreciate environmental limits. One example being that for every one calorie we consume through the current industrialised agribusiness sector; at least ten calories of fossil fuel energy is required in ploughing, planting, pesticides, herbicides, harvesting, processing, transporting and delivery to supermarkets (FAO, 2008b). This excludes waste of food associated with the supermarket system and household disposal of edible food.

As modern industrialised agribusiness has reduced diversity in all areas of the food chain from crop types to sales outlets, if we are interested in altering our cities without trauma to be capable of meeting vital environmental challenges such as climate change and peak oil, then consideration of and change to the existing monopolistic food system is vital as part of developing food sovereignty[10] (Rosset et al., 2006 :305).

However there are alternatives to industrialised food production, which are more agile, smaller scale, more local, less environmentally damaging and yet often more productive and less expensive; despite not having economies of scale. Urban agriculture (UA) is a growing area of research, policy and practical interest for both developed and developing countries (Pretty, 2008, Smit et al., 1996, Veenhuizen et al., 2006, Wright, 2009, Mougeot, 2005).

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[9] Argentina is due to sow about 2.9m hectares with wheat, the smallest area since records started more than a century ago and down 30 per cent from last season's 4.2m, according to estimates from the Buenos Aires grain exchange. The reasons given are drought, lack of credit and government policies (FT June 29th 2009)

[10] Food sovereignty incorporates rights to food, to land and to produce; going beyond the food security concept of physical and economic access to sufficient, safe and nutritious food.

Two major reasons why UA is being considered converge from different angles; small farms are more efficient and with growing pressure on land, growing in smaller urban areas is an important consideration. Additionally the existence of a growing urban population dependent on an external food supply has prompted research on how city areas can be more self sufficient.

Consumers in Britain are also starting to demand a closer connection to their food, which facilitates the rise of alternative food production; sold through farmers markets; community supported agriculture and vegetable box schemes. Urban dwellers, particularly in London, are starting to grow their own food in greater numbers in allotments, shared gardens and liminal city spaces.

## 3.4 Urban Agriculture – Allotments

In Britain policy and research attention for UA is concentrated on allotments (Capital Growth, 2009, GLA, 2006b). However, there are more diverse forms of UA and urban farmers. UA can simply be defined as growing food in cities, and takes diverse forms: small animal husbandry, bee keeping, recycling urban waste as compost, or vegetable production. UA is undertaken for various reasons ranging from leisure to food security and in a multiplicity of settings: home gardens: window boxes; green roofs; growing walls; community gardens across the world's cities; and is to a greater or lesser extent integrated into the city infrastructure (Veenhuizen et al., 2006).

Allotments are considered further below, to establish if allotments in their current form are not sufficient to provide resilience in UA for British cities.

'an industry that produces, processes and markets food and fuel, largely in response to the daily demand of consumers within a town, city or metropolis, on land and water dispersed throughout the urban and peri-urban area, applying intensive production methods, using and reusing natural resources and urban wastes, to yield a diversity of crops and livestock.'

(Smit et al., 1996 :5)

**Figure 11: Urban agriculture or metropolitan-intensive agriculture definition**

### 3.4.1 Allotment movement

Allotments have existed in Asia for over four thousand years (Conan et al., 2007) and in Europe since the fourteenth century (Vroom, 2006). The British allotment is a plot of land typically about 10 rods - 250 m2 allocated to an allotment holder for a low rent (c. £50 per annum) for food vegetable, fruit and flower growing (Vroom, 2006 :35). Allotment plots are usually grouped into sites incorporating between 10 and 500 plots for economies of scale and sociability. The typical plot had a hut for equipment and shelter and was considered sufficient land to produce vegetables and fruit to feed a family over a year. (Figure 12)

'Allotment plots were divided in two, and one half planted with potatoes and the other half with wheat or barley. The garden was reserved for green vegetables, currant and gooseberry bushes, and a few old fashioned flowers. Proud as they were of their celery, peas and beans, cauliflowers and marrows, and fine as were the specimens they could show of these, their potatoes were their special care, for they had to grow enough of these to last the year round. They grew all the old-fashioned varieties – ashleaf kidney, early rose, American rose, magnum bonum, and the huge misshaped white elephant.'

**Figure 12: 19th Century Oxfordshire Allotments** from Flora Thompson 'Lark Rise to Candleford' (Burchardt, 2002 :168)

Allotments were defined in Britain previously by their origins (provided by charity, or rented land tenancies) and were initiated during the eighteenth century shift to industrialisation (Burchardt, 2002). Allotment demand came from rural and urban labourers in various waves from 1793, 1830, 1850s when landowners issued allotments probably to discourage land agitation following enclosures and an attempt to improve labourers' moral character. Allotments provided an important part of livelihoods for the urban poor, as yields were high, twice that of farming land, for a low opportunity cost. Allotments were important materially and culturally and their success was demonstrated by the strength of demand nationally by both rural and urban industrial workers; in 1873 there were 241,973 allotments in Britain; one plot for every three male agricultural labourers (Burchardt, 2002) : 183). (Figure 13, Figure 14)

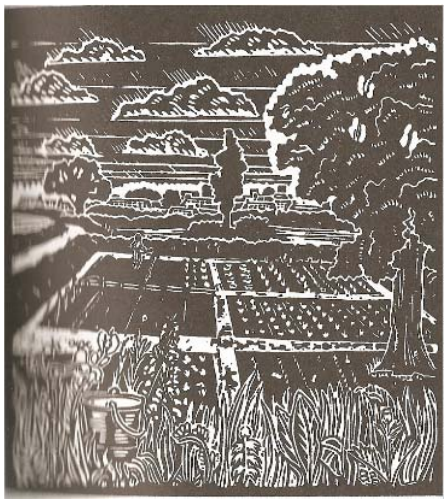


**Figure 13: Changing images of Allotments. Woodcut image 1988**

Henry Iles. (Crouch and Ward, 1988)

**Figure 14: Changing images of Allotments: Allotment 2006:** (GLA, 2006b)

### 3.4.2 Food Security in war time

Allotments were relied on for food security in Britain during the first and second world wars. The 'Dig for Victory' campaign, a well known state sponsored world war two effort, saw many parks and even Buckingham Palace allocating food growing space ( Figure 15). The impact on food production was effective; Britain in 1939 imported 55 million tonnes of food, but due to the sea blockades and the 'Dig' campaign, halved food imports by 1945. An estimated 1.5 million allotments and private gardens supplied 10% of Britain's total food needs and half of vegetable requirements. Allotments and small animal producers also managed to provide 12 million birds; and hundreds of thousands of pigs. (Crouch and Ward, 1988 : 76). These impressive figures show that urban agriculture in a crisis has the capacity to feed large populations.



**Figure 15: Dig for Victory advertisements**

(Johnson, 2009)

### 3.4.3 Periodic Fluctuations

Since the 1940s allotment sites in Britain steadily declined in number and acreage. In 1970 half a million allotments on fifty eight thousand acres, 1996 one in sixty five families in Britain had allotments (Crouch and Ward, 1988 : xv), but by 2006 only a quarter million plots remained in Britain. London had a steep drop of allotment sites, in 2006 only 737 allotment sites in 30 London boroughs totalling 20,786 plots were identified, the majority in outer London. The reasons being that legislative safeguards have not been sufficient to protect statutory sites, and temporary sites are not protected against loss. The mismatch of allotment location and demand means that allotments are not as effective for food production as in the past (Crouch and Ward, 1988, GLA, 2006a, GLA, 2006b). This development has impacted on food security. In 2006 Britain imported nearly thirty four million tonnes of food; about half a ton per person per annum (Gourley, 2009).

### 3.4.4 Policy shift in favour of UA

London is now showing signs of a policy shift in the acceptance and encouragement of allotments and UA generally. Examples are the Capital Growth 2012 scheme; a conference on Food for London in 2008 (Howard, 2008, Capital Growth, 2009) and numerous examples of positive media attention to urban food production, possibly affecting lifestyle trends.

It can be argued that this policy change is an example of emergence or systems shift in response to perceived problems with industrial agriculture. How to ground this emergence into planning and institutional models to allow UA to become integrated parts of city institutions? The difficulty is to avoid positive trends such as UA being co-opted to merely provide high quality food for middle class families and not solving the overall problem for the city.

Are allotments in their current form sufficient to provide resilience in UA for British cities? Allotments have shrunk in number since they fed London in the Second World War. Likewise knowledge about food growing has disappeared with changes in work pattern and aging. Finally, as with any single solution, allotments are not sufficient to feed cities. In the case of industrial agriculture system collapse or partial collapse, varying types of agile, quick moving UA would be needed. The next section discusses methodology, and the following findings chapter examines some examples of diverse forms of UA which London and other British cities could learn from.

# 4 Methodology

During the research process I became interested in how people and society construct reality. A three dimensional construction of understanding; developed from the multi dimensional interaction of systems, intricate webs of relationships, matters of quality and speculation. This constructivist representation of reality is deliberatively open to change, as the structures and links made in one area make other knowledge structures possible. Likewise our perceptions of the world construct our ethics, how to live, and the proper use of resources. This is exemplified by the link between the systemic theory of life and people and ecology applicable to urban agriculture. My research decisions (examining the problems of IA through systems theory; and the potential of diversity in UA resilience) have shaped the way that I understand urban agriculture, the importance of diversity; and the relations of energy to food production systems.

On the choice of a *research question* as opposed to a *hypothesis*; a research question poses a relationship between two or more variables but phrases the relationship as a question; whereas a hypothesis represents a declarative statement of the relations between two or more variables; and establishes criteria to prove or disprove the argument. The research question: the relevance of lessons from international experience in improving resilience in urban agriculture for British cities. Posed as an operational alternative hypothesis it might be worded: the more that British urban agriculture diversifies in variety from the current dominant UA type (allotments); the better alternative UA can provide to the modern industrialised food system. As the focus of this research is on international experience assisting with improving British UA, rather than on proving the extent that diversity impacts on resilience, I have chosen the research question. The conclusion proposes further areas of research which could be developed as hypotheses with criteria and proven or disproven.

## 4.1 Methodological Approach and data collection tool

The methodological approach is largely qualitative and non experimental. This is exemplified by the use of secondary source reported and documented case studies, with peer reviewed literature and reports. However there is limited use of primary research for the St. Petersburg case to confirm data and update published research with a current *dacha* user. An interpretative approach demonstrates the rationale of the case study qualitative method of data collection. However a theoretical framework guides research; where the main arguments are deconstructed; evaluated against the research question; and synthesised into relevant categories.

This report uses case study analysis of real life urban agriculture situations to understand holistic patterns and the interaction of significant factors (planning, institutional arrangements, economic and ecological) in the diversification of UA. The different case studies highlight the alternative ways the problem of feeding people in cities has been approached; defined by the need of the particular situation. Importantly the sharing of multiple perspectives; such as are found in case studies; can simultaneously change our representations and those who are shared with. The case study evidence; as a description of a complex, multilayered situation may assist with readers' reconceptualising of the place of UA in the city; and the importance of diversity of UA systems.

Yin explains that once parameters are set; the theory developed can be objective; that a single case can '*contribute to new insights on concepts and practice and allow general theorizing about the issues identified*.' (Yin, 1994 :23). The case study methodology therefore ties in with the principles of systems theory; which prioritises the importance of understanding the whole; appreciating complexity; searching multiple sources for evidence and seeing patterns and emergent ideas.

## 4.2 Limitations

This dissertation does not try to capture the entire diversity of international experiences in urban agriculture; concentrating on four case studies allows investigation of particular situations in urban agriculture through system theory. The benefits of urban agriculture in general are not covered; as there is extensive research and writing carried out on this area (Mougeot, 2005, Smit et al., 1996, Veenhuizen et al., 2006, Wright, 2009, Lawson, 2005, Pollan, 1991, Thapa, 2008).

The research concentrates on London, Britain's capital city for a number of reasons: First, London is crucial to Britain's UA movement: London is where the majority of UA-related research, decision-making and support networks are based. Second, London represents a variety of UA opportunities, from allotments to city farms. Third, both as the capital and the most urbanised area of the country, London provides opportunity to theorise and experiment on the limitations and benefits of mixing city life and food production in a dense urban area; and the impact on food security and city ecology. Britain in general is also referred to, to assess potential replication of the UA innovations in other northern European cities.

Limitations relating to the case study data collection and analysis are as follows: the case studies information is through secondary sources; therefore there are potential weaknesses in the sample publications chosen. For instance it was not possible to get up to date peer reviewed published information on the Cuba and St. Petersburg cases. However this was mitigated where possible, for instance by contacting a St. Petersburg *dacha* owner who provided important information on the current situation.

Each case has been documented differently; the Cuba case has been peer review published extensively; unlike the *dacha* system, Growing Power or guerilla gardening. Findings and analysis of the case studies are specific to my socio-cultural context; and my interpretations relate to my theoretical assumptions about the relationship and cross-referencing of human and biological systems.

# 5 Case Study Findings

This chapter examines the research findings from the four case studies examined – Growing Power farm, Havana *organoponicos*, St. Petersburg *dachas*, guerrilla gardening. These findings are illuminated through the lens of system theory; in relation to the theoretical framework. The following analysis chapter is concerned with how these findings might be implemented or applied to London and other cities.

## 5.1 Will Allen – Growing Power

Will Allen's Growing Power farm feeds ten thousand city dwellers from two acres in a low income area of Milwaukee city, USA. This highly productive, highly innovative farm established in 1993 uses constant experimentation, cutting edge knowledge and simple technology. The farm's success is based on mimicking ecosystems; the biodiversity of a river, the process of decomposition with compost making worms. The varied outputs from the farm; fish to compost sales to salad; are examples of ecological and production diversity and social inclusiveness led by Allen means that the farm is part of the city fabric.

'My motivation comes from a family tradition of passing on food and knowledge about the agriculture system to others. I grew up on a farm and in a culture that used food as a way to bring people together and transform society....If people can grow safe, healthy, affordable food, if they have access to land and clean water, this is transformative on every level in a community... I believe we cannot have healthy communities without a healthy food system'

**Figure 16: Will Allen: picture and quote.**

(Institute for Sustainable Communities, 2005)

### 5.1.1 Context and background

Allen, a driven and socially aware African-American ex professional basket ball player, is an excellent inspiration to teach and provide example on food and farming to the surrounding communities. Allen was assisted in the 1990's by Heifer International, (an NGO dealing with sustainable agriculture) which partnered with Growing Power farm to develop the vermiculture and aquaponics systems. These low input systems developed are one of the keys to the farm's success. The process of food production relies on Allen's dozens of employees creating eco-cycles of nutrition for example: compost made from urban food waste heat greenhouses; aquaponics where fish ponds recycle dirty water through filtering watercress plants for return to the ponds. It is a highly successful system based on making soil from urban waste, incorporating mixed farming with greenhouses, vermiculture (worm farms), fowl, goats, and beehives. (Figure 17, Figure 18)


**Figure 17: Closing the urban nutrient loop, using UA to produce food from waste via compost** (Drechsel et al., 2004)

**Figure 18:** Image: Growing Power's compost worms (Pierce, 2009)

The outputs and results are impressive: every year the farm grows 20,000 plants and vegetables, thousands of fish, livestock including chickens, goats, ducks, rabbits, and bees. Food production is worth $250,000 dollars annually. Three hundred thousand pounds of compost are created annually from woodchips and 6 million pounds of waste food. Most of the compost is sold and the rest used to fill twenty five thousand pots tiered in greenhouses and in the open air for tomatoes, salads, beets, chards and other vegetables. Every week a thousand trays of sprouts are sold, for $30 dollars a square foot. The aquaponic fish farm system produces watercress at $16 per pound, tilapia and perch fish at $6 each (Figure 19). Teaching and lecturing about the farm system is also profitable, Will Allen has received hundreds of thousands of dollars in awards and grants. [11] All the profits are reinvested in the farm

[11] Ford Foundation leadership grant, MacArthur Foundation Genius award, Kellogg Foundation UA job creation grants.

and community (Royte, 2009). The initiatives don't stop there. Growing Power is part of the Farm-City Market Basket Program, providing reduced cost urban agriculture food to low income residents.

**Figure 19: Fish farm water filtered through greens.** (Buttery et al., 2008：26)

### 5.1.2 Future plans

Allen wants a community food system scaled to meet a city population needs. He plans to encourage Chicago to use its 77,000 vacant plots to grow food; and is campaigning for new community urban agricultural centres to help avert food security problems. A centre would incorporate a policy institute, training and outreach, experimentation in a research and development centre and a demonstration working urban farm (Allen, 2009).

## 5.2 Cuba – urban farming of the future

Spring 1992. Doctors, teachers, young and old urbanites attend an urban agriculture class in Havana. They are learning from older farmers, brought out of retirement, who are teaching urban dwellers the basics of traditional agricultural knowledge using organic and permaculture methods for growing vegetables and fruit in vacant plots in the city. The students are listening hard; as current food shortages mean that they need UA to feed themselves from their home gardens and plots. The average Havana citizen's daily food intake has dropped by half since the late 1980s (Wright, 2009).

### 5.2.1 Context and background – the years of the Fat Cow and the Special Period

This unlikely scenario in the twentieth century was brought about by a crisis in oil access after the collapse of the Soviet Union which radically affected Cuba's highly industrialised agricultural food production. The trading relationship until 1989 between Cuba and Russia meant the island was relatively well off – Cubans call the period the years of the Fat Cow, but in fact Cuba was extremely vulnerable, relying on a single trading relationship. Russia bought Cuba's mono crop sugar output at five times the world price; Cuba in return bought 90% of oil needs, tractors, fertilisers and 63% of imported food needs from Russia.

Due to the island's physical, political and economic isolation after the Soviet Union collapse, this Special Period tested Cuba almost to breaking point; overnight oil imports dropped from fourteen million tonnes a year to only four tonnes; meaning that crucial fuel for tractors, fertilisers, pesticides, animal feed, food transport and food preservation were not available. Almost immediately symptoms of malnutrition appeared in Cuba and an average Cuban lost twenty pounds by 1994 (Rosset, 1996, Wright, 2009, Morgan, 2006).

The State and people reacted quickly to the food crisis and with remarkable success; as the problem was defined as food security for everyone; and the solution as a self-sustaining agricultural system, incorporating permaculture and organic aspects.[12] By mid 1995 the Cuban food crisis was under control (Rosset, 1996), and widespread changes had occurred in food production systems. Research in 2006 revealed a mere two hundred urban gardens providing ninety per cent of Havana's fresh fruit and vegetables. Vivero Organoponico Alamar is an example of a highly successful Havana urban farm; dating from mid 1990s, only 0.7 hectares; it employs c. 25 people and has a large output. It uses organic low input methods, like most Havana plots. The labour intensive, micro management required for organic and permaculture methods is particularly suited to the small plots available in cities (Buncombe, 2006).

**Figure 20:** (Buncombe, 2006)
***Organoponicos* image**

Of course a crisis in food production on the scale of Cuba was not resolved immediately. Rural state run farms were slow to respond, and in the void left by the state farms; city dwellers out of necessity plunged into small scale, intensive, organic urban agriculture to feed themselves. The urban dwellers' lack of knowledge about conventional farming meant they were not prejudiced about farming techniques, and were quick to learn about and use permaculture and organic methods. After initial failures with rural crop yields falling; the government started a complete reorganization of land allocation and farm

[12] In Iraq, by contrast, a similar food crisis was defined as a military issue; the soldiers were financed but people starved.

management; particularly focusing on urban agriculture which had proved successful: agile, producing new growing plots and improved food yields. Other changes the state initiated included facilitating the various forms of UA which had arisen through mapping potential UA sites and assisting with training and marketing. In addition the state worked in integrating new agro and bio-technologies with traditional knowledge.

### 5.2.2 Urban farming systems

There were a variety of types of plot; home gardens which were intensively farmed and privately owned. Patio and balcony growing produced vegetables, salads and small livestock. *Organoponicos*; a raised bed irrigated intensive food production system was either state or cooperative owned (Wright, 2009). *Parceleros*, or farming on abandoned plots, marginal and wasteland; usually through gardening clubs and community organised workshops; were highly successful, by 2000 around one hundred thousand plots existed; with greater yields than combined *organoponicos* and home gardens. The workplace frequently facilitated workers to organise plots at work; and Havana was also surrounded by over two thousand small (2-15 hectares) private and State owned urban and peri-urban farms (Morgan, 2006, Rosset et al., 2006, Wright, 2009).

### 5.2.3 Current situation

The latest published research shows Cuban urban agriculture is still flourishing and largely organic with about seven thousand *organoponicos* urban allotments on eighty one thousand acres. However with availability of oil and conventional farming inputs the rural agriculture system has largely reverted to the pre-crisis industrialised system. Reforms to the agricultural system are still ongoing under Raul Castro with agricultural supply shops for farmers. Higher farm gate prices and encouragement of farm ownership mean farmers in Cuba are now paid relatively highly, unlike before the Special Period. Urban agriculture gives economic and job opportunities (an average fifteen jobs per hectare), along with environmental advantages of city greening. The *organoponicos* system is heavily supported and subsidised by the State, land is owned by the government but farmers have the opportunity to sell food at markets (Wright, 2009).

## 5.3 St. Petersburg *Dachas* – Urban planning and urban design

Every May Day there is a special and much loved holiday when millions of St. Petersburg citizens known affectionately as the summerfolk or *dachniki* - make an exodus from the city by train, car or bus. They go to their *dachas* to sow food crops for the year; at least half a million stay on the *dachas* for the entire summer; *dachas* account for over half a million hectares in cultivation around the city (Figure 21).This is a phenomenon not confined to St. Petersburg – it is common practice throughout Russia and Eastern and Central Europe for urban

dwellers to produce considerable amounts of food on their residential plots outside the city. The food is harvested and stored in root cellars, bottled and pickled and brought back in batches to the city as needed, and it makes an important contribution to urban dwellers' food security and livelihoods especially during economic uncertainty (Lovell, 2003, Moldakov, 2003, WHO and Unit, 2000, Rose and Tikhomirov, 1993, Seeth et al., 1998, Struyk and Angelici, 1996).

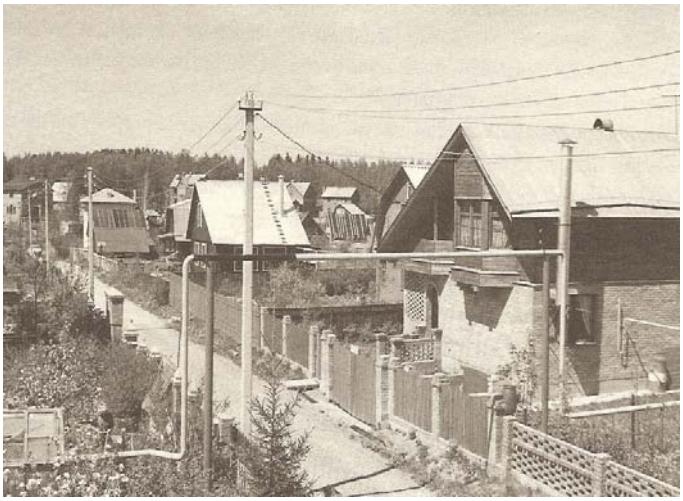


**Figure 21: Dacha cooperative village** (Lovell, 2003 : 225)

A St Petersburg grandmother dacha worker says: 'I try to help my young ones, .. my children... But what can I do as an old one... Well, I help bring up and care for my grandchild and of course I take care of our small kitchen garden on my dacha... little by little we manage to raise enough vegetables and berries to provide for our family. Not only do we eat fresh tomatoes, cucumbers and peppers in summer, but we also prepare our own supplies such as potatoes, pickles, preserves, jams and more for the whole year. Then we sell some outside the metro station as you see here today.'

**Figure 22: Dacha produce** (Ivanova, 2004)

### 5.3.1 *Dachas* context and background

In St Petersburg *dachas* are common. A *dacha* spans from modest, simple structures to elaborate country house, the more basic being generally used for active food production and the larger ones more likely for leisure. Lovell points out the changing context and meaning of *dachas*. For instance it was after the 1917 Bolshevik coup, in fact during the Second World War, that *dachas* became closely associated with food growing by urban workers. Opinions on *dachas* have changed too over time, from a rejection of agricultural work to a recent return to the soil, from a disdain for the frivolous intelligentsia in their *dachas* (exclusive *dacha* areas existed, for politicians, artists and professors) to an appreciation of the importance for everyone to have access to fresh air and countryside (Lovell, 2003 :236).

*Dachas* arose at the start of the nineteenth century as summer residences for nobility situated on the Neva River and islands. Land nationalisation after the revolution did not wipe out *dachas*, but added to their variety with *Sadovodstvo* and *Ogorod*, collective *dacha* organisations. By the end of world war two, *dachas* became associated with the under provisioned urban worker - a small hut on an allotment rather than the original large summer

house for leisure. The contradictions between a second home with its connotations of property and opportunity for income and the legitimate Soviet workers allotment hut were not addressed and deliberately left vague. Private *dacha* ownership existed throughout the Soviet period – an argument that the authorities recognised the importance of private food production plots to the city populations (Lovell, 2003 :173).

By the 1960s cooperative *dacha* garden plots of 600 sq m each, with huts of 25m2 (*Tovarishchestvo*) were common, big state enterprises or institutions were issued land, and organised garden cooperative societies with multiple plots. However, the legal title was attached to the land use, not the ownership of the house (Lovell, 2003 : 194).

### 5.3.2 Planning and urban design issues

St. Petersburg has a lack of public green space; despite being a planned city[13]. Unlike Greater London with one third of its area green or water, (Capital Growth, 2009) Greater St Petersburg makes do with 17% public green space. The historic city core area only has 618 hectares (c. 8%) green space; as 17% is water (Clark, 2006 :268). This lack of public green space is offset by over twenty thousand hectares of agricultural land (c. 9%) within the city boundaries used for urban agriculture in *dachas* and over half a million hectares in the peri urban area. The *dacha* 'band' of garden plot communities around St. Petersburg replaces the suburb, which is not prevalent in Russian cities (Lovell, 2003).

Although Clark considers that green space in St. Petersburg is not adequately protected by legislation, a 2003 law was passed 'on the protection of green space' however this legislation leaves open space vulnerable to land grab development and there is little public participation in urban planning decisions (Clark, 2006 :268). Despite this, large areas of green space in the peri urban areas still survive, protected by being used for the *dacha* system of urban agriculture as usufruct.

### 5.3.3 Current situation

An estimated four in every five St. Petersburg families by 1997 had a *dacha* or similar land plot, and a special national public holiday; Gardeners' Day to mark the importance of urban agriculture was initiated in 1999. Interestingly it was women who managed the *dacha* plot. (Lovell, 2003 :218). By the millennium *dacha* huts were still simple; typically between 30 and 44 m2 (the size varied whether the *dacha* was for summer or winter proofed) and only 5% had plumbing (Lovell, 2003, Struyk and Angelici, 1996). *Dacha* houses still have no legal status of permanent dwelling; the simplest are called *sadovy domik* - garden hut, and do not have post addresses (Kononenko, 2009).

[13] Europe's youngest capital, founded in 1703 by Peter the Great.

Elena, a St. Petersburg *dacha* owner experiences with her 670m2 *dacha*, 54 km from the city (Kononenko, 2009):

Elena's Dacha

*'This is my little motherland. I spent there all the summers in my childhood, and did the same for my son from his babyhood to the time he was 14 ….*

*A 600 sq. m plot is enough to feed a single person for a year, and gives good variety to a family menu. For instance, every summer in the 1970-1980s my mother made nearly 300 litres of fruit juices, 10-20 litres of jams, 40-50 litres of pickled cucumbers, tomatoes and bell-peppers. We also had for winter some fresh carrots, beets and turnips, as well as potatoes. My father also made 60-70 litres of black currant sweet wine a year. We used to have glasshouses for tomatoes and cucumbers, as well as a cellar ….. My 'farming' is completely organic…. I still have apple and plum trees, red and black currants, gooseberries, raspberries and strawberries - usual set of fruit plants in St. Petersburg region, but do not grow any vegetables.*

*Most of my dacha neighbours still do [grow vegetables] … nowadays in St. Petersburg dacha farming doesn't mean that much [for] family nutrition….[However in the] 1980s -1990s it was different. I knew many people who lived on what they or their relatives grew in the gardens, and not only vegetables. Then, besides .. potatoes and fruit, retired parents could keep rabbits or chickens, or even goats in their gardens to feed their adult children. It was relevant, as at that time state employees got their salaries irregularly, and inflation destroyed half of the expected money….*

*My dacha, as most of such gardening plots, is part of a gardening cooperative society….[total area] about 4km long and 10km wide…. about 20,000 plots. All the dacha villages have no status of permanent settlements. All the (roads, gas supply, electricity,) services are provided at single or grouped cooperative societies' expense…. Garden cooperative societies pay for electricity a bit more, than city dwellers. Garden societies are not subject to the administration of Leningrad Region despite [being] located on the Region land and all the plots are registered in the Land Committee of Leningrad Region. Local authorities sometimes send special commissions to check, if the borders of the society's property are correct …. Garden societies members have right to call for the local police or firemen.'*

**Figure 23: Elena's Dacha**

Despite the positive and very necessary contribution that the *dacha* food allotment has made to St. Petersburg citizens for subsistence food production and particularly in negotiating the chaotic transition post Soviet economic period, there are criticisms. Local authorities in the *dacha* areas complain about the necessity to cater for temporary *dacha* dwellers with roads, services etc. The *dacha* is also criticised for the same aspects that allotments have been – removal of the demand for radical societal change (Figure 24).

'..the dacha turns a Russian into an idiot, it takes away his strength, makes him impotent. Any connection with property tends to make people submissive, cowardly, dense and greedy. And when millions of Russian people are attached to dacha plots and spend their time planting carrots, potatoes, onions and so on, we can't expect any changes in society'.

**Figure 24: Limonov quote** (Lovell, 2003 : 231)

## 5.4 Guerrilla Gardening

The famous Johnny Appleseed, the early nineteenth century apple tree planting American, got his nickname from planting apple seeds to spread orchards. In fact it was probably more a business venture, selling trees and fruit to American settlers, than a desire to improve the world. In fact he became extremely rich, owning many thousands of orchard acres. His tactics would be considered guerrilla gardening today. It may come as a surprise to have the rural and preindustrial Johnny Appleseed in the same category as the urban gardening equivalent of the graffiti artist. However, Johnny Appleseed's and guerrilla gardeners' common activity: illicitly planting in public or underused private land, by definition, makes them both pirate gardeners.

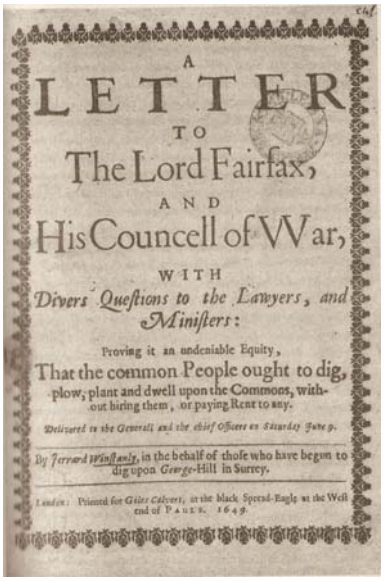
**Figure 25: Guerrilla gardening example, before and after** (Reynolds, 2009)

This case study looks at the chaotic, amusing, daring, beautifying area of guerrilla gardening (GG). Guerrilla gardening takes to heart Gandhi's saying: *Be the change you want to see*. Instead of walking past neglected urban space and complaining; guerrilla gardeners get out and improve the situation themselves by planting trees on a roundabout, pansies in a tree pit, and lavender on a road verge. It is the punk version, the radical cutting edge of the urban community gardening movement.

### 5.4.1 Context and background

The first guerrilla gardener was arguably Gerrard Winstanley, who in 1649 dug up and planted common land in Surrey. His movement, the Diggers, had initial success. However his argument published in *The True Levellers Standard Advanced* that the land is a '*Common Treasury for All'* and belongs to the people for their own food production was too radical for landowners (Figure 26). He was finally obstructed, the movement died out but the

ideas reemerge at various times to today, and enthuse both guerrilla gardeners and land movements (Reynolds, 2009, Wall, 1994).



A
LETTER
TO
The Lord Fairfax,
AND
His Councell of War,
WITH
Divers Queſtions to the Lawyers, and Miniſters:
Proving it an undeniable Equity,
That the common People ought to dig, plow, plant and dwell upon the Commons, without hiring them, or paying Rent to any.
Delivered to the Generall and the chief Officers on Saturday June 9.
By Jerrard Winſtanly, in the behalf of thoſe who have begun to dig upon George-Hill in Surrey.
London: Printed for Giles Calvert, at the black Spread-Eagle at the Weſt end of Paules. 1649.

**Figure 26: Gerrard Winstanley Digger's publication** (Reynolds, 2009 : 66)

New York's illicit community gardens grown by the Green Guerillas on abandoned lots were the 1970s and 1980s version of extended guerrilla gardens (Tracey, 2007 : 24). This example of guerrilla gardening showed how community efforts in environmental improvement and food growing resulted in property values rising to the extent where the city authorities decided to take over and sell the gardens to private developers. Some lots were bought by the gardeners with fundraisers; to protect the public garden amenities. This example of co-opted emergence, where private capital accumulating interests take over an emerging movement is one which Biel notes occurring (Biel, 2006).

### 5.4.2 Current situation

Guerrilla gardening springs up in today's cities for a multiplicity of reasons: hunger, idealism, self sufficiency, community, health, economics, fun, creativity. Examples of guerrilla gardening today include: illicit use of public spaces for and food growing, herbs (and even marijuana) growing, planting ornamental trees on traffic islands, local businesses illicitly planting to improve the nearby environment for commercial reasons, planting in public places to make political statements. An example of the political statement guerrilla gardening is the view of the House of Parliament framed by illegal sunflowers (Figure 27). Guerrilla gardeners arise spontaneously across the world and act, and there are more than you might think – thousands of guerrilla gardeners meet and share stories. They use new, fast moving technology to connect with each other:

www.guerrillagardening.org/

www.spiralseed.co.uk/guerillagardening

websites, blogs, Twitter (

Figure 28).


**Figure 27: House of Parliament and guerrilla gardened sunflowers** (Tree Hugger, 2009)

www.guerrillagardening.org/

www.spiralseed.co.uk/guerillagardening

**Figure 28: Examples of Guerrilla Gardening websites**

'Guerrilla gardening is an organic movement, … it has sprung up whenever the environmental conditions of society have been conducive to it. Like seeds blowing from one patch to flower in another near by, guerrilla gardens grow and adapt to local conditions, and in time take on new characteristics, almost like new species of a genus.'

**Figure 29: Guerrilla Gardening Adaptation** (Reynolds, 2009 :10)

### 5.4.3 Link with systems theory

There is an interesting link with systems theory view of emergent structures which pop up when systems are far from equilibrium. As an emergent activity, it is adaptable and reacts to circumstances and conditions with varying forms and species. Guerrilla gardening could be considered as the period in a social or ecological cycle of rapid reorganization. This period is characterised by new combinations, unexpected seedings, innovations which are developed and understood only in the next cycle. This is an aspect which is understood by guerrilla gardener Richard Reynolds (Figure 29).

# 6 Analysis of each case study by issue

## 6.1 Will Allen – Growing Power Farm

The aspects of the Growing Power farm which are particularly interesting for this research include the hyper productivity of the urban farm and the integration of the farm with the city in diverse ways. This also provides a theoretical link with systems theory: in the ecological systems used in the farm, the knowledge transfer and social inclusion. For instance, Growing Power demonstrates an important synthesis of a number of inexpensive farming techniques: tiered and raised beds, aquaculture, vermiculture, heating greenhouses with heat from compost making to transfer the urban waste into food. The high productivity coming from the use of urban waste and the constant experimentation could be seen as an example of the holistic pattern which governs systems theory of living eco-systems. On the ecological level urban waste is diverted from methane making landfill to compost. Additionally Allen and his team carry out careful observation and continuous experiments to devise mutually supportive farm eco systems. There is an important ecological diversity of farming production: fish, worms, compost and vegetables.

Knowledge transfer; as discussed earlier is also an explicitly important element. In Growing Power's teaching and schools partnering. Social outreach and education are particularly important for the farm; working with community groups and schools, leading workshops to teach disempowered minorities sustainable farming techniques and giving opportunities to volunteers. There are important yet intangible social benefits of a vibrant and working farm in a deprived urban area. Economically, the highly productive food harvest and compost sales are an important income source.

### 6.1.1 Implication for British cities

Growing Power has already seeded. There are Growing Power outreach farms in Chicago and Illinois, which indicates that the system could be replicable. However the personal impact of Will Allen for initiation and driving passion should not be underestimated in the success assessment of setting up similar farms. For instance a farm in an analogous location in a mixed neighbourhood: Freightliners' farm in London's north city area of Islington, has both the required land and local authority backing. The farm is currently run largely as a community resource animal petting farm; with an element of compost making from local community waste. Although the systems required to transform it into a Growing Power experimental powerhouse are not all in place, there is potential (Freightliners, 2009).

In relation to Allen's plans for community food, Salatin from Polyface Farm (the farm studied in Michael Pollan's critique of the food industry *The Omnivore's Dilemma* (Pollan, 2006)) has a similar strategy. He plans to scale up food production to community level with 'food clusters' to cover urban food production from farm to fork. These clusters are intended to link the necessary elements in a food production chain, processing, marketing, accounting, distribution and customers. With enough sizable food clusters; a few hundred each valued $5 to 10 million, Salatin envisages that urban centres could be serviced by local community based food clusters instead of the current industrialised system (Salatin, 2009).

## 6.2 Cuba: Response to crisis

The concern with defining, and formalising UA spaces led to mapping all the actual and potential urban agriculture sites and issuing usufruct (right to use) rights. Facilitation of UA by the State with activities such as plot mapping (Figure 30) and allowing limited food marketing were part of the important services the Cuban government carried out (Mougeot, 2005 :177). The mapping and formalising of UA was importantly allied with promoting research on sustainable technologies, the transfer of organic and permaculture agricultural knowledge to Havana's citizens and the provision of affordable agricultural inputs to urban farmers through the TCA, (agricultural goods and services centres) (Mougeot, 2005).

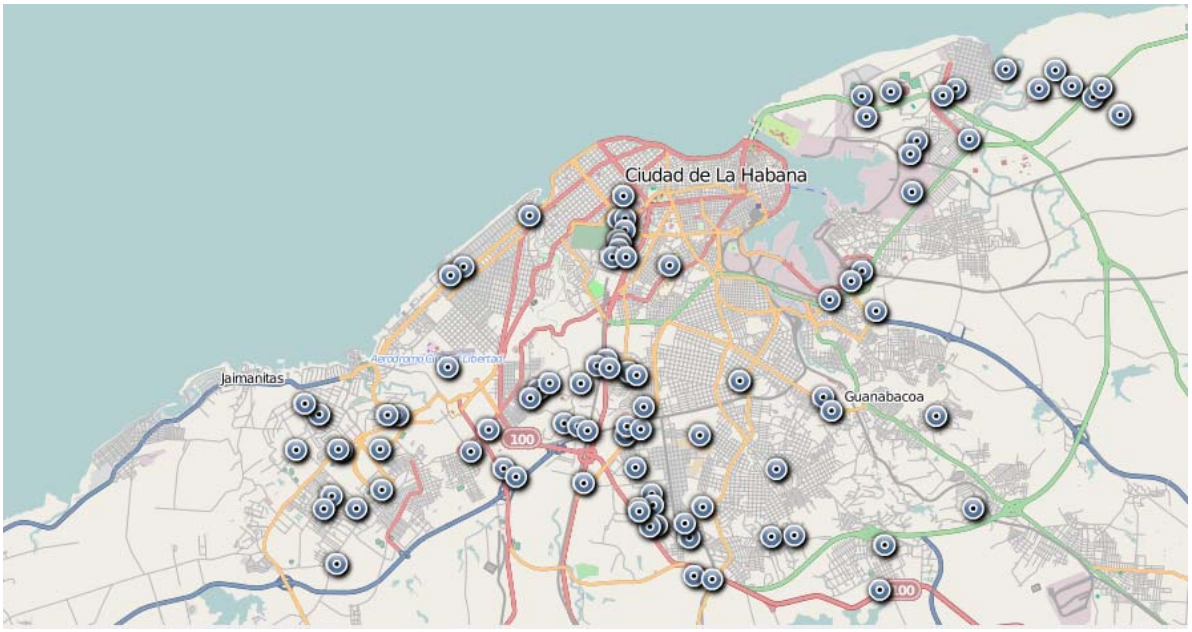



**Figure 30: Havana Urban Agriculture map showing UA sites.** (Geocommons, 2009)

In a recent major publication on Cuban agriculture, Wright (2009) does not specifically deal with permaculture separately from organic agriculture; however there are permaculture aspects implicit in many of the statements made about organic farming. For example: '*farmers realised they had to develop ecological literacy and agro-ecology*' (Wright, p208) and a farmer quoted on the learning process of farmers about working with nature and increasing their knowledge (See Figure 31). The State run rural farms were slow to adopt permaculture and organic. As Wright points out, no access to oil does not immediately mean widespread organic methods; which allows us to differentiate between the industrialised agriculture mindset (present in Cuba) and effect of agri-business interests (not present in Cuba) (Wright, 2009).

'agronomists especially have to start learning everything through observation; mixing plants of different colours and smells to regulate insects, noticing air currents at different times of the year and wind direction, and the influence of the sun and the moon' (Wright, 2009 : 216)

**Figure 31: Farming observation quote** (Wright, 2009)

Permaculture and organic agriculture (under certain conditions) reduce the fossil fuel requirements in food production, a major input. The other major input required for food growing in Havana was information. Knowledge transfer was a crucial element in the success of Havana's UA– the older farmers as bearers of traditional knowledge about farming were recognised by the State as necessary to impart knowledge to help the young and urban dwellers learn how to grow food.

Permaculture and systems theory overlap in several areas. For instance permaculture attempts to design and set up self-governing systems with feedback loops to produce food, which has a close link with systems theory. Permaculture theory considers that a deficit in inputs creates work; and considers a deficit in output to be pollution or waste; it is a cradle to cradle concept of cycling resource use (McDonough and Braungart, 2002), similar to Systems theory view of inputs and cycles.

### 6.2.1 Implication for British cities

The Havana case indicates the importance of the centrally controlled state's role in supporting and promoting UA in an oil induced crisis through mapping, ensuring knowledge transfer and facilitating marketing food produced. The state's role (discourse analysis), is not recognised by a number of Cuban UA researchers, (Hopkins, 2008, Morgan, 2006) instead study concentrated on the organic production aspects.

In applying lessons of the Havana experience to Britain the central control of the state is most unlikely to be replicated. However, the concerted and coordinated response to the crisis; with the successful outcome for low

input organic and permaculture food production and the avoidance of prolonged food insecurity could be reviewed for the facilitatory role the state could take in transferring mapping and low input farming techniques.

## 6.3 St Petersburg *dacha* system

### 6.3.1 Land use planning implications for London and British cities

A summary of policy and planning framework for London follows, reviewing the key contextual planning and policy framework issues relating to Green Belt and the potential for UA. Planning frameworks and objectives are initiated at the London Level (Greater London Authority) and Borough Council scales respectively.

*Policy 3D.14 Agriculture in London*
The Mayor will and boroughs should seek to encourage and support a thriving agricultural sector in London. Policies in UDPs should provide for the protection of the best and most versatile agricultural land in accordance with national guidance, and allow for appropriate projects for farm diversification and other measures to meet the needs of farming and rural business development. Such policies should be consistent with the other policies of this plan, such as having regard to sustainable development and transport and the presumption against inappropriate development in the Green Belt.

**Figure 32: The London Plan policy on UA** (Greater London Authority, 2004)

A key document is the London Plan which outlines the strategic priorities for UA in London (Figure 32).

The Plan intends to provide protection and allow diversification for London's best farmland. Farmers' markets are seen as good practice. The Plan also foresees the Green Belt acting as a pastoral relief to Londoners.

National Planning Policy Guidance (PPG) is prepared by the Office of the Deputy Prime Minister. This outlines how Unitary Development Plans (UDPs) relating to local circumstances and political priorities need to give account to issues including Green Belts (PPG 2), Retail Planning (PPG 6) and Waste Management (PPG 10) (Barrett and Keech, 2004).

The Curry Report contained over one hundred recommendations for change in the food and farming sectors. Not only was it pointed out that farming is in serious trouble, but consumers and producers are not in tune with one another. Curry recommended, for example, extending support by local councils for farmers' markets in areas undersupplied by retailers, developing food buying co-operatives especially in areas of low income, and examining how public sector procurement could achieve environmental and economic benefits. However, based on the research carried out on industrial farming, there are doubts that the intentions of the Curry Report would be

helpful for food production. For instance the report recommends that the countryside be preserved as an attractive place for weekend walking (Policy Commission on the Future of Farming and Food, 2002).

The 2008 Growing Food for London Conference highlighted that an enormous reduction in London food growing within the M25 had occurred from 1970 to 1995, although a short food chain close to the city was of great importance for London communities. Peter Clarke from Kingcup Farm in Buckinghamshire; a London Fringe farmer dependent on the London farmer's market network; told the conference that despite problems of labour shortage, vandalism, road congestion, water supply, and the age profile of farmers that the urban proximity gave excellent opportunities in niche markets. To take advantage of this, he suggested that the County Council Smallholders' Scheme be revived and extended to London boroughs (Howard, 2008).

### 6.3.2 Benefits and limitations of transplanting the *dacha* idea to London

Although the St Petersburg *dacha* allotment system is not indigenous to Britain, there is potential for a form of the *dacha* system to be exported and applied to London and other cities. There are a number of reasons why implementation of a *dacha* food growing system close to the city could have planning, economic and social benefits.

*Dacha* allotments are potentially a highly effective strategy to protect UK city's Green Belt by giving it a positive use rather than the existing system of assessing the constant applications to develop in the Green Belt area (Figure 33). Urban agriculture in the form of a residential allotment system would provide a clear use which would maintain the Green Belt character and use. This planning benefit is in addition to the other benefits of *dachas* for social cohesion, food production, re-use of waste and encouraging ecological diversity.

However these benefits need to be considered against some potential problems. The most obvious is the issue of 'doubling up' on housing for the urban dweller with a *dacha*, and all the attendant services required. A solution to this problem would be to carefully design standard *dacha* huts as very simple, 'off grid' units, with composting toilets, rainwater harvesting and renewable energy for lighting and heating. The grouping of *dacha* huts and the allotments in permaculture community-like lots of twenty or fifty could lead to economies of scale for roads, waste management and other servicing. *Dacha* allotments would also reduce the demand for the resource demanding yet unproductive weekend country cottage. Against the objection that successful *dacha* allotment schemes may mean hundreds of thousands of urbanites travelling (with the attendant transport and carbon use) *dacha* allotments could be situated in the urban or peri urban areas on public transport lines to reduce car travel. A further benefit is that the movement from city to country could be considered a healthy change for urbanites; breaking down the traditional city/country divide. For example, Ireland tends to be more integrated than Britain in

terms of city and country interaction; with a large proportion of Irish urban dwellers travelling to the country at weekends to spend time with extended rural family.

*'Green Belt and Metropolitan Open Land*

The best known initiative to safeguard open land from erosion was the green belt legislation that was introduced after the Second World War - as a direct consequence of the growth of suburban house building in the 1930s.

The inclusion of land within the green belt ensures that countryside is close to the built-up parts of London. It provides recreational opportunities, protects and promotes the landscape and biodiversity, promotes the improvement of damaged and derelict land, and helps to retain agricultural land. The green belt is a permanent feature, with the prime purpose of preventing urban sprawl and preventing neighbouring towns from merging into one another. Its boundary should only be changed in exceptional circumstances.'

**Figure 33: London's Green Belt** (GLA, 2006a)

### 6.3.3 Close

In conclusion, a proposal to initiate *dacha* allotments in London, facilitating urban agriculture by urbanites in the peri-urban area, may assist with breaking the log jam of destructive (private single house) uses for agricultural land. The British planning laws could be amended or interpreted to allow a *dacha* type allotment system to be implemented and thereby protect Green Belt and countryside which is currently vulnerable to the numerous exemptions which allow building. This planning benefit is in addition to the above mentioned economic, environmental and social benefits; but the planning implications could provide the impetus to planning authorities to encourage or initiate a *dacha* allotment pilot scheme.

A major contribution that I see *dachas* make is not just in food production; but also in the social relations built outside the city; non monetary exchange, friendship, community. This, allied to the access that *dachas* give to urban dwellers to the country, is invaluable in social, economic and environmental terms (Figure 34). *Dachas* could be knitted into the social fabric of British holiday making, as they have much in common with the existing much loved beach huts and allotments.

> ‘At one time I couldn’t stand life out of town. I laughed when people started looking for dachas in the spring… But now, you see, I feel drawn to the land.’

**Figure 34: Nikolai Zabolotskii 1958 (Russian Poet)** quoted in (Lovell, 2003 :186)

## 6.4 Guerilla gardening - institutional experiment

Guerrilla gardening is a living example of the Lefebvre’s city dwellers’ right to the city (Lefebvre, 1991, Lefebvre, 1996), the right to interact with the space, to enhance and beautify. The strength of guerrilla gardening is in how it unites Thoreau’s ‘civil and social’ gardening with the ‘vigor and freedom’ of the forest (Figure 35).

> ‘Gardening is civil and social, but it wants the vigor and freedom of the forest and the outlaw.’
>
> Henry David Thoreau

**Figure 35: Thoreau quote** (Tracey, 2007)

### 6.4.1 Implication for British cities

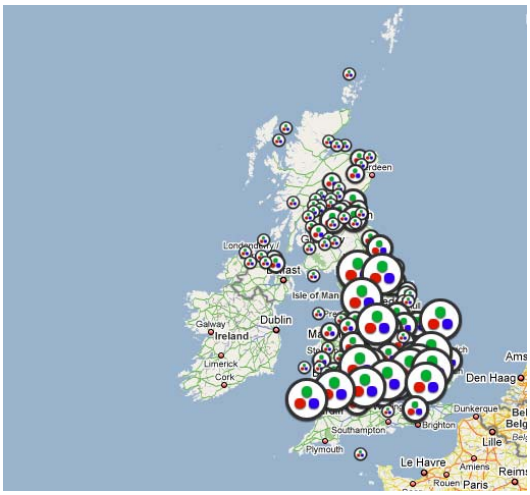



**Figure 36: Landshare Map** (Landshare, 2009)

What could the guerrilla gardening movement give rise to? Is it merely activities carried out by scattered individual people who like planting without permission? Or is it the sign of a sea change of opinions about land ownership and community responsibility? I would like to think guerrilla gardening is an expression of new emerging socio-political forms which bring the debate on how cities should be (e.g. resource hungry or integrated into their eco-systems) into concrete form before our eyes.

Guerrilla gardening also helps answer questions about how we can make cities. They demonstrate directly to observant citizens and policy makers how cities can be: greener,

community conscious, resource sensitive, thoughtful, and food producing. There are opportunities here for the state, or an authority like the GLA to encourage and nurture guerrilla gardening. One way to support guerrilla gardening might be through linking with movements to share and offer land for gardening. An example is Landshare, which links people with underutilised land and those who want to garden (Figure 36).

Another option is to just observe, and not interfere. Guerrilla gardening has the potential to seed further and more developments, which are likely to be interesting and creative.

Finally, Figure 37 (below) summarises the information discussed above. Each issue is identified, along with the lessons that could be picked up from each case study and applied to British UA situations to improve resilience. The positive potential of each case study, along with limitations is also highlighted.

| Case Study | Issue | Positive potential | Limitations |
|---|---|---|---|
| Will Allen, Growing Power Farm, Milwaukee | High productivity and social inclusion | Counters social exclusion - inclusive<br><br>Highly experimental – cutting edge<br><br>Diverse Solution – lots of elements.<br><br>Solves the issue of high productivity and closing the nutrient loop.<br><br>Integrates UA into the city | Not self sufficient, reliant on grants and lecture fees.<br><br>If so successful, why has it not been replicated? |
| Cuba, Havana urban agriculture | Mapping and permaculture | Example of strategy in a country wide food crisis<br><br>Knowledge transmission of organic and permaculture low input food systems.<br><br>Facilitating role of State in site location, supporting marketing. | Enabling role of the State is a large factor in the Cuba case. Cuban Government extremely supportive of UA due to oil crisis. This is not brought out in many analyses. |
| St. Petersburg dacha food growing allotments | Urban Planning<br>Urban Design | Existence of a dacha solution in a peri urban area.<br><br>Relevant to renegotiation of the Green Belt strategy. Ties in with GLA strategy. It is not enough to defend the Green Belt – it is important to give positive uses as well. | Planning a pilot dacha initiative in a Green Belt area would need to be carefully strategised to avoid attrition of protected land. |
| Guerilla gardening | Institutional experiment | Emergent system, high energy. | Potential to be co-opted |

**Figure 37: Summary table, case study issues**

# 7 Conclusions and Recommendations

It is not entirely unlikely that Britain could suffer a hiatus in food accessibility, this has already happened during the world wars. A financial crisis, like the 1980s St. Petersburg experience which reinvigorated UA food growing is also possible. If the industrial food production system collapses; or goes into crisis and cannot deliver, for instance in a situation similar to the Cuban food crisis, then city populations are likely to need agile, diverse, UA forms to feed themselves. As the Cuban example showed, rural agriculture could not respond quickly for a variety of reasons, which is likely to be replicated in the British context. These reasons include: lack of knowledge and suspicion of organic and permaculture techniques, the time lag (five to eight years) required to regenerate the soil after industrial farming, lack of productivity of extensive farming compared with UA allotments and micro plots and most importantly, lack of diverse systems in place which could quickly scale up to deliver in place of the current industrial food system.

### 7.1.1 How has the literature contributed to the research?

The literature review on the problems with industrial agriculture gave this research a sense of urgency. During the study period it became clear that industrial agriculture was both causing and suffering from a variety of problems environmental and financial. It also became clear that allotments, although an important form of UA in the past, would not be sufficient to replace the output of industrial agriculture, particularly in London. With these two points identified, the relationship between diversity and resilience took on a new clarity. Once it was established that the concepts of diversity and resilience could apply to both social and biological systems, it became clear that this could be true of UA, an activity poised between the environment and society. The case studies research could be viewed as reflecting particular concepts in systems theory: emergence, low input and high output.

### 7.1.2 Contribution the research has made to the literature

I feel that this research has made a useful contribution to grounding the literature on UA in theory with a certain rigour, as opposed to a large proportion of UA literature which is concerned with best practice. For instance the Capital Growth scheme for community food growing does not appear to have any provision for assessing the quality of the 2012 growing spaces planned (Capital Growth, 2009). Neither are there apparent plans for follow up research or publishing the results of the 2012 scheme to allow analysis. Additionally the four case studies have not been studied together before to my knowledge. The lessons learnt from each study make useful connections for UA theory development when looked at as a whole in relation to UA resilience in London and other British cities.

### 7.1.3 Has research met aims and objectives?

This research is on the relevance of international experience to improve resilience in urban agriculture for British cities. This has been demonstrated, in the case study findings and analysis, if each lesson identified in each of the four case studies was applied to London and other cities, UA resilience would be improved. The summary below gives the highlights and limitations of each case study in diversifying UA (Figure 37).

Despite the fact that all these lessons, if applied in London would be costly and complicated, working on diversifying UA is still worthwhile. Even though the industrial food production system is still producing food, to have redundancy built in could be extremely valuable. Hospitals have back-up generators, and fire brigades stand by all over the country, although they are relatively underused, for the same reason: redundancy keeps systems running. An adjunct to this argument is the aspect that it is much cheaper and more long term efficient to fix a problem now rather than when a crisis happens. This is a similar argument made by Stern about climate change budgeting (Stern et al., 2008).

### 7.1.4 Further research recommendations

Further research could be carried out on the extent of the relationship between resilience and diversity. The more that British urban agriculture diversifies in variety from the current dominant UA type (allotments); the better alternative UA can provide to the modern industrialised food system.

An additional area for research is to review and publish all the current initiatives and programmes in UA in London and other cities. There does not appear to be a unified report on the variety and quality of what currently exists in city food production and distribution. The research for this report identified a number of fascinating items which could be synthesised into a publically accessible database which could inspire and guide policy.[14] . However it is hard to see how cohesive policy and planning can be made about UA in London and other cities with the dearth of focused research on UA in its wider theoretical, economic and social setting.

If carried out, this research would be of great benefit in assessing the current resilience of UA in London. Additionally it would highlight the gaps in the food chain, which may give impetus to implementing a 'food cluster' similar to the Growing Power farm and Polyface farm idea of community scaled food production and distribution.

[14] For instance: 15½m people in Britain are already estimated to grow some of their own food, St James's Park and Kensington Gardens in London are planning allotments. There are some initiatives for green walls and roofs. Farmers markets and community box schemes are very popular, community supported agriculture has potential. London has sixteen city farms and over one hundred community gardens. There is a market garden sector, and commercial urban and peri urban farms.

### 7.1.5 Implication or implementation for practitioners

There are implications from the international experiences for the different areas of government policy and academic research. One major implementation issue relates to urban planning and design. Spatial planning intends to ease the conflicts between different users of space; for instance residential and industrial or commercial users. In cities administering these conflicts fairly can be extremely complex. In adding yet another claim, urban farmers with their particular spatial requirements, could be seen as a complication too far. Mapping is one method to solve this issue; GIS systems allied with AHP (Analytic Hierarchy Protocol) can provide a framework for city planners in spatial analysis and modeling, allowing integration of complex soil analysis, roads access, water and markets, land use pattern to optimise land allocation for UA in city plans (Thapa, 2008).

Innovations that might come about include piloting each of the major lessons from the international examples. For instance, a pilot Growing Power farm could be set up in London. Permaculture principles could be taught to large sections of the London population, following the Cuban example, along with a mapping exercise to identify potential growing spots. A section of the Green Belt could be set aside for a pilot *dacha* allotment scheme in conjunction with the GLA and the local authorities. Guerrilla gardening could be encouraged, and nurtured.

As the Happy Planet Index points out (NEF et al., 2009) '*more immediate contact with, and hence a greater awareness of, physical limits can successfully encourage ecological efficiency*'. This is also an argument for UA as urban dwellers are frequently cushioned from an awareness of ecological results from lifestyle choices which growing food can alter; in demonstrating ecological limits to urban farmers.

What this report could do is lead to constructive change. It triggers awareness of the preservation of accumulated experience. Communicating the results of the case studies to policy makers and citizens could stimulate innovation. It could encourage and sustain the capacity of people, institutions, and the environment to deal with change and build resilience in urban agriculture.

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# Appendix 1: Alternatives to Industrial Agriculture

What alternatives are there to industrial agriculture in extensive, non urban agriculture? Three options are examined below: sustainable agriculture, organic agriculture and permaculture.

**Sustainable Agriculture** (SA) could be considered, the difference from (IA) is that SA treats the land as a source of production to be nurtured, rather than as a resource to be mined. The Food and Agriculture Organisation's (FAO) Framework for Evaluating Sustainable Land Management (FESLM), ensures four major aspects. FESLM requires that land maintains or preferably enhances its productivity; it is concerned with reducing the level of production risk. Natural resources are protected, and attention is given to preventing degradation of soil and water quality. As agriculture feeds people, it also requires that the process is both economically viable and socially acceptable.

However there are no agreed definitions or standards of sustainable agriculture in Britain, unlike organic agriculture which we consider next.

**Organic agriculture** is worth considering as an alternative system to industrial agriculture. Recent research commissioned by the Soil Association (Jones and Crane, 2009) indicates that organic yields are not as low as common opinion holds them to be. Britain could produce considerable proportions of food requirements under an organic system. The research reveals that rural organic agriculture could yield 60% of current conventional cereals production; forage peas/beans, potatoes and vegetables 100% of conventional yield. Dairy is predicted to reach 70% of conventional yield; an organic system would produce 68% more beef and 55% more lamb; 73% of the conventional egg yield; but only 30% of current intensive pig and poultry meat output. However self-sufficiency in cereals would reduce from c. 100% to nearer 60% and dairy self-sufficiency ratio from around 90% to near 60%. Farm labour requirements would be predicted to rise by 70%; giving employment opportunities.

However, organic agriculture doesn't mean low input. Organic agriculture as described above has potential to be co-opted by agri-business and is likely to be oil thirsty therefore producing the same entropy and monopoly problems.

**Permaculture** can be understood as a design system rather than as a gardening or farming method. Permaculture was developed in the 1970s as 'permanent agriculture' by Bill Mollison and David Holmgren, and is now used as a framework in a variety of applications from community design to energy use. Permaculture, as an overall framework puts a diversity of green ideas into perspective; the overriding intention of to create a self sustaining system with little requirement for inputs (fossil energy, labour, weeding, fertiliser) but with high outputs (crop yields, profits) which sustains and does not exploit the environment it is embedded in. (Burnett, 2008). It requires observation and knowledge on the part of the permaculture designer -whatever field the framework applies to, and willingness to experiment and learn how to work with nature. (Mollison, 1990, Mollison et al., 1992, Naturewise and Organisation, 2009, Pilarski, 2009, Whitefield, 2004)

Due to its starting point; permaculture is frequently conceived as a gardening method suitable only for tropical, seasonless environments and restricted to vegetables and not grain crops. However permaculture is adaptable to temperate climates, and to grain growing; as Fukuoka (One Straw Revolution) Marc Bonfils (Burnett, 2008) and the Earthcare Manual (Whitefield, 2004) illustrate. In fact, permaculture can reach comparable yields to industrialised agriculture; if soil damage and industrial inputs are not externalised in pricing; as permaculture forest garden techniques of growing on several height levels on one plot allows far higher yields than monoculture on one level. (Whitefield, 2004)

Holmgren's design principles 1-12 illustrated in Figure 38 show some of the main permaculture principles, along with permaculture ethics of equity and nurturing; take care of the earth, take care of people and fair shares.

**Figure 38: Permaculture principles and ethics**

Permaculture principles (Naturewise and Organisation, 2009)

- Work with Nature
- Multiple Yields – multiple functions
- See solutions not problems
- Everything gardens or modifies its environment
- Make the least change for the greatest effect