Increasing Food Security and Community Development in eThekwini through Urban Agriculture:

An Evaluative Case Study of Cato Manor

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An Evaluative Case Study of Cato Manor

A short dissertation submitted in partial fulfilment of the requirements for degree of Masters in Town and Regional Planning (MTRP) in the

School of Built Environment and Development Studies

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COLLEGE OF HUMANITIES

DECLARATION - PLAGIARISM

I, Mr Wade Banks, declare that:

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ABSTRACT

The world's population continues to grow exponentially along with the share of the population living in urban areas. In 2014, there were 7,176,023,055 people living on the planet. Current demographic estimates indicate that by the year 2050 this figure would have grown to 9,376,416,975 persons (Source: U.S. Census Bureau, International Database). The idea of the megalopolis or multi-city conurbation, which has been considered science fiction in the decade of the 1970s, is a potential challenge faced by town planners today. More than half of all people on earth now live in cities or urban settlements. These cities require vast land cover and massive amounts of resources to function. This trend poses the question, if more and more people are living in urban areas, at what point will there be too few farmers, too little fertile land, and too few resources available to those farms that invariably feed our mega cities? Furthermore, how will the growing urban poor become food secure? Will the solutions made by politicians be safe for consumers?

The answer to this question when considered together with present development challenges such as the shortage of oil, poverty, and environmental issues, places us in situation where the security of food provision and access is no longer a given. Food security is very much an urban challenge because they rely on outside rural farms for their food supply. The need for a safe and secure food supply is a concern, which agriculturists, development planners, and governments throughout the world need to deal with. In the Developing South where a rapid urbanisation trend is apparent, this has become a fundamental concern for urban management and rural farming. The literature shows that many cities and communities in South Africa have high percentages of people living food insecure (Caesar et al, 2013; Rudolph et al, 2012 and Battersby, 2011). A step away from our modern food system, towards a more primitive and basic form of securing our own food source, taking control of our own lives, may be what is needed. Urban agriculture could be this step. Urban agriculture is a modern term to describe an ancient practice. People have been growing food near or within the city walls since ancient times, and many still do it today. It has been proven possible that a family can grow enough food at home to sustain themselves, and to produce a surplus to sell for a profit. As a by-product of this localised activity, they contribute to the greening our cities and contribute to sustainability.

This dissertation will be looking deeper into the concept of urban agriculture, into its potentials and into its constraints. The focus of this dissertation is on how this practice can up-lift a community,

and how it can provide those involved with improved food security, while remaining sustainable and beneficial for the natural environment. The community of Cato Manor and those living around the Mandene Sports Club have been used as the case study for this dissertation. The research for this dissertation involved many site visits, interview surveys with 60 local residents (30 from the informal settlement area and 30 from the formal housing area), interviews with six professionals in related fields and an interview with a former member of the Cato Manor Development Association. The aim was to prove that urban agriculture in its various forms would be beneficial for the community of Cato Manor and assist in improving food security for those involved. The introduction of an 'urban agricultural hub', which makes use of various forms of urban agriculture, will be beneficial for the uplifting of the Cato Manor community, and assist in providing local residents with farming/ gardening knowledge, fresh and healthy food, and ultimately increasing their food security. The research provided evidence that the introduction of an urban agricultural hub would be possible in the Cato Manor study area, and that this can be used as a tool to uplift the community and increase food security. This research showed that people are interested in participating in urban agricultural activities, including participating in a community garden. It also showed that people in the area are already practicing urban agriculture in various forms.

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ACRONYMNS

AFSUN:	**African Food Security Urban Network**
CBO:	**Community Based Organisation**
$C0_2$:	**Carbon Dioxide**
CH_4:	**Methane**
CMDA:	**Cato Manor Development Association**
CMRA:	**Cato Manor Residents Associates**
DAAHP:	**Detroit African-American History Project**
DAN:	**Detroit Agriculture Network**
DFJTF:	**Detroit Food Justice Task Force**
DBCFSN:	**Detroit Agriculture Alliance and the Detroit Black Community Food Security Network**
DNA:	**Deoxyribonucleic Acid**
EIA:	**Environmental Impact Assessment**
FANTA:	**Food and Nutrition Assistance**
GDP:	**Gross Domestic Product**
GHG:	**Green House Gas**
GMO:	**Genetically Modified Organism**
GURT:	**Genetic Use Restriction Technology**
HDDS:	**The Household Dietary Diversity Scale**
HFIAP:	**The Household Food Insecurity Access Prevalence Indicator**
HFIAS:	**The Household Food Security Access Scale**
HIV/AIDS:	**Human Immunodeficiency Virus/Autoimmune Deficiency Syndrome**
IDP:	**Integrated Development Plan**
IPCC:	**International Panel on Climate Change**
KZ-N PDA:	**KwaZulu-Natal Planning and Development Act (No. 6 0f 2008)**
MAHFP:	**The Months of Adequate Household Provisioning Indicator**

NGO: **Non-Governmental Organisation**

NO_2: **Nitrogen Dioxide**

O_3: **Ozone**

SDF: **Spatial Development Framework**

SO_2: **Sulphur Dioxide**

SPLUMA: **Spatial Planning and Land Use Management Act (No.16 of 2013)**

UA: **Urban Agriculture**

WHO: **World Health Organisation**

UN: **United Nations**

CHAPTER ONE: INTRODUCTION AND BACKGROUND

1.0 INTRODUCTORY OVERVIEW

This chapter sets out to answer the question, what is urban agriculture? More importantly, is it a desirable practice for urban regions and communities? Could it be said, that it may become a necessity in the near future of our cities, especially in poorer urban environments?

Urbanisation is a global phenomenon that has resulted in the migration of millions of people from rural areas to more developed urban areas and cities. This phenomenon is occurring at a far greater rate than ever expected in the past, with more than half of the world's population now living in cities (Cockrall-King, 2012). Along with urbanisation, there has come a drastic change in the way food security and the population are viewed. The manner in which food is produced, transported, stored and consumed is being reconsidered in light of these trends. In the industrial world, the economic interdependence between the city and rural agricultural regions has been lost. In part, this economic change has been brought about by the infiltration of urban space into the rural areas where urban sprawl has encroached on rural lands. The commercial industrialisation of agriculture has also contributed to the change in the dynamics between the city and rural country. The purchase of edible products is commercialised to the extent that most purchasers are often completely unaware of its source or quality. Questions related to who produced the food, how it is processed, what chemical additives it contains or whether there are alternative, healthier, or organic options are often not raised by consumers. Large-scale farms that feed these cities are found far out of sight and out of mind of those living in these cities. Moreover, more people are being born into cities, rarely leaving them to venture out and discover how their food is grown, produced, packaged and transported. This means there is a growing population of people who may never physically see the areas where their food comes from, or step foot on a farm or a vegetable garden. There may be a generation of people coming into our world oblivious to their connection to nature and to their food. They are removed from a state of biophilia, which is an appreciation of life and the living world. When ordering chicken from fast food outlets, for example Kentucky Fried Chicken (KFC), the chicken itself, the farm it was produced on, what it was fed and how it came about to become a burger patty are often not considerations the consumer is concerned about. Similarly, when opening a packet of frozen vegetables, or reaching for a pocket of potatoes, consumers rarely consider how and where they were farmed, by who or what inputs were used.

For many however, choice is not a luxury they can afford. A growing urban population has brought with it - increased levels of malnourished and poverty-stricken populations, some of whom exist on the edge of starvation. The future challenge and harsh reality being faced here is that there is a need to provide food for the ever-growing urban population, while also making food available to everyone.

> "*Imagine all the food mankind has produced over the past 8,000 years. Now consider that we need to produce that same amount again — but in just the next 40 years if we are to feed our growing and hungry world.*" (Polman and Servitje, 2012)

1.1 THE INDUSTRIAL FOOD SYSTEM

At the beginning of the 1900s, the world's population was estimated to be approximately 1.6 billion people, which was considered by some to be the world's carrying capacity in terms of food production at the time. There was fear that the estimated annual population increase of five per cent would outstrip land availability and the soils natural ability to regenerate its nutrients (nitrogen in particular) in time (Cockrall-King, 2012:38). In fact, this concern dates back even further. From around the mid-1800s, Britain began realising that their soil fertility was depleting. This was attributed to the capitalist style of intensive agriculture, and the 'over-use' of the soils, drawing more nutrients from the soil than they were replacing. The soils nutrients where exploited, then food that was produced from these soils is transported away from the farms to feed growing urban populations. Waste from these foods (including human excrement) ends up becoming pollutants rather than returning to the soils from which it came. It was from this period that Karl Marx drew inspiration to develop his theory of the 'metabolic rift', a separation of people from nature and their 'normal metabolism' or interaction (Foster, 1999: 370). Farmers also had to consider the seasonality of certain crops. There were methods to combat these factors, such as organic composting and the growing of nitrogen fixing plants (such as legumes, beans, lentils and others) to assist in replacing nitrogen and other nutrients in the soil. However, these mechanisms were slow, and thus the need for faster and more efficient methods was required to support the ever-increasing global population. The answer has been found in science.

Chemical fertilisers where soon invented and introduced to commercial agriculture to replenish lost nutrients in the soils. Chemical pesticides were also developed and designed to kill off crop damaging insects. Along with the chemical and food source development, the nature of agricultural production changed. Smallholdings and medium sized farms have become non-viable. They have

been replaced with large manufacturing agro-industrial farms. However, the wave of agro-industrial production also encountered problems. The use of chemical fertilisers and pesticides soon become the convention in commercial agriculture, allowing record high crop production to support the population explosion (Cockrall-King, 2012:40). The introduction of chemical aids in food production worked well until industrial agriculture began taking more out of the land than it could replace with its chemical fertilisers. Production levels dropped, but the population continued to grow. More extreme methods of increasing yield where explored. One of these methods included genetically modifying certain crop variations, changing their genetic make up to create crops that could thrive in otherwise unfavourable conditions.

The first crops to be genetically modified were produced in 1984. Since then the GMO (Genetically Modified Organism), revolution has grown to the point where now 70 per cent of processed foods contain GMO ingredients in some form (Cockrall-King, 2012: 43). Some sustainability activists believe that GMO foods will be the answer for the future production of food, arguing that it increases food yields, while also being environmentally friendly. Gene manipulation allows certain crops to become draught tolerant, more salt tolerant, pest resistant, and so forth, which will drastically improve yields. Environmentally, pest resistant crops require far less pesticides (Rauch, 2003: 479). This reduction in the use of chemicals has a positive impact on the natural environment, for example, in minimising the runoff of fertilisers and chemicals into watercourses. For this reason, many believe that GMO crops represent the future of farming. Other agricultural scientists, ecologists and academics have expressed reservations about this perspective.

Although GMO foods and products have not yet been completely accepted and integrated as the commercial answer to the need to increase food production, it is still creating havoc amongst small-scale organic farmers, environmentalists, food activists and many other groups of people. Anti-Genetically Modified food groups believe that the long-term use of modified crops will do more damage than good to our food system, the environment and to the consumers. The use of imported GMO seeds particularly in developing countries has the potential to create a greater economic dependence between them and the more developed nations of the world in relation to food security (Shiva and Jalees, 2006: 27). The question being posed is whether the use of GMO seeds is worth the potential longer-term consequences, such as economic and social impacts on food security.

From a health perspective, gene and Deoxyribonucleic Acid (DNA) manipulation can prove to be dangerous. The modification of the plant genome is facilitated using viruses as the carrier agent. The original virus, which would have created disease, is rendered harmless and used as a vehicle to

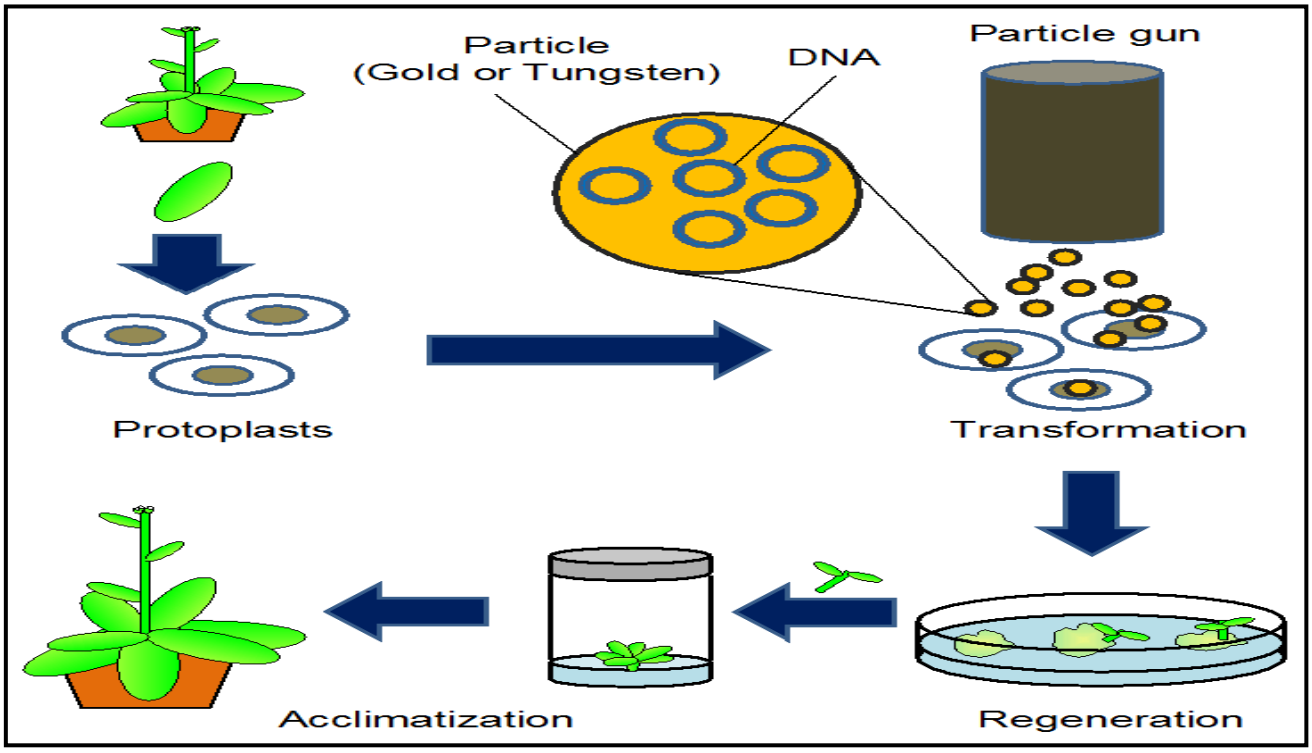
create changes in the genetic material of plants and animals. The viruses have the ability to invade cells form a variety of species, therefore even cross contamination is possible (Ho, 1997: 485). These genes are often antibiotic resistant. They are designed to breakdown the host organisms defence mechanisms and by this process to modify the organism's cellular structure. New antibiotic resistance diseases are a possible outcome of such DNA and gene manipulation (Ho, 1997: 489-490).

Another aspect of certain GMO seeds is that they have special properties regarding second-generation prorogation. The use of Genetic Use Restriction Technology (GURT), which is more commonly termed "terminator technology or suicide seeds", ensures that second generation GMO seeds are infertile[1]. This means that there is no chance of a second crop from the seeds of the first plants even though they may look normal (Shiva and Jalees, 2006: 48). In effect, the sale of GURT seeds to developing countries will mean that an economic dependence will be created for the resale of seeds every year from the source country. This creation of a dependency is counter-intuitive to the principles of sustainability.

The science associated with GMO seed production (as illustrated in Figure 1 below) has allowed the development of drought and disease resistant food crops; however, there have been unforeseen consequences of the new science in agriculture. These include seeds that do not germinate beyond one sowing (e.g. the second generation seeds from GMO crops are sterile), and the development of 'super weeds' that are resistant to existing herbicides. Thus, on the one hand, there is the need for the greater production of first generation GMO seeds for on-going food production, and on the other hand, stronger chemicals to kill the new weeds that are a consequence of the advances in science designed to create a more sustainable food supply.

[1] It must be noted that 'terminator' seeds are not yet commercially available due to controversy surrounding their unethical nature (Mukherjee and Kumar, 2014: 51).

Figure 1: A Diagram showing how Plant Cells are Genetically Modified



Source: http://www.intechopen.com/source/html/30876/media/image1.png

From a social and legal perspective, GMO seeds can cause huge problems for farmers using conventional seeding processes. Land located in close proximity to farms where GMO crops are cultivated stand the risk of cross contamination by wind and other natural forces. This is particularly relevant where organic farming enterprises and more industrialised farming ventures are located next to one another. GMO seeds are patented and have a signature, which is traceable. Farmers caught with crops that have the genetic signature of patented GMO seeds could face serious legal action, despite the contamination of their crop being out of their control (Kariyawasam, 2010: 465).

In India, mass suicides of farmers have been accredited to the switch from traditional seeds to GMO seeds, in particular the *"Bt"* cotton variation. This cotton variation promised to increase yields and decrease costs, by reducing the need for pesticides. The 'failure' of this variation of cotton has been blamed for mounting debts and ultimately large numbers of farmer suicides by those unable to pay off their loans and thus unable to purchase new inputs (Shiva and Jalees, 2006: 56). For these (and many other) reasons, and as the result of public outcry, many governments have not yet fully

accepted genetic engineering as the conventional method to increase food production. Consumer choice is the biggest concern and greatest lobby group to prevent the change.

Large companies that control the purchase and distribution of these GMO seeds have argued that their foods should not require labelling stating that they are in fact GMO products. Some argue that the '*over-regulation*' (by requiring GMO labelling) of the food industry will "compromising the competitiveness of the industry" (Ho, 1997: 484). This is despite other legislation requiring that food be properly labelled for health reasons, such as potential allergens. In the future, growing your own food may be the only way to ensure what you are eating, has not been genetically engineered.

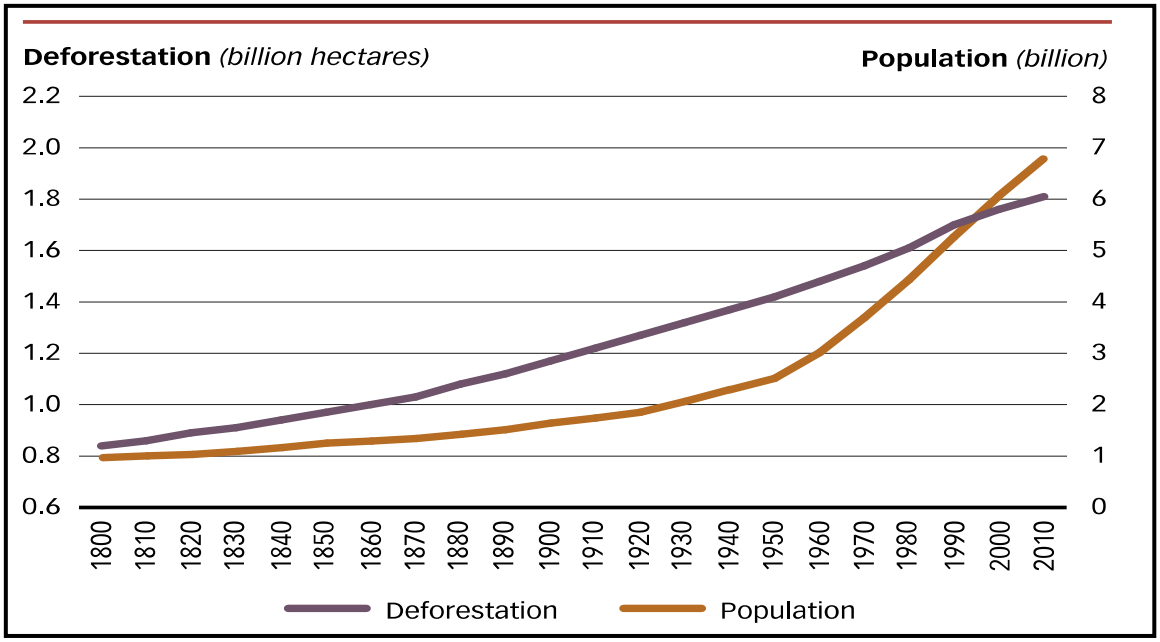
The above represents how after the industrial revolution, agriculture shifted away from a crop rotation technique of cultivating a variety of crops, to a highly specialised, high-tech (GMO), input intensive, mono cropping of one or two products on a massive scale. The use of large-scale agricultural machinery such as reapers, cultivators, threshers, combines, tractors, and irrigation systems have all replaced the ox, wagon and human labour in the interest of saving time and greater production yields. A diverse refrigeration method has allowed crops and meat to be stored after harvest, allowing more to be produced at a time. Pesticides and herbicides kill off any threats to the crops themselves, which increases yields. The focus shifted away from feeding people, to profit making. This economic shift in the agricultural system began to spread globally. Therefore, large-scale industrial agriculture or agro-industry was beginning to consume smaller-scale, sustainable, subsistence farms that could not compete with the larger producers. In parts of the United States of America, the concept of the family farm is disappearing. It is being replaced by farming conglomerates that bought out land holdings, often at lower than market value (Toews, 2015). The power of control over many of our basic food crops now lies in the hands of just a few multinational corporations. Our food, a basic human need, has been turned into one of the world's largest industries. The vast majority of people rely on this industry to feed themselves, however this industrial food system has begun to show signs of failure.

1.2 SIGNS OF FAILURE

One of the many concerns with our current industrial food system is the massive pressure it places on our planets limited resources. Land, for one, is a finite resource and only a small percentage of the total area can be used for cultivation. Space is not so much the issue as is the availability of fertile land for large-scale agriculture. Pressures from development and the need for agricultural

land to supply a growing population have resulted in the clearing of forests in many countries around the globe, especially as this land is often very fertile, which is most ideal for agriculture.

Figure 2: Graph Showing Deforestation in Relation to Population Growth



Source: FAO, 2012: 9

The Food and Agricultural Organization (FAO) has been monitoring our world's forests and has prepared a series of reports that provide valuable information about of forests over time. The FAO produced their most comprehensive of these reports for their 2010 edition, after working with many countries and forests specialists, titled "The Global Forest Resources Assessment 2010 Main Report" (FAO, 2010a). This report concluded a number of facts about deforestation globally, as well as in Africa specifically. The FAO has confirmed that in 2010, forests covered approximately 4 billion hectares of land on our planet. In the "State of The World's Forests" report (2012), it was confirmed that over the last 5000 years, approximately 1.8 billion hectares of forests have been destroyed (FAO, 2012: 9). Deforestation, caused mainly by the conversion of tropical forests into agricultural land, has been rampant over the past few decades. This deforestation is however showing signs of slowing down. Approximately 13 million hectares of forests were cleared for development or agriculture or through natural disasters each year between 2000 and 2010 compared to 16 million between 1990 and 2000 (FAO, 2010a: 15).

Policy failure is deemed the main culprit for deforestation in many regions, including Africa. Many governments indirectly encourage deforestation by providing incentives and subsidies for agriculture, while failing to recognise the benefits of forests outside of their use for wood (FAO, 2012: 17). The problem many countries face is that fertile land is scarce, and there is more money to be made from faster growing cash crops and a greater need to feed their people than they can receive from slow growing trees. Therefore a balance is needed, or an innovation solution to the problem of land availability.

Water is another finite resource, with more than 70 per cent of the world's current fresh water supply already being used for agricultural purposes (Cockrall-King, 2012: 69). This is in an age where a fresh water supply is no longer a given. Many countries are in danger of serious water shortages, dramatically affecting their agricultural sectors. There have been a number of international studies on water availability for agriculture. In these reports, the threats to our world's water supply are also addressed (McDonald *et al*, 2011 and Gerten *et al*, 2011). Two common major concerns that have been highlighted are the increase in population (particularly those in urban areas) and global warming. An increased population will increase the demand for fresh water supply in two main ways. Firstly, the demand for household water will increase. Secondly, it will increase the amount of water needed in the production of anything from industrial products to food as the demand and supply grows (especially food, as an increase in the demand for food crops means more crops being grown and thus more water needed). Global warming will affect water supply differently. Increasing temperatures have and will continue to affect our planets climate, affecting regions differently, by either drying a region through increased evaporation or wetting a region through increase storm activity (McDonald *et al*, 2011 and Gerten *et al*, 2011). Water shortages in some countries could dramatically affect their ability to remain food secure.

1.2.1 Oil Dependence and Agriculture

Oil is another finite resource that our current world food system relies on, from transportation to the production of chemical fertilisers and packaging materials, all of which are linked to the petro-chemical industry. As this resource becomes harder to extract from the ground, it becomes more expensive. As the price of fuel increases, so does the price of food products due to an increase in production costs. For example, an increase in the price of oil results in the increase in transportation costs, running costs of powering tractors and other farm machinery that runs on petrol or diesel, the price of chemically produced nitrogen-based fertilisers and more (Gilbert, 2008). Oil is also involved

in producing and transporting many different types of plastic packaging for food products as well as in transporting the food itself. Although some view the production and use of biofuels as a viable alternative to oil, they also have limitations. Sourced mainly from monoculture crops like sugar cane, corn, soya beans and maize, biofuels require extensive land resources for viable production and yield (Gilbert, 2008). This means that their use and development will reinforce large-scale production processes and thus the use of even more of these finite resources.

1.2.2 Climate Change

Climate change due to global warming is yet another threat to the world food system. Farmers have always had to depend on predictable weather patterns in order to manage their crops and harvesting periods. The rise in temperature and the consequential increase in extreme weather events, droughts and floods have added to the levels of uncertainty about the weather and its changes. Climate change is likely to have its most direct and critical impact on agricultural systems, especially in poorer regions with less technological advancements in the agricultural field (Brown and Funk, 2008). Increasing temperatures and declining precipitation in certain regions (as climate change affects regions differently) will result in lower productivity. This will affect farmers that rely more on rainfall and who grow non-GMO crops that have not been modified to handle the increased temperatures and that require reduced amounts of water. The productivity of farmers using petroleum-based fertiliser and pesticides, genetically modified crop variations, and technically advanced mechanisms is often higher that those who rely more on natural systems (Brown and Funk, 2008). Therefore global climate change is likely to increase already record high food prices, as countries may need to switch to more technically advanced farming techniques (as mentioned above) or countries may need to import a higher percentage of their food requirements. For those who cannot afford either of these options, food security could become a major threat.

Brown and Funk (2008) also express how food security is not only about food productivity and food prices, but also by factors such as disease. Increased temperatures increase the areas with the presence of disease carrying pests, such as mosquitoes. Brown and Funk predict that diseases such as Malaria will become more widespread and severe because of global climate change.

1.2.3 The Monopoly of Agro- Industries

Radical ecological groups like Greenpeace believe that agriculture has become controlled, specifically by agri-business monopolies, and that food production is managed from field to plate.

Big business is rarely concerned with those who suffer from their choices, those being the consumer. The current world food system (inclusive of food and beverage production) is essentially owned by a small number of Multi-national Corporations e.g. Monsanto, Associated British Foods (ABF), Coca Cola, Danone, General Mills, Kellogg's, Mars, Mondelez, Nestlé, Pepsico, Syngenta, Bunge, Dreyfus and Unilever. These companies, amongst others, control the entire process of our food production and distribution, making important decisions about our food, often without the best interests of the consumers in mind (www.greenpeace.org). This industry generates more than one billion dollars in revenue daily. These same corporations own patents on gene manipulations on some genetically modified crops and thus control access, distribution and sales of seeds. Figure 3 provides an illustrative overview of these monopolies.

Figure 3: Examples of Food and Beverage Multi-Nationals Controlling Food Production

Source: http://www.thesleuthjournal.com/wp-content/uploads/2012/11/these-companies-oppose-carighttoknow-prop-371.jpg

With all these factors considered, it comes with little surprise that the system has failed in a number of key areas. Food riots have begun to emerge all over the globe in response to sudden and steep price hikes. In 2008, the price of staple food products spiked because of the price of wheat doubling, causing riots in three major cities of Burkina Faso in Africa (Bush, 2010). According to Cockrall-King (2012), this also resulted in 'pasta riots' in Italy. Argentina experienced tomato boycotts in protest to the vegetables soaring prices. In Asia, the price of rice doubled over a period of two weeks

causing further food related civil disturbances. In 2011, violent riots erupted in Egypt over the increase in the price of bread due to an increase in the price of wheat (Cockrall-King, 2012:71). These examples are just a few of many food riots that have occurred around the globe. Hunger is a great motivator for civil unrest and political change. If current trends prevail, these riots and civil unrest may soon become events that are more commonplace and may become more violent as people become increasingly desperate as poverty rates climb.

The current industrial world food system has provided evidence for a significant rethink about food production. Failures in the system have illustrated that there is a need for something new, something very different, and something unconventional, local, adaptable and accessible to everyone. Urban agriculture has the potential to be that something new or at least a step in the right direction. The words "agriculture" and "urban" together are not often synonymous in the literature related to food security and food production; however, in many city areas today urban agriculture has become an important part of the spatial landscape (Redwood, 2010).

1.3 URBAN AGRICULTURE AND ITS LINKS TO URBAN PLANNING

Urban agriculture has a strong link to urban planning. This urban activity is growing in importance across socio economic levels of society. Increasing numbers of urban residents are engaging in the activity of growing home produce at the household or community level. It can be argued that food security is also an urban issue, as city residents are far more susceptible to food price spikes or shortages and therefore need to create alternative methods of food supply. Urban residents are also more likely to mobilise to affect change through riots and strikes (Cockrall-King: 72, 2012). In many cities, urban agriculture is considered an illegal activity, but is tolerated by authorities. For example, in Zimbabwe there has been an official belief that urban agriculture is damaging to the environment (Kisner, 2008). This unfounded belief has been exacerbated by the intensive use of fertiliser and pesticides at the commercial level of agriculture with the associated contamination of watercourses and underground aquifers. Similar approaches are deemed to apply in the context of the city even with smaller areas of cultivation and thus it is discouraged or frowned upon. The increasing urban population, growing food price fluctuations, environmental concerns and livelihood issues amongst the urban poor, all demonstrate the need for planners to include urban agriculture in their plans. Invariably, urban agriculture is an activity that will occur regardless of its inclusion in the planning and development of an area. However, when planned and regulated, urban agriculture has the potential to uplift a community and improve the quality of the environment.

1.3.1 Policies

The following national and provincial policies influence commercial agriculture in South Africa but could also impact on the development of urban agriculture in the cities of the country:

- White Paper on South African Land Policy (1997);
- The Green Paper on Land Reform (2013);
- The White Paper on Agriculture for KwaZulu-Natal (1996)
- Draft KwaZulu-Natal Appropriate Land Use Controls Study (1998); and,
- Draft Policy for Public Open Space in Urban Areas of KwaZulu-Natal (1998)

1.3.2 Legal Framework for Agriculture

There are both national and provincial laws that provide a framework for agriculture namely:

- The Constitution of the Republic of South Africa Act, (No. 108 of 1996);
- The National Spatial Planning and Development Act (No. 16 of 2013)
- The Sub-Division of Agricultural Land Act, (No 70 of 1970);
- Abattoir Hygiene Act, 1992 (Act No. 121 of 1992);
- Conservation of Agricultural Resources Act, 1993 (Act No. 43 of 1993);
- Fencing Act, 1963 (Act No. 31 of 1963);
- National Environmental Management Act (NEMA) (No 107 of 1998);
- Water Services Act, (108 of 1997);
- Health Act, 1977 (Act No. 63 of 1977); and
- The KwaZulu-Natal Planning and Development Act (No. 6 of 2008)

In KwaZulu-Natal, there are a number of laws and policies which urban agriculture to be accommodated in the city spaces if they are utilised properly. These laws and policies are examined in this research, as they will all be relevant in the application of urban agriculture on a larger scale. Urban planners, who wish to involve urban agriculture in their plans, or to make provisions for such activities, will need to be familiar with these laws and policies.

1.4 MOTIVATION FOR THE STUDY AND ITS CONTRIBUTION TO RESEARCH

The many benefits of urban agriculture highlighted above can be realised in eThekwini Municipality. In fact, many local residents are already growing their own food. There are a large number of households, which either cannot afford to buy a sufficient amount of food, or who spend a large

portion of their salary on food, leaving little for anything else. Food security is a basic human right, as outlined in the Bill of Rights, Chapter 2 of the National Constitution of South Africa, (Act No. 108 of 1996). Therefore, measures to achieve food security for all residents of eThekwini Municipality need to be implemented, starting with increasing people's ability to feed themselves through urban agricultural projects.

The case study area (Cato Manor) located in the eThekwini Metropolitan Municipality in KwaZulu-Natal has been chosen because it holds the potential to become an 'urban agricultural hub' (Refer to Map 1). The suburb has the potential to facilitate various types of urban agriculture, mainly in the form of home gardens, and community gardens. Between these types of urban agriculture, the food security of the local residents can be increased. Such an initiative would also contribute toward local economic development through market gardens and social cohesion through participation and interaction. This case study area is also ideal as it is home to two socio- economic class groups, both of which will benefit differently from urban agricultural projects, while also facing their own constraints. A comparison between these two class groups can be made. This area also has two primary schools, a university, a Technikon and a clinic. The future involvement of these institutions into an urban agricultural project could prove to be beneficial.

Urban agriculture has the potential to uplift this community, and turn it into a benchmark example for other similar areas and communities within the eThekwini Municipality. The area has a rich history of contestation in terms of the rights to live on the land. Prior to the mass removal of Africans and Asians in terms of the Group Areas Act regulations, the area was a successful urban agricultural area in its own right, in the form of market gardens (Walker, 2008: 149). The success of an urban agricultural project in Cato Manor would not only be a way to reclaim some of its past but could encourage new, innovative initiatives and projects to occur in communities with their own challenges and needs. An assessment will be done in order to determine the type of community garden that would be most suitable for the Cato Manor area (in the sense of what will be grown there and how it will be run). This research will contribute to the field of knowledge by providing a practical example of the potential benefits of urban agriculture for a specific community. The project would also encourage new insight into the many benefits of urban agriculture and its possible application in different areas. How Cato Manor links into the strategic intentions of the central eThekwini Integrated Development Plan (IDP) will also be examined (See Map 1 for the locality of Cato Manor in eThekwini Metropolitan Municipality).

1.5 AIM OF STUDY

The aim of this research is to provide empirical evidence that the introduction and encouragement of new urban agricultural activities and the enhancement of existing urban agricultural practices would be beneficial for the community of Cato Manor, and that this can be used as a tool to uplift the community and increase food security. This research also aims to show that the introduction of an 'urban agricultural hub' in the area, with a community garden and training facility at the epicentre, would not only be possible but greatly beneficial for the community.

1.6 RESEARCH QUESTION

The main research question being posed by this research is "Can urban agriculture provide increased food security and uplift the community of Cato Manor?" There are a number of related sub-questions, which unpack the elements of the main question above.

1.6.1 Sub-Questions

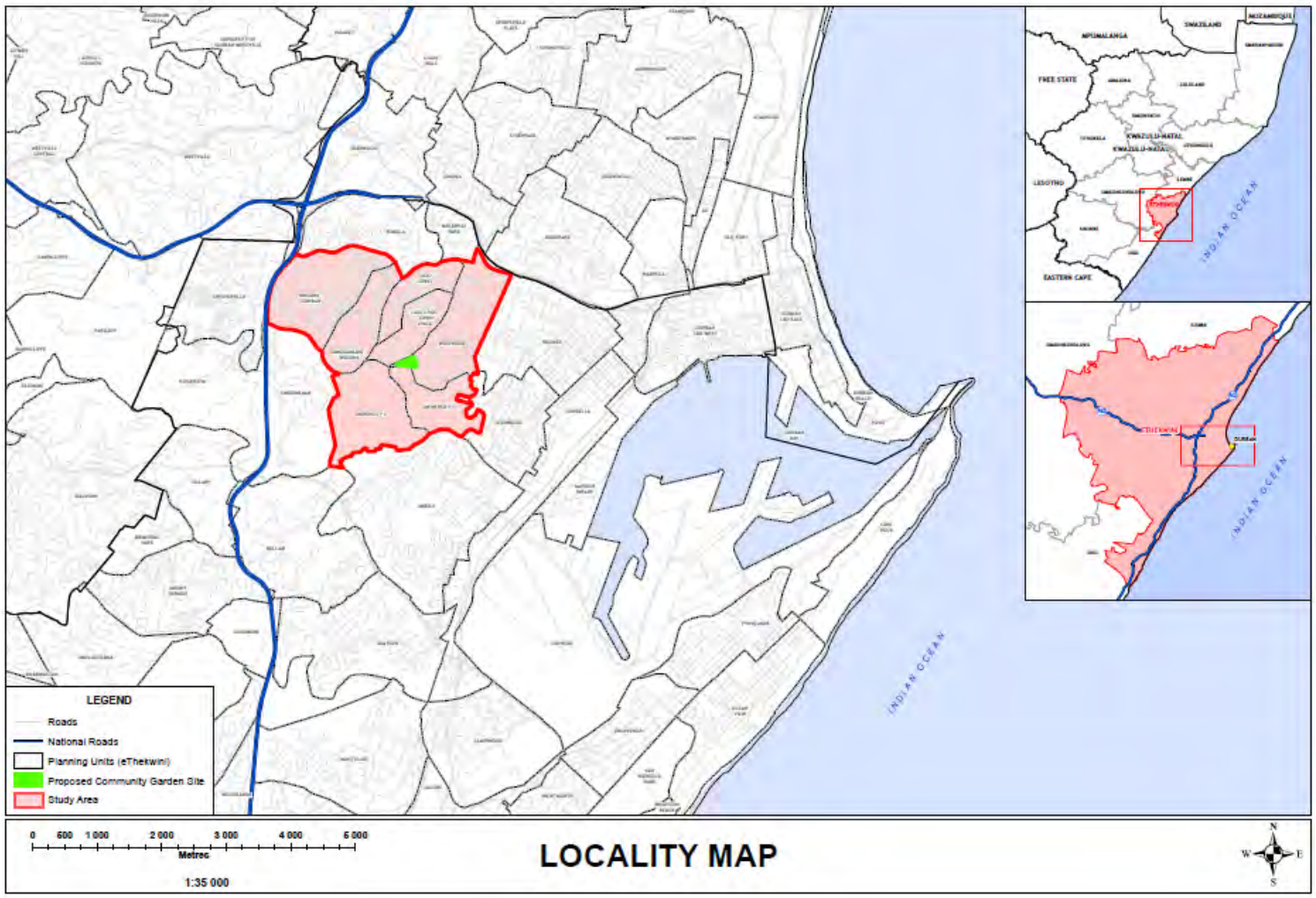
The main question can be broken down into the following 6 sub questions as follows:

1) What are the social, economic and environmental benefits of urban agriculture?
2) What does the international, national and local literature suggest about urban agriculture as a mechanism for food security and upliftment?
3) Are there international case studies for urban agriculture, which provide good practice lessons for consideration in South Africa?
4) Is there an appropriate theoretical and conceptual framework for the inclusion of urban agriculture in city planning and management?
5) What types of urban agriculture are prevalent in South Africa and eThekwini?
6) Will an urban agricultural hub be feasible in Cato Manor?

1.7 HYPOTHESIS

A hypothesis is a statement that can be proved or found to be correct or incorrect. When considering this particular research, the hypothesis being posed is that the introduction of an urban agricultural hub, which makes use of various forms of urban agriculture, will be beneficial for the uplifting of the Cato Manor community, and assist in providing local residents with farming/ gardening knowledge, fresh and healthy food, and ultimately increasing their food security. At the conclusion of the dissertation, this statement will be revisited to assess its accuracy in terms of the research findings.

Map 1: The Location of Cato Manor in eThekwini Metropolitan Municipality



(Source: MHP GeoSpace)

1.8 OBJECTIVES

The objectives of this research are outlined below and include:

1) To consider international and national models of urban agricultural concepts for applicability in South Africa and eThekwini;
2) To evaluate international and African case studies on urban agriculture and its accommodation in the city;
3) To consider what changes in policies and approaches would be required to include urban agriculture as an urban land use nationally and in eThekwini
4) To identify and analyse the current land usage within and around the Mandene Park Sports Club;
5) To assess the potential use of rooftop gardens and personal gardens within the study area;
6) To assess the potential use of the Mandene Park Sports Club for a community garden;
7) To assess the possibility of introducing an Urban Agricultural Hub into Cato Manor;
8) To identify and address the challenges urban agriculture will face in this area; and,
9) To make a set of recommendations based on the findings of the dissertation's research for future planning initiatives for urban agriculture in Cato Manor

1.9 RESEARCH METHODOLOGY

The research methodology applied in this research is both quantitative and qualitative. It makes use of three questionnaires that were designed to conduct interviews with 60 local residents (30 from the formal housing area and 30 from the informal settlement area), professionals in related fields, and former members of the Cato Manor Development Association (CMDA). A physical analysis was also conducted as part of the research. The results from these various questionnaires and observation studies were then collected, tabulated and discussed in Chapter 5 of this dissertation.

The research methodology has been conducted in this way in order to explore and unpack the perceptions and attitudes of those living within the case study area and explores their concept of, and attitude towards urban agriculture. In its analysis, the research will explore the acceptability of the creation of an urban agricultural hub amongst the participants. An assessment will be made of resident's preferences in terms of the kinds of crops they would like to grow in their own backyards and roofs (if and where possible), as well as those they would like to be grown in the community garden. The research aims to provide a professional understanding of the feasibility of establishing

an urban agricultural hub in Cato Manor and the suitability of the site identified in Cato Crest. These professional perspectives will be undertaken by conducting interviews with planning and development professionals and experts on local economic development initiatives. Interviews conducted with former members of the Cato Manor Development Association were done in order to gain information on any previous urban agricultural projects in the area.

1.10 DISSERTATION STRUCTURE

The structure of this research dissertation consists of eight parts, which as outlined in detail below:

Chapter One: is the introductory overview chapter of this dissertation. This chapter introduces the topic and the intention of the dissertation. This chapter also provides a clear breakdown of the chapters, the aim, hypothesis, main research question, subsidiary questions and the objectives.

Chapter Two: is the conceptual framework chapter of this dissertation. In this chapter an explanation of the various concepts and theories informing the study are made. This chapter also provides a link on how these theories relate to the study area and to urban agriculture in general.

Chapter Three: of this dissertation provides a review of the related literature. This chapter explores the literature on the topic of urban agriculture and its place in planning.

Chapter Four: introduces and explores the case study area of this dissertation, and highlights the research methodology adopted in this research. This chapter provides a background and history of the study area and carries out an analysis of the current condition of the physical, social and economic environment, and expresses how this study site is ideal for the development of an 'urban agricultural hub'. This chapter then goes on to describe the research design, and how the study area is examined and assessed as a possible site for an urban agricultural hub, which has the potential to serve the residents living in both the informal settlement as well as those living in the middle class homes near the park. This chapter describes the various approaches used to conduct the research needed to ensure the main research question is answered and the set aim and objectives of this dissertation are met. This chapter also presents the questionnaires used to carry out the research. The target groups for this research include local residents, Architects, Town Planners, Housing specialists, Environmentalists and previous members of the Cato Manor Development Association (CMDA). The findings of the interviews and questionnaires that were conducted are explained in

this chapter. Secondary data used in this research came from local and international case study examples.

Chapter Five: of this dissertation explores and unpacks the research results and findings. This chapter makes use of maps, graphs and tables that are used to support and present the findings of the various surveys conducted. This chapter also analyses and discuss the results found during the research. This chapter will then address the validity of the proposed benefits of urban agriculture, as well as the perception of urban agriculture and its application in the study area.

Chapter Six: concludes this dissertation, and includes recommendations for future studies or related research. This chapter provides closure to the dissertation through ensuring the hypothesis and research question was met. This chapter also ends by stating the limitations encountered whilst carrying out the research and offers recommendations on how to improve the study.

1.11 LIMITATIONS TO STUDY

There are a number of potential limitations to this research. Firstly, the chosen study areas has been previously well researched and therefore a potential problem could be the fact that residents are tired of answering numerous questionnaire over the years, yet very little real change has happened in the area. Therefore respondents may feel a sense of 'pointlessness' to the research and not answer correctly or with any interest. This area has also been known to be volatile and therefore access to residents in some part may not be an issue. A language barrier may also present issues when interviewing local residents. A translator, who is able to communicate in Zulu, will be brought along on days that they are available in attempt to mitigate this issue. For the formal housing area, gaining access to the homeowners or even those who live there may be difficult if they leave their homes for work. Arriving at someone's doorstep too early in the morning, or too late in the afternoon will also not likely be welcomed by many residents, and therefore is no one is home during the day, these people may not be accessible.

Interviewing the professionals in related fields may also prove to be difficult to coordinate. If these professionals are busy, or are not interested in participating in research for a University student, then accessing when may be challenging. This could also result in not enough professionals being interviewed and therefore requiring enough 'scope' in this sense might become a reality.

The length of these questionnaires could also provide to become a limitation. Lengthy questionnaires might bore or scare off people from participating. Therefore, the questionnaire was kept relatively short. This may however present problems later in the research if important questions, that may not seem important in the beginning, are left out.

1.12 CONCLUDING COMMENTS

This chapter has answered the question of what the concept of urban agriculture encapsulates. More importantly, consideration is given to the potential or urban-based agriculture to benefit the community of Cato Manor (the case study area) and the environment. These benefits can be realised not only by the poor, but also by all members of the community. This is due to the wide range of benefits urban agriculture can have, from increasing food security, to reducing greenhouse gasses and even assisting in the aesthetic quality of a community or area as well as community cohesion. The Cato Manor area is an ideal place to start applying urban agricultural practices. This is due to the diverse range of people that can be found in its immediate vicinity. They range from the very poor living in informal housing and settlements, to middle class residents living in formal homes. This diversity is mirrored in the social disparity that the diverse settlement types represent. Here, the full range of benefits that urban agriculture has to offer can be realised. Urban agriculture can also become a powerful tool for the redevelopment of the area, in the aftermath of its disruptive history.

CHAPTER TWO: CONCEPTUAL FRAMEWORK

2.0 INTRODUCTION

There are several interrelated concepts that inform urban agriculture. These include food security, local economic development, community development, urban ecology, open space, and urban management. Urban agriculture interlinks, contributes to or is affected by each of these concepts, and therefore represents an important relationship between contemporary town planning, development and urban agriculture. This chapter aims to answer the question of how these concepts relate to urban agriculture as a practice or land use, and how these concepts form the conceptual/ theoretical approach taken by this research.

2.1 URBAN AGRICULTURE (UA)

Urban agriculture can be understood and practiced in many different ways, in many different places and for many different reasons. The concept of urban agriculture therefore can be defined differently according to its context. Urban agriculture in its more simplistic form can be understood as follows:

> "*Urban and peri-urban agriculture (UPA) can be defined as the growing of plants and the raising of animals within and around cities*." (FAO, 2015)

This definition can be expanded on to include its purpose, such as the following definition:

> "*Urban agriculture encompasses a type of agricultural activity, which occurs along or within the urban periphery. It includes the growing of crops or the keeping of livestock, either for personal use, or to turn a profit*" (Rees, 1997).

These definitions are essentially what urban agriculture is, however urban agriculture can be understood as something more. The following definition encompasses more of urban agricultures potential:

> "*UA is an industry located within (intra-urban) or on the fringe (peri-urban) of a town, a city or a metropolis, which grows or raises, processes and distributes a diversity of food and non-food products, (re-) using largely human and material resources, products and services found in and*

around that urban area, and in turn supplying human and material resources, products and services largely to that urban area" (Mougeot, 2000: 10).

There are many examples of urban agriculture that suit both these definitions taking place in cities all around the world, in both developed and developing countries. This could be due in part to necessity (as in the case of Cuba) but also as the result of localised problems or circumstances. At the level of the individual household, the choice to engage with urban agriculture is often driven by survival strategies, but can also be a way of 'reconnecting with nature' or a way to gain control over the source of one's food and therefore has a more personal meaning. Whether it occurs as the result of a national strategic strategy or as a response to limited income or even as a way to reconnect with nature, urban agriculture can have many benefits in different spheres of life. These benefits include the positive implications it has for the natural environment, as well as its ability to improve the aesthetic quality of an area. However, the most obvious benefit of urban agriculture is that it supplies those involved with an immediate source of fresh food. If one is able to produce a surplus, this additional output could be sold for a profit.

The World Health Organisation defined food security, at the World Food Summit of 1996, as a state when "*all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life*". Food security can also be understood at a household level. Food security includes the physical and economic access to food that meets people's dietary needs as well as their food preferences (WHO, 2013). Food security is achieved through three means, including food availability (sufficient food available on a constant basis), food access (being able to afford a diversity of food) and food knowledge (knowing basic nutritional requirements). Improving these three means for the people of Cato Manor is what this dissertation refers to when it addresses the concept of improving food security. Food security is therefore as much about access to food as it is about food being available, and urban agriculture has the potential to improve food security among the poor, as well as providing a healthier and cheaper alternative to super market food for all classes of people. Being able to grow your own food will help loosen the grip that the industrial food system has on both the individual and community alike. It is a strategy to redress dependency at the local level.

Urban agriculture is a sustainable practice, which will in turn 'green' the city, as well as reduces carbon dioxide (CO_2) and other pollutant levels in the air. Therefore, this practice provides a more aesthetically pleasing approach to upgrading previously degraded urban landscapes. It also provides a way of better utilising some of the cities organic wastes, by converting it to compost to feed the

crops, instead of dumping it at landfill sites or in the ocean. Wastewater, which is undrinkable, yet clean enough for agricultural use, can be utilised instead of being wasted. In fact, in many African countries, wastewater is an important aspect of urban agriculture (Lydecker, 2010).

Furthermore, urban agriculture has potential social benefits. For example, community gardens bring people together who might otherwise not have mixed socially, such as people from a different class, race or religious groups. Community gardens have the potential to create a sense of pride in one's area, and can often become a tool for community development programmes. They are also a means of allowing access to additional land for recreation and production in areas where residential lots are small and opportunities for socio –economic development is limited. Urban agriculture can produce food, fuel or even alternative medicines, for personal use, or to be sold in a market or to neighbours for a profit. This activity can be placed nearly anywhere urban such as on rooftops, in home gardens, along roads, in nurseries, greenhouses, in unused public open space and so on (Pearson, 2010). Urban agriculture has a number of benefits across social, economic and environmental spheres, including the following:

- Increase food security;
- Increase health and wellbeing of those involved;
- Improved aesthetics of an area;
- Increase social interaction;
- Gender equality;
- Job creation;
- Diversifying poorer urban economies;
- Waste recycling;
- Reduction of urban heat and improving air quality;
- Carbon reducing qualities, and
- Improved biodiversity within urban areas (even if limited)

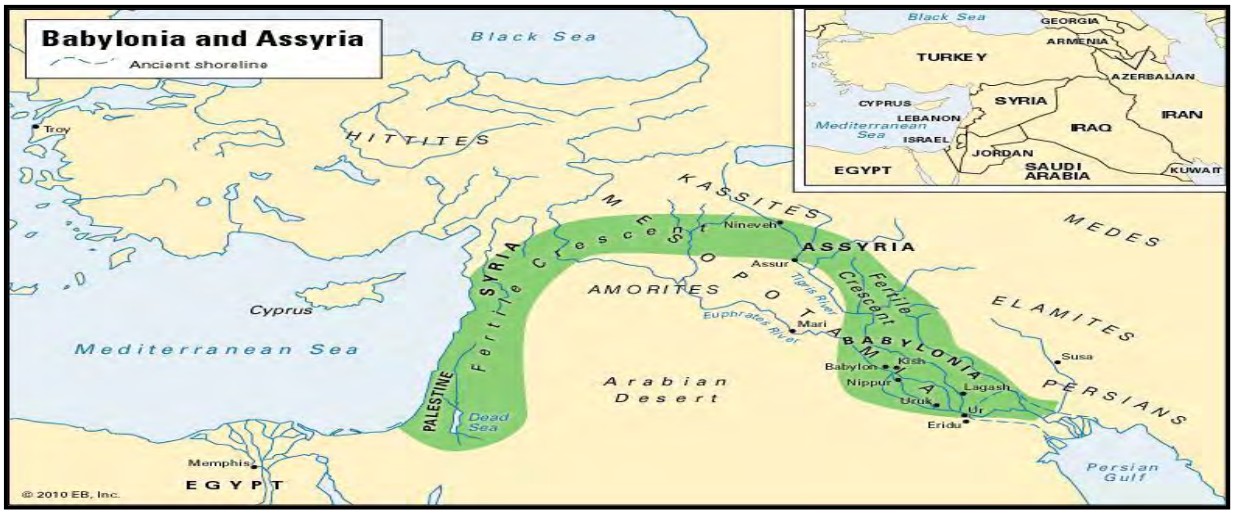
Source: Pearson, 2010

Specific to the Cato Manor case study area, considered in this research is the potential of urban agriculture for urban reconstruction or urban renewal and the decreasing of crime through the provision of alternative community based social and economic opportunities. The Mandene Park Sports Club, which is located on the west side of the University of KwaZulu-Natal, is this study has

chosen site for a proposed community garden. It is situated at the south end of the study area, in close proximity to both formal housing and an informal settlement. This facility has become run down, with abandoned buildings such as the squash courts. The derelict buildings are attractive locations for criminals to hide in from the police, or to conceal the selling of drugs. This sports club is also unsightly, and potentially degrades the value of the area. Renovating this sports club to become a fully functional community garden would assist in moving criminal activities elsewhere, away from the immediate community, as well as improving the 'look' of the area and thus its potential value. All of the above benefits of urban agriculture will be explored and expanded upon in this dissertation.

The words 'Urban' and 'Agriculture' are seemingly polar opposites in conventional thinking. Urban being the city where people work, live and commute on a daily basis. It is a place where buildings, development, streets and bright lights are the surroundings. The word agriculture is synonymous with the rural context and is related to farms away from the city, in remote places. These areas are far less noisy, with the lack of streets, bright lights and development that is more characteristic of the city. Here food is grown to feed the city. This sense of separation is a modern concept as historically; urbanism and agriculture were essentially linked. Around 10, 000 years ago, in an area known as the 'fertile crescent', agriculture and urbanism where born, around the same time, designed to go hand in hand.

Map 2: The Fertile Crescent in Historical Times and Today



Source: http://media-2.web.britannica.com/eb-media/50/64950-004-EAA1108C.jpg

Map 3: The Fertile Crescent Today

Source: http://outfitnm.com/wp-content/uploads/fertile-crescent.jpg

As towns and cities began to emerge, a food source to sustain the growing concentration of people was needed. Agriculture began on the outskirts of the city as an answer to this issue. Agriculture was a stable way of feeding a large number of people living in a permanent settlement. These

settlements where compact, with farmland surrounding it producing food to sustain them (Steel, 2009). Without one, there would not be the other. Without cities, there would be no need for large-scale agriculture and without agriculture (and the improvement of agricultural technologies); cities would not look the way they do today.

Cities with millions of inhabitants (which are common in the world today) may never have come about as rapidly as they have without food being sourced in from farms around the country and around the world. In fact, stripping away large-scale agriculture would cause mass starvation in cities across the world. Food was and still is a very important aspect in the shaping of our modern world. The more food that could be grown, the faster the population grew, the bigger the cities got and the more they relied on improved agricultural technologies and techniques. Today, our current agricultural model looks drastically different to what it did thousands of years ago. With cities now host to as many as 37 million people (Tokyo, Japan), and locally nearly 8 million (Johannesburg), the issue of feeding these people becomes increasingly difficult (World Atlas, 2012).

Perhaps a step away from our modern food system (the supermarket and many of its imported mass produced products) and towards more localised, hands on, adaptable food system may soon be required. Growing food right in or near to the city, in community gardens, home gardens, rooftops and so on has the potential to become a historical *"*step back*"* in the right direction. Growing food in and near these cities might be the only choice to guarantee a steady supply of food in the future.

2.2 A TYPOLOGY OF URBAN AGRICULTURE

2.2.1 Common Types of Urban Agriculture

There are different types and forms of urban agriculture, namely roof top gardens, home gardens, crops grown behind buildings or along roads, and the different forms of community gardens. These are not the only types; in fact, with imagination one can develop a wide range of types of urban agriculture. In many circumstances, a garden can fit into more than one of these typologies. For instance, a community garden can also often be a therapy garden, and could be a market garden all at once. Community gardens develop for different reasons and in distinct contexts. In this next section, this concept of urban agriculture and its more common associated types will be further explained.

Roof top gardens can be considered a form of Urban Agriculture. These are quite simply gardens that are located on the roof of a building, or home. They can be used for the growing of food crops, flowers or any other type of plants. These types of gardens are very popular and can be seen on the roofs of universities, high-rise buildings in the city centre, in suburbs and even townships. The gardens increase urban food production, minimise urban heat island effects, improve air quality, they delay storm water runoff, increase the insulation of the building and increase the value of that building. The mitigating role played by rooftop gardens in managing storm water run-off and pollution has made the concept a central part of 'green building technology'.

Home vegetable gardens are another example of a type of urban agriculture. These gardens are the food patches found surrounding, behind, or in front of one's home. These gardens are usually small and only produce a few herbs, basic vegetables and sometimes fruit; however, they also have the potential to produce enough food to support that household. On a larger scale, these home vegetable gardens will be an important component of increased urban food production in general. Homes gardens are especially useful for those who are less mobile, such as the elderly and those suffering from HIV /AIDS or other diseases, due to the ease of access. These gardens are also less prone to theft in some many cases (but not all).

Neighbourhood or community gardens are similar forms of urban agriculture to the above examples; however, they are usually larger in comparison to home or rooftop gardens. These gardens can be owned and run by either Non-Governmental Organisations (NGO's), the community themselves or by the government. Sometimes they have a select few people working on these gardens but provide for the community. Other times, sections of these gardens are rented out annually to members of the community. The goals of these gardens are to promote community development and unity amongst the local residents (Martin, 2007). In eThekwini, roughly 600 registered community gardens could be found in 2009 (Leech, 2015: 48).

Non-profit-organisation assisted community gardens are another form of community garden, except they work on a volunteer basis, and are sponsored through donations, fundraisers and some money provided by local government grants. These gardens are usually organised through a particular non-profit organisation, which manage and maintain the garden. The gardens aim at promoting gardening to all residents, especially the very poor.

Some community gardens are established through local legislative efforts that convert city parks and recreational areas to spaces where urban agriculture is allowed and encouraged. These are considered Parks Department Community Gardens. Projects and dedicated funding is provided and is channelled into the redevelopment of the site, into the refurbishment or construction of buildings and to the maintenance of the community gardens. The only difference with these community gardens is that they were once parks or recreational areas, such as a sports club or a community park, which have been converted into a community garden. This conversion is done to better utilise open public spaces for the benefit of the community, while still maintaining the original purpose of natural open spaces in urban areas by also being beneficial to the natural environment.

School gardens can also be considered a type of urban agriculture. These gardens are most commonly found within schools grounds. They are managed by either a teacher or a group of teachers and are often maintained by students and parents. These gardens can be used for multiple reasons, such as a learning facility, or a place to relax for teachers and students alike (*Ibid*, 2007). Another purpose for such gardens could be to provide food for members of staff or to supplement child headed households and as part of a school-feeding scheme. The need for open space located in educational facilities for the production of food has increased as the social consequences of the HIV/AIDS pandemic has become evident. For child headed households, those supported by elderly women, and those supported by a parent with HIV/AIDS, the creation of a school garden can make a difference in terms of their survival strategies and access to food.

Entrepreneurial training gardens are similar to school gardens as they are designed for educational purposes. However, the learning that occurs at these types of gardens focuses more on job opportunities through skills training programs sponsored by Non-Profit Organisations. Training at these gardens covers all aspect of food production, including planting, harvesting, maintenance of gardens, as well as marketing, packaging and sales skills (*Ibid*, 2007).

Market gardens can also be considered a type of urban agriculture. These gardens are developed with the economic benefits of urban agriculture in mind. Local urban producers are able to sell their produce to individuals, restaurant owners and in local food or farmers' markets in order to earn an income (Wallace, 2009). Therefore, these gardens have an economic base, with the purpose of turning a profit for those involved.

Many would argue that gardens, and the act of gardening itself, could be very therapeutic. For this reason, gardens have been established at hospitals, clinics, and even special needs schools with the intention of providing therapy to the disabled and the elderly (*Ibid*, 2009). These types of gardens are considered as Therapy Gardens. The use of gardens (with their natural settings) for healing and relaxation is nothing new. Ancient civilisations such as the Persians created beautiful and elaborate gardens to *"please all of the senses"* (Detweiler, 2012). Although there is yet to be scientific proof linking gardening and natural settings to assistance in healing of the human body and mind, there have been many preliminary studies proving its feasibility (*Ibid*, 2012). These preliminary studies have concluded that horticultural therapy and the exposure to gardens have many benefits to human health and healing in the following ways:

- Sleep improvement;
- The learning of new skills;
- Regaining knowledge of lost skills;
- Improved memory and attention;
- Increased sense of responsibility and achievement;
- Improved self-esteem;
- Improved social skills and interaction;
- Reduction in stress;
- Improved sense of calm and relaxation; and,
- Reduced pain perception.

Source: Detweiler, 2012

2.2.2 Urban Agricultural Hub

An "Urban Agricultural Hub" is another concept explored in this dissertation. Essentially, an urban agricultural hub is a designated area within the city or sub-urban areas that is working collectively to better utilise the space of the area to produce food crops and possibly keeping of livestock. Working collectively in this case means the sharing of food, ideas and knowledge, with a central "meeting point" or common ground such as a community garden. All residents who live within the immediate area will be allowed to participate if willing; however, the success of an agricultural hub will partly rely on local community participation. Participation will afford residents food from the community garden itself, as well as knowledge, seeds and other resources to continue more crop production at

home. Food sharing in these hubs is encouraged. This kind of hub can be adapted, manipulated and suited to fit any areas specific needs and restrictions. These hubs will make use of any or all of the above-mentioned types of urban agriculture and include other models not outlined.

There are a number of Urban Agricultural Hubs (UAHs) around the world, which are dedicated to delivering food security to the local population by empowering them through education, the provision of resources, funding and access to local markets. Each of these hubs is unique to their area and are very site specific. All attempt to achieve the same goals with an emphasis on the improvement in food production and security at the local or community level.

2.2.2.1 An Agricultural Hub in Cato Manor

Cato Manor has the potential to be host to one of these urban agricultural hubs. There are strategic sites within Cato Manor, such as the Mandene Sports Club, that are currently being underutilised, and which have space, which could be converted into a community garden and the establishment of a Hub. This community garden could host a wide range of horticultural activities. For example, food gardens organised in rows of raised beds, tyre beds, greenhouses or even just basic shade cloth houses (to protect certain crops from monkeys), or vegetables planted right into the ground itself. A chicken pen could be created in a sheltered section of the field to produce eggs, as well as valuable by-product of chicken manure (faeces) that has value as a natural fertiliser. Worm farm systems could be created to produce in-expensive natural fertiliser, compost and insecticide in the form of 'worm wee', which can be sold and/or used. These 'low tech' systems are easy and inexpensive to set up and maintain. A compost station could be created to package the by products from the worms and chickens.

At a later stage when the project is successful, and there are enough funds for it, there is also the potential to introduce hydroponic systems for cultivation on the abandoned tennis courts. It is possible to retro fit a standard container to accommodate a hydro-phonic garden. This would largely depend on funding and knowledge available. Local gardeners would be recruited from the nearby informal settlement to manage the various gardens, chicken pen, worm farms, composting and potentially, the hydroponics. These gardeners will then directly benefit from the produce of this community garden, by selling its produce at a Sunday market or even to consumers through various other market-related vehicles. This will directly benefit those involved by providing them not only

with fresh healthy food, but also with an income. Furthermore, local residents from the formal housing areas will also benefit by having a healthier alternative to the supermarket produce. Socio-economic opportunities can be created through the organisation of a Sunday market or even pre ordered vegetable packs that can be collected at the community garden.

The abandoned buildings on the Mandene site can be converted into a small shop, education centre and storage facility for harvested crops, seeds and farming equipment. This commercial outlet could sell everything from seeds, to farming inputs and small scale gardening equipment or even homemade sauces preserves and pastes made from the crops grown at the community garden. Money raised by the shop could then be reinvested into the community garden. The education centre could potentially host classes to educate people on efficient and effective gardening techniques on a weekly basis free to the local community. It could potentially also provide local residents of the nearby informal settlement with *'starter packs'*, which will include compost/potting soils, seeds or seedlings, organic fertiliser (in the form of chicken manure or *'worm wee'* and anything else that may be relevant to the crops being grown or to what they had learnt in that class. This would be empowering local residents to either improve on their existing food gardens or increase their yields. Local residents from the formal housing areas of Cato Manor would also benefit from these classes. The hub could assist as a springboard for the establishment of household food gardens that will improve local residents' access to healthy, fresh food.

An example of a similar initiative can be found in Havana, Cuba. The Ministry of Agriculture and the Cuban government set up information offices (which later became known as Agricultural Support Stores) in 1991 in each municipality, to provide new urban farmers with technical assistance and support. These support stores provided *"technical assistance to urban producers and…provide them with seeds and seedlings, biological products, and veterinary medication and products, agricultural tools, bio-soil, earthworm humus, ornamental plants, brochures and specialised literature. They also offer assistance services concerning plant health, animal health (to a lesser extent) or on other related issues, either on their premises or on the producer's premises. Both the stores and their extensions are self-financing and they charge for the provision of services. They also sell the products mentioned above. The profits they make are used for paying salaries and buying agricultural input, seedlings and other products from government stores and private producers."* (Cruz *et al*, 2003: 42). This is similar to what could be implemented in the study area, but adapted to suit the locality and context of the study area.

To achieve the above mentioned *'urban agricultural hub'*, there would need to be a community garden, with an education centre, shop and Sunday market at the centre, with the surrounding local residents starting or expanding on their own food gardens with the support of the centre, all together in one localised area (or hub) such as the proposed study area. This will require funding from sponsors, local government, and from the shop. It will need to be championed by a willing and respected local resident, and possibly a small team of management, administrative staff and gardeners (who will earn money from selling produce from the community garden). The management and administrative staff members can come in the form of paid staff (paid by local government and sponsors) as well as volunteers from local NGO's or volunteer groups.

Costs will need to be kept to a minimum, and resources used optimally. Water harvesting in one form or another will be essential, as gardening can be water intensive. Creating compost and fertiliser on site will also assist in keeping costs down, as well as keeping the gardens organic. Such hubs are possible, and in fact, many already exist both locally and internationally.

222.2 Examples of Agriculture Hubs in South Africa

There are a number of urban agricultural project operating in other metropolitan areas in South Africa, which can be used as precedent examples for the proposed Cato Manor Hub. They are outlined in detail below.

Abalimi is a Non-Governmental Organisation (NGO) whose aim is to *empower the disadvantaged through urban agriculture and environmental programmes and projects* (Abalimi Website, 2015). In a metropolitan area of Cape Town where more than one million residents live in informal settlements located outside the city and there is a 40 per cent unemployment rate this NGO assists communities in setting up '*urban agricultural hubs'* that enable informal settlement residents to engage in significant food production (Mansfield et al, 2015). Abalimi focuses on the development of *'micro-farms'*, which take the form of individual and community gardens within the Cape Town informal settlements of Nyanga, Philippi and Khayelitsha, as well as surrounding settlements. They negotiate access to numerous neglected or underutilised spaces from private or public landowners that residents from the adjacent informal settlements can utilise for the practice of urban agriculture (Mansfield et al, 2015).

Abalimi supports individuals and communities to develop their own vegetable gardens at a variety of scales. These range from small well-organised home gardens that are used to improve food security at the household level, to larger gardens (sometimes in the form of a community garden) that provide those involved with an additional income through the sale of their surplus (Mansfield et al, 2015). According to their website, Abalimi's success rate has been as high as 90 per cent (Abalimi Website, 2015). The NGO provides urban farmers with free advice and knowledge through information sites and mobile educators teaching groups, as well as providing agricultural inputs such as soil improvers, seeds, ground covers, basic tools, windbreaks and safe pest control solutions. In the near future, Abalimi also hopes to provide these urban farmers with micro-finance solutions (Abalimi Website, 2015).

One of Abalimi's key innovations in a social marketing business called *"Harvest of Hope*". This business collects, packages and delivers surplus produce grown by local urban farmers in informal settlement areas (who were often previously unemployed) to families living in formal areas in Cape Town (Mansfield et al, 2015). Effectively, Abalimi creates "hubs" where local residents are assisted in setting up 'micro-farms' in urban informal settlements through acquiring them land (or permission to use underutilised land), providing them with knowledge and resources, as well as creating a market for their surplus. This is effectively one example of what an urban agricultural hub potentially consists of that Cato Manor could look at adopting.

The Lukhanyo Community Farm and Hub is another example of an urban agricultural hub. This new development is currently being developed in conjunction with neighbouring informal settlement community living in an area called the BT Section, on land that is owned by the Department of Education (Mansfield et al, 2015). This '*hub'* will include space for planting crops, a local market space, an orchard, a multi-functional community building. The long-term aim of this development is assist farmers to produce enough surplus crops that will provide them with an income selling through local markets such as the Harvest of Hope (Mansfield et al, 2015). Potentially, Cato Manor and the Mandene Sports Club could be the beginning of such a *'urban agricultural hub'*, or be used as a pilot project that if successful could be replicated across Cato Manor and the rest of the province of KwaZulu-Natal.

Plate 1: Harvest of Hope Surplus Ready to be Packaged and Distributed

Source: Mansfield et al, 2015

2.3 FOOD SECURITY AND FOOD SOVEREIGNTY

The global demand for food continues to rise as the world's population grows. Limited land, diminishing clean water supplies and finite energy sources are placing increased pressures on the ability to produce enough food to meet current and future demands at the current rate of consumption (Godfrey *et al*, 2010). Many people are excluded from the food system, as they are unable to afford to access food and are not part of the decision-making processes that govern how the food system they rely on is managed. The world's industrial food system also remains precarious and susceptible to failure, which would leave millions in a state of food insecurity. These factors, that threaten to diminish our ability to remain food secure, include the following.

2.3.1 Land

Continued growth and development is placing pressure on land availability for agricultural use. With the total human population, having grown from three billion in 1960, (Smith *et al*, 2012) to over seven billion today, (U.S. Census Bureau, International Database, 2014) so too has the need for increased total food production. Since 1960, cereal crops have nearly tripled, root food crops have

increased in production by 16 per cent, and meat production has quadrupled. If the total population reaches its predicted number of nine billion by 2050, and consumption patterns continue as they are today, then there will need to be a further increase in food production (Smith *et al*, 2012).

According to Cockrall-King, (2012: 65) of the world's 13.5 billion hectares of land, only three billion or 22 per cent is considered suitable for agricultural purposes. According the FAO (2013: 10) however, 1.5 billion hectares of land (12 per cent of the world's total area) is currently being used for crop production[2]. While there may be more land available with the potential for agriculture, much of this land is covered by forests, protected for environmental reasons or used for urban settlements (FAO, 2013: 10). This fact has resulted in mass deforestation and the purchasing of land from poorer countries (which is often being used by small family farmers) in order to satisfy the demand for agricultural land (Cockrall-King, 2012: 65).

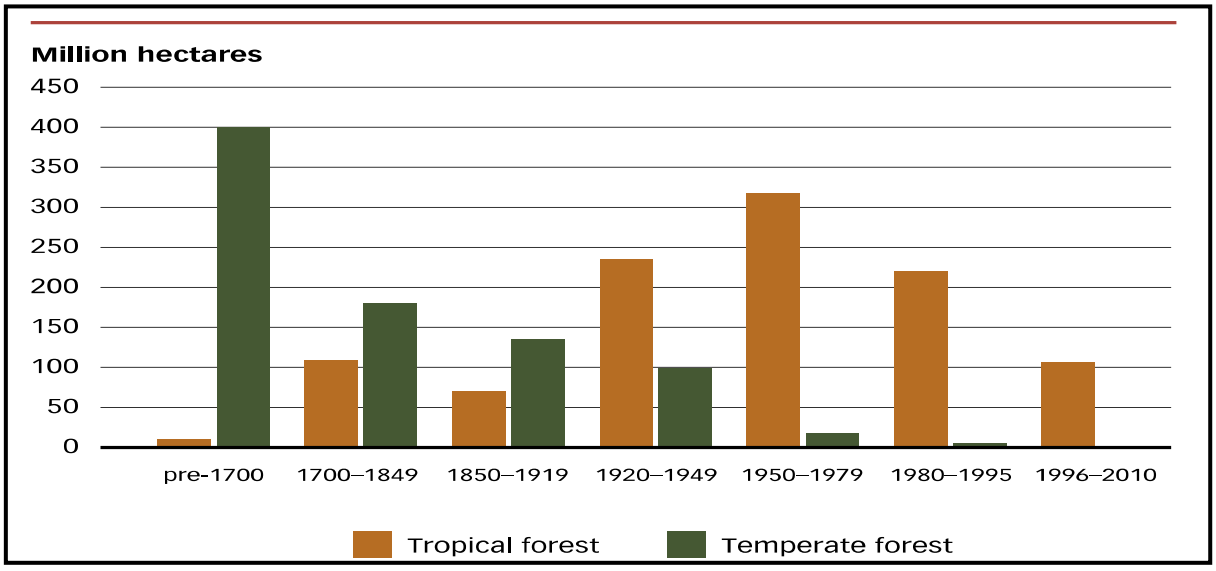
The FAO's 2012 "State of The World's Forests" report confirmed that over the last 5000 years, approximately 1.8 billion hectares of forests have been destroyed (FAO, 2012: 9). Deforestation, caused mainly by the conversion of tropical forests into agricultural land, has been rampant over the past few decades. Approximately 13 million hectares of forests were cleared for development or agriculture or through natural disasters each year between 2000 and 2010 compared to 16 million between 1990 and 2000 (FAO, 2010a: 15).

When you compare deforestation across various regions, the temperate forests of Europe, Asia and North America historically had the highest rates of deforestation. This changed in the early 20th Century, when tropical forests in South America and Africa began experiencing the greatest net loss of forests annually around the world (FAO, 2012: 9). The FAO contributes this change to the increased production of industrial crops (cash crops) for export in Africa and South America. Furthermore, many communities in Africa rely on forests for wood for fuel (FAO, 2012: 15). South America as a region experienced the largest net loss of forests between 2000 and 2010 at a rate of 4 million hectares per year. Africa followed at a close second, experiencing a net loss of 3.4 million hectares per year over the same time (FAO, 2010a: 18). The rate of deforestation in sub-Saharan Africa seems to be linked to increase in population, and is caused mainly by the need for wood as

[2] This does not include land for meat and dairy production, which would increase this number.

fuel, clearing of land for growing crops (many of which are not food crops but rather export related 'cash crops'), and for grazing (FAO, 2012: 9).

Figure 4: Estimated Deforestation by Type of Forests and Time Period



Source: FAO, 2012: 9

The FAO (2010) main report did confirm that progress has been made to improve the sustainable management of forests in Africa and globally, however they express concern that the rapid loss of forests in this region is still too high. Policy failure is deemed the main culprit for deforestation in many regions, including Africa. Many governments indirectly encourage deforestation by providing incentives and subsidies for agriculture, while failing to recognise the benefits of forests outside of their use for wood (FAO, 2012: 15). Countries, especially developing countries, also feel the pressure to develop and grow their economies. This adds further pressure on space and land availability and for the need to produce more food.

The problem many countries face is that fertile land is scarce, and there is more money to be made from faster growing cash crops and a greater need to feed their people than they can receive from slow growing trees. There unfortunately is no market for the benefits that forests supply our world through their ecosystem services, their carbon absorbing function and their water cleaning service

to name a few. Therefore a balance is needed, or an innovative solution to the problem of land availability (FAO, 2012: 15).

In addition, many wealthy major corporations are turning to food production as a new viable investment opportunity. They are purchasing land in poorer countries particularly in Asia and Africa whose land markets provide lower prices and whose governments are either desperate or corrupt. Worldwide there is 50,500 hectares of land being leased to rich countries such as Japan, South Korea and America solely for the production of food (Cockrall-King: 66, 2012). Most of these farms are environmentally damaging, using dangerous pesticides and fertilisers and adopting techniques such as mono-cultural cropping practices that degrade the quality of the soil. If countries do not have land to grown their own food, it means they will have to import these foodstuffs. Relying on imports for your food supply is risky business in today's market and political instability. If borders where to close for any reason, these countries will undoubtedly experience a food crisis.

For example, a Saudi Arabia billionaire executive owns 1,000 hectares of land in Ethiopia, on which he grows 30 tons of tomatoes and hundreds of tons of other fresh vegetables every day. None of these vegetables reaches local Ethiopian markets. Local small-scale farmers, producing food for themselves and their communities, formerly used the land. Instead, all the vegetables grown on this land are exported to the Middle East (Cockrall-King: 2012: 65). This occurred because the land in Ethiopia is fertile, but more importantly it is cheap. This is just one of hundreds of examples of poor countries that are leasing their precious land to the highest bidders.

Cities rely on land that is far greater in extent than the city itself, to provide that city with its food and resources. The concept of a cities 'ecological footprint' is a lens from which to view this situation. Ecologists Rees and Wackernagel, (1996) use the concept of an ecological footprint as a means of quantifying the land requirements needed to supply a city with essential resource services, and to absorb the waste that is produced by the city. Three main components are included in the calculation of a cities ecological footprint; these include the surface area required to:

- Feed the city
- Supply the city with fuel, products and services
- To absorb the city's waste and their carbon dioxide output

Source: Rees and Wackernagel, 1996: 9-12

For example, it has been estimated that the ecological footprint of Cape Town is 4.28 hectares per capita. If everyone on earth lived in accordance with this average ecological footprint, we would require 2.3 planets. This compares to Canada's 4.3 hectares per capita, the USA's 5.1 hectares per capita, India's 0.4 hectares per capita and a world average of 1.8 hectares per capita. That means the total ecological footprint of Cape Town is 128,264 m^2, of which the large majority (112,349m^2) is for food production (Swilling, 2006: 33-34).

Another example used by Girardet is the ecological footprint of London. According to Girardet (2002: 97), London's ecological footprint was at one stage 20 million ha, or 125 times its own size. This is broken down as follows: London requires roughly 1.2 hectares of farmland per capita, which comes to around 8.4 million hectares (or 40 times its own size), 768,000 hectares of forest land to produce paper and timber, and about an area the size of ten million hectares to absorb the $C0^2$ London produces (Girardet, 2002: 97). In terms of demand for food, forest products and energy, Girardet argues, when considering the ecological footprint of cities, that we would need three planets to sustain the cities of the world (Girardet, 2002: 97).

These issues represent a need for new innovative ways to produce food for the ever-growing population that will not require large plots of land. Urban agriculture has the potential to be one of these initiatives. Gardens can be placed just about anywhere where there is sun, soil/ compost and water, which open up many opportunities within the city. Urban agriculture has the potential to reduce a cities ecological footprint in a number of ways. For instance, growing food locally and closer to the consumers reduces the fossil fuels used in transporting food across vast distances. Emphasising and promoting the use of food products grown locally from urban food gardens or community gardens will reduce the demand for imported foods. Recycling urban waste is another way in which urban agriculture can reduce the cities ecological footprint, by reducing the amount of waste dumped into landfills or rivers and oceans (Girardet, 2006).

2.3.2 Water

Growing food requires water, and lots of it. In fact, 70 per cent of the world's fresh water is being used by agriculture (Cockrall-King, 2012: 69). Many countries are in danger of serious water shortages, dramatically affecting their agricultural sectors. There have been a number of studies on water availability for agriculture in countries around the world. These documents also discuss the threats to our world's water supply (McDonald *et al*, 2011 and Gerten *et al*, 2011). The two most

common concerns that have been highlighted are the increase in population (particularly those in urban areas) and global warming. An increased population will increase the demand for fresh water supply in two main ways. Firstly, the demand for household water will increase. Secondly, it will increase the amount of water needed in the production of anything from industrial products to food (as an increase in the demand will result in the need for an increase in supply and thus a need for more water). Global warming will affect water supply differently. Increase temperatures have and will continue to affect our planets climate, affecting regions differently, by either drying a region through increased evaporation or wetting a region through increase storm activity (McDonald *et al*, 2011 and Gerten *et al*, 2011). Water shortages in some countries could dramatically affect their abilities to remain food secure.

As noted, not all countries have enough of their own water to sustain themselves and their agricultural practices, and therefore rely on water from their neighbours. If this water supply were to be cut off, it would put some countries into a very desperate situation. Fresh water is such an important resource, that some authors believe it is likely to take oils place in the cause of future conflicts (Cockrall-King, 2012: 69). The "war for water" may result in certain countries having their water supply severed, which would drastically affect their ability to feed themselves. This kind of scenario is not impossible and has additional socio-economic and political consequences. For example, water shortages could potentially cause an increase in food prices, the failure of industry, civil unrest, the need for martial law and political collapse. Just like oil, if fresh water becomes scarcer, it will become more valuable and thus more expensive.

2.3.3 The Role of Oil in Agriculture

"Eating Oil" is a term phrased by Green, (1978) following the first oil crisis in 1973, to describe how the food industry is heavily oil dependant. Oil is used in nearly every stage of food production, from fuelling machinery for planting, irrigation, feeding and harvesting, through to processing, distribution and packaging, its storage and finally its distribution to our homes as we drive to the shops to collect it. Once food has reached our homes, it has again stored (sometimes in the fridge) and then often cooked, using further energy. A large amount of oil is also used in the manufacturing process of fertilisers and pesticides, as well as in their distribution and use (Church, 2005). There is virtually no aspect or point in our food system that does not reply on oil in some way or another.

Oil is a fossil fuel that has been produced by the earth's natural processes over thousands of years. It will be impossible for the earth to replenish its oil reserves at the rate we are using it. This finite resource will therefore not be available forever, but the problems associated with relying on oil will be felt long before the last drop is extracted from the ground. Oil output is expected to peak in the next few years and steadily decline thereafter. As oil becomes harder to find and extract, so will its price slowly but surely increase (Cockrall-King, 2012:68). It is difficult to predict to what extent the fluctuations in the availability and cost of oil will affect the global food supply systems. What is certain is that in the near future, energy scarcity through a lack of oil, combined with the factors mentioned earlier, will likely cause significant food shortages and sharp food price hikes. The global food system that people rely on to feed themselves is completely and outright dependent on the flow, processing and distribution of oil (Church, 2005). If this flow were to be cut or even reduced as predicted, the loss in agricultural productivity would be extensive.

Transporting large amounts of food on a daily basis represents a huge portion of the oil used in the food industry. "Food miles" is the term used for this phenomenon. That is the distance our food travels before it is finally consumed. The extremity of this phenomenon can be personified by the Swedish tomato ketchup example. Researchers at the Swedish Institute for Food and Biotechnology analysed the production processes involved in producing this product. The study considered everything from the production of the inputs for farming tomatoes, tomato cultivation, and the conversion of these tomatoes into paste. It also considered the processing and packaging of the product, all its added ingredients, its retail and its storage. All this involved more than 52 transport stages (Church, 2005). The research from this study cited the following example.

Tomatoes are grown in various Mediterranean countries, which are then transported to Italy to be turned into paste then filled into bags that were produced in the Netherlands. This paste is then moved to Switzerland (Andersson et al, 1998: 278). The bottles used to package the product are produced in the UK and in Sweden. The raw materials used for the bottles come from Japan, Italy, Belgium, the USA and Denmark. The polypropylene (PP) screw cap of the bottle and plug, made from low-density polyethylene (LDPE), is produced in Denmark and transported to Sweden. Other steps involved in the production of this everyday product include the transportation associated with the production and supply of nitrogen, phosphorous and potassium fertilisers; pesticides; processing equipment; and farm machinery used in the farming of the tomatoes. Added ingredients are also likely to have been imported (Church, 2005).

Once the finished product finally reaches the shelves, each customer individually is likely to drive to the shops in their own cars to purchase this product. This is just one example of an everyday product, which relies on multiple transportation stages. This transportation utilised is in the form of trucks, trains, boats and aeroplanes, all of which consume large amounts of fuel, and thus oil. The Swedish tomato ketchup serves to illustrate the multiple layer interlink-ages between countries and raw materials for the production of one item. When this process is multiplied exponentially to cover the contents of a basket of food, the complexity of the food production industry becomes evident. The vulnerability of the system where there are manifold actors and countries in play is clearly illustrated by this example.

2.3.4 Cash Crops

The favouring of cash crops over food crops places further pressure on the availability of these finite resources mentioned above. Using land for mono-cropping styled production of cash crops (for example; cotton, tea, coffee or cocoa) is taking up thousands of hectares of fertile land and millions of litres of water and oil. Many countries however rely on some of these cash crops, as they account for a large part of their economies. For example, Ethiopia is the largest coffee producer and exporter in Africa. The crop is the backbone of Ethiopia's economy. With a share of less than three per cent of the global market for coffee, the country relied on the crop to make up 41 per cent of its total foreign exchange earnings in 2005. Furthermore, coffee is responsible for sustaining the livelihoods of more than one million coffee growing households in Ethiopia, or around 15 million people in total (Petit, 2007: 226).

Cocoa in Ghana is another example. Ghana is a predominantly agricultural nation, with more than half the population engaged in some form of cultivation. Cash crops grown in Ghana include palm, rubber, and cocoa. Cocoa is a very important crop, accounting for about 57 per cent of the country's overall agricultural export, earning them about 30 per cent of their export revenue (Gakpo, 2012). The cocoa sector alone contributed 8.1 per cent to the country's Gross Domestic Product (GDP) in 2001 (Gakpo, 2012). Cocoa has played a crucial role in Ghana in the following ways:

- Generating foreign exchange earnings, government revenues, and household incomes in Ghana;
- It has expanded economic activities in rural communities;

- It has funded the construction and maintenance of road infrastructure through the Cocoa Roads Improvement Project;
- It has funded the building of health care infrastructure in cocoa growing areas and even in places like Kumasi and Accra; and,
- It has attracted private sector investment into various spheres of the nation.

Source: Gakpo, 2012

It is clear that cocoa is an extremely important cash crop for Ghana. It is therefore extremely difficult for the countries that rely on a monoculture system of cash crops (the production of coffee in Ethiopia and cocoa in Ghana) to balance out the allocation of their resources for food production and the demand for these cash crops. Despite having ideal climatic conditions for food growing, these countries end up importing food because the majority of their agricultural resources are allocated to the production of a single crop. This leaves these countries vulnerable to food price hikes (with the poor suffering the most) and other unpredictable factors such as food shortages due to war, conflict or even natural disasters. Urban agriculture therefore becomes a very important alternative source of food supply, and should be encouraged in these places, especially when considering a countries heavy reliance on cash crops for the GDP's. Urban agriculture can combat the strain felt by food price hikes, and reduce the risk of food shortages due to war and conflict. Urban agriculture is especially important in countries that rely on the export of cash crops, and should be encouraged in these areas.

2.3.5 Climate Change

According to the Intergovernmental Panel on Climate Change (IPCC), the global climate system has unmistakably experienced significant warming. The IPCC also concludes in its 'Fourth Assessment Report' that since the 1950s, the human population has accounted for a large percentage of the warming (IPCC, 2007: 37). Very few specialists across all fields of study would disagree that the global climate is warming. This warming is a cause for concern for the agricultural sector. Significant weather events that are caused by global warming are causing serious threats to food-growing regions. These include droughts, floods, fires, and unusual temperatures that disrupt the growing patterns of certain crops in certain regions. A serious weather event in a key food-growing region could result in a world-wide shortage and once again spike the cost of those crops beyond the affordable limits of many (Cockrall-King, 2012:63).

Significant weather events are not the only way global warming will affect the agriculture sector. In general, the biggest concern will be the average reduction in rainfall in certain regions, and the generally higher temperatures. Farmers have always had to depend on relatively predictable weather patterns in order to manage their crops and harvesting periods. Increasing temperatures and declining precipitation in certain regions (as climate change affects regions differently) will result in lower productivity. The productivity of farmers using petroleum-based fertiliser and pesticides, genetically modified crop variations, and technically advanced mechanisation however, is often much higher than those who rely more on natural systems (Brown and Funk, 2008). Global climate change is likely to increase already record high food prices, as countries may need to switch to more technically advanced farming techniques (as mentioned above) or countries may need to import a higher percentage of their food requirements. For those who cannot afford either of these options, food security could become a major threat.

Ironically, the food industry itself is contributing massively to the world's total greenhouse gas emissions. Yet, the food industry is at serious risk from global warming, caused by these greenhouse gases. Furthermore, environmental degradation, water shortages, soil erosion, pests, disease and desertification that all pose serious threats to our food supply, are made worse by climate change (Church, 2005). Environmentally sustainable farming methods thus need to be encouraged in urban agricultural practices to keep them sustainable. This can be achieved by reducing the amount of pesticide and herbicide used (even removing this in totality, or using organic home-made versions) and by using organic compost as opposed to fertiliser, such as manure, worm tea/wee[3] and bone meal.

2.3.6 Genetically Modified Foods

Genetic modification of crop species has been praise by some as a scientific achievement that will provide this world with drastically improved food security through an increase in yields across the board. Genetic engineering (or modification) is design to modify crops to remove their weaknesses, enhance their abilities to grow under harsher than normal conditions, and to resist pests by introducing foreign genes into the genetic make-up of the host species. This modification allows tomatoes to grow in below zero degree weather, which is a condition normal tomatoes would not

[3] Worm tea/wee is the liquid given off from worm farms or worm systems. In these systems, worms consume soils and food trimmings. A liquid from the decomposition of the organic material in the system and from worm excrement is then drained into a container, which is an excellent natural fertiliser.

cope with. In the 1990s, 'Bt' cotton was created. This variation of the cotton plant creates its own 'pesticide', designed to only deliver its toxin to insects trying to eat the plant. This drastically reduces the need for chemical pesticides. From 1996 to 2000, this crop reduced the use of pesticides for cotton farming in the United States by two million pounds and halved the use of pesticides in China over the same period (Rauch, 2003: 479). In 2001, a group of scientists created a trans-genetic tomato that can withstand salt levels up to 50 times that of an ordinary tomato. This is a huge breakthrough as millions of acres of land are lost each year to salinity. It would allow food crops to be grown on land that was once 'lost' or declared unsuitable for growing food crops (Rauch, 2003: 479). These are just a few of many examples of what genetic engineering is capable of doing. Food that can be grown on 'lost' or once unsuitable land, that can thrive in even the harshest weather, and food that reduces the need for chemical inputs such as herbicides or pesticides in commercial farming, seems like the food of the future. It is understandable why many people believe this to be the answer to the world's food questions.

Despite their potential benefits to society and the natural environment, GMO products have come under heavy fire from environmental, food, health and social activists. From a health point of view, a genetic transfer of foreign genes into their new host organism comes with many unpredictable risks. For instance, gene transfer relies on vectors to invade the host species cells and insert itself in that organism's genetic make-up. These vectors are derived from disease-carrying viruses that are designed to break down the host species genetic barriers, allowing new genes to be ushered into the host species. The vectors used in gene transfer have a wide host range, meaning that they have the ability to invade many plants and animals, picking up new genes from viruses along the way, creating new 'super pathogens'. Genes used in genetic engineering are also often antibiotic resistant, creating further dangers to health by reducing our ability to treat new viruses and pathogens that may result from GMO foods (Ho, 1997: 485). This ability to transfer to a wide host range could also result in the creation of 'super weeds', that are resistant to weather and herbicides (Rauch, 2003: 478). These would be a huge problem for farmers and for natural ecosystems, as they would completely take over without the use of even more toxic chemicals that would be more detrimental to our natural environment.

Cross-pollination from bees or wind carrying seeds from GMO crops, has the ability to 'infect' or spread to other areas, and thus onto other farms. Some argue that for those trying to stay organic, or those with thousands of years of traditional varieties of crops, could end up losing it all when their

crops have been genetically contaminated. Other farmers have even faced legal action against them, when traces of patented GMO crops have been found in their fields. An example of this can be found in the decade long battle between Percy Schmeiser and Monsanto that reached the Supreme Court of Canada. Schmeiser was found guilty for a type of indirect infringement for unknowingly growing some of Monsanto's 'Roundup Ready' canola on his farm (Cockrall-King, 2012: 46). This is a type of canola that was engineered to resist Monsanto's Roundup Ready herbicide. Farmers then only needed to spray this herbicide over their crops to kill off all other plants, other than the canola. To grow and sell this crop, one has to buy the seeds from Monsanto and the related herbicide each year. Percy did not do so, as he was unaware that this variation of canola had found its way to his fields. In his case, cross-pollination and wind over the years carried strains of this new crop onto his fields from neighbours (all five of them) using this crop variation. Furthermore, Percy did not use the Roundup Ready herbicide, therefore did not gain any benefits from the crops genetic modification. Despite this, he was still found guilty for growing Monsanto's patented crop without paying the licencing fee. Monsanto was determined to make an example out of this case, striking fear into the remaining small-scale farmers who had till now stood against the use of GMO products. This type of bullying could be detrimental to the small scale farming community, who would still wish to remain organic or natural (Cockrall-King, 2012: 46).

In India, genetically modified crop variations such as '*Bt*' cotton and others have been blamed for causing mounting debts and resulting in alarming increases in farmer suicides. The first '*Bt*' cotton hybrids to reach the Indian market contained a transgene from a common soil bacterium, *Bacillus thuringiensis* (hence the name '*Bt*' cotton). Its selling trait was insect resistance, mainly for the bollworm that feeds on cotton bolls, which is a major problem for cotton farmers (Herring and Rao, 2012: 45-46). The advocates of this new type of cotton argue that this technological change offers a way out of the classic poverty trap in agriculture (the cycle of low yields, low income and low investment). From an environmental view, the '*Bt*' technology also claims to offer relief from environmental concerns caused by the pesticide use to control bollworm infestation (Herring and Rao, 2012: 50). Field studies were conducted and reported in Parliament from officially sanctioned field trials of '*Bt*' cotton. These studies and field trials reported favourable results, claiming that harvested yields increased because of superior bollworm control. The central claim was that costs of bollworm control went down, and therefore, net incomes went up. These results, coupled with the apparent environmental benefits of lower use of pesticides, led to an official approval of '*Bt*' cotton for commercial use in March 2002 (Herring and Rao, 2012: 50). In contradiction to these reports, studies conducted by opposing NGOs contradicted these conclusions, and argued that '*Bt*' cotton

has been failing the Indian farmers by resulting in lower yields and higher debt (Herring and Rao, 2012: 51).

To illustrate the problem, examples are draw from two farmers. Ramesh Rathod, a cotton farmer from the village of Bondgavhan in India, committed suicide in December of 2005. He had purchased the MECH 162 variety of '*Bt*' cotton from a licensed supplier of Monsanto, for the equivalent of $36 per 450g. This is compared with the $9 cost of non-Bt cottonseeds of the same weight (Mittal, 2006: 35). Despite the product promising higher yields and decreased need for pesticide, Ramesh's hopes of profit were crushed when his '*Bt*' cotton crops suffered from disease and a severe pest attack. His new genetically enhanced crops had failed. After having spent a large amount of money on inputs, the yield was destroyed irreparably. The failure of his crops left Ramesh unable to pay back his loans, which he took out in order to purchase farming inputs, including the '*Bt*' cottonseeds (Mittal, 2006: 35). Chandrakant Gurenule, a 34-year-old Indian cotton farmer suffered the same fate. He too bought a variation of '*Bt*' cotton in the hopes of increasing his yields, only to watch his crops fail for two successive years. Desperate to recuperate the funds he had lost to pay off his loans, he sold off the pair of bullocks he used to plough the fields, and pawned his wife's wedding jewellery. When this proved to be in unsuccessful, he doused himself in kerosene and lit a match on 1 April 2006, inevitably ending his life (Mittal, 2006: 36). The tragedy suffered by the Rathod and the Gurenule families are just two of thousands of examples across India.

Shiva and Jalees, (2006: 56) claim in their paper "Seeds of Suicide: The Ecological and Human Costs of Seed Monopolies and Globalisation of Agriculture" that globalisation, privatisation and liberalisation since 1995 overseen by World Bank and World Trade Organisation (WTO), and supported by the Indian government, is ruining Indian Agriculture. Farmers have been left at the mercy of Multinational Corporations controlling seeds, chemical processing and trade. According to Shiva and Jalees, (2006: 44), over 40,000 Indian farmers have committed suicide, due to being trapped in a vicious cycle of debt and crop failure due to the use of '*Bt*' cotton and other genetically modified crops. The inability to repay past debt (and subsequently the inability to access new loans) has been widely accepted as the most significant cause of the farmers' suicides. Farmers who fail to pay their loans, even due to uncontrollable factors such as weather or natural causes, are disqualified from receiving further loans unless they pay their previous loan back in full (Shiva and Jalees, 2006: 61). A large number of these suicides occur between April and May, which coincides with the time farmers learn the fate of their crops, with the added pressure from summer being

'wedding' season in India (Shiva and Jalees, 2006: 60). Furthermore, every time a cotton crop fails or commodity prices crash, farmers' suicides start flooding the headlines. These facts lend themselves to the assumption that suicides result from rising agricultural indebtedness.

What these examples show is that GMO seeds and foods can be devastating to those involved, from the farmer to the consumer. A move away from these technologies that seem to support the agro-giants and monopoles more than the farmers growing the food and the people they are feeding, towards a move 'natural', organic and self-sustainable food supply solution is what is needed. Perhaps urban agriculture may be one of only a few solutions remaining in future, which can guarantee individuals own food sovereignty, by giving control back to the individual.

2.3.7 Food Sovereignty

Food sovereignty is an evolving term and thus has various definitions, however with the same underlying premises. An international small-scale farmers movement, the 'La Via Campesina' offered an early (1993) description of food sovereignty as "*a call for people to have a greater capacity to ensure that farming, fishing, labour and land policies are appropriate to the diverse social and ecological contexts in which they occur*" (Weiler, 2014: 3). Food sovereignty's approach is essentially in contestation to the current dominant neoliberal economic system, as it imagines rather an autonomous, self-governing ownership of food resources and policies at all scales (Weiler, 2014: 3). It highlights the right for communities to define their own food and agricultural policy. It calls for people's right to be 'sovereign' over their food systems and to decide how they operate. Essentially, people in support of food sovereignty want to see decisions about food made by the people that rely on the food system, as opposed to multi-national organisations and agri-businesses (Patel, 2012). The current industrial agricultural model and food systems have become capital intensive, and sees large scale "*land-grabbing and market dumping*" that disadvantages and even drives out smallholder farmers and economies for the benefit of the capitalist market, while plundering the environment at the same time (McMichael, 2013: 3). The paradox of the current food system is that motivation for profit has seen the production of more processed, nutrient deficient foods leading to obesity problems globally, while more than a billion people go hungry because they cannot afford to purchase enough food (Patel, 2012).

The need for a food regime based on the principles of food sovereignty were highlighted by La Via Campesina'.

> "*20 years after the Earth Summit, life on the planet has become dramatically difficult. The number of hungry people has increased to almost a billion, which means that one out of every six people is going hungry, mostly children and women in the countryside. Expulsion from our lands and territories is accelerating, no longer only due to conditions of disadvantage imposed upon us by trade agreements and the industrial sector, but by new forms of monopoly control over land and water, by the global imposition of intellectual property regimes that steal our seeds, by the invasion of transgenic seeds, and by the advance of monoculture plantations, mega-projects, and mines.*
>
> *We should exchange the industrial agro export food system for a system based on food sovereignty that returns the land to its social function as the producer of food and sustainer of life that puts local production of food at the centre, as well as the local markets and local processing..."* (McMichael, 2013: 4-5).

From this, we can draw on three main pillars from which to describe food sovereignty as a concept, or rather a movement. Firstly, food sovereignty is based on the people's right to food. The second is the recognition that the current food system, which aims to provide food security through the market, is not reaching everyone, but rather a minority who can afford to participate. Thirdly, food sovereignty as a movement calls for the independent and self-governance of food security issues for the benefit of the people and the environment (McMichael, 2013: 5).

2.3.8 Urban Agriculture and Food Security/ Sovereignty

> "*Food security is not in the supermarket. It's not in the government. It's not at the emergency services division. True food security is the historical normalcy of packing it in during the abundant times, building that in-house larder, and resting easy knowing that our little ones are not dependent on next week's farmers' market or the electronic cashiers at the supermarket.*" (Salatin, 2001)

All of these factors discussed in the above sections drastically affect the global, as well as localised, food security. In order to improve the food security of a region or globally, these issues will need to

be faced one way or the other. Food security and urban agriculture are essentially linked. Urban agriculture in many cases is a response to a lack of food security, and in many instances, food security is seen as one of the many benefits of urban agriculture. Urban agriculture provides those involved with a direct supply of food. Thus, it can potentially improve an individual's diet by providing fresh, nutritious food, and by diversifying ones diet. This food supply does not require large amounts of resources. It will not be affected by international conflict or boarder closes for any reason. Urban agriculture reduces the distance ones food travels before it is consumed. This drastically reduces our foods ecological footprint by reducing its impact on greenhouse gas emissions, its fossil fuel consumption and its impact on the natural environment. The consumer grows the food; therefore, the consumer has full knowledge about their food, where it came from and how it was grown. The consumer also has full control over decisions about their food and how to grow it, what to grow and so forth. Therefore, urban agriculture contributes not only to food security, but also to one's food sovereignty.

From an economic point of view, surplus produce can be sold for a profit, which in turn can be used to purchase a diversity of food for the household. The other side to that argument could be that growing one's own food reduces the amount a family needs to spend on food, thus allowing them to use that 'saved' money on more and healthier foods as opposed to purchasing cheaper 'bulk' foods as is common in poorer households (Njogu, 2009: 21).

2.4 LOCAL ECONOMIC DEVELOPMENT (LED)

According to South Africa's constitution, the responsibility to facilitate local economic development, by facilitating a favourable environment in which local businesses may flourish, falls upon the local government.

"*152. Objectives of local government. - (1) The objects of local government are-*

a) *To provide democratic and accountable government for local communities;*
b) *To ensure the provision of services to communities in a sustainable manner;*
c) *To promote social and economic development;*
d) *To promote a safe and healthy environment; and,*
e) *To encourage the involvement of communities and community organisations in the matters of local government.*

(2) *A municipality must strive, within its financial and administrative capacity, to achieve the objects set out in subsection 1*" (Constitution of the Republic of South Africa, Act No. 108 of 1996: 51).

To promote social and economic development is one of the objectives of local government listed in this section of the constitution. Many municipalities struggled to do this with their limited resources. Unemployment (which is what LED aims to rectify) continued to rise as a result. In 2005, Deputy President, Phumzile Mlambo-Ngcuka stated "*We are faced with the stubborn reality of unacceptable levels of unemployment and poverty… due attention needs to be given to the second economy…. All South Africans are invited to 'think outside the box' if we are to tackle unemployment*" (Fray, 2006: 4).

In response to the difficulties municipalities faced in reinforcing their responsibilities as outlined in the constitution, the Department of Cooperative Governance and Traditional Affairs (CoGTA) published a new framework for Local Economic Development in 2006. They titled it "National Framework of Local Economic Development", sub-tilting it "Stimulating and Developing Sustainable Local Economies". A key difference to this new National Framework of Local Economic Development was that the private sector and other key stakeholders were encouraged to collaborate up with local government in the promotion of local economic development. It revealed, "*the distinction between public and private initiative was to be blurred by the rise of growth coalitions and the increasingly popular concept of partnership*" (DPLG, 2006: 4). The White Paper on Local Government also adds that:

> *"Local Government is not directly responsible for creating jobs. Rather, it is responsible for taking active steps to ensure that the overall economic and social conditions of the locality are conducive to the creation of employment opportunities."* (Layman, 2011)

The responsibilities of facilitating LED have shifted. There are diverse defintions of the concept and this research has to pose the question what are the most appropriate definitions for this study? Local Economic Development (LED) can be understood as most effectively utilising local resources and opportunities to provide increased local wealth (Dass, 1995). LED is used to diversify an area's economy, to improve its functionality, and to provide jobs to local people who may have been struggling to provide for themselves (*Ibid*, 1995). It is a multi-faceted strategy for the promotion of economic development and the self-sustaining urban and rural areas. The aims of LED are therefore

to promote employment, to mobilise the public, private and community resources, and to promote development at a local level (Van Wyk *et al*, 2001).

Local Economic Development is directly linked to urban agriculture. Urban agriculture can be used as an example of 'out the box' initiatives that can stimulate local economies by providing people with an income as well as a future viable business opportunity. Setting up community gardens, as well as education and distributions centres, would create jobs and improve the circulation of money around that area in a sustainable manner. Furthermore, a favourable local business environment, which is going to improve LED, is one that *"reduces the costs of doing business, unleashes economic potential and attracts investment"* (Layman, 2011). Urban agriculture can become an economic activity in which many people are involved, and require very little start-up capital and training (Van Wyk *et al*, 2001). Urban agriculture does hold economic potential, making it an ideal LED initiative.

2.5 COMMUNITY DEVELOPMENT

A community can be defined in a number of ways; for example, a community can be considered a group of people living in the same geographic location, such as the community of Westville, the community of eThekwini or the South African Community at large. A community can also be a group of people that have a particular characteristic in common, such as the gay community. Furthermore, a community can be considered as a group of people with the same values or religious beliefs (for example, the Christian community). A community can also be recognised in terms of race, class, or gender. A community can also include more than one of the above characteristics, for example, the gay community of South Africa, the Indian community of Durban, the Christian community of East London and so on.

Community development is usually associated with the geographical context of a community. Community development is an intervention that assists in the development of the community from within, with the aim of increasing that community's choices and ability to improve their own lives and interact better with each other. The word community in this case means those living within a geographical location (Cato Manor). Ledwith, (2005) viewed community development as historically a "*practice based in [local] neighbourhoods, helping local people to decide, plan and take action to meet their needs with the help of outside resources. Within that, key components were improving the delivery of local services, developing interagency coordination and influencing policy and planning*" (Ledwith, 2005: 15). Community development essentially "*strengthens the capacity of*

people as active citizens through their own groups, organisations and networks..." (Gilchrist, 2009: 24).

This is similar to the concept of local economic development, as community development assists communities in job creation, while also improving infrastructure and utilising the skills and assets of the community for the good of that community (*Ibid*, 2009: 24-25). It enables the community to develop and improve itself, when government is unable to deliver fully to that community's needs. Urban agriculture is directly linked to community development and it has the ability to give communities a chance at developing themselves both economically and socially, while being environmentally sustainable. Urban agricultural 'hubs' and community gardens are inexpensive to set up, yet they have the potential to empower the community to not only take control of their food supply, but to also set up farmers markets to sell fresh food to neighbouring areas. This will create employment, improve food security, and create community cohesion as people come together to work to build their communities.

2.6 URBAN AGRICULTURE AND THE 'METABOLIC RIFT

Karl Marx's critique of the capitalist style of agriculture (or the 'business' of food production solely for profit) was birthed from a time, which agricultural historians refer to as the 'second agricultural revolution'. This period (1830 – 1870) in the history of agriculture is characterised by the growth of the fertiliser industry and the advancements in soil chemistry, documented in particular by agricultural chemist Justus von Liebig (Foster, 1999: 370). The sudden rise in the fertiliser industry and interest in soil chemistry emerged from fears of 'soil exhaustion', which was considered a major environmental and sustainability issue in that time. Agriculture saw large pieces of fertile land produce crops, crops that drew nutrients from the soil, and then transported these crops far removed from the land from which they came. This is a linear rather than a circular process, and therefore nothing was being returned to the soil. The capitalist style of agriculture in Britain and in parts of North America was drawing more nutrients from the soil than it was replacing, causing a decrease in soil fertility. A flurry to obtain fertiliser to support capitalist agriculture saw imports of bone (some even from raided Napoleonic battlefields) and Peruvian guano into Britain skyrocket over a few short years. The increasing sense of crisis in agriculture in Europe and North America, which was attributed to the depletion of the natural fertility of the soil, and Liebig's ecological critique of capitalist development (particularly in agriculture), both inspired Marx's criticism of capitalism and the agricultural system. He believed that capitalist agriculture was characterised by contradiction and unsustainability (Foster, 1999: 376). The contradiction and unsustainability of the

system is found in the decline in the natural fertility of soils due to the disruption of the soils natural nutrient cycles and the expanding scientific knowledge on the need for specific soil nutrients, while the limitations in both the natural and synthetic supply of fertilisers remains. Marx thoughts on this matter can be condensed into segments from his work on '*Capital*' Volume 3 and Volume 1 respectively:

> "*…in this way it (capitalist agriculture) produces conditions that provoke an irreparable rift in the interdependent process of the social metabolism, a metabolism prescribed by the natural laws of life itself. The result of this squandering of the vitality of the soil, which is carried by trade far beyond the bounds of a single country*." (Marx 1981, pp. 949-50 (In) Foster, 1999: 379)

> "*Capitalist production collects the population together in great centres, and causes the urban population to achieve an ever-growing preponderance. This has two results. On the one hand it concentrates the historical motive force of society; on the other hand, it disturbs the metabolic interaction between man and the earth, i.e. it prevents the return to the soil of its constituent elements consumed by man in the form of food and clothing; hence it hinders the operation of the eternal natural conditions for the lasting fertility of the soil… But by destroying the circumstances surrounding that metabolism…All progress in capitalist agriculture is a progress in the art, not only of robbing the worker, but of robbing the soil; all progress in increasing the fertility of the soil for a given time is a progress toward ruining the more long-lasting sources of that fertility…Capitalist production, therefore, only develops the techniques and the degree of combination of the social process of production by simultaneously undermining the original sources of all wealth-the soil and the worker.*" (Marx 1976, pp. 637-38 (In) Foster, 1999: 379)

In these segments from his works, Marx speaks about a 'rift' or a 'gap' in the 'metabolic' or 'natural' interaction between man and the earth. The rift he argued came from the removal of essential elements from the soil, requiring its repair from artificial replacements. These replacements would come from what turned into a lucrative fertiliser industry that took advantage of the capitalist system, which caused the problem in the first place. Furthermore, by doing so, it allowed for the further and more intensive exploitation of the soil, thus increasing further the demand for fertiliser (Foster, 1999: 376-377).

Marx used his theory of a metabolic rift to represent the distancing of humans from their "*natural conditions of existence*" and from nature of which they are essentially a part of. He linked the failure to recycle nutrients back into the soil with the rise in pollution in cities and the irrationality of the modern sewage system. He argued that "*excrement produced by man's natural metabolism*" needed to be recycled back into agricultural production, in the same way as industrial waste needed to be recycled back into production, in order for the system to become sustainable (Foster, 1999: 384). He argued further that capitalism, its blind pursuit of the immediate form of monetary profit is in stark contradiction to what agriculture should be, and that is a life sustaining food system (Foster, 1999: 380). Agriculture however, was more influenced by capitalism than it should be. For example, farmers tend to orientate their produce towards what produces profit (often not even food crops, but cash crops like coffee, tobacco, and so forth) and farmed in a manner that was profit driven, not sustainability driven.

How then is this rift that Marx talks about, to be mitigated? How are we supposed to shorten the rift between humans and the earth, and bring people closer to the production of their own food and the natural processes of producing food? Finally, how are we to 'close' the cycle of nutrients, to keep the soils fertile without having to rely on synthetic fertilisers? Some would argue that urban agriculture has the potential to do just that, even if on a small scale. McClintock, (2010: 194) argues that Marx's theory of metabolic rift can be divided into three types of rifts, and how urban agriculture can mend these rifts. These include an 'ecological rift'; which refers the rift in biophysical relationships (that result in the depletion of soil fertility) and the rift between country and town. This rift is cause by the continual accumulation of land by the capitalist system, and the 'displacement' of the issues of soil fertility elsewhere (importation of natural fertiliser such as the Peruvian guano trade) (McClintock, 2010: 194). A second is a 'social rift'; caused by the commodification of land, labour and food at various scales. The third is an 'individual rift'; caused by the alienation of humans from nature and from the products of their labour (McClintock, 2010: 196-201).

Rescaling nutrient cycles and creating a circular cycle of soil nutrients, whereby waste is returned to the soil in a smaller scaled local system, is the key to mitigating the ecological rift described above. Recycling organic waste, in the form of composting, is nothing new in urban agriculture. Utilising compost as opposed to synthetic fertiliser assists in closing this rift. To optimise the system, urban waste, in the form of food scraps (except meat), yard trimmings, garden refuge, and even human

excrement, will need to be collected and composted, and to be returned into the soil of urban agricultural farms, lots or gardens (McClintock, 2010: 196). The use of manure from livestock, ash, and composted garbage for urban agriculture as opposed to synthetic fertiliser is nothing new. This not only assists in replenishing the soil, but utilising organic waste as a means of fertilisation, also reduces the need for synthetic versions that pollute the soil and water systems (McClintock, 2010: 195-196). McClintock, (2010: 196) explains that to truly close the nutrient cycle, human waste from urban consumers would also need to be returned to the soil. This practice is also nothing new. It does however come with stiff negative perceptions and stigmas, along with health concerns (which will be discussed in more depth later in this chapter). Never the less, urban farmers in Ghana and China (and very possibly many others) have been using human waste in their compost to improve soil fertility. While this practice many be harder to motivate for modern urban farmers, due to constraints such as its foul odour, health risks and negative social connotation's, composting other urban waste as mentioned above, and utilising practices such as crop rotation and including nitrogen fixing crops, does have great potential in naturally improving soil fertility (McClintock, 2010: 196).

The commodification of land and labour, which Marx theorised as part of primitive accumulation, is central to understanding the 'social rift'. The rise in industrial-scale farming has resulted in the consolidation of land, and ultimately absorbed large portions of land once used for subsistence farming. This forced thousands of poor farmers off what was once 'common land'. This, coupled with the ever-increasing mechanisation of farming techniques and new farming technologies that reduced the need for labour, resulted in thousands of subsistence farmers to migrate to the city in search of jobs. As Marx (1976: 795) predicted, "*Part of the agricultural population is therefore constantly on the point of passing over into an urban or manufacturing proletariat*" (McClintock, 2010: 197). These thousands (if not millions) end up fuelling slums and squatter settlements due to a lack of employment opportunities in the city, which simply cannot cope with the influx of people. This inevitably drives wages, for those who do find jobs, down as surplus labour continuously enters the market (McClintock, 2010: 198). This works well for the capitalist, as profits increase while the cost of labour remains the same, or even decreases, and a larger and larger work force are available to replace anyone who resists. In a capitalist system, land, labour and food are bought and sold as a commodity, which they were intended to be e.g. commodities. Under economic liberalisation, these 'commodities' are subject to fluctuations in the free market. In times of economic decline, social dissolution tends to follow as these 'commodities' can decrease in value in a short period of time. When wage labour becomes a commodity, and is left to the logic of a free market, wages decline as surplus labour enters the market (through the concept of 'primitive accumulation' or the social rift).

When land is treated like a commodity, it is often exploited for short-term benefits, with little concern for its future purpose, as it will eventually simply be sold off (McClintock, 2010: 198). When food is produced as a commodity in the capitalist agricultural system, it too is subject to market forces. These influences detract from its complex 'metabolism' all the way from its seeds, to growth, to the market. This has resulted in the rise of patented seeds, artificial ingredients, processed foods, and fast food outlets (McClintock, 2010: 200). When profit driven, food as a commodity becomes cheap and nasty, as producers are more interested in profit than nutrition. With this, there has been a noticeable decline in the knowledge behind the culture and traditions of food and its production, along with a decline in culinary and nutritional knowledge (McClintock, 2010: 200).

Urban agricultures role in the 'social rift' is that it emerges because of, or as a means of dealing with the combined impacts of low wages and dispossession of land (the social rift). Urban agriculture is often used as a means of survival (more so in the global south), when families are unable to afford to feed themselves. For example, in Nairobi, as many as 70 - 75 per cent of those surveyed in urban agricultural studies, indicated the need for a secure food source as their primary motivator (McClintock, 2010: 197). Urban agriculture typically arose as a 'counter-movement', or as a coping strategy to protect the people from the fate of the market (and often-large fluctuations in the cost of food). During times of conflict, social dissolution or economic hardships, urban agriculture would often arise. For example, the mayor of Detroit launched the "*Potato Patch Plan*" where by residents were provided with small plots on vacant lots during the Depression in 1893. These small farms were created with the intention of both providing food security and a sense of self-respect in times of economic hardship (McClintock, 2010: 198-199). During World War II, under the National Victory Garden Program as many as 20 million gardens were created. The gardens produced 40 per cent of America's food by 1994 (McClintock, 2010: 199). Urban agriculture most vital role in repairing the social rift is therefore in 'de-commodifying' land, labour and food.

In Marx work on Capital, he refers to the alienation of people and their natural environment, as well as their alienation from the fruits of their labour (the individual rift). This alienation arises from the perception that people have, of being external or separate from nature, and from the process of production (including food production). Under capitalist production, including agricultural production, the wage labourer does not own the product he or she produces. In agriculture, the workers in the field that are directly responsible for the care and production of food (and non-food) produce, do not own any of the literal fruits of their labour. Rather than working to produce food

for his or her own use, the labourer works to provide the capitalist with a product that will be used to make a profit (McClintock, 2010: 202). Urban agriculture can be considered the key to unlock this perception and potentially overcome it. For Marx, the only way to repair the rift or alienation between man and both the fruits of their labour and nature itself will be their active metabolism of nature through their labour (McClintock, 2010: 202). When one is directly involved in physically labouring the soil, sowing seeds, watering the crops, harvesting those crops, and by understanding and being a part of the process of producing food, and then using the fruits of his/her labour for themselves (in the literal sense), human beings get "*back in touch with nature*" and begin repairing the individual rift. In this way, urban agriculture repairs the individual rift by reintroducing individuals with their own metabolism of the natural environment (McClintock, 2010: 202).

While the theory of the metabolic rift has been pivotal in environmental and capitalist arguments and debates, there are some would argue that the metabolic rift theory does not quite cover the reality, in that it does not go far enough in its explanation. Moore (2011) argues that the theory of metabolic rift treats environmental issues, social crises and capitalism as three separate entities. It sees the accumulation of capital, the pursuit of power, and the production of nature (to achieve the first two) as separate instants in the history of capitalism (Moore, 2011: 2). This would mean that environmental degradation is a consequence of capitalist development. What Moore agues is that these issues are not separate at all, and are in fact an essential part of, and evolve with capitalism throughout the history of capitalism. He argues that capitalism does not '*act upon nature*' as much as it '*develops through*' nature-society relationships (Moore, 2011: 2). To separate 'society' and 'nature' he argues confuses the historical relationships between humans and the rest of nature, and focuses on 'products' rather than on 'relationships'. Here there exists an actor (society and capitalism) and an acted upon (nature), as he puts it "*a foot and a footprint*" (Moore, 2011: 3). This narrows the impacts under investigation. Instead, Moore (2011) suggests that an approach that is based on a "*dialectical movement and interpenetration of the (so-called) social and the (so-called) natural*" is a more appropriate to the reality (Moore, 2011: 3). This moves away from the view of "*social drivers*" of environmental degradation and towards "*socio-ecological relations*" (Moore, 2011: 5). Ultimately, Moore suggests that the theory of metabolic rift, while moving in the right direction so to speak, is only a part of the story. The metabolic rift theory is based on the depletion of resources as nutrients flow from agricultural land to the city, and very seldom returned. The rest of the story, such as the rising difficulties in accumulation due to resource depletion, and how capitalism finds new ways of accumulating capital in spite of depleting resources and the ever changing relationships between society, nature and accumulation, in various contexts (Moore, 2011:

34). Never the less, the role of urban agriculture in 'repairing' this rift (as discussed earlier) still remains (or at least its non-involvement in this rift[4]).

2.7 LINKED THEORETICAL CONCEPTS

There is a wide body of linked theoretical concepts to the practice of urban agriculture. Some of these include Urban Ecology, Open Space, and Urban Management. These concepts are not the focus of this study but are briefly included in this dissertation due to their links to urban agriculture.

2.7.1 Urban Ecology

Urban ecology constitutes the study of how humans and natural ecosystems evolve and co-exist together in urban areas. This relationship between humans and the natural environment can be viewed through two lenses. The first of these lenses is the influence of Social Darwinism, which recognised humans as being the dominant species. The theory proposed that the rest of the natural environment being a source that can be exploited for our own gain (Royal, 1998: 28). The second lens is that of urban ecology, which argues that humans are intrinsically intertwined into nature and the various ecosystems it supports (*Ibid*, 1998). Urban Ecology is a very broad concept with a number of different approaches.

The words 'urban' and 'ecology' can be understood separately. Urban being a word used to describe an area, which is highly modified by humans, with an increased density of population and activities. These areas are characterised by human made structures designed for human living and mobility, with usually very little consideration to the environment. Cities, suburbs and industrial areas all fall under urban. Ecology on the other hand, is understood differently according to the approach taken towards it. It can be seen as a science, as a natural resource, as an idea or as a movement. Ecology as a science investigates nature's distribution and abundance of organisms and all the complexities involved in nature. Ecology, as a natural resource, is a resource base for human use. As an idea, ecology is a concept that views human existence in relation to the complexities, distributions and abundances of natural systems (the science of ecology). Finally, ecology as a movement refers to political activities related to ecological and environmental issues, also known as the 'Green Movement' (Niemelä, 1999: 121). An ecological approach to planning and managing cities combines all the various types of ecologies in considerations, thus making the integration of ecology into urban

[4] As long as it remains different from the current dominate model of food production.

planning very difficult. Urban ecology can therefore be defined as ecological research in a city setting; however, it is also a very broad concept. It takes the scientific component of ecology, and aims to develop applications of this research in the planning and management of urban green areas (Niemelä, 1999: 121).

Urban agriculture in its essence is the coexistence of nature and urban space. Sociologists, urban planners and other specialists taking an urban ecology approach to their work will aim to create healthier and more sustainable cities by considering the natural environment in their plans (Breuste, 2011). The concept and principles of urban ecology are very relevant for urban agriculture and for this proposed study, as urban agriculture is an important ecological tool that can be used for this very purpose.

2.7.2 Open Space

Due to the many environmental concerns, public open space has become its own recognised land use, and is now an important part of planning. Public open space has two main purposes:

- To satisfy social needs of the population; and,
- As well as serving biophysical needs or to serve as a mitigation measure for environmental degradation (Royal, 1998: 28).

In developing countries, there is the issue of land availability. This is especially so within urban areas, due to the spread of informal settlements and the demand for housing. This is placing pressure on public open space, which is often situated on prime land for various types of development (Royal, 1998: 31). Public open space areas that do exist however are often being underutilised. Aesthetic, environmental and even economic value can be increased in these areas by introducing urban agriculture in the form of community gardens that will serve the immediate and surrounding community. By doing so, the public open space will still serve two main purposes, by serving both the population as well as the environment. By adding value to the space, these areas will be less likely to fall victim to 'higher uses' of development such as industries that carry more economic value for a smaller percentage of the community, and will be a better utilisation of valuable space within urban areas.

2.7.3 Urban Management

Urbanisation brings with it many benefits and opportunities, but many challenges. These challenges are exacerbated in regions that are experiencing the most rapid urbanisation, including many African countries. According to Stren (1991: 9), African countries are not only disproportionally poor (According to Gross National Product per Captia), but they are also the most rapidly urbanising. African cities, because of this rapid urbanisation and relatively low GNP per capita, have historically struggled with many urban challenges. Some of these challenges include congestion, shortage of housing, environmental degradation, pollution, poverty and even social conflict. In the face of these challenges, urban management becomes an important concept and practice to strengthen cities capacity to manage both the opportunities and challenges of urbanisation (Wong *et al*, 2005: 3). As a concept, urban management is understandably very broad, and therefore hard to define. Stren (1991: 10) however, explains that urban management has four important components.

These are as follows:

- To develop context specific urban development projects.
- To identify and capitalise on sources of local finance for a more decentralised municipal government.
- To identify alternative means of financing and managing urban services such as electricity, water supply, sanitary services, waste disposal and public transport.
- To identify and encourage local community and participatory sources of support for urban services and infrastructure

Source: Stren, 1991: 10

Wong *et al* (2005: 6), views urban management as more of a process of managing patterns of growth and change in a sustainable manner, with the ultimate goal of enhancing competitiveness and sustainability. An important aspect of urban management is to take into account local traditions and to acknowledge, respecting and building upon local cultural values. Integrating the public and private sectors is also seen by Wong *et al* (2005: 5) as an important aspect of urban management to deal with problems faced by the city collectively. This is done in order to address a broad spectrum

of urban issues and to achieve the goal of making a city more competitive, equitable, and sustainable (Wong *et al*, 2005: 5).

Urban management as an approach to city development seems to have a common underlying factor of being an approach to manage: the city, development, services and so forth in a sustainably manor. Urban agriculture, being a sustainable practice, has many benefits that the urban management approach hopes to achieve. For example:

- Urban agriculture has environment benefits for the city;
- It can be used to supplement income and has the potential to contribute to local economic development and community development;
- It will improve food security, especially for the poorer communities thus assisting in combatting the struggles of poverty in the city;
- It can be used as a tool for the most vulnerable groups (such as those with HIV/AIDS); and
- It can improve the aesthetics of an area.

These are some of the many benefits urban agriculture and its related activities could have beneficial outcomes for a city. The activity could be used as a tool in the process of urban management.

2.10 THE THEORETICAL APPROACH ADOPTED BY THIS RESEARCH AND CONCLUSION

All the above concepts are important to urban agriculture in many aspects, especially when urban agriculture is considered a tool for improving the lives of those involved in many different ways. The first concepts explored looked into the various forms of urban agriculture (urban agriculture, typologies of urban agriculture, and urban agricultural hub). The forms of urban agriculture that this research is more focused on (but not exclusively) are community gardens, home gardens and an urban agricultural hub that includes a combination of these.

Urban agriculture can be used as a means or as a tool in achieving goals set out by other concepts of which are highlighted above. For example, urban agriculture can be used to improve food security, it can be beneficial in local economic development projects, it can be beneficial for community development in both uplifting the community and bringing people together, and it is an

environmentally beneficial (urban ecology) practice (provided no harmful pesticides are used). This research therefore touches on all of the above concepts in the sense that it argues that urban agriculture lends itself to these concepts. This research does however focus more on food security (especially for the poor) and general community upliftment through the lenses of local economic development and community development approaches, while remaining environmentally sustainable.

CHAPTER THREE: LITERATURE REVIEW

3.0 INTRODUCTION

This chapter is directed to answer the question: what does the international, national and local literature suggest about urban agriculture as a mechanism for food security and community upliftment? Does the literature support urban agriculture as a viable and sustainable practice that has many potential benefits for a community, including but not exclusively providing the participants with improved food security? This chapter will answer these questions, as well as exploring what the literature says about the benefits urban agriculture can have for the natural environment, its health and mental well-being benefits for those involved, and its potential contributions to the education and schools. This chapter will also explore gender issues linked to urban agriculture, and its potential waste management applications.

There are currently more people living in cities around the world than ever before. For the first time, more than 50 per cent of the population live within cities (Brenner and Schmid, 2013: 731). Rural areas (where the majority of the cities food comes from) have become increasingly removed from the sight and minds of urban dwellers. This has caused a disconnection between people and the natural environment. Long work hours, computers, televisions and a host of other technologies and comforts associated with 'indoors' leaves very little time for people to spend time outdoors with nature. This is especially worrying for children who are growing up learning that 'outside' is bad, because outside there is traffic, crime, strangers and nature itself that could be harmful (such as pests, insects, snakes and so on). Studies conducted around the world have shown that the amount of time and space available for children to play outdoors has dramatically decreased (Louv, 2008: 34). Further studies have shown that a disconnection with nature can cause a host of medical and social disorders, especially in children. Likewise, exposure to nature has similar yet positive impacts. New research shows that nature can offer powerful therapy for depression, obesity, and attention-deficit disorder in children. Experience in nature can increase a child's and an adult's power of concentration and creativity. Exposure to nature has also been proven to assist children develop skills in problem solving, critical thinking, and decision making processes (Louv, 2008: 35 -36).

The supermarket, grocery store and so forth have further aggravated the disconnection we have with nature in the sense that people are now removed from nature as well as from the food they eat. Many people cannot answer questions about the food they eat, such as where it is from, how it

was farmed or how it may have been produced, packaged and exported. This brings to light a famous phrase, 'out of sight, out of mind'.

> "*The average person is still under the aberrant delusion that food should be somebody else's responsibility until I'm ready to eat it*." (Salatin, 2001)

Authors such as Lewis Knight and William Riggs argue that while there is a continued disconnection between urban and rural (or natural) areas, their coexistence and their synergy is vital for the survival of both (Knight *et al,* 2010: 116). They argue that while urbanisation is good for inter-connectivity, educational, social, and economical reasons, it also comes with a huge environmental cost and raises issues of food security (Knight *et al*, 2010: 117). The increasing demand for urban space places enormous pressure on natural areas and the biodiversity within those areas. These authors argue that this exacerbates the paradigm that 'urban' and 'non-urban' are divided, when they are in fact essentially linked, coexisting together on one planet (Knight *et al*, 2010: 117). One area where this paradigm is most evident is in food production. The general view is that farming of food and other commodities is a non-urban activity that happens outside of a city or suburb. However, there are many who would argue that this is not true, as it is been proven possible to grow food within the city boundaries. At the same time, there is a growing population of urban poor who are continuously struggling to feed themselves and their families. Once again, urban agriculture has the potential to feed the masses that are unable to afford a healthy diversity of food.

3.1 FOOD SECURITY

Food security (or rather insecurity) has been an increasingly important and prevalent issue in South African cities. To address the issue, a scale of the problem fist needed to be established. The African Food Security Urban Network (AFSUN) formed and implemented a baseline urban food security survey in 11 cities across nine African countries. Overall, 6,453 households with 28,771 household members were included in the various survey's (Battersby, 2011: 2-3). In South Africa, three major urban areas participated in these surveys, which included Cape Town, Johannesburg and the Msunduzi Municipality. Unfortunately, Durban (or eThekwini Municipality) was not included in these surveys. Despite this, these surveys still shed light into some key realities relevant to this research. In Cape Town, 1,060 households were included in the survey from three 'poor' areas within the city, including Ocean View, Browns Farm in Philippi and Khayelitsha (Battersby, 2011: 3). The Johannesburg surveys were conducted in three districts within the city, Joubert Park, Alexandra and Orange Farm, and included 3,762 people from 996 households (Rudolph *et al*, 2012: 6). The

Msunduzi Municipality surveys were conducted in various areas with the poorest parts of the city, and included 556 households (Caesar *et al*, 2013: 2). All of these surveys utilised a series of 'food security assessment tools' developed by the Food and Nutrition Assistance (FANTA) project. They were designed to understand the prevalence and causes of food insecurity in these regions. They also show which households are most prone to food insecurity, and what strategies people utilise to deal with food insecurity in their area and context (Caesar *et al*, 2013: 2). The 'food security assessment tools' utilised in these surveys included the following:

- The Household Food Security Access Scale (HFIAS);
- The Household Food Insecurity Access Prevalence Indicator (HFIAP);
- The Household Dietary Diversity Scale (HDDS); and,
- The Months of Adequate Household Provisioning Indicator (MAHFP).

The Household Food Security Access Scale (HFIAS) measures the degree of food insecurity during the month prior to the survey. The HFIAS is based on nine "frequency-of-occurrence" questions that are then used to calculate a score, which ranges from Zero to 27. The higher the score, the more food insecure the household is believed to be (Caesar *et al*, 2013: 13). The average HFIAS score was 11.3 in Msunduzi Municipality, 10.7 in Cape Town and 5.7 in Johannesburg (Caesar *et al*, 2013: 13; Battersby, 2011: 3; and Rudolph *et al*, 2012: 6). These figures represent an overall high degree of food insecurity across all the regions involved in these surveys, with Msunduzi ranking the worst in terms of food security. Nearly 30 per cent of households in Msunduzi Municipality had HFIAS scores of 15 or above, and as many as 13 per cent had scores higher than 20 (Caesar *et al*, 2013: 14).

The Household Food Insecurity Access Prevalence Indicator (HFIAP) uses key questions to rank households into one of four levels of food insecurity. These levels range from food secure, mildly food insecure, moderately food insecure and severely food insecure (Caesar *et al*, 2013: 13). In Msunduzi, 60 per cent of households were considered severely food insecure according to the HFIAP, with a further 27 per cent being classified as moderately food insecure (Caesar *et al*, 2013: 15). These are high numbers of households that are not food secure. In Cape Town, 80 per cent of households surveyed were considered to be moderately or severely food insecure, with only 15 per cent being considered food secure (Battersby, 2011). Johannesburg seemed to score the highest in terms of food security, with 27 per cent of households surveyed being considered severely food

insecure, and 15 per cent moderately food insecure. While these numbers are better than in Msunduzi and Cape Town, they are still alarmingly high.

The Household Dietary Diversity Scale (HDDS) refers to the variety of food groups that the household consumed in the previous 24 hours, ranging from zero to 12. The diversity of food groups being consumed by the household is generally an indicator of the level of food access enjoyed by that household, with a higher score representing a greater access to a diversity of foods. From the households surveyed in Msunduzi, the average score was 5.5 out of 12, with 53 per cent of households having eaten from only five food groups or less (Caesar *et al*, 2013: 16). The households surveyed in Cape Town scored an average of 6.33 on the HDDS, which is higher than Msunduzi but still represents a relatively low dietary diversity (Battersby, 2011: 13). Johannesburg seemed to score the highest in terms of the HDDS, scoring an average of between 7.2 and 8 across the three areas involved in the survey (Rudolph *et al*, 2012: 12). These numbers may seem relatively high, however according to Rudolph, Kroll and Dlamini (2012: 13) roughly a third of households involved in the survey across the three areas involved in Johannesburg do not get the dietary diversity they need to be considered 'healthy'.

The Months of Adequate Household Provisioning Indicator (MAHFP) is designed to identify which months, and how many months, from the previous year a particular household went without adequate food to meet the household's needs. Sixty nine (69%) per cent of households that participated in the survey said that there were month in the previous year that they did not have access to a regular supply of food. Nineteen per cent (19%) indicated that they had an inadequate supply of food for more than 6 month of the year, and 15 per cent saying they had an inadequate food supply the entire year (Caesar *et al*, 2013: 18). From those surveyed in Cape Town, seventy one per cent (71%) indicated that they did not have access to an adequate food supply for over the previous year (Battersby, 2011: 15). Johannesburg scored slightly higher in this regard, with an average of 35 per cent of the households that participated in the survey indicating that they did not have an adequate supply of food for several months of the previous year (Rudolph *et al*, 2012: 13).

What these surveys show, firstly, is the level of food insecurity for many of the poorer households across South Africa. It shows that many households go months of the year without adequate supply of food. It also shows the even when people are eating, their dietary diversity is very low, often relaying on unhealthy 'bulk' foods that are low in vitamins and micronutrients, which is affecting

their health (Battersby, 2011: 14). One would expect, with these levels of food insecurity and dietary diversity, that urban agriculture would be a prevalent in these areas as a survival strategy. This however does not seem to be the case. Despite the many benefits and potentials of urban agriculture, e.g. improving food security and dietary diversity, it is not a common practice in the surveyed areas. A small portion of the 11 per cent of those surveyed in Msunduzi, 4 per cent of those surveyed in Cape Town and 16 per cent of those surveyed in Orange Farm in Johannesburg participated in some forms of urban agriculture. So why then, if urban agricultural practices can improve the livelihood of these households, is it not a common practice within these areas? Rudolph *et al*, (2012: 20-21) attributes this lack of participation in urban agriculture to difficulties in accessing land, a lack of skills, ineffective agricultural extension services, lack of financing/ capital to begin with, and the risk of crop and equipment theft.

Due to this lack of the presence of urban agricultural practices, those surveyed across all three regions purchased most of their food. As many as 90 per cent or more of all those surveyed across all three regions frequent the supermarket as a source of food (Battersby, 2011: 24; Caesar *et al*, 2013: 21 and Rudolph *et al*, 2012: 19). Informal markets, street venders and other informal market sources where also utilised by the majority of those surveyed across all three regions. This correlates with what Rudolph, Kroll and Dlamini (2012: 14-15) found in their study, which is the fact that household income has an impact on the likelihood of a household being food secure or not. The higher the average household income, the more likely they will be food secure (Rudolph *et al*, 2012: 15). Other sources of food included rural-urban food transfers by family members or friends, food sharing amongst family and other households, as well as from social aid (Battersby, 2011; Caesar *et al*, 2013 and Rudolph *et al*, 2012).

If urban agriculture is too reach its potential in these areas, and combat food insecurity, then the issues relating to access of land, a lack of skills, ineffective agricultural extension services, lack of financing/ capital to begin with, and the risk of crop and equipment theft need to be dealt with in one way or another. NGOs collaborating with local government can achieve this, as can be seen in many examples locally and internationally.

Research conducted in the South Durban Basin, which included the areas of uMlazi, Wentworth and Isipingo; seem to have produce slightly different results. This research by Smith, Yusuf and Neergaard (2005: 17), showed that urban agriculture is a widely practiced activity in these

communities. Urban farmers in these areas were involved in individual, backyard, community, school and even ad-hoc gardening, which occurred on public land (Smith *et al*, 2005: 17). Motivation for participating in urban agricultural activities varied, while they all commonly expressed interests such as nutrition, food security and community development. Some participate for social reasons, using the time and space as a communal meeting. Some participate to contribute food to their household, and increase their sense of worth. Furthermore, some urban farmers even used urban farming as a tool for community organisation and political mobilisation (Smith *et al*, 2005: 17). In Umlazi in particular, urban agriculture was practice mainly by women (80 per cent of those involved in the research), all with dependants in their household, and relying on social grants as a source of income. For this reason, urban agriculture represents an important livelihood tool, that provides these households with a source of nutrition and even an income in some cases (Smith *et al*, 2005: 17). Urban agriculture has been deemed important in these areas for increasing food security, building social networks and for challenging historical patterns of distribution and support (Smith *et al*, 2005: 18). HIV/AIDS is prevalent in these communities. For this reason, urban agriculture is also practiced as a means of supporting those infected. An initiative in the area, which includes an HIV/AIDS support group and the uMlazi hospital, sees urban farmers producing food to supply those infected with nutritious foods (Smith *et al*, 2005: 17).

Key constraints in this area are mainly linked to access to land to farm. Diversity of titles, which are considered complex in these areas, has been deemed one of the main issues (Smith *et al*, 2005: 17). The reason this is an issue is because if urban farmers wish to request or secure tenure for land to farm, they must first determine who the legitimate owner of the land is. This process can take time. According to Smith, Yusuf, Bob and Neergaard (2005: 17) there have been cases were community projects that aimed at accessing land for community gardens were denied their official status (and thus funding and support) due to the lack of clarity of ownership of the land. Other constrains highlighted by urban farmers in this area include crop theft, limited resources and limited support (Smith *et al*, 2005: 18).

Njogu, (2009) in Nairobi, Kenya conducted one of many studies on urban agriculture and food security. The research involved 300 children in Nairobi as a base line study to ascertain a community's wellbeing in terms of food intake. The rationale for using children is that they are good indicators of nutrition. These children were placed into categories according to their "nutritional statuses", either being "stunted, 'underweight', or wasted" (wasted being chronically malnourished)

according to their height, body fat and age (Njogu, 2009: 22). Out of the 300 children Njogu surveyed, 53.7 per cent were found to be underweight, 31 per cent were categorised as "wasted" and 62 per cent of children under the age of five were considered stunted. All of those surveyed were identified as consuming less calories and vitamin A than is recommended by the World Health Organisation (WHO). However, those who had families who engaged in urban farming generally scored better in these surveys (Njogu, 2009: 22).

These findings represented a need for intervention, as in general the children in this community simply were not eating enough food or enough variety of foods to be healthy individuals. One of the problems identified in the study was a lack of knowledge on agricultural practices. Other issues included a lack of knowledge on nutritional and dietary information as well as a lack of basic infrastructure among other constraints. Therefore an intervention was carried out in collaboration with the Ministry of Agriculture and Ministry of Livestock and Fisheries Development, whereby selected local farmers where taught new and improved farming techniques. Mothers and other caregivers were taught about their nutritional needs and basic infrastructure such as fencing and farming equipment was provided (Njogu, 2009: 25).

A year later, the intervention had proved to be successful. Firstly, 50 per cent of the households in the study group where producing surplus food, which they could sell for a profit. In addition, more food was available to these farmers thus reducing the amount of money spent of purchasing food while also improving the diversity of food available to them (Njogu, 2009: 22). Agricultural knowledge had increased as was evidenced by their improved farming methods and increased produce. Food security among households had concurrently increased, with people now consuming more calories, protein, vitamin A and iron in their improved and diverse diets (Njogu, 2009: 28-29). Although conducted over a short period, the study proved that urban agricultural interventions have the potential to dramatically increase a community's food security and generally improve their well-being. This study illustrated the point that a successful intervention requires supportive mechanisms such as knowledge about agricultural practices and nutritional information. Theseobservations are vital for urban agricultural projects to be successful.

Mutonodzo (2009) conducted another similar study on urban food security in Harare, Zimbabwe. This study used a method of analysing food security by measuring resident's daily calorie intake. The widely recognised daily intake is 2100 calories for an average adult. A household was considered

'food secure' if they could each consume at least 70 per cent of this requirement, because not everyone in the household were adults. Of the 368 residents interviewed, only 92 (25 per cent) were considered to fall within the category of having food security. Large amounts of people living in the city are simply not eating enough food. However, this study also indicates that people involved in urban agriculture are more likely to reach their energy requirements (daily calorie intake). Those involved in urban agriculture were considered twice as likely to reach their energy requirements (26.3 per cent), than those who are not (13.5 per cent). Food accounts for the largest amount of expenditure (an average of 49 per cent of the household's income) across all the households surveyed in this study. The poor however, allocate a higher percentage of their income to food. As a household's income increases, the percentage of that income spent on food decreases, meaning the poorest suffers the most from any unexpected rise in food costs (Mutonodzo, 2009:83).

Other authors such as Bellows, Brown and Smit view urban agriculture as a way of providing food security during times of war or conflict (Bellows *et al*, 2012). Growing food locally provides more control over resources and does not require food to be bought in from outside areas. Many countries rely heavily on food imports to sustain their supermarkets. Each product on the shelf has likely travelled vast distances across multiple borders before it is purchased. This is a tenuous system, which can be disrupted. What if the borders between these countries where to be closed off due to war, economic strike action or a natural disaster? Even within a country, a specific region could be isolated. In these circumstances, the commercial supply of food would be compromised. Where then would the food products come from? According to Cockrall-King's (2012: 15) analysis, the supermarket that most rely on for their food only stocks up to three days' worth of food. This means that we *are "9 meals away from anarchy"* as she terms it. This concept is used to describe the situation that would occur if the supply of food were to be cut off to a certain country or region for any reason. In theory, there would only be enough food to produce roughly nine meals for the average family who shops at that particular store (e.g. averaged at three meals a day).

3.2 FOOD SECURITY AND CONFLICT

Cuba is a perfect example of what may happen to a region or countries food supply in times of conflict, and when the industrial food system fails to continue supplying food or inputs. From the 1950s right through to the 1980s, Cuba had embraced large-scale industrial style agriculture. Its main produce at this time was sugar, shipping out up to 75,000 tons a day from certain bulk shipping terminals. Sugar alone accounted for 74 per cent of the total value of Cuba's exports. The country

had a favourable arrangement with the Soviet Union, who paid above market price for Cuba's sugar, as well as providing the country with cheap fuel, machinery, rice and wheat. This bilateral agreement came with a price, which was Cuba's commitment to the communist ideals. Cuba enjoyed its arrangement with the Soviet Union until disaster struck. After the Soviet Union collapsed in 1991, Cuba had nowhere to sell its sugar, losing as much as 85 per cent of its foreign trade overnight. This is devastating to a country that imports two thirds of its food supply, all its fuel and 80 per cent of its farming equipment (Cockrall-King, 2012: 285-289).

Map 4 and 5: A Locality Map and Detailed Map of Cuba

Source: http://www.worldstampalbum.com/Doc/Cuba/English/Cuba_files/image003.jpg

In 1992, economic and trading conditions worsened for Cuba with the introduction of the Torricelli Act that banned any American company from trading with them. With only a third of its food supply and a crippled agricultural sector, the Cuban government declared a state of emergency with the immediate concern being mass starvation (Cockrall-King, 2012: 285). This is a real life example of what can happen when the supply bringing food and agricultural inputs into your country are unexpectedly interrupted. The industrial food system of specialised mono cropping for export leaves few resources and space form multi-cropping, rotational style of food producing farms that actually feed its nation. Therefore leaving entire nations, or even smaller areas within, vulnerable to food insecurity as these links providing them with food can very easily be reduced or removed altogether. Natural disasters, which have begun occurring more frequently, could easily negatively impacts upon the food supply of a country or region. Cuba did manage to rise from its despair. Utilising urban farming practices that are essentially the opposite of the normal industrial style they had been using before, in a period in Cuba history known as the "special period".

Cuba's educated sector were tasked with reinventing their food system in a way that required far less inputs yet still produced a high return. Oxen, human labour, cheap inputs, and crop rotation style of farming were all introduced back into the farming system as part of the new way of farming. This approach was the polar opposite of the highly mechanised, input intensive, mono-cropping styled agriculture they had before. Scientists developed bio pesticides that were produced locally instead of having to be imported. National seed-sharing programs were put in place in order for food production to spread. Soil experts were on call to any farmer who needed expert advice (Cockrall-King, 2012: 287). The Cuban food system seemed to take a leap back in time, but it proved to be a beneficial change. With a lack of fuel for transportation and refrigeration, food was sold right where it was farmed. "Organoponics" were set up right in the heart of many urban areas in Cuba. These are largely organic farms which had small retail shops attached to them and which could sell directly to the public. Vacant and abandoned lots were converted into these "organoponics" which were selling fresh, organic, locally produced food right off the farm. There is virtually no need for supermarkets. Soon, Havana was growing and selling as much as 90 per cent of its own fresh produce, right in the city (Cockrall-King, 2012: 287). Urban agriculture formed a large part of Cuba's recovery from its food crisis. What commenced as an economic emergency response, evolved into a food system model that could be replicated elsewhere in the world.

Detroit, Michigan in the US, offers another example, albeit closer to home. Closer to home in the sense that Detroit is found in a capitalist first world country. Detroit is an example of how the food system can fail even western communities, and offers a different look on how it can fail. In Detroit, the current food system failed to keep residents food secure, and left them with little to no choices for healthy food options. Detroit is well known for its social conflict in the form of hostile racial relations, racial segregation and police brutality towards Black residents. These factors led to a number of race riots, mainly the 1943 and 1967 riots that devastated Detroit. These riots resulted in hundreds of deaths, thousands of injures and the destruction of local businesses (DAAHP, 2001). A preliminary study based on the US Census Bureau 2010, finds Detroit to be the most segregated cities in the US (White, 2011: 407).

As a result of the conflict, and the degradation in Detroit, many businesses and residents started leaving the city. In 1950, Detroit had a population of almost 2 million residents. According to the 2010 census data, from the US Census Bureau, the population in 2010 was at 713,777 residents. This is less than half the population in 1970 (White, 2011: 407). 'White flight' occurred first, with the majority of White residents moving out of the city to the more affluent suburbs in the late 1950s. It was only in the beginning of 2000 that the middle-class African American residents mirrored this migration to similar suburbs. This large migration of the middle class (and their wealth) out of the city centre, the continued race tensions and unequal economic opportunities, and the transformation of the automobile industry that now no longer employs the large number of local residents that it previously did, resulted in a decline of socio-economic conditions. These conditions included a decline in quality of city services, education, health care, employment and public transportation, coupled with unequal opportunities in housing and an increase in crime and housing foreclosures (White, 2011: 406-407).

As discussed earlier on, to be considered food secure, people need to have access to healthy food options and have the means to acquire that food. By this definition, Detroit cannot be considered food secure. Due to the various socio-economic declines, major food outlets and supermarkets have closed their doors or stay away from investing in Detroit. This is due to either a 'lack of demand' in terms of there being greater demand in middle class areas (such as the suburbs) or due to fears of more degradation and conflict. The last of these major food outlets was Farmer Jacks, who closed down its last store in Detroit in 2007 (White, 2011: 407). Residents now had to access 80 per cent of their food from liquor stores, gas stations, party stores, dollar stores, bakeries, pharmacies,

convenience stores and other such venues. These venues are not known for stocking health food options such as fresh fruits or vegetables, and residents often end up paying high prices for lower quality foods. With the abundance of fast food outlets in the city and a lack of public transport, many residents are forced into maintaining poor diets (White, 2011: 408).

In response to the decline in the community's diet and the socio-economic hardships, there are some who are fighting back for the food security of their people, using urban agriculture and education as their weapons. Earthworks Urban Farm, the Detroit Food Justice Task Force (DFJTF), the Detroit Agriculture Alliance and the Detroit Black Community Food Security Network (DBCFSN) are organisations in Detroit that have decided to take action. Earthworks Urban Farm was the first certified organic urban garden in Detroit. Their motto is to "*build a just, beautiful food system through education, inspiration, and community development*" (White, 2011: 408). Most of Earthworks Urban Farm's produce is prepared and served to the poor community at the Capuchin Soup Kitchen. They also however sell some of their produce through the 'Youth Farm Stand program', where children learn about and participate in the development of a community food system including production, marketing, sales, and value- added products (White, 2011: 408).

DFJTF is a collective of organisations led by people of colour who are engaged in "*creating a food security plan for Detroit that is: sustainable; that provides healthy, affordable foods for all the city's people; that is based on best-practices and programs that work; and that is just and equitable in the distribution of food, jobs and profits*" (White, 2011: 408). They sponsor monthly activities that encourage interethnic interaction, cooking, eating, and discussions around food issues in the city. The Detroit Agriculture Network (DAN) offers resources to community and family gardeners. They provided seed, education, tools, and other support with an estimated combined mass of over 120 tons of produce for 263 community gardens, 55 schools, and 557 families (White, 2011: 408).

Malik Yakini, a long-standing resident and political activist of Detroit, founded the Detroit Black Community Food Security Network (DBCFSN) in 2006. His organisation is responsible for the development of D-Town, an 80 Hectare urban agricultural project (which is in the process of expansion to become 283 Hectare) in Detroit (White, 2011: 411). In 2010, the D-Town farm produced as many as 30 different crops, which was sold at various farmers markets across the city of Detroit. D-Town also participates in other food producing activities such as beekeeping (White,

2011: 412). Volunteers farm D-Town for many reasons. Some do it to improve the aesthetics of their community, others do it to improve their community's access to clean and health food, others still to improve the quality of their environment. Some view D-Town as a strategy to engage in farming as a community-based resistance with a political change initiative, one that will assist in building a sense of community and to allow that community to gain control of their lives (White, 2011: 412).

All these organisations have a few factors in common. Firstly, the increase in vacant land in Detroit, a consequence of Detroit's depopulation of their middle class, presented these organisations with a unique opportunity to capitalise on the use of these spaces. Secondly, these organisations use urban agriculture, education, policy advocacy, and the physical improvements in neighbourhoods to increase access to a healthy food supply and prevent hunger, thereby enhancing the health of its residents through improved diets. They are revitalising their neighbourhoods through urban garden and urban 'greening' projects that improve the aesthetics of previously dilapidated and abandoned land, which also improves and strengthens the community's local economy. By doing so, these organisations build a sense of justice, equity, and self-determination as the community takes control of their own lives (White, 2011: 408).

3.3 BENEFITS FOR THE NATURAL ENVIRONMENT

There are a number of benefits for the natural environment, which result from the encouragement, and support of urban agricultural activities and these are outlined in more detail below.

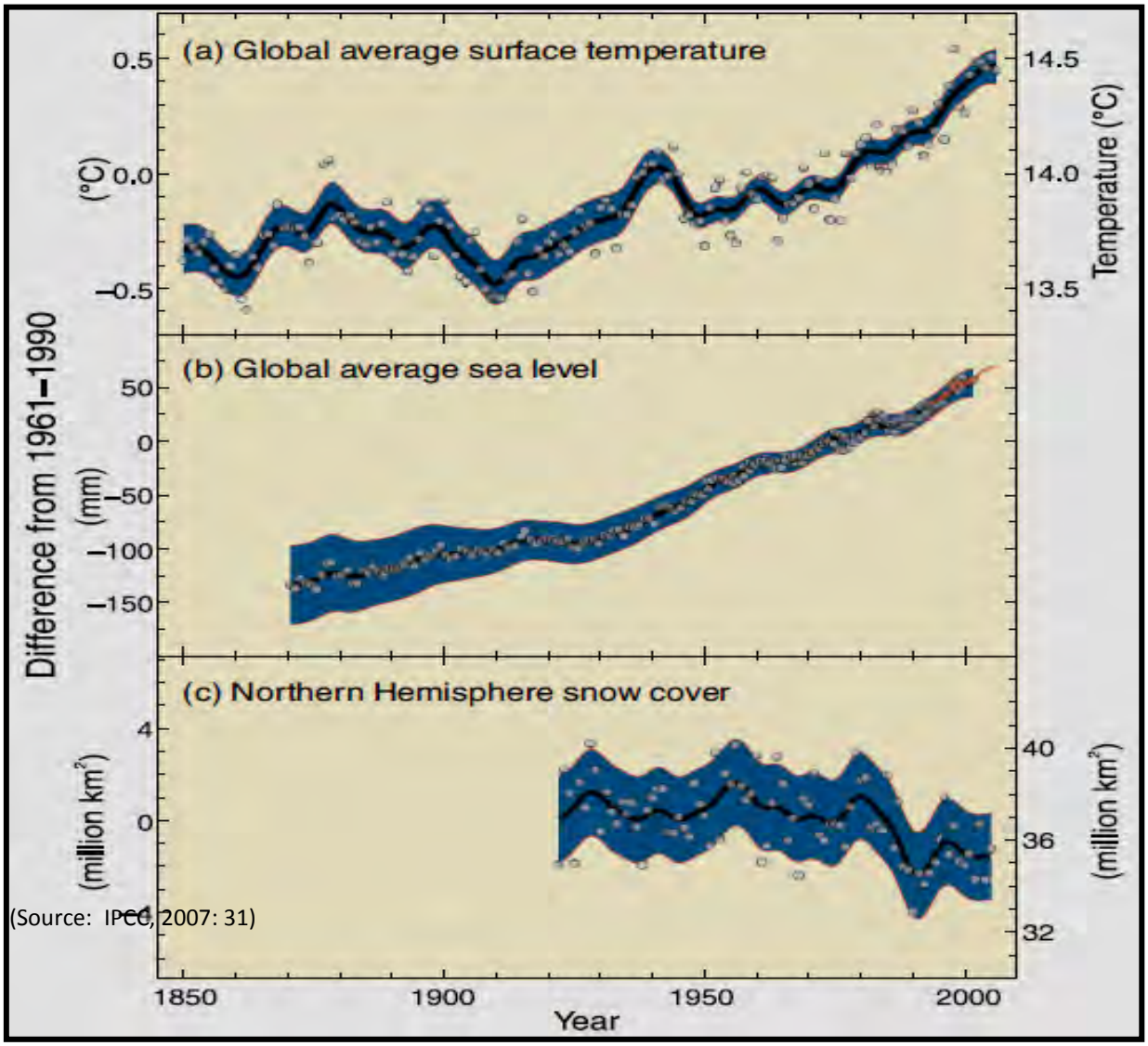
3.3.1 Green House Gases

Authors such as Van Leeuwen, Nijkamp, and de Noronha Vaz (along with many others) argue that urban agriculture has important qualities that benefit the natural environment. For example, plants absorb carbon dioxide (a greenhouse gas responsible for rising global temperatures), and produces clean oxygen through the process of photosynthesis. This air cleansing quality of plants could soon become an important life-sustaining feature of cities in the future. This characteristic of plants could make them important features in every city around the world as the issue of global warming becomes more prominent. According to the Intergovernmental Panel on Climate Change (IPCC) the "warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global

average sea level" (IPCC, 2007: 72). In addition, 11 of the 12 years between 1995 and 2006 have been global records for an increase in temperature rise in recorded history.

This rise in average temperature may not dramatically affect plant growth in cities; however, the increase in extreme tropical cyclone activity experienced in many regions across the globe is a serious cause for concern (IPCC, 2007: 30). Below in Diagram 1 and Map 2 are the indicators of the change in temperature, sea level, snow level and the increase in cyclone activity around the world, all associated with an average increase in global temperatures?

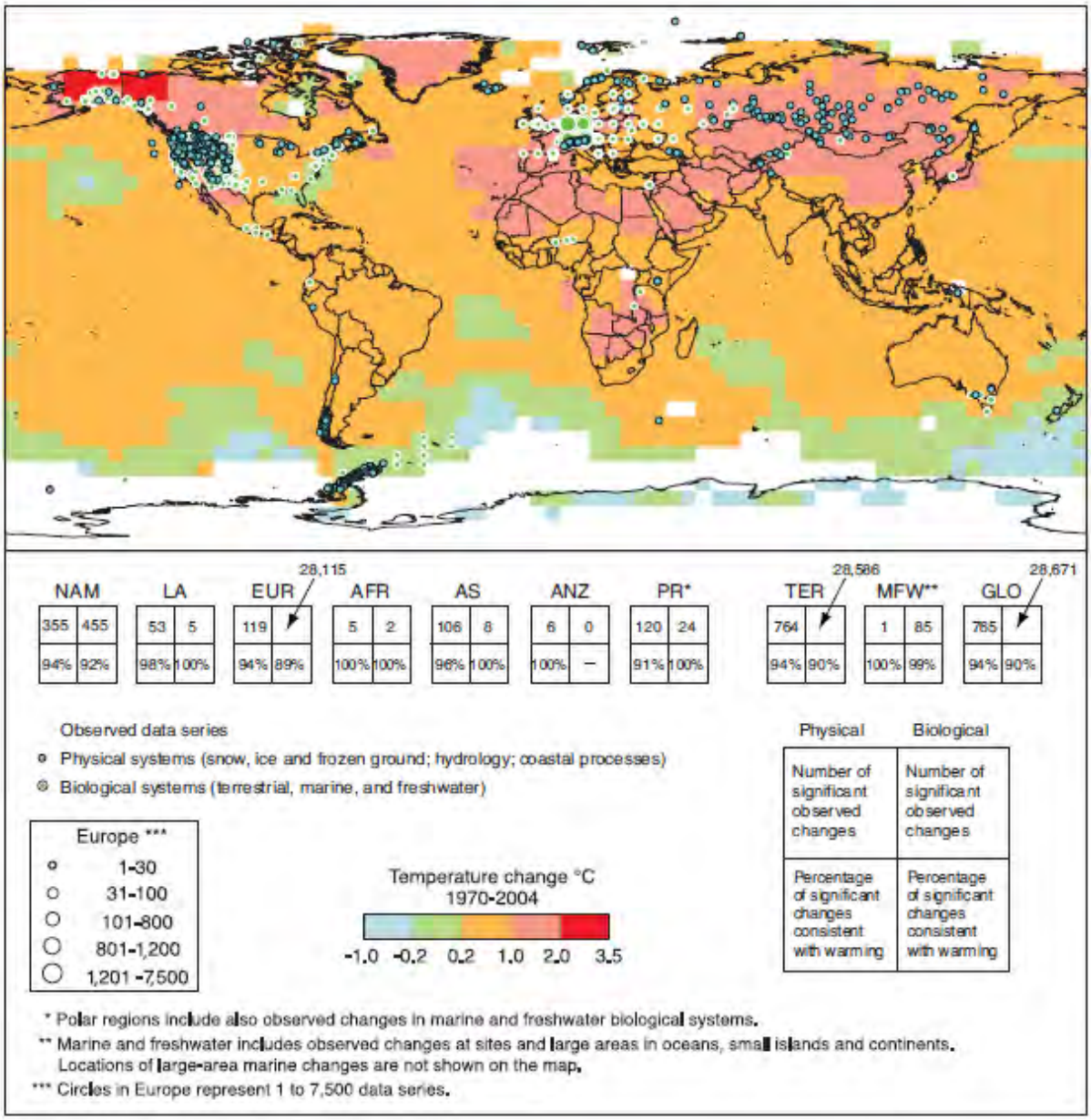
Figure 5: Changes in Temperature, Sea Levels, and Northern Hemisphere Snow Cover



(Source: IPCC, 2007: 31)

Source: IPCC, 2007: 31

Map 6: Changes in Physical and Biological Systems and Surface Temperature 1970 -2004



Source: IPCC, 2007: 31

The IPCC credit the causes of these climate changes to human activity, and in particular the increase in global Green House Gas emissions (GHG). Global GHG emissions have increased by 70 per cent between 1970 and 2004. Atmospheric concentrations of CO_2 and CH_4 in 2005 are noted as being the highest in the last 650,000 years (IPCC, 2007: 36-37). This rise in "greenhouse gases" has correlated simultaneously with industrialisation, the increased burning of fossil fuels in all aspects of life, and all

types of economic activities that produce various types of pollutants. Plants ability to absorb these GHG's, especially CO_2, could make them the unspoken heroes of future cities. Large areas of plant life are also able to act as heat sinks, mediating the high temperatures associated with the city. Reducing the immense heat produced by the city will make urban space more liveable as general temperatures rise. This will reduce stress levels and improve comfort levels of local residents.

3.3.2 Food Miles

Tim Lang, a British Academic Professor, first used the term "food miles" in the mid-1990s. He used this term to describe the distance food products travel before reaching the consumers plate (Ballingall and Winchester, 2008). This distance includes all stages of food transportation, including transporting food from the farm to the processor, from the processor to storage depots, from the depots to the vendors or supermarkets, and from the vendors to the consumer's homes. The general premise of the concept of food miles is that the further food travels before consumption, the worse for the natural environment, and therefore, locally grow foods should be favoured over importing foods from countries thousands of kilometres away (Ballingall and Winchester, 2008).

Bellows also argues that locally grown food for self-use reduces the distance that food has to travel, thus reducing "food miles" and foods 'ecological footprint' (Bellows *et al*, 2012). Transporting large amounts of food has implications for the natural environment. Large trucks, cargo ships and even planes transporting produce from farms to stores across the country and across the world are becoming a huge threat to the environment. In fact, authors such as Nongpluh and Noronha, (2013: 23) argue that 'food miles' are now among the fastest growing sources of greenhouse gas emissions in the world. The food consumed has often travelled thousands of kilometres to reach our local supermarkets, sometimes from other countries or continents. In the United Kingdom, Heathrow Airport, which was once a market garden, now bears witness to large-scale importation of food into the country in planes (Girardet, 2002: 98). The energy used in transporting food drastically outweighs the energy that food provides. This imbalance of energy in food production and transportation is unsustainable.

This argument is supported by examples such as the apple trade between Germany and New Zealand. European countries tend to be net food importers, and import fresh fruit (and some vegetables) from overseas during their winter months. Germany imports most of its apples from

New Zealand for example, as opposed to growing them locally for Germany's winter (Blanke and Burdick, 2005: 125). The question raised was, would it require less energy to produce apples locally in Germany and store them for the winter, as opposed to importing them fresh during these months. This would need to take in consideration the energy requirements of both options. For instance, in the scenario of growing apples locally in Germany, to calculate the energy requirements would need to include the following: Energy required during production of the apples, their storage for several months during the summer, and their transportation from the farm, to storage, to vendors, and finally to the consumers home. In the scenario of importing apples from New Zealand, calculating the energy requirements would need to include the following: The production of apples, their transportation overseas (roughly 23,000 Kilometres), their transportation to the venders, and finally their transportation from the vendors to the consumers home (Blanke and Burdick, 2005: 126). According to research done by Klein-Altendorf Research Station of Bonn University and the Consumers Protection Agency of North Rhine-Westphalia, it was concluded that growing apples locally in Germany would in fact require less energy than it requires to import them. This was in spite of the fact that New Zealand farms produce 25 per cent higher yields per hectare (Blanke and Burdick, 2005: 126).

Focusing on the distance food travels is a way to highlight the amount of energy used, the depletion of none renewable resources (fossil fuels), the issue of climate change through greenhouse gas emissions, the increasing demand for 'exotic' and out-of-season foods, and the growing globalising of the worlds food system (Wynen and Vanzetti, 2008). The less energy required, the more environmentally friendly, is the underlying premise of the 'food mile' argument. Many would argue however that the distance food travels alone is not enough as an argument for food to be grown locally. In many cases it may be better to grow locally, form an environmental and energy use perspective, however in some cases it is not. For instance, in some cases it requires more energy to produce foods locally, when one takes into consideration the energy it may require to keep greenhouses warm in cooler climates, or in the storage of produce in cold rooms. For example, a study in the United Kingdom found that growing tomatoes in greenhouses in the UK to be more environmentally damaging than it would be to import them from Spain or Morocco. This was due to the fact that the gas used to keep the greenhouses warm (methane) has a global warming potential that is 20 times higher than carbon (CO_2) (Wynen and Vanzetti, 2008).

In addition, to bear in mind is the mode of transport used. For instance, transporting food on ships or rail requires considerably less energy per kilogram of food, compared to air or road transport (Wynen and Vanzetti, 2008). Other research also showed that the majority of 'environmental costs' associated with the transport of food is generated from domestic transportation, rather than from the trans-oceanic importation of food. (Ballingall and Winchester, 2008).

Furthermore, socio-economic factors are often also ignored. If for instance, the UK decided to decrease its food imports, and grow food locally instead, food-exporting countries will experience losses. Welfare losses are predicted to be highest (relative to GDP) in Sub-Saharan African countries (Ballingall and Winchester, 2008). Countries such as Malawi and Kenya export large amounts of agro-food products to Europe, representing a large portion of their GDP. The UK spends around one million Pounds every day on produce from this region. For example, 87 per cent of the green beans sold in the UK come from Sub-Saharan countries (MacGregor and Vorley, 2006). The food export industry, particularly between Sub-Saharan countries and the UK, presents poor rural economies with direct economic benefits. It is estimated that between one - one and a half million people in Africa are supported by the export of fruits and vegetables to the UK alone. Furthermore, an estimated 200 million Pounds is injected into rural economies in this region through the export of fruits and vegetables (MacGregor and Vorley, 2006). If the UK had to put a stop to importing food products from Africa, in an effort to reduce their food miles, it would have devastating effects on the economies of food exporting countries in Sub-Saharan Africa. This in turn would reduce the livelihoods of millions of people.

In South Africa however, food miles are not as big an issue as other industrialised nations, such as the United Kingdom. Many of our staples are grown locally and have a relatively short distance to travel before being consumed, compared to the UK. South Africa has always had a well-developed food industry, partly because of the country's major agricultural activity, which has been developed into food production. Most of South Africa's imports in the food industry are fruits and vegetables that are out of season here, and sauces, condiments and a few luxury items (SouthAfrican.info, 2013). Yet, trucks carrying food across provinces are still imminent.

Growing food locally, especially within urban areas, close to the consumer, either at home or at the local community garden, drastically reduces the distance that food products will travel. Furthermore, if consumers are getting a portion of their food from their own gardens or straight

from the farm (such as a community garden) then the only distance that food travels will be from farm to plate, cutting out a drastic amount of transportation. The environmental benefits of food coming from home or community gardens are further evident, when one considers that these types of gardens/ farms are often low-input and organic. Urban agriculture also does not threaten overseas markets and livelihoods in Sub-Saharan Africa. Food products will still likely continue to be exported from this region to places like the UK, however, possibly not at an ever-increasing scale (depending on how large urban agriculture grows in places like the UK). In South Africa, urban agricultures' potential contribution to reducing food miles will be by cutting out a large portion of road transport from farms in the countryside, to storage warehouses or depots, to the supermarkets and finally to the consumers home.

3.3.3 Soil Erosion

Plant life also reduces soil erosion. In urban areas, there are more impermeable surfaces than there would occur naturally. These include roads, walkways, pavements and buildings. Therefore, rainwater is less able to seep into the ground, and usually fills storm water or sewer systems within the city. During heavy rains, water run-off gathers momentum and can prove devastating to soils through erosion of topsoil and to plant life. Soil erosion is reduced by rooted plants, which stabilise the soil (Bellows *et al*, 2012). Plant life will also reduce the amount of run-off during times of excessive rain, thus reducing soil erosion (Van Leeuwen *et al*, 2010: 21). This benefit is compromised when plants are uprooted during harvest time; however the benefit still exists during the growing seasons. Harvesting at different times and replanting soon after harvest (which may need to be a different crop depending on the time of year and seasonality of the crops being grown) will assist in preventing soil erosion.

3.3.4 Green- Spaces and Urban Agriculture

Many contemporary authors, such as Van Leeuwen, Nijkamp, and de Noronha Vaz, (2010: 21) view urban agriculture from an urban green-space prospective. From this perspective, urban agriculture is seen as a form of urban greening, similar to a park or greenbelt. Urban agriculture is seen to have aesthetic and environmental value for a city, which contributes to human relaxation and health, environmental protection, and the general uplifting of an area. These authors point out that many urban green-spaces (which could be utilised as farms/ food gardens) are being utilised by the public for recreational purposes, where people can enjoy the pleasure of being in a natural setting (Van Leeuwen *et al*, 2010: 20). The gardens may also be used as tools for educational purposes,

especially school gardens. Urban agriculture need not be exclusively for food production; in fact, many urban gardens produce only flowers and aesthetically pleasing plants and trees. These types of gardens further add to the beautification of an area and improve the quality of the environment (Van Leeuwen *et al*, 2010: 20-21). Urban agriculture can be seen as a planning tool that adds value to an area. Other authors such as Bellows, Brown and Smit speak of urban farmers as people whom"*create nature*" within areas where it was once removed. These gardens add biodiversity to an area, attracting and protecting a host of microorganisms, insects, birds and reptiles, providing them with food and refuge from the busy city life (Bellows *et al*, 2012).

3.3.5 Biodiversity

Another important aspect of urban agriculture is the biodiversity it supports. It is clear that urban development (and the modern agricultural system for that matter) have drastically reduced the earth's natural biodiversity. Mass extinctions of millions of species have been the result. In the modern age, urban residents have begun to witness what some authors describe as 'an extinction of experience', whereby people living in "*species-poor*"' cities are becoming increasingly disconnected from the natural world that they rely so heavily on (Goddard *et al*, 2010: 90). With the rapid loss in biodiversity occurring due to urbanisation, urban green spaces and urban gardens are becoming an increasingly important refuge for a variety of species. For example, urban parks in San Francisco support high numbers of Bumblebees (Bombus bimaculatus) with populations that are higher than those recorded in parks located outside the city boundaries. This example served to illustrate the ability of natural species to adapt to new habitats if there are supportive structures in place, for example, green spaces. Another study of six gardens in Pennsylvania, found that planting native plant species in gardens around the city significantly attracted bird and butterfly diversity (Goddard *et al*, 2010: 92). These are just a few examples of many insects, birds and plant species that are found in urban gardens around the world. Such gardens also allow for an increase in mobility for many species. More gardens in individual homes, rooftops and communities provide paths for species to move into new areas further adding to the natural biodiversity of the entire city.

Urban agriculture typically focuses on the farming/ growing of food crops (but not exclusively). This activity may seem to have less of an impact on improved biodiversity than a more varied garden that includes a greater variety of vegetation. However, the biodiversity benefits of food gardens can make a contribution e.g. there are many vegetables that flower and require bees to pollinate before they begin producing their fruit. Therefore, growing these vegetables will attract more bees into

these gardens. Insects and other pests naturally also seem to arise in food gardens, attracting birds to feed on them. The soil that the food grows in has a complex biodiversity of its own, which is even more extensive in healthier soils. These are just a few examples of many more insect and bird species that will find solace in urban food gardens. Everything is linked in a wonderfully complicated ecosystem that can be created even in food gardens. The richer the biodiversity becomes, the more diversity it attracts. Simple features such as birdbaths and bird feeders can add to the attraction of species into the area.

3.4 THE HEALTH BENEFITS OF URBAN AGRICULTURE

Urban agriculture can have health benefits for those involved. Growing one's own food provides a safe and healthy supply of nutrition. The idea of a global world is often an unsettling idea for many consumers who struggle with the idea that decisions about their foods production, distribution, storage and price are all made by outside and unknown decision makers. Authors such as Van Leeuwen, Nijkamp, and de Noronha Vaz believe urban agriculture in many instances has developed in response to this "lack of trust" in the global food market (Van Leeuwen *et al*, 2010: 21). It stems from the unknown factor associated with having very little knowledge about where one's food comes from. Choosing between brands is also not a clear indicator of where that product was farmed or produced and how. A salmonella scare in America resulted in billions of eggs across various brands being taken off the shelves, all due to a contamination scare at a single mega farm (Cockrall-King: 2012: 29). This is just one of many contamination scares that transcend supermarkets and brands.

In South Africa, many meat products in stores were found to be contaminated with DNA from a variety of different animal meats, for example donkey, horse and pig. According to *City Press*, Shoprite, Pick n Pay and Spar along with other major supermarket outlets where found to be selling contaminated meat products. As many as 80 meat products were found to contain soy, donkey, water buffalo, goat, chicken and beef meat in products that are not meant to contain these ingredients. Minced meats, burger patties, deli meats, sausages and dried meats were amongst the products tested. In one case, ostrich patties also contained beef, pork, sheep and chicken. In another, "*quality braai wors*" contained pork, donkey, sheep and chicken, none of which were indicated on the packaging (City Press, 2014). There are far more frightening examples of food contamination and poisoning.

In Johannesburg, a seven year-old girl died from food poisoning in April 2013. A further 11 pupils from the same school complained of a headache, stomach-ache, nausea and vomiting the very same day before her death. Although it was believed that food poisoning cause these symptoms, the source of the contamination was never identified (News24, 2013). This unresolved puzzle about the source of the poison led to a number of questions being posed. Was the source of the problem due to an over use of pesticides? Or perhaps this incident was indicative of a contamination that may have been far more wide spread than anyone noticed? If the young child's death was caused by food poisoning, what food product was the culprit? This case raised awareness about the safety of products that are bought off the shelves of our supermarkets and how they can affect our health so drastically without any warning. In this context, the role of urban agriculture in contributing to food security, food safety, and money savings is an important one to consider. It allows a greater level of control over the use of chemicals and in general provides a supply of fresh food where the role of the consumer has been maximised (Van Leeuwen *et al*, 2010: 21).

Bellows, Brown and Smit also view urban agriculture as beneficial to the health and well-being of those involved. Firstly, these authors believe urban agriculture provides a valuable source of nutrition. They argue that a plot of land or space that is ten by ten meters in size, and which is well tended over 130 day period with a temperate growing season, can provide a small household with the majority of its yearly vegetable needs[5]. It has the potential to provide them with much-needed vitamins A, C, B complex and iron (Bellows *et al*, 2012). They also point out that productivity can be enhanced using techniques such as greenhouses and hydroponics. Vegetables are relatively easy to grow, and represent a very important food group that many modern diets lack. Vegetables are low calorie but nutrient dense foods, yet many urban poor are unable to afford them in their diets, which consist mainly of bulky foods that will fill them up rather than provide efficient nutrition (Bellows *et al*, 2012). By growing one's own vegetables to provide for themselves and their family, urban farmers will be improving their diets dramatically, thus improving their overall health. Freshness is linked to health, a fact that has been documented in the literature. Research has shown that in the five to ten day lag period between the harvest of a crop and its appearance on the shelves of a local store, food can lose as much as 30-50 per cent of its nutritional values. Once a fruit or vegetable has been harvested, it has essentially been cut from its life source. The fruit or

5 The author does not make it clear what size household the ten by ten patch of garden can support, however the point made here is that it is possible for a household to grow a large portion of their vegetable needs in a relatively small piece of land. This is especially important to poorer households as it diversifies their diet to become healthier, while reducing the amount of money they spend on these foods. Protein (from meats) and fats would then still have to be raised in a separate area or bought.

vegetable then needs to feed off itself for calories, thus depleting itself of nutrients. Furthermore, fruits and vegetables are made up mostly of water, and begin to decrease in quality through moisture and microbial loss over time after its harvest. Nutrients are also lost through oxidation, especially in warmer climate areas (Rickman *et al*, 2006: 931).

An example of nutrient loss during dry storage of fruits and vegetables can be found in ascorbic acid (Vitamin C) and Vitamin B. A study on the effects of storage on common vegetables found that within seven days, vegetables lost between 27 and 100 per cent of their ascorbic acid levels. When refrigerated, their ascorbic acid levels dropped at a lesser rate, with the same vegetables loosing between zero and 77 per cent of their ascorbic acid. The least affected vegetable at room temperature was carrot, which lost only 27 per cent of its ascorbic acid levels in seven days. The least affected vegetable when refrigerated was broccoli, losing none of its ascorbic acid over a week when refrigerated (Rickman *et al*, 2006: 934). It is clear that refrigeration helps, however it is usual that vegetables to take as number of days just to reach the store, let alone the individual household and eventual consumption. Vitamin B levels seem to drop at a slower rate in many vegetables after harvest. The same study showed that over a three-week period, vitamin B levels in common vegetables dropped from between 23 per cent and 46 per cent when refrigerated. These levels drop even further over the same time period when not refrigerated (Rickman *et al*, 2006: 937).

These are just two examples of vitamins that are lost from fruits and vegetables over time after harvest. When the time it takes between harvest, transportation, storage and eventual consumption is factored in, together with the nutrient losses due to cooking, our food soon begins to look rather dull and 'empty' in a sense. It would be necessary to double the average food intake; in order to gain the same nutritional benefits as would be expected from these foods. From a general health perspective, it is more beneficial to consume food shortly after the harvesting process than to wait for its processing for consumption. It has increased nutritional value if it is eaten early. Urban agriculture has the potential to improve the quality of food people consume, as those involved generally consume vegetables from their garden the same day they are harvested, or shortly after, thus improving their health.

Nutrition is not the only benefit to one's health that urban agriculture offers. Urban agriculture is believed to transcend physical, as well as emotional and mental health (Bellows *et al*, 2012). It requires physical labour, mental concentration, planning and socialising that produce's food as well

as a sight of human made natural beauty (Bellows *et al*, 2012). Gardening is a physically demanding exercise that involves both fine motor skills such as cutting and trimming, and aerobic exercise such as churning of compost and soil. Physical exercise is often a factor of gardening that is overlooked, despite it being potentially beneficial for those with varying degrees of fitness levels and strength.

3.5 URBAN AGRICULTURE AND MENTAL WELL BEING

Bellows, Brown and Smit (2012) go further by highlighting the mental aspect of gardening. Few would disagree with these authors when they state that being outdoors and working with plants benefits ones mental outlook and wellbeing. They argue that cultivation and plant life assist in illness prevention and healing, as well as reducing stress, blood pressure, fear, anger and muscle tension (Bellows *et al*, 2012). Stress and high blood pressure are known causes of many human deaths. Therefore it makes sense that relaxation and the calm natural beauty of gardens and gardening itself can have a profound impact on the general health of human beings. Using gardens for therapy is not a new practice. During World War II, horticulture was used in many clinics in the United States of America (USA) in rehabilitation programs for returned wounded war veterans. In 1959, the Rusk Institute of Rehabilitative Medicine added a greenhouse to its rehabilitation unit (Detweiler, 2012). Ulrich[6], (1984) conducted a study on patients' recovery rates. Patients with rooms that faced a park, experienced recovery times that were ten per cent less than those who did not, and required far less pain relief medication (Ulrich, 1984: 420-421). It has become a common understanding that gardening does have medical benefits for those involved. Although there is yet to be scientific proof liking gardening and natural settings to assistance in healing of the human body and mind, there have been many preliminary studies proving its feasibility. These preliminary studies have concluded that horticultural therapy; therapy gardens and simply the exposure to gardens have many benefits to human health and healing in the following ways:

- Sleep improvement;
- The learning of new skills;
- Regaining knowledge of lost skills;
- Improved memory and attention
- Increased sense of responsibility and achievement;
- Improved self-esteem;
- Improved social skills and interaction;

[6] Roger Ulrich was a Swiss Professor of Architecture at the Centre for Healthcare Building Research

- Reduction in stress;
- Improved sense of calm and relaxation; and,
- Reduced pain perception.

Source: Detweiler, 2012

3.6 URBAN AGRICULTURE IN THE CONTEXT OF EDUCATION

When asked, what was the most pressing educational challenge facing South Africa today, the then Education Minister Asmal, said: "*the first fundamental challenge, the biggest disability from which children suffer, is their poverty*" (Barnett, 2006: 172). Poverty impacts on education in a number of ways, mainly though through the inability of children to learn, and sometimes even to attend school because of hunger (Barnett, 2006: 172). School gardens therefore provide an opportunity for urban agriculture. They present an opportunity to feed children, educate them from a young age about how to grow healthy food, and teach them what is healthy to eat and what is not. Bellows, Brown and Smit (2012) discuss this opportunity, and express the view that school gardens can become unofficial classrooms on foods that could reduce obesity and chronic diseases associated with poor diets. Teaching sustainable farming methods, general food, and nutrition education from a young age, could breed a healthier and more productive generation. These authors also point out that school playgrounds are ideal spaces to produce food that the children themselves will eat (Bellows *et al*, 2012).

This potential has been recognised by organisations such as Food and Trees for Africa. This organisation, with the assistance of funding from Woolworths and endorsed by the Department of Education, has established the EduPlant programme. This programme assists schools in developing food gardens, which are used to teach children how to grow fruits and vegetables (FAO, 2010b: 24). These children are able to consume their produce, as well as sell the surplus for a profit to raise funds. These gardens are aimed at combating malnutrition amongst learners, and to promote environmental education and sustainable natural resource management. Schools are supported by EduPlant for two years until they can manage on their own. Workshops for educators are arranged and education materials are provided (FAO, 2010b: 24).

The Ikaneng Primary School, in Soweto, is an example of a school garden project that originated from Food and Trees for Africa. At the Ikaneng school garden, children grow over 15 varieties of vegetables, fruit, herbs and flowers with the assistance of parents and other members of the community. They have also used these gardens to developed windbreaks to stop the dust blowing into the classrooms. They produce their own organic compost, farm earthworms and even recycle most of their waste (Barnett, 2006: 172). These gardens are also used as teaching tools. As noted by one of the teachers at this school, "*We don't need fancy equipment to teach subjects like science, mathematics, technology and commerce any more…we just use our gardens. The students have to measure up a plot – that's mathematics. When the seeds germinate and grow – that's science. When the pupils have to price and sell the goods, that is commerce*" (Barnett, 2006: 172).

The Banareng Primary School in Pretoria is another example. Part of the playground was converted into a vegetable garden. This garden produces enough vegetables to feed all 670 students for free on a daily basis, which is sometimes the children's only meal of the day. These gardens not only feed the children, but they become teaching tools as well (Barnett, 2006: 172).

Children's diets are often under scrutiny by health professionals, as they consume large amounts of snack foods, sweets and sugar. Healthy vegetables and leafy greens are often at the bottom of the list of foods found in children's lunchbox's. Studies of children, teenagers and prisoners have repeatedly shown that a simple change in one's diet can dramatically alter disruptive and even violent behaviour. A diet consisting of refined carbohydrates, high sugar content, and low nutrient contents (very common entities of a school child's lunchbox) have been proven to lead to irritability and generally disruptive and antisocial behaviour (Benton, 2007: 753). Therefore, providing a school with a "*school garden*" for teaching purposes, as well as practical reasons such as providing lunch for the school children, can prove to be beneficial in improving children's behaviour and their performance in the classrooms.

3.7 BENEFITS FOR THE MOST VULNERABLE GROUPS

> *"Overcoming poverty is not a task of charity; it is an act of justice. Like Slavery and Apartheid, poverty is not natural. It is man-made and it can be overcome and eradicated by the actions of human beings. Sometimes it falls on a generation to be great. YOU can be that great generation. Let your greatness blossom"* (Nelson Mandela, 2005)

"The man who has bread to eat does not appreciate the severity of a famine." (Yoruba Proverb)

"There are people in the world so hungry, that God cannot appear to them except in the form of bread." (Mahatma Gandhi, 1869-1948)

The vast majority of literature on urban agriculture argues that it should be a vital component of planning. They argue that its diverse benefits for communities and even entire cities make urban agriculture a necessary element of sustainability and good planning practice. However, its benefits seem particularly important for the poor and vulnerable. Community gardens in particular have been seen to have multiple benefits for communities. Authors such as Hou, Johnson and Lawson (2009: 3) argue that community gardens have the potential to assist communities in reaching social, personal and environmental goals. By participating in community gardens, these authors argue that it will provide a constructive form of physical exercise, improve one's health, improve participants nutritional intake, aid in participants personal growth, facilitate companionship as well as empower individuals. The benefits of community gardens in particular extend to the entire community, not just the individual. These include improving food security, environmental protection through growing of a range of plants, cultural diversity and acceptance through shared participation, and physical benefits such as the beautifying of an area with elaborate gardens (Hou *et al*, 2009: 5).

Authors such as Karanja, Yeudall, Mbugua, Njenga, Prain, Cole, Webb, Sellen, Gore and Levy (2010: 40-53), have expressed the view that urban agriculture can have a positive impact on those that are most vulnerable and susceptible to food insecurity and malnutrition, such as those suffering from and AIDS and the very poor living in poverty. Authors, such as Hovorka (2005: 137), view urban agriculture as a survival strategy for many households in African cities, as a means of providing nutrition as well as an income.

Other authors such as Loevinsohn and Gillespie (2003: 4) argue that there is an essential link between the spread of HIV/AIDS and poverty. These authors argue that not only does food insecurity worsen an already dire situation, but it could also be contributing to the spread of the disease. The two most common (but not exclusive) forms of infection in sub-Saharan Africa are sexual transmission and mother-to-child transmission (Loevinsohn and Gillespie, 2003: 7). From a

prevention point of view, ones nutritional status can have a profound impact on the likelihood of infection. For one, those with higher nutritional levels are less susceptible to infection in general, thus increasing their chances of avoiding infection after exposure. Once the HIV virus has been exposed to the host, a stronger immune system can keep the virus at bay, preventing or slowing its conversion to full blown AIDS (Loevinsohn and Gillespie, 2003: 8-9). Secondly, micronutrient deficiencies in mothers increase their baby's chances of contracting the disease. Mothers with micronutrient deficiencies have a reduced ability to resist the HIV virus from penetrating their epithelial tissue. Mothers with good immune statuses are at a far lesser risk of transmitting the disease to their unborn child. While the opposite remains true that a mother with a lower immune status is more likely to transmit the disease to their unborn child (Loevinsohn and Gillespie, 2003: 9-10). This is a profound truth, as it means that a simple good diet can become the greatest key in fighting the spread of this disease.

Once a person already has HIV/AIDS, their diets become even more important, especially because this disease fights off ones immune system, which is supported by good nutritional intake. It becomes a vicious cycle for the host. The HIV/AIDS attacks the immune system; lowering the bodies' ability to fight of infection, while the lack of nutrition results in the immune system not being able to replenish itself, further leaving the host even more susceptible to other infections that will eventually kill them. The HIV virus may also have more opportunity to mutate to more powerful variations amongst the malnourished (Loevinsohn and Gillespie, 2003: 9).

There are many vegetables containing immune boosting properties as well as antioxidants, which aid in overall health that are easy to grow at home. These include spinach (many varieties), lettuce, cabbage, broccoli, cauliflower, chilli, garlic, kale, Brussel sprouts and more. All of these vegetables were found to already be growing in the study area (except garlic). They require little attention yet their health benefits are immense.

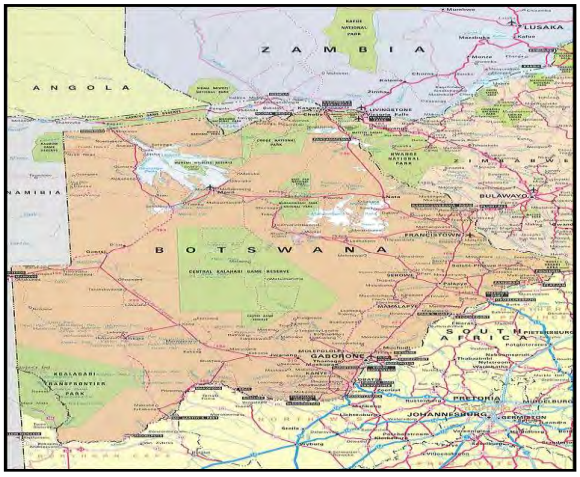
3.8 GENDER ISSUES IN URBAN AGRICULTURE

The issue of gender is one that is highlighted in many articles related to urban agriculture. Men and women both take part in various forms of urban agriculture. According to the literature, men seem to have the advantage in terms of land, resources and thus output in the form of more produce. A study done by Hovorka, (2005) in Botswana illustrates this point. Hovorka argues that the social

ideas and norms within Botswana about the roles and responsibilities of men and women influence the opportunities and constraints each gender group will face (Hovorka, 2005: 143). In the case of urban agriculture, these opportunities and constraints come in the form of access to valuable and productive resources such as equipment and land. Womens' reduced access to these resources impact upon their ability to produce enough food at the required speed and at a high quality. Their socio-economic status is also hindering them from accessing capital and larger plots of land. Without sufficient capital, or land to produce enough food for a profit, these women are unable to hire labour or purchase inputs such as fertilisers, seeds, water, equipment and support (Hovorka, 2005: 143-144). Men seem to have greater access to these resources. Hovorka's (2005: 141) study, which involved 109 agricultural enterprises (44 per cent male owned and 47 per cent female owned) within the city of Gaborone, Botswana, highlights these issues. According to the study, men invested nearly double on their agricultural inputs, hired more than double the amount of employers over the same dperiod, and occupied as much as three times the amount of land as their women counterparts. As a result, women farmers in the city of Gaborone produce less product, and of a lower quality. In many cases, this results in lowered income (Hovorka, 2005: 144-145).

This study also found that men are involved in a greater diversity of urban agriculture, such as dairy, fisheries, horticulture and livestock as opposed to women who were mainly involved in broiler production (Hovorka, 2005: 146). Hovorka believes that the result of her study indicates the need for improving women's socio-economic status. This will in turn improve the productivity of food for the entire city, as more than half of the urban producers are women. It will therefore allow the city to reach its full potential in terms of providing food security, and a diversity of better quality foodstuffs for its citizens (Hovorka, 2005: 147).

Map 7: Locality Map for Botswana **Plate 2: Women in Agriculture**



Source: http://www.southern-africa.arroukatchee.fr/botswana/map-botswana.htm **and** http://www.farmingfirst.org/tag/international-womens-day/

Gabel (2005) conducted a similar study in Harare, Zimbabwe. However, Gabel's study only involved seven urban open-space cultivators, as she termed them. The approach of this study was different in terms of the fact that it took a feminist approach. Through her study in 2005, Gabel hoped to demonstrate the power of women farmers within the city, and the way they have shaped their urban context. A conclusion drawn from her work indicates that urban agriculture, and in this case open-space cultivation, has been a means of resisting or undermining patriarchal control.

By cultivating their own food for consumption and for sale, these women are pursuing their own independence. In Harare however, these women are facing many challenges including the negative perceptions of their neighbours, planners and decision makers, as urban agriculture and farming is frowned upon, as well as a lack of legal access to land. Despite their many challenges, women in Harare continue to farm regardless of the legal implication, making use of social networks and any open plot of land not being used (Gabel, 2005). This demonstrates real enthusiasm amongst these women, and a real presence of women in urban agriculture in the city.

Map 8: A Locality Plan of Zimbabwe

Source: http://www.zambuko.com/mbirapage/resource_guide/rg_art/map_zimbabwe03.gif

Plate 3: Urban Space Cultivators Harare

Source: http://oxfamblogs.org/fp2p/killer-factcheck-women-own-2-of-land-not-true-what-do-we-really-know-about-women-and-land/

3.9 URBAN AGRICULTURE AND WASTE MANAGEMENT

In nature, every output form a particular organism is also an important input for others that form a living ecosystem. In this ecosystem, there is no true waste, as energy flows from one organism to another, in a cycle that keeps renewing itself. If cities are to become sustainable, they need to begin to function in a similar manner, and develop a 'circular metabolism' whereby resources are used and reused, and waste recycled (Girardet, 2006). An important issue that needs to be addressed in cities is the linear or uni-directional nutrient flows from the country (or farm) to the city, and then to the sea or landfill, without ever returning to its source. This trend is believed to have begun in Rome more than 2000 years ago, when food would be farmed, transported to "cloaca maxima", eaten, and then sewage would be flushed into the Mediterranean (Girardet, 2002: 98). In the 1850s, London saw an outbreak in typhoid and cholera as a result of sewage pollution in the river Thames. The London authorities decided to pump this sewage into the ocean instead, rather than forming a system to re-cycle it.

Even today in South Africa, sewage finds its way into our oceans. Plate 3 and 4 below are images taken by Jean Tresfon, an environmental photographer, of Cape Town's pristine coastline. In these images is a clearly visible sewage plume, which has resulted from pumping sewage directly into the ocean. It is estimated that 55 million litres of untreated sewage is pumped into the ocean per day in Cape Town. This sewage is discharged through several diffusers at a depth of 30 metres, according to the local municipality. Due to the shear volume though, visible plumes of sewage can be seen such as indicated below (Zigzag Magazine Online News, 2015).

Plate 4: Sewage Plume Off Cape Town's Coastline

Source: http://www.zigzag.co.za/featured/cape-town-poo-poo-problem-open-to-public participation/

Plate 5: Sewage Plume Close to Local Beaches

Source: http://www.zigzag.co.za/featured/cape-town-poo-poo-problem-open-to-publicparticipation

Similar situations occur in Durban as well, were millions of litres of sewage finds itself in the ocean. One such example was reported in the *Daily News* on the 15th November 2013. The report spoke about a planned illegal diversion of up to 15 million litres of raw sewage into the uMhlatuzana River, to flow for 20km before it reaches Durban Harbour. The community was concerned over the fear of harmful bacteria and disease infiltrating their waters, as well as the potentially high number of fish deaths in Durban Harbour. Work was due to commence on November 26; on an inlet pump station at the eThekwini Municipality's uMhlatuzana Waste Waterworks Treatment Centre. These works would have resulted in the sewage diversion into the uMhlatuzana River (Rondganger, 2013).

Despite community uproar, the city maintained that this repair was a necessity, and that the maintenance on the pump was part of the city's plan of upgrading many of the aging infrastructures of the city. The city also noted that if these repairs were not done, the pump would permanently pollute the river anyway. The scale of the problem is what rose concerns. Within just six hours of maintenance work, five million litres of sewage would be released into the river. If it took 24 hours to repair, 15 million litres would be released (Rondganger, 2013).

Communities bordering the river were outraged that no alternatives could be found (Rondganger, 2013). Imagine this sewerage could be collected and used as fertiliser in near by urban agricultural projects or initiatives. This would not only be solving one problem (the concerns of the community, the river and Durban Harbour), but it would also be producing a useful resource, and assist in returning nutrients back to the soil.

Sewage (human waste) is rich in nutrients such as nitrogen, phosphorous, and potassium, all of which are vital for plant growth and are the first to be depleted from the soil (Girardet, 2002: 99). To create a more circular, "closed loop" system, urban waste (and in particular human waste) would need to be recycled, and returned to the soil as best it can. This would reduce the amount of waste that needed to be 'dumped' in landfills or the sea, and it would be returning some of the nutrients that agriculture has taken out of the soil.

Authors such as Dulac (2001), Girardet (2002: 99-100), and others explore the issue of waste management and its potential application in urban agriculture. Cities produce tons of waste daily, as much as 5,000 tons per one million inhabitants (Dulac, 2001). This represents a large challenge for city officials to manage and dispose of this waste. On the other side of the coin, urban farmers are in

need of organic wastes and materials to fertilise and condition the soil they use. Therefore, a potential partnership exists between city officials disposing of organic wastes and urban farmers. In China, this has already been occurring on smaller plots within the city. It is considered common practice for urban farmers to combine regular soil with 'night soil', which is composted human waste, in their vegetable beds (Girardet, 2002: 100). This practice is however beginning to diminish in popularity as western culture has began to grow in Chinese cities, and with the instillation of western toilets. In Bristol, a company called Wessex Water dries out the cities sewage output, and turns it into pellets called Biogran (Girardet, 2002: 102). These pellet fertilisers are then sold to farmers. It is not an uncommon practice to even simply release liquid waste form septic tanks onto land intended for gardening due to this waste's fertilising qualities (Dulac, 2001). This technique, and the use of sewage containing human faeces in general, does however come with many risks. This waste often contains pathogens, xenobiotics, and other disease carrying agents that threaten the heath of those handling the waste, as well as those ingesting the food grown from it. The build up of heavy metals is another concern with this practice, which is less of a concern for the short term used of sewage as fertiliser (Girardet, 2002: 102). This is not to mention the strong negative social connotations with such a practice.

Human urine is the most nutrient rich form of urban waste, and is the safest to use for farming. Research has show that human urine is a well-balanced and complete fertiliser, with its nutrients being readily available to plants. Compared to synthetic fertilisers, urine has been found to contain about 90 per cent as much nitrogen, and as much phosphorous (Jonsson, 2002: 117). As noted above however, the use of sewage (which contains this urine) as fertiliser comes with many health concerns. The solution would then be to separate the urine from the rest of the sewage, at its source. Swedish researchers dominated the research studies of source-separated urine in the 1990s, and its potential application as fertiliser (Jonsson, 2002: 118). Research has showed that even though pathogens could be found in the urine samples, these pathogens died off after a storage period. The time urine needed to remain in storage before use depended on a number of factors, including which crops it is intended for, the storage temperature and the size of the storage system (Jonsson, 2002: 119). Separating the urine can also become a challenge. Urine separating systems would need to be installed in homes, which many people may not want or would find a nuisance. Educating people of its potential environmental and agricultural benefits would be the first challenge for anyone wishing to implement such a system. More localised focus, for instance in an 'urban agricultural hub', may be the best starting point. In such an area, a urine separating system could be used to service the local community garden. There are a few risks using human urine as

fertiliser. For instance, if human faeces had to contaminate the urine separation system for any reason, this could pose health risks (although not all faeces contains harmful pathogens). The handling of urine also poses another health risk for those involved in the process of utilising the urine. These risk are however relatively low, and the use of human urine for fertiliser is generally considered to be safe (Jonsson, 2002: 121-122).

Since 2010, the Swiss Federal Institute of Aquatic Science and Technology, eThekwini Water and Sanitation, the University of KwaZulu-Natal and the Swiss Federal Institute of Technology Zurich have been working together in the 'Valorisation of Urine Nutrients in Africa' project to develop sustainable urine collection systems and treatment processes. By 2012, an estimated 75,000 urine-diverting dry toilets (UDDTs) have been installed in the rural and peri-urban areas of eThekwini (Grau *et al*, 2012). The motivation behind these UDDT's has been to address the sanitation "backlog", however their potential to also be used as a fertiliser 'collection tool' remains.

For those who are against or who are uncomfortable using human waste as fertiliser for soils, composting could be an alternative. Composting involves layering organic material, allowing it to dry and partially decompose to form compost, a highly nutrient rich material ideal for farming. It is a simple and affective process that is commonly used in vegetable gardening, and is the 'safest' method of utilising urban waste. This process does however face some challenges. For example, it requires space that is often hard to find in the city, and it can produce a nasty smell[7]. Co-composting, a process of layering organic materials with human waste and left to dry, is a similar and also very affective form of fertiliser. It is safe to use as the human waste has been left to dry, and is mixed with decomposing organic materials (Dulac, 2001). The issue of space and smell however will still be a prohibiting factor. An alternative could be to utilise a method called "*closed composting*". This consists of a large, insulated container with a device to mix the compost. To prevent bad odour, it is recommended that this container be ventilated, preferably into a sewer system or something similar (Brynjolfsson, 2002: 185). For this to work for a community garden for example, it would need to start with the people. Those within the 'urban agricultural hub' or those involved would collect all their organic waste and leave it outside on a certain day. A collection truck would then collect this waste, weight it, and add it to the compost container along with supportive material. This supportive material usually consists of sawdust, straw and even paper or cardboard. The role of the supportive material is to keep the compost from becoming too wet and soggy, which

7 Composting can produce an undesirable odour that could be considered by some as a public nuisance. There is however methods that can be used to combat this issue, such as the 'closed composting' system described by Brynjolfsson, (2002: 185).

would hinder the growth of desirable microorganisms. After a few weeks (between one and three depending), compost can then be removed and placed in insulated boxes to mature. The matured compost is the final product, which is considered an excellent fertiliser (Brynjolfsson, 2002: 186). From a waste management point of view, this method does little to combat the growing issue of managing urban waste. It is however a step in the right direction, and is the safest and easiest form for urban agricultural use. With the right education on technique and safety, urban farmers can prepare their fields with such methods, before planting their crops. This will most certainly improve the quality and quantity of their crop production. This could be particularly beneficial for those farming on degraded soil.

The use of urine diverting toilets can be improved by the use of 'vermicomposting'. A study conducted in Durban by Gårdefors and Mahmoudi (2015), tested vermicomposting as a possible means of reducing the mass of human waste, as well as preparing it for safe use as compost for use. Vermicomposting involves the uses earthworms to break down organic material, or in this case, human waste. This process involves the combination of compost materials (vegetable trimmings/ wastes for example), bedding materials (potting or top soil for example), human waste and worms (Gårdefors and Mahmoudi, 2015: 2). The worms consume and digest the organic fraction in the faeces.

In urine diverting toilets, urine is diverted into a tank that is situated separate from the toilet. The faeces on the other hand gets collected in one of two vaults, typically situated directly under the toilet bowl. When one of these vaults is filled, the toilet bowl is moved to the other vault. Typically vaults are emptied in intervals of approximately six months. If managed properly, the faecal matter after six months is comparable to soil in texture. Vermicomposting could potentially be used to achieve both mass reduction of human waste as well as remove pathogens, therefore tackling two issues at once (Gårdefors and Mahmoudi, 2015: 7). This would be a great way to fertilise urban agricultural fields, as well as manage urban (and peri-urban) waste.

Another low-cost solution is the Peepoo, a single-use, self-sanitizing, biodegradable bag that captures human excreta and can be used, or even sold, as fertiliser 2–4 weeks later. For the poorest of the poor, it would be a potentially radical transformation if their own 'waste' could become a source of income (Elser and Bennett, 2011: 30).

Good design and planning in the future should start to look like natural ecosystems, with closed loops systems in which the majority of wastes are recycled for future growth. Progress is being made, with new innovative technologies and policy makers recognising the importance of such systems. Urban agriculture, while possibly not being the ultimate solution, does have potential to become a small part of the solution. At the very least, urban agriculture could benefit from tapping into the vast supply of human and urban waste reserves, and become one of many solutions to urban waste management towards a closed loop system.

3.10 CONSTRAINTS

Despite the many benefits of urban agriculture, it has not yet realised its full potential in many cities due to the constraints urban agriculture faces. One such constraint is the issue of space. Community gardens form an important aspect of urban agriculture and its success in uplifting a community. However, spaces for these gardens are often contested. As authors Hou, Johnson and Lawson (2009) express, one can argue the benefits of urban agriculture tirelessly, yet in many instances they will *"fall victim to higher and better uses"* (Hou *et al*, 2009: 4). Space and land in urban areas are expensive. More economically beneficial activities are thus encouraged over less economically beneficial activities such as a community garden, thus representing one of the biggest constraints for urban agriculture.

Despite the imminent space issue in urban areas, there are still ways to grow your own food. As author David Tracey puts it, "*If the sun is shining on your space, you're in a farmable area*" (Tracey, 2011: 43). It is a misconception that one needs huge areas to plant their own vegetables or fruits. Plants only need a few necessities to be able to grow, mainly sunlight, water, nutrients and a bit of space. The solution to a lack of space for a garden, especially for those living in flats or apartments with small or no garden area is to plant in pots or containers (Tracey, 2011: 53). As long as they are in the sun, and can drain excess water, the plants will grow. An innovative and simple design for this type of farming can be found in the 'veggie bottle' example. This design was formulated by, Shouichi Taniguchi, of Japan (Tracey, 2011: 53). The design is as follows:

Step 1: Cut the narrow neck off a plastic bottle;

Step 2: Place absorbing peat moss at the bottom of the bottle;

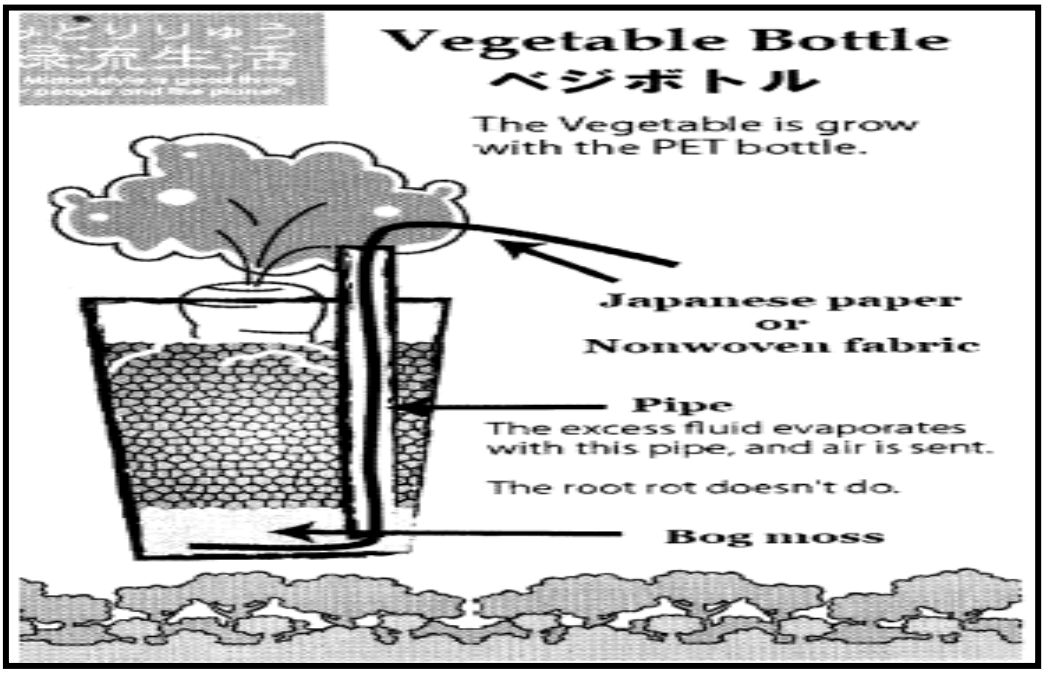
Step 3: Threat a strip of fabric, such as a dishcloth, through a straw and place the straw in the bottle, one end at the bottom and the other coming out the top;and,

Step 4: Add organic fertiliser and plant the seed on top.

Source: Tracey, 2011: 53

The beauty of this design is that it can be used indoors, as the excess water evaporates out the straw and not out the bottom of the container (Tracey, 2011: 53). This is one technique people can use to grow plants in areas with a lack of space for such activities e.g. high-rise buildings and flats.

Figure 6: Japanese Vegetable Bottle Design



Source: Tracey, 2011: 53

The potential yield of any urban agricultural site, garden or plot, will depend on the supply of inputs and the lack of constraints. To achieve a sites maximum yield, there needs to be an optimum supply of inputs and an absence of constraining factors. However, there are very little examples of areas

and gardens that experience zero constraints, especially within a city. Authors such as Eriksen-Hamel and Danso (2010) explore some of these constrains that are often (but not always) characteristic to urban agriculture. The first of these constraints is a decrease in solar radiation. Plants rely heavily on the process of photosynthesis that uses solar radiation to convert water and carbon dioxide into energy that feeds the plant. Therefore, a lack of sunlight leads to a decrease in plant growth and sustainability. Eriksen-Hamel and Danso report that in general, urban areas and cities experience less direct radiation from the sun compared to rural areas (Eriksen-Hamel, *et al*, 2010: 87). This they argue could be due to a higher degree of reflectance from air pollution and aerosols over urban areas. Smog over cities is often visible from a distance, acting as a sort of sunblock for plants. According to Alpert and Kishcha (2008), highly polluted cities receive as much as eight per cent less solar radiation when compared to rural areas (Alpert *et al*, 2008: 1). Shade is another issue in urban areas. High-rise buildings cast huge shadows in many areas within a city that could prove to be problematic for plant growth. Eriksen-Hamel and Danso (2010) point out that a mitigation strategy for the issue of decreased solar radiation will be to choose crops that are less reliant on sunlight.

As mentioned above, air pollution poses a threat to plant growth in urban areas, however not exclusively due to a decrease in direct sunlight. Air pollution also directly damages crops. There is no surprise that air pollution is higher in cities than in rural areas, due largely to industry and increased burning of fossil fuels such as petroleum and diesel. Air pollutants such as O_3, CO_2, N_2O, SO_2, and suspended particles are all commonly higher in cities (Eriksen-Hamel *et al*, 2010: 88). Authors such as Emberson, Ashmore, Murray, kuylenstierna, Percy, Izuta, Zheng, Shimizu, Sheu, Liu, Agrawal, Wahid, Abdel-Latif, van Tienhoven, de Bauer and Domingos, M (2001) argue that these air pollutants have been known to damage crops and decrease yields. Fruit and tree crops seem to be most affected by air pollution. Eriksen-Hamel and Danso (2010) point out that in China, pollution has damaged fruit and tree crops by delaying sprouting, shortening the flowering period, reducing CO_2 absorption and in general decreasing the quality and number of fruit produced (Eriksen-Hamel, *et al*, 2010: 89). Techniques to reduce the effect of air pollution on crop production include dusting or washing of crops to remove impurities, or to even cover the plants in a thin mesh (Eriksen-Hamel *et al*, 2010: 88).

Similar studies have been conducted around the globe. In India for example, authors Agrawal, Singh, Agrawal, Bell and Marshall (2006) conducted a study on the effects of common air pollutants on

mung bean cultivation. This study tested the effects of SO_2, NO_2 and O_3 in the various stages of this crops development. The result was that all three pollutants negatively impacted on amount of produce cultivated, as well as on the quality of seeds produced. The study concluded that air pollution in the city of Varanasi is a major threat to mung bean plants, in terms of yield and quality (Agrawal *et al*, 2006). This they believe will have serious implications for the nutrition of the urban poor.

Water availability, quality and run-off are other constraints to urban agriculture, highlighted by Eriksen-Hamel and Danso (2010). Although both rural and urban agriculture rely on the same annual rainfall, urban areas are presented with unique challenges. Run-off is one of these challenges that threaten productivity. Un-natural hard surfaces decrease the amount of rainfall being absorbed into the ground, and increase the run-off. This run-off can be un-predictable, flooding and damaging entire fields or gardens of crops (Eriksen-Hamel, *et al*, 2010: 90). The run-off gathers many pollutants along its way, which in turn can contaminate waterways and urban agricultural crops. Urban agricultural sites near rivers or streams could also be subject to water contamination. Using water form these streams and rivers might contaminate the soil or plants grown. Fresh clean water is not often abundant in cities, especially in developing countries. The availability of fresh water in general is becoming a global concern. Many countries rely on their neighbours for a source of fresh water. The United nations believe that water could become the defining resource of the next century, taking over oil as a potential cause of conflict (Cockrall-King, 2012: 69). This may pose a risk for future urban farmers in drier cities.

Many researchers however suggest that low rainfall is not the only cause of low productivity (in terms of root moisture availability), but that it more often has to do with less than ideal performance related to management of soil moisture. There are two broad approaches to increasing water availability in the root zone. The first is to capture more water and allowing it to infiltrate into the root zone. The second is using the available water more efficiently (Rockström, 2009: 546). To capture more water, water-harvesting techniques can be applied. Water harvesting can be defined essentially as the collection of run-off for productive use (Rockström, 2000: 6). It is a practice that essentially increases the water available for crops at their roots, and reduces the reliance on portable water sources (and on unreliable rainfall in the case of rain-fed agriculture). Water can be harvested in a number of ways. The two main sources of water harvesting include collecting run-off either from rooftops or ground surfaces, called rainwater harvesting, as well as

from seasonal streams, which is considered flood water harvesting (Rockström, 2000: 6). The water harvested is then stored to be used during a 'dry spell', either in tanks, reservoirs or dams, or even below ground in the soil itself.

The more efficient use of available water is the second broad form of water management. This involves increasing the plant's water uptake capacity and/or reducing non-productive soil evaporation (Rockström, 2009: 546). In some cases between 60 and 85 per cent of the rainfall simply evaporates from the soil surface before reaching the roots and thus contributing to productivity (Woyessa, 2006: 223). Increasing the soils infiltration (or drainage) capacity will increase the amount of water that reaches the roots before it is evaporated. A common practice is also to cover the ground with mulch, which will reduce evaporation from the soil surface and thus increase productivity (Woyessa, 2006: 223). The ultimate goal of water management is to take advantage of what nature provides in the form of rainwater falling onto the crops naturally.

Wastewater is another issue highlighted by Eriksen-Hamel and Danso. In many cities such as Lome, Togo, and Accra, wastewater that has been treated is used for irrigation. This practice however is often not favoured due to the health risks involved. Authors such as Amoah, (2009) have done other studies on the effects of wastewater use in urban agriculture in Ghana. Amoah found in his studies, in three different cities in Ghana, that many urban farmers relied heavily on the use of wastewater due to the un-availability of fresh clean water (Amoah, 2009: 105). The use of wastewater comes with many health risks, but in many cases, urban farmers have no choice. Wastewater contains a host of disease causing pathogens that can survive for several weeks after being applied to fields. Treatment of wastewater does reduce the amount of pathogens in the water, however, in many developing countries; treatment is not always done due to high costs, resulting in much of the water being left untreated (Amoah, 2009: 105). In Ghana, the proof of the potential risks of consuming vegetables grown with the use of wastewater came at the cost of many tourists. Tourists consuming vegetables in the urban areas of Ghana where suffering from gastrointestinal disorders, forcing Ghana's Tourism Board to start a campaign to promote "*safer vegetables for healthier cities*" (Amoah, 2009: 105-106). In his study, Amoah sampled three main vegetables sold at local markets, totalling 180 samples all together. These vegetables were tested for bacteria and Helminth egg populations, which are both popular contaminants associated with wastewater.

The word "*helminth*" is derived from the Greek "*helmins*" (worm). A Helminth is therefore a worm classified as a parasite, a disease-causing organism that lives on or in a human or another animal and derives its nourishment from its host. Bacteria and viruses are also examples of parasites that live on or in the host's body. Helminth eggs can contaminate food, water, air, and objects such as toilet seats and door handles. The eggs enter the body of a human through the mouth, the nose and the anus. Once inside the body, helminth eggs usually lodge in the intestine, hatch, grow and multiply (Medicine Net, 2013).

The results of this study showed that the presence of both these contaminants where high. All three crops showed to have faecal coliform (bacteria) levels much higher than recommended by the International Commission on Microbiological Specification for Food. Only 30 per cent of this sample group where Helminth egg free, meaning the 70 per cent contained these infectious contaminants (Amoah, 2009: 112). This study represents a huge problem with urban agriculture in poorer countries where access to clean water is a major issue, especially as urban agriculture is often argued to be the 'healthier alternative'.

Despite the associated health risks to both the farmers and consumers, many do not have a choice in poorer cities around the world. A lack of supply of water for irrigation can be detrimental to crops, especially those that are water intensive such as cabbage, lettuce and spring onions. This places many farmers who do not have adequate access to clean water under pressure to use wastewater. As the demand for water in the city increases, so will the use of wastewater for purposes other than irrigation (Eriksen-Hamel, *et al*, 2010:90). Therefore, farmers will need to pay more for this water, representing another future challenge.

Soil contamination in urban areas poses another constraint to urban agriculture. Soil in urban areas are often exposed to a number of pollutants such as herbicides, fertilisers, leaks from underground petrol tanks, leachate from landfill sites, industry or mining, and even motor vehicle emissions (Hazelton *et al*, 2011:83). The list of sources of pollution in urban areas is seemingly endless. It becomes a danger however, when those pollutants are absorbed into crops and subsequently digested upon consumption, or when they begin damaging crops.

Authors Bellows, Brown and Smit (2012) also look at heavy metal contamination in urban soils. Soils in urban areas often contain high levels of heavy metals, including lead, cadmium, mercury, nickel

and copper. These metals arrive in the soil from various sources including paint, gas, oil, waste incineration, lead pipes and industrial wastes (Bellows *et al*, 2012). Hazelton and Murphy (2011) explore other more dangerous metals, such as arsenic and mercury, and their effects on soil and plant life. These metals accumulate in the top layers of soil usually through repeated exposer by urban activities. In coastal regions, acid sulphate is naturally found in the soil. When excavated, the acid sulphate oxidises and releases sulphate ions, which turn to sulphuric acid when introduced to water. The soil thus becomes acidic (a pH of less than 4.5), releasing the aluminium in the soil, which is toxic to plants (Hazelton *et al*, 2011:87).

The danger of these heavy metals for urban agriculture is when they are absorbed into the crops grown on soils containing these metals. This is especially so for leafy greens. Humans consuming plants grown on contaminated soils run the risk of digesting these metals, which over time can be detrimental to one's health. Despite this danger, there are methods to reduce the risk of heavy metal absorption into plants. Growing crops in pots, raised beds, or in ground that has been dug up and replaced with non-contaminated soil and compost, are ways to ensure soils are not contaminated. There are many creative ways to get around such issues. Education and support will therefore become very important for the success of community gardens especially in areas with contaminated soils. Bellows, Brown and Smit (2012) outline other methods to prevent heavy metal contamination. These methods include the following:

- Stabilising the soil, by planting root crops, reduces soil tracking and thus reduces the chance of contaminated soil moving from industrial areas into residential areas;
- Cultivating fruit plants, peppers and eggplants reduces risk of absorption of heavy metals; and;
- Adding compost or calcium to the soil reduces its acidity and reduces the potential absorption of heavy metals.

Source: Bellows *et al*, 2012

Organic contaminants such as dioxides are also common in urban soils. These are often derived in soil through industrial products and wastes, such as petroleum, kerosene, diesel, jet fuel, benzene, toluene, and xylenes. These organic contaminates are highly toxic to both plants and humans, and can be present in soils for up to 20 years after the initial exposure (Hazelton *et al*, 2011: 85).

Policies regarding urban agriculture are often insufficient in allowing urban agriculture to reach its full potential, and in some cases, if strictly speaking, can be outright adverse. Typically, urban agriculture is not included in the planning process (Smit *et al*, 2001). Historically, agriculture and livestock farming were prohibited in colonial times in most sub-Saharan countries. This trend seems to have gone unchanged until recently, however policies and government support still remain insufficient (Smit *et al*, 2001). Backyard home gardens are well-tolerated features in many cities. The situation can however be different in high housing density areas, and where agriculture is perceived more as an informal or rural activity than a modern one (Drechsel *et al*, 2008: 120).

Examples of this insufficiency, or out right adversity towards urban agriculture can be seen in many African cities. In Nairobi, after World War II, the government passed a law that saw the cutting down of all urban crops. Livestock and horticulture continue to remain illegal today. Similarly, in Kampala, more than 20 per cent of farmers face harassment and eviction from the officials or landowners (Smit *et al*, 2001). Only a few cities include urban farming in the land-use planning. The lack of support by government and policy affects urban agriculture in a number of ways, and restricts this practice from reaching its full potential. Access to land, secure tenure, and access to credit, water and waste management utilisation are all examples of how lack of appropriate policy initiatives affect urban agriculture (Smit *et al*, 2001).

For example, in Kano and Nairobi, many sites that had previously been formally allocated for urban agriculture have disappeared. This seems to be a common trend in African cities due to unfavourable land-use plans and the lack secure tenure arrangements (Drechsel *et al*, 2008: 122). Similarly in Umlazi, eThekwini, urban farmers have difficultly accessing secure tenure for land to utilise for urban agriculture. Despite this, urban agriculture in the area continues. The issue however is that it remains an informal activity, due to a lack of secure tenure for land, resulting in a lack of support and funding (Smith *et al*, 2005: 17). Another aspect of urban agriculture reaching its full potential would include the recycling of urban wastes. Unfortunately, due to the informality of the activity, potential organic inputs from urban wastes are often not formally included in urban agriculture, as they are removed by modern sanitation and garbage disposal systems to determined sites that dispose of this waste (Smith *et al*, 2001). Again in Ivory Park, Midrand urban farmers report the difficultly in obtaining permits allowing them to farm on urban land as a major constraint (Nel and Rogerston, 2005: 246).

In eThekwini, urban agriculture is not yet completely embraced by everyone, with opposition coming mostly from environmentalists, public health practitioners and urban planners. This resistance is however in contrast to the Local Government perspective and the viewpoint of the eThekwini Municipality in particular (Leech, 2015: 14). For example, the Parks and Recreation Department have previously been allocated the responsibility of taking custodianship of urban agriculture in the region. This implies that officials, particularly horticulturists employed by the eThekwini Municipality, should be driving and managing urban agriculture within regulation (Leech, 2015: 14-15). Despite the perceived support for the municipality, there are a number of limiting or potentially legal issues. For example, according to the KwaZulu-Natal Provincial Land Use Management System (LUMS), under the heading 'Healthy Living Environment', specific reference is made to land use that cause nuisance and pollution, with the suggestion that those operations need to be in appropriate locations (Leech, 2015: 23). This would mean that many agricultural activities (such as urban agriculture as its related activities) would ultimately not be supported. Furthermore, section 1.6 effectively excludes any agricultural activity within the built-up environment of any municipality (Leech, 2015: 23). To overcome the obstacle an application can be made, however this has a cost implication and requires knowledge of procedure, which many poorer urban farmers would not be in position of. Leech (2015) highlights two zone regulations that would assist in this regard, and that would enable to protection of community gardens and urban farmers. These include:

- *"User Zone Protection. The proposed model suggests that a community garden be approved for use in residential, high density, industrial and other areas subject to its use being determined by the community.*
- *Open Space Protection. The model allows for the community garden to become a sub-use of open space."*

Source: Leech, 2015: 23-24

Further potential legal constraints surrounding urban agriculture include the issue of obtaining water. In terms of the Water Act, water can be taken from a stream for growing a small food garden, but not for commercial purposes without a water permit. Again, this process cost money and requires knowledge of procedure. This becomes further complicated when the urban farmer is not the owner of the land (Leech, 2015:45).

From an environmental point of view, Section 26 of the Environmental Conservation Act requires that an Environmental Impact Assessment (EIA) be done prior starting a commercial gardening project. Furthermore, Section 6 of the Conservation of Agricultural Resources Act requires written authorisation to be applied for at the same time as when the application for the EIA is done. On top of this the Environmental Management Act states that land may not be cultivated within the minimum buffer strip of 30 metres from the edge of a watercourse. The reality is simple, most poorer uneducated urban farmers will not be aware of these regulations, let alone how to apply for the necessary permissions or have the money to do so. Secondly, most urban gardens are found within 30 meters from a watercourse, as it makes for easier access to water to irrigate the crops (Leech, 2015: 45).

It is important to overcome these legal issues if urban agriculture is to reach its potential, and if it is to become a viable survival strategy to address poverty and food insecurity. Leech (2015) suggests that "*a coherent and non-conflicting policy that clarifies responsibilities for urban agriculture*" be established, and that there needs to be a "*remove restrictive policies and replace them with a policy which recognizes and permits urban agriculture (i.e., allow for urban agriculture in zoning controls)*" (Leech, 2015: 22). Furthermore, the issue of securing land tenure for urban producers will be important for the legitimisation of urban agricultural projects, which will be important for acquiring funding.

A lack of skills is another constraint to urban agriculture. Due to urban agriculture, for the most part, being considered and informal activity, the necessary technical training and supervisory services will continue to be weak or even inexistent. Leech (2015) states that "*community gardeners are* [often] *operating from a platform which reeks of poverty, low skills levels and under-development*." (Leech, 2015: 89-90). Skills in efficient, safe and productive farming would seem to be considered 'lacking' in many cases. Furthermore, if urban agriculture is to provide an income for those involved, skills related to gaining a significant economic return for gardening activities would need to be obtained, as currently they are not considered high in eThekwini Leech, 2015: 90).

Crop and equipment theft is another issue for urban farmers. In Umlazi, eThekwini, urban farmers highlighted the issue of crop theft in their area as a constraint they had to deal with. Theft of crops are either as a source of conflict or because people in the area are hungry and have little other

option (Smith *et al*, 2005: 18). Incorporating these people into urban agricultural projects could thus combat this issue, as they would therefore not have the need to steal crops if they are also producing them. The same can be said about Ivory Park, Midrand. Urban farmers here reported crop theft as one of the major constraints they face, due to a lack of fencing and security (Nel and Rogerston, 2005: 246).

Other constraints to urban agriculture could be less predictable, such as disease born from wastewater and from pests such as mosquitoes. Malaria in many African countries is a serious threat to life for the poor, and accounts for large percentages of fatalities annually. Studies have been conducted to determine if the presence of mosquitos (who carry the disease) is higher in areas with urban agriculture. One such study conducted in Kumasi, Ghana. Authors Afrane, Klinkenberg, Drechsel, Owusu-Daakua, Garmsd, and Kruppa, (2004) concluded that it is plausible that open-irrigation systems in urban areas can increase the presence of mosquitoes by providing suitable breeding grounds. This suspicion was supported by fact, as the study showed that there were more reports of malaria near urban agriculture sites compared to control areas in both the wet and dry seasons (Afrane *et al*, 2004: 132). Malaria is a serious threat to the urban poor, who often lack the resources to obtain appropriate treatment.

Despite the many constraints that are preventing urban agriculture from flourishing in many cities, urban agriculture is still present and growing in popularity. For many people, urban agriculture is a life support system, and often these people have very few alternative options. As discussed by these authors, the benefits of urban agriculture cannot be ignored in this discussion, as they often outweigh any negative outcomes (Afrane *et al*, 2004: 133).

3.11 RELEVANT POLICIES AND LAWS

There are a number of laws and policies that affect urban agriculture from a town planning prospective. Authors van Wyk, Jewell and Ewang (2001) highlight these laws and policies in their paper titled *"Policy Guidelines for Agriculture In and Around Towns"*. The laws and policies highlighted in this paper are specific for KwaZulu-Natal and for South Africa. Each law or policy affects urban agriculture in its own unique way, yet they can all be used to advance urban agriculture to the point where it can successfully uplift a community and provide food security for local residents. These laws and policies include the following.

3.11.1 Relevant Policies

3.11.1.1 The White Paper on Agriculture for KwaZulu-Natal (1996)

The aim of this White Paper is to improve the quality of life for the agricultural community. It hopes to develop advanced yet environmentally responsible production systems. This White Paper is important to participants of urban agriculture as they are recognised as clients of the Department of Agriculture and therefore are potential beneficiaries of the departments many programs and support services (Van Wyk *et al*, 2001). These support services can be very beneficial for urban farmers, and include the following:

- Extension services;
- Training;
- Financing;
- Household food security;
- Disaster aid;
- Agricultural economics;
- Agricultural engineering technology;
- Marketing infrastructures; and,
- Irrigation and stock watering systems.

Source: Van Wyk *et al*, 2001

3.11.1.2 The White Paper on South African Land Policy (1997)

This White Paper is administered by the Department of Land Affairs, and it deals with the restitution, re-distribution and tenure reform as three major components to land reform. An important aspect of this policy paper for urban agriculture is the "grant for the Acquisition of land for municipal commonage". This grant will allow the municipality to extend or create commonage, for productive activities such as food gardens, eco-tourism, grazing and so forth, by or for the benefit of the poor and disadvantaged (Van Wyk *et al*, 2001). The ownership of the land will remain in the hands of the municipality; however, this land will be leased to qualified applicants. This grant is particularly important to the promotion of urban agriculture, as it will allow for the acquisition of land directly for agricultural use in urban areas.

3.11.1.3 The KwaZulu-Natal Appropriate Land Use Controls Study (1998)

A study was undertaken by the Town and Regional Planning Commission on appropriate land use controls in KwaZulu-Natal, where by a broad range of land uses where proposed to have 'use-rights' attached to them (Van Wyk *et al*, 2001). These proposed land use rights afford municipalities more say over the various types of land uses, which fall within their jurisdiction. Municipalities are expected to categorise land uses under the following headings:

- Uses permitted as Free Entry Rights;
- Uses permitted by Development Permit;
- Uses permitted by Conditional Use Permits; and,
- Prohibited uses.

This study provides urban agriculture with a more streamlined method of applying for use of land. It will allow urban agriculture to be included in town planning schemes under a broader range of appropriate use rights categories (Van Wyk *et al*, 2001).

3.11.1.4 Draft Policy for Public Open Space in Urban Areas of KwaZulu-Natal (1998)

The Town and Regional Planning Commission examined the identification, use and development of public open space. The resulting draft policy promotes the use of public open space by multiple uses and allows for the temporary use of the land in the interim. This is very important for urban agriculture, as these open spaces could be used for urban agriculture. There are many such sites in urban areas, which are often subjected to illegal dumping and invasion, therefore urban agriculture would be considered a useful and productive land use activity for such areas in the interim of finding a permanent use for the land (Van Wyk *et al*, 2001).

3.11.2 Relevant Laws

There are a multiple national laws and provincial statutes that relate to the management of urban agriculture. They are outlined in detail below.

3.11.2.1 The National Spatial Planning and Land Use Management Act (No. 6 of 2013)

The objects of this Act are to provide for a uniform, effective and comprehensive system of spatial planning and land use management for the Republic that promotes social and economic inclusion. *"The act is also in place to provide for development principles and norms and standards, and to redress the imbalances of the past and to ensure that there is equity in the application of spatial development planning and land use management systems"* (Government Gazette, 2013). This is relevant to urban agriculture as it needs to be considered a formal land use if it is to realise its full potential in 'urban agricultural hubs'.

Chapter 2 of this Act highlights development principles, norms, and standards that are to be adopted. The relevant principals, norms and standards are as follows:

i. Development Principles

The following principles apply to spatial planning, land development and land use management:

"*(b) the principle of spatial sustainability, whereby spatial planning and land use management systems must—*

(ii) ensure that special consideration is given to the protection of prime and unique agricultural land" (Government Gazette, 2013).

Prime agricultural land may not necessarily be in farm areas outside the city. One can argue that prime agricultural land could be where ever it is suitable and where agriculture could thrive. This could be in the form of an abandoned sport fields turned into community gardens for example. As for unique agricultural land, this could mean anywhere outside of the norm for agriculture, to include just about any form of urban agriculture. This Act therefore could be referenced in an argument in support of urban agricultural projects.

ii. **Norms and Standards**

This Act details that the Minister must, prescribe to norms and standards, of which the following is included:

"(2) The norms and standards must —

(iv) (include) mechanisms for identifying strategically located vacant or under-utilised land and for providing access to and the use of such land" (Government Gazette, 2013).

There are many pieces of land in and around urban areas that are currently under-utilised that would be suitable for the use of urban agricultural activities and the various benefits these activities have for the community and for the area.

This Act identifies "**agricultural purposes''** to mean the following:

"*purposes normally or otherwise reasonably associated with the use of land for agricultural activities, including the use of land for structures, buildings and dwelling units reasonably necessary for or related to the use of the land for agricultural activities*" (Government Gazette, 2013).

3.11.2.2 The KwaZulu-Natal Planning and Development Act (No 6 of 2008)

This act makes provisions for the preparation and management of development plans, rezoning of land, and the sub-division of land in a co-ordinated, harmonious and sustainable manor (Government Gazette, 2013). These development plans will also incorporate the principles and requirements of the Integrated Development Plan of a given area. This affects urban agriculture, as urban agriculture is an important land use that needs to be taken into account in any development plan. These plans should also identify appropriate locations, land-use mechanisms and application procedures for urban agriculture (Government Gazette, 2013). Treating and respecting urban agriculture as an important land use that needs to be taken into account right from the planning stages of development will be important in assuring its success.

3.11.2.3 The KwaZulu-Natal Land Affairs Act, 1992 (Act No. 11 of 1992)

This Act makes provision for the planning, development, establishment and administration of urban land and provides tenure rights through '*Permissions to Occupy'* and '*Deeds of Grant'*. This Act is fairly flexible in terms of accommodating for various land uses under certain conditions. Under this Act, urban agriculture as a land use can therefore be accommodated in urban areas when accompanied with guidelines and land use management mechanisms (Van Wyk *et al*, 2001).

2.11.2.4 The Water Services Act, (No of 1997)

This act requires any municipality or authority that is responsible for providing access to water services to prepare 'draft water services development plans'. The plan requires basic information about a towns water resources and a plan of use for the water for both domestic and other consumption. This act is important for urban agriculture as it considers details about the use and conservation of water for all major uses, therefore urban agriculture needs to be considered in these plans as it requires the use of municipal water (Van Wyk *et al*, 2001). This is more so for community gardens and larger urban agricultural fields in peri-urban areas.

3.11.2.5 Environmental Conservation Act, 1989 (Act No. 73 of 1989)

This act has important implications for urban agriculture, mainly in the change of land use. Schedule I of the regulations of the act require an application be made to the Department of Traditional and Environmental Affairs for approval of, or to determine the level of environmental assessment of, various activities (Van Wyk *et al*, 2001). This includes the change of land use of various activities. Examples include the following:

- Changing land use from grazing to any other form of agricultural land use
- Use for nature conservation or zoned open space to any other land use
- The concentration of livestock in a confined structure for the purpose of mass commercial production

Source: Van Wyk *et al*, 2001

3.11.2.6 NEMA – the National Environmental Management Act (Act No. 107 of 1998)

The National Environmental Management Act is relevant to urban agriculture because urban agriculture is an activity that occurs in urban areas and therefore may require environmental authorisation before it will be legal.

i. Purpose of Regulations

Outlined in chapter 1, section 2 of NEMA, the purpose this Act is to regulate the preparation, evaluation, submission, processing and consideration of, and decision on, applications for environmental authorisations for the commencement of activities, subjected to environmental impact assessment, in order to avoid or mitigate detrimental impacts on the environment, and to optimise positive environmental impacts, and for maters pertaining there to (Government Gazette, 2014). The Act highlights activities that would require environmental authorisation, what type, how to obtain the required authorisation, who the competent authority will be, the timeframes for an application and the content of an application and so on.

ii. Definitions

NEMA defines key concepts related to the Act, of which the following are relevant for this dissertation:

- "*agri-industrial*" means an undertaking involving the beneficiation of agricultural produce
- "*Concentration of animals*" means the keeping of animals in a confined space or structure, including a fed lot, where they are fed in order to prepare them for slaughter or to produce product such as milk or eggs; and,
- "*Small stock unit*" means domesticated units, including sheep, goats and pigs, as well as game, including but not limited to antelope and buck with an average adult male live weight of less than 10 kilograms.

Source: Government Gazette, 2014

iii. **Activities that require a Basic Assessment and Environmental Management Program:**

Activities that are relevant to urban agriculture that will require a Basic Assessment (BA) and Environmental Management Program (EMPr) are as follows:

Activity 5 of the list of activities:

"*The development and related operation of facilities or infrastructure for the concentration of -*

More than 10 poultry per facility situated within an urban area, excluding chicks younger than 20 days" (Government Gazette, 2014).

This regulation is relevant for community or other types of gardens that are found in an 'urban agricultural hub'. Keeping livestock, especially in the form of chickens or goats, is commonplace in urban areas in South Africa, more so in township areas. Including livestock in community gardens or urban agricultural hubs is an important aspect of urban agriculture. Urban agricultural gardens or 'hubs' will therefore need to become aware of this regulation if they are keeping chickens on site.

iv. Activities that require an EIA and EMPr:

Activity 13 of the list of activities that require a full Environmental Impact Assessment and EMPr is the only relevant activity for this dissertation. It reads as follows:

"*The physical alteration of virgin soil to agriculture, or afforestation for the purposes of commercial tree, timber or wood production of 10 hectares or more*"

NEAM defines "*Virgin Soil*" as "*land not cultivated for the preceding 10 years*" (Government Gazette, 2014).

This is relevant for urban agricultural practices as this is a broad terms that may be difficult to identify. Many open spaces or parks in urban areas that may be converted into food gardens have soil that has not been cultivated for the previous ten years. This could mean that any larger scale urban agricultural initiative or project may require a full Environmental Impact Assessment that will be costly and time consuming.

3.11.2.7 The Abattoir Hygiene Act, 1992 (Act No. 121 of 1992)

The Directorate of Veterinary Services administers this act and it applies to the keeping of livestock in urban areas. This act requires that proper maintenance and standards of hygiene be kept in the slaughtering of animals and in the handling of meat and other animal products (Van Wyk *et al*, 2001). This Act will be relevant for the keeping of livestock in community gardens, especially if these animals will be slaughtered for their meat.

3.11.2.8 The Local Government Transition Act, Second Amendment (Act No. 97 of 1996)

This Act gives municipalities the authority to adopt by-laws that complement existing planning and development legislation. These by-laws are developed over time usually through the complaints of residents and are related to preventing noise, nuisance, smell, pollution, and unhygienic conditions and to promoting public health in general (Van Wyk *et al*, 2001). This act is applicable for urban agriculture when developing appropriate land use management mechanisms for urban agriculture, especially the keeping of livestock (Van Wyk *et al*, 2001). Composting is another example, if enough people object to compost piles or composting techniques within their area, this may hinder its application for community gardens.

3.11.2.9 The Less Formal Township Establishment Act, 1991 (Act No. 113 of 1991)

This Act can be used as a mechanism to establish lower income residential areas in KwaZulu-Natal, and provides land use conditions that need to be prepared, published and included into the title deeds registered with the Deeds Office. This Act is applicable to urban agriculture as these conditions are flexible and can include urban agriculture as a land use condition (Van Wyk *et al*, 2001).

3.11.2.10 The Health Act, 1977 (Act No. 63 of 1977)

This Act is administered by the Department of Health and is mostly implemented in areas with a lack of a formal municipality structure. This Act controls the use and disposal of wastewater and the operations of 'kitchen abattoirs' and contains regulations relating to offensive trades (Van Wyk *et al*, 2001). The Act relates to urban agriculture in the way that it prevents certain activities that could possibly be offensive to other local residents. Examples include the production of compost or fertiliser, the slaughtering of animals in one's kitchen or backyard, or drying of meat and so on.

3.11.2.11 The Conservation of Agricultural Resources Act, 1993 (Act No. 43 of 1993)

The Directorate of Engineering Resource Conservation in the Department of Agriculture enforces this Act. It provides for the control over the use of natural agricultural resources in order to conserve soil and water resources as well as vegetation. This Act usually applies in areas without a formal municipality structure; however it can be applied in peri-urban areas and on commonage land to promote environmentally sound urban agriculture (Van Wyk *et al*, 2001).

3.11.2.12 Fencing Act, 1963 (Act No. 31 of 1963)

This Act regulates matters to do with boundary fences, and can be applicable to certain types of urban agriculture that require fencing such as community gardens or the keeping of livestock (Van Wyk *et al*, 2001).

3.12 THE ETHEKWINI INTEGRATED DEVELOPMENT PLAN (IDP 2012/13 TO 2016/17)

3.12.1 Key Development Challenges identified by the Integrated Development Plan (IDP)

The Integrated Development Plan has identified some key development challenges. The following are relevant to this dissertation:

- High levels of poverty;
- Increased incidents of HIV/AIDS;
- Loss of natural capital;
- Ensuring food security; and,
- Climate change.

Source: IDP Annual Review, 2013/2014

All of the above are linked in some way to urban agriculture, or can be positively impacted upon by the activity.

3.12.2 Ensuring Food Security

Hunger and food insecurity are two challenges that have been identified by the IDP as a great threat to communities residing within eThekwini Municipality. Challenges that have lead to this problem of hunger and food insecurity include:

- High levels of hunger and food insecurity;
- Shortage of arable/fertile land to undertake food production;
- High unemployment rates lead to low purchasing power;
- Inadequate safety net, few household income earners and high dependency ratios exacerbates the situation; and,
- Impact of climate change on food security.

Source: IDP Annual Review, 2013/2014

A key challenge however, identified by the IDP, in alleviating the problem is the ability to create or recognise opportunities for the local production of food. The Municipality has initiated a number of programs to assist in the alleviation of food insecurity, including aqua and poultry farming programs, soya bean projects, community support farms, one home one garden project and so on. These however are not yet realising their full potential and need to be combined within each community in the form of an urban agricultural hub (IDP Annual Review, 2013/2014).

The eThekwini Municipality has an "Agro ecology" Program in place, which is in line with other municipal policies, which focus on poverty and unemployment through sustainable urban and per-urban farming. The aim of this Agro ecology Program is to promote sustainable approaches to the planning and implemented of agriculture in urban and per-urban areas. Six agricultural support hubs have been established or under development that contain demonstration sites of agro ecology techniques, a research and development centre on agro ecology, training sites, packing and marketing hub and a future seed bank.

The hubs are as follows:

- Northdene Agro ecology Research and Development Centre;
- Newlands-Mashu Permaculture Centre;
- Inchanga, Scorpio Place in Mariannridge;
- Mariannhill Monastery; and
- Umbumbulu

Source: IDP Annual Review, 2013/2014

According to the IDP, these programs prime targets are those who need them the most and where the most impact can be made with limited resources. These programs, even if they are still under development, show that the Municipality is in full support of such programs. An agricultural hub, with a community garden as a centre point with an education centre, seed bank and support for families also growing food in their own gardens is therefore not a far-fetched idea. Such an idea is in line with the municipality's policy and in line with battling key challenges identified by the municipality.

3.13 TOWN PLANNING SCHEMES

Many urban areas in KwaZulu-Natal and in South Africa have town-planning schemes. These schemes are affective tools in managing land uses, and allow municipalities to organise the use of land into zones in which the land use is either allowed or prohibited (Van Wyk *et al*, 2001). Most schemes already manage the use of agricultural land by defining what is allowed in agricultural areas (usually outside a scheme). These schemes however could potentially include urban agriculture as a viable land use zone, or simply an allowed use within key zones (such as residential zones) within urban areas that are within the scheme area (Van Wyk *et al*, 2001).

The eThekwini Municipality has developed a land use management system for the whole Municipal area as required by Section 26 of the Municipal Systems Act (2000). The Spatial Development Framework (SDF) is the spatial translation of the development context and development vision of the Municipality. It is the primary Land Use Management tool of the Municipality (IDP Annual

Review, 2013/2014).

Spatial Development Plans, or schemes, have also been prepared for the North, South, Central and West (inner and outer west) planning regions. Spatial Development Plans provide planning guidance for each planning region. They essentially translate the spatial intentions of the SDF by:

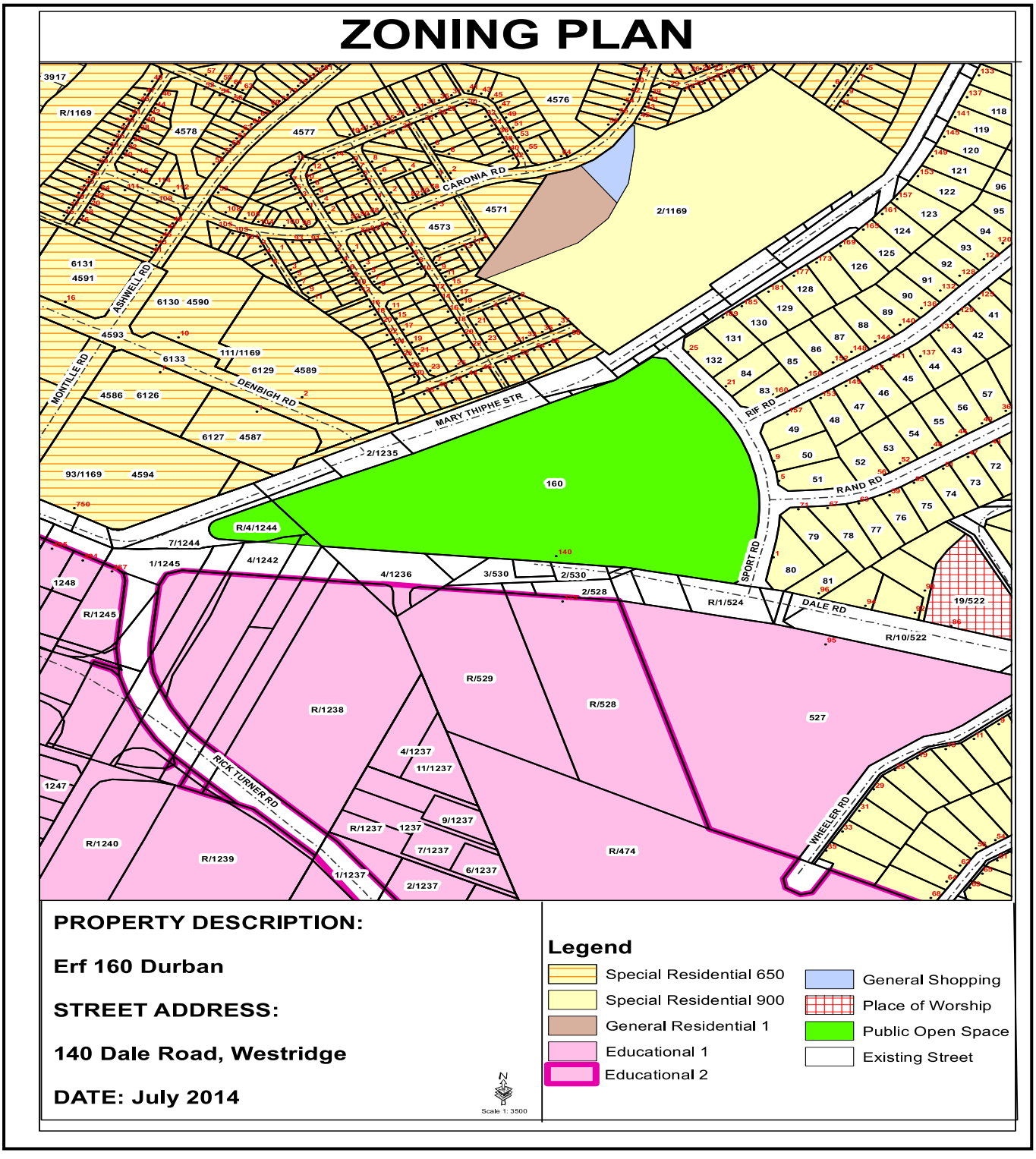
- Indicating the short, medium and long term growth and development opportunities;
- Managing future development;
- Identifying the Municipalities development priorities and phasing;
- Providing land use, environmental, transport planning;
- Directing bulk infrastructure to guide more detailed planning within Local Areas; and,
- Informs the 'Land Use Schemes'.

Source: IDP Annual Review, 2013/2014

The SDF or Scheme relevant to this dissertation and the proposed development is the Central Scheme. This Scheme is for the central region of the municipality, which is essentially the Urban Core of the municipality. The boundaries of the Central SDF begin at the Umgeni River, in the North, along the coast through to the Umlaas Canal in the South and extend to the escarpment in the west encompassing an area of 677 square kilometres.

According to the Central Spatial Development Framework (SDF), the study area for this dissertation falls within an area zoned as Public Open Space. On the next page is a zoning map of the site, indicating its zone as Public Open Space. This map also shows the surrounding zoning of Education 1, Education 2, Special Residential 650 and Special Residential 900. This is important, as certain types of development would not be allowed in certain zones. According to the municipality, they would allow the use of this land for a community garden and small education centre/ seed bank under a Special Consent Application for the zone Public Open Space.

Map 9: Zoning Plan for Cato Manor



Source: Municipality of KwaZulu Natal Zoning Extract

3.14 THE MILLENNIUM DEVELOPMENT GOALS AND SUSTAINABLE DEVELOPMENT GOALS

World leaders gathered at the United Nations to develop and shape a broad vision to fight poverty in its many dimensions. That vision has been translated into eight Millennium Development Goals (MDGs). These MDG's have since remained the overarching development framework for the world for the past 15 years (UN, 2015). These eight MDG's include the following:

- Goal 1: Eradicate extreme poverty and hunger;
- Goal 2: Achieve universal primary education;
- Goal 3: Promote gender equality and empower women;
- Goal 4: Reduce child mortality;
- Goal 5: Improve maternal health;
- Goal 6: Combat HIV/AIDS, malaria and other diseases;
- Goal 7: Ensure environmental sustainability; and,
- Goal 8: Develop a global partnership for development.

Source: United Nations, 2015a: 4-7

Following the UN Conference on Sustainable Development (Rio+20) in 2012, an international agreement was reached and the 17 new Sustainable Development Goals (SDGs) to guide the path of sustainable development in the world after 2015 were created. These goals are anticipated to be "*action-oriented, concise and easy to communicate, limited in number, aspirational, global in nature and universally applicable to all countries, while taking into account different national realities, capacities and levels of development and respecting national policies and priorities." They should be "focused on priority areas for the achievement of sustainable development.*"

These SDG's include the following:

- Goal 1: End poverty in all its forms everywhere
- Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture
- Goal 3: Ensure healthy lives and promote well-being for all at all ages
- Goal 4: Ensure inclusive and equitable quality education and promote lifelong learning

opportunities for all

- Goal 5: Achieve gender equality and empower all women and girls
- Goal 6: Ensure availability and sustainable management of water and sanitation for all
- Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all
- Goal 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
- Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
- Goal 10: Reduce inequality within and among countries
- Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable
- Goal 12: Ensure sustainable consumption and production patterns
- Goal 13: Take urgent action to combat climate change and its impacts*
- Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development
- Goal 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
- Goal 16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
- Goal 17: Strengthen the means of implementation and revitalize the global partnership for sustainable development

Source: United Nations, 2015b: 12

Urban agriculture has the potential to assist in achieving a number of these goals and objectives, as has been highlighted already in previous sections. Eradicating extreme poverty and hunger, improving food security and improving nutrition are the first of the MDG's and SDG's. Urban agriculture as a practice provides those involved with an immediate supply of food, as well as potentially providing an income (as well as savings) through the sale of surplus produce. This essentially combats poverty and hungry directly, and improves nutritional intake by diversifying diets.

For urban agriculture to assist in promoting gender equality and empower women (the second MDG and fifth SDG), women urban producers should be assisted where possible, through government and NGO initiatives, providing them with knowledge, skills, inputs and access to markets.

With regards to reducing child mortality and improving maternal health (MDG numbers four and five and SDG number three in general), urban agriculture contributes in the sense of improving health in general amongst those involved. As shown earlier, poorer households generally consume nutrient deficient bulk foods (due to them being inexpensive). Urban agriculture has been shown to diversify diets and improve the intake of essential nutrients for human health. Thus, by improving health in general, urban agriculture potentially could assist in reducing child mortality and improve maternal health, and in general improve the well-being for all at all ages.

When it comes to combating HIV/AIDS, malaria and other diseases (MDG 6), urban agriculture may not constitute an ultimate solution to these epidemics. However, urban agriculture can assist those who suffer from these diseases, and it can reduce the likelihood of contraction. Poverty and malnutrition worsen already dire situations when people are seriously ill. In this sense, growing food for ones self or for a family member who's sick will improve the immune system of those involved by again improving their diets (and more importantly their intake of vital nutrients). This is especially important for those with HIV. Similarly, improved immune systems of those who are not sick reduce their chances of getting sick in the first place.

Urban agriculture, if practiced sustainably, is not only an environmentally sustainable practice, but can also reduce green house gases in the atmosphere. This fact, coupled with the biodiversity benefits of urban agriculture as disused earlier, means that urban agriculture is inline with the seventh MDG and the 12th and 13th SDG's. As shown earlier, urban agriculture has a wide range of benefits for the communities involved and therefore contributes or is at least in line with many of the MDG's and SDG's, especially for the poor. Urban agriculture therefore should be encouraged in the growing poor areas within and along cities as a survival strategy and as a way for people to feed themselves and improve their lives in general.

3.15 CONCLUSION

"Fine words do not produce food."

- Nigerian Proverb

"An empty stomach is not a good political advisor."

- Albert Einstein

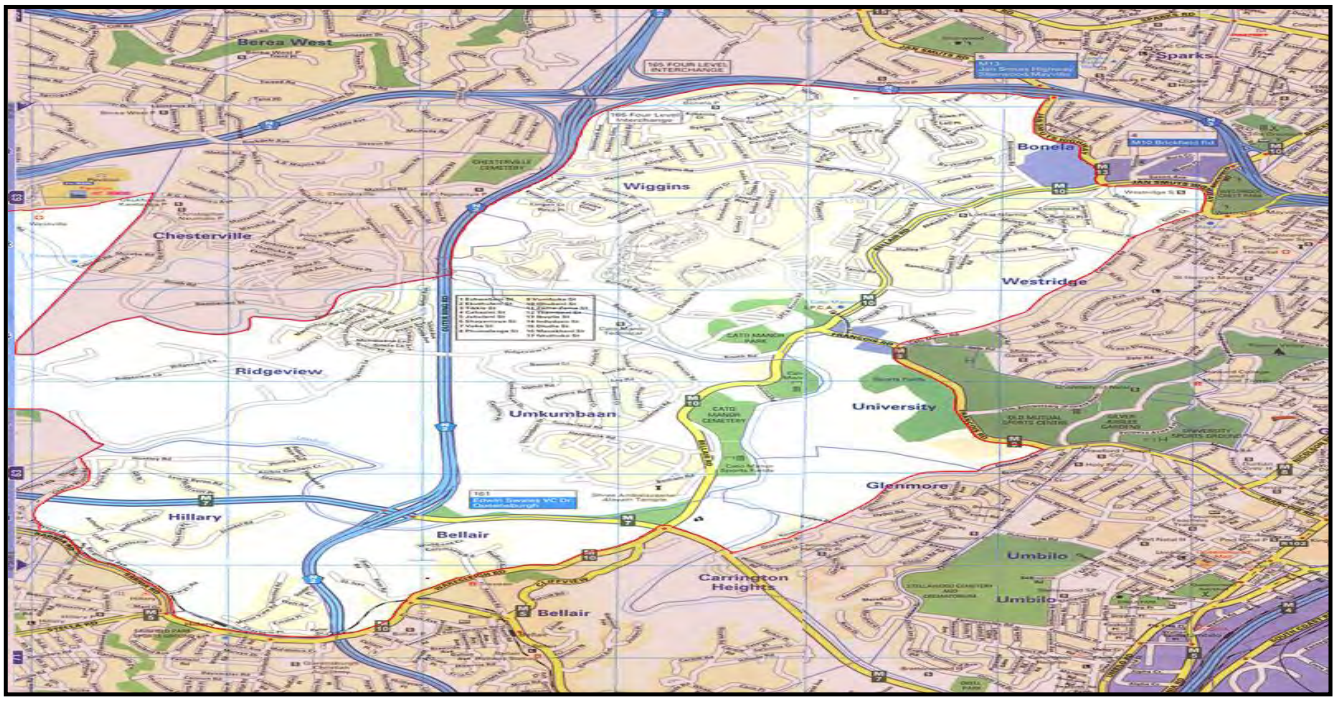
The literature on urban agriculture is vast, and it all indicates that despite various challenges, urban agriculture is a viable and sustainable practice that has the potential to benefit a wide range of people and communities. The literature also indicates that urban agriculture has been proven to improve food security already in many poorer communities around the world, and has up-lifted the community in general. This biggest challenge is not the lack of resources, the contamination of water and soil, the increase levels of air pollution, the lack of policies allowing for it, nor the fact that people want fresh and healthier foods, but rather the lack of physical action being done on the ground in our communities. There will be no action with regard to urban agricultural projects without the supporting framework to allow it implementation. Initiatives, such as the establishment of community gardens and urban agricultural hubs with seed banks and education centres need to be spear headed by a champion, such as a responsible authority, Non-Government Organization (NGO), Community Based Organisation (CBO) or a community group. Local government will need to step in during the feasibility and start phases of the project and to assist with maintenance costs, which will be low for such initiatives. All of the constraints highlighted by the literature can be overcome and addressed. As Edmund Burke states "*All that is required for evil to flourish is that good men do nothing*." In a similar observation, starvation and poverty rises when good people do nothing. The lack of action will be greatest challenge in the realisation of urban agricultures potential.

CHAPTER FOUR: THE CATO MANOR CASE STUDY AREA AND RESEARCH METHODOLOGY

4.0 INTRODUCTION

Cantor Manor is the focus of this dissertation. The question could well be posed, why Cato Manor and not another case study area in eThekwini? This chapter explores Cato Manor, its history, economic and social status, its physical layout and developmental challenges. By doing so, it answers the question posed and shows through an analysis of the area that Cato Manor has the potential to be the location of a pilot project for urban agriculture in the form of an 'urban agricultural hub'. Then the chapter addresses the question of how the research was carried out for this dissertation by exploring the research methodology applied during the research.

Map 10: Map of the Greater Cato Manor Area



Source: http://www.quazoo.com/q/Cato_Manor

Cato Manor is located roughly ten kilometres inland from the Durban Central Business District (CBD) and the harbour, behind the University of KwaZulu-Natal. It includes the smaller areas of Wiggins

and a portion of Bonela in the northern end, Ridgeview on the eastern border, portions of Hillary and Bellaire at the south end and Umkumbaan in the centre. Map 10 highlights the area that falls into 'Greater Cato Manor'. The study area will be located in a smaller area within Cato Manor, in an area known as the Cato Crest. Map 11 outlines the proposed case study area.

4.1 BRIEF HISTORICAL BACKGROUND

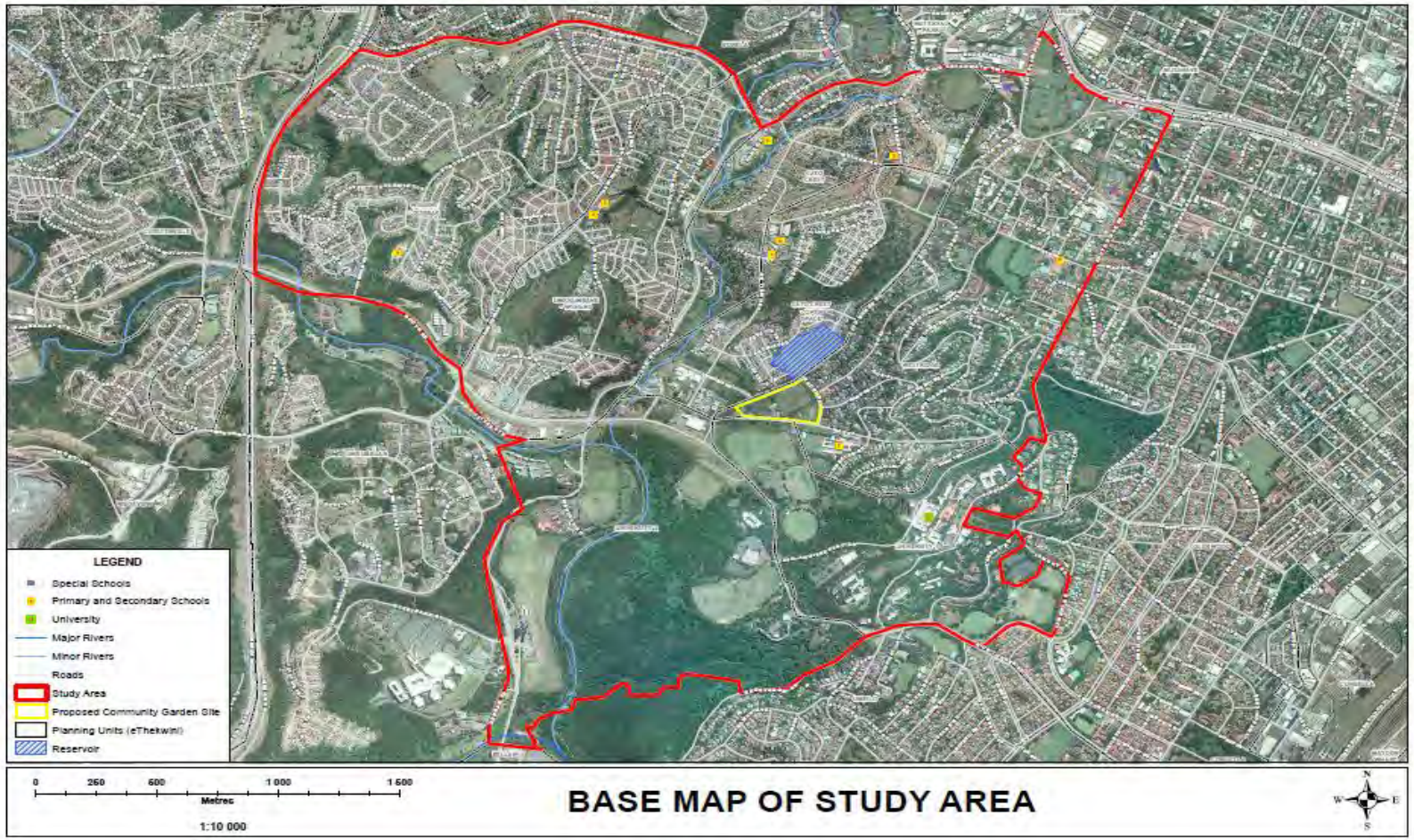
The following section outlines the broad historical context of the broader area known as Cato Manor and within which the specific study area of Cato Crest is situated.

4.1.1 Cato Manor Pre-1994

Cato Manor has a rich and yet troublesome history, with racial segregation and contestation over the ownership and control of land in the area. The name "Cato Manor" was derived from the area's first official mayor of Durban, George Cato, who was granted ownership to this land in 1845. George Cato, his family and his descendants farmed the land up until the 1900s. It was then subdivided into smaller farms and rented out or sold to a number of Indian market gardeners (Walker, 2008: 149). This area was well suited for these gardeners, who were growing mainly bananas at the time, as it was close to their markets in Durban (Maylam, 1983: 413).

By the 1920s, the African population of Cato Manor began to grow. Indian landowners and tenants saw an opportunity to turn a profit and began leasing portions of their land to this growing African population (Maylam, 1983: 413). During 1932, the Cato Manor area was in incorporated into the administrative area of Durban's Municipality, and therefore these squatter settlements that were growing in Cato Manor where considered illegal, yet "*tolerated*" by the authorities (Robinson *et al*, 2004: 27-28). By 1943, the African population in this area grew to an estimated 17,000 people. Authorities and residents in surrounding areas soon become concerned with this growing African population and the resulting squatter settlements (Robinson *et al*, 2004: 28). As seen by Plate 5, many of these settlements where dense, un-serviced and where believed to be a health and safety risk.

Map 11: Locality Map of the Case Study Area in Cato Manor eThekwini



Source: HMP GeoSpace

Plate 6: Pre 1950 Houses in Cato Manor

Source: http://www.mantramedia.us/sites/cmt/images/hist_sepia.jpg

In 1949, a major turn in the settlement patterns and social relations of the area came about after the "Durban Riots" (see Plate 6 in text). Violent riots against the Indian residents where sparked off after an Indian man allegedly assaulted an African boy at a bus stop, which resulted in many Indian residents fleeing the area (Walker, 2008: 150-151). By 1950, squatter settlements had increased in density to house as many as 45,000 to 50,000 people. Post 1948, the government policy of racial segregation became pronounced particularly with the promulgation of the Group Areas Act No. 41 of 1950 and the Illegal Squatting Act No. 52 of 1951. Both statutes were used along with the land acts to sanitise urban areas through a programme of forced removals and relocation. In 1958, Cato Manor was proclaimed as a 'White' area under the Group Areas Act No. 41 of 1950 (Walker, 2008: 151). After nine policemen were killed by a mob in an emergency camp in 1960, the tide turned for Cato Manor as authorities no longer turned a blind eye, and began to clamp down with rapid clearances (Robinson *et al*, 2004: 31).

Plate 7: Cato Manor Riots 1949

Source: http://www.mantramedia.us/sites/cmt/images/hist_l_04.jpg

In the early 1990s, as the country moved into a democracy, Cato Manor once again experienced an influx of informal settlers. By 1992, there was an estimated 28,000 informal households in the area (Walker, 2008: 154). In 1993, the Cato Manor Development Association (CMDA) was formed after many negotiations, which aimed to facilitate the re-development of Cato Manor and to create an "*efficient and productive city-within-a-city*" (Walker, 2008: 155).

4.1.2 Cato Manor Post 1994

South Africa's democracy was born in 1994, after the nationalist government and the African National Congress (ANC) reached a political settlement and a universal franchise was introduced. In the post-election era, the focus of the government was encapsulated in the Reconstruction and Development Programme (RDP). From this four key urban projects were identified in Cape Town, Pretoria (now Tshwane), Durban and Johannesburg. Cato Manor soon became one of the largest lead projects for development in 1995, gaining the status of Special Presidential Project alongside the likes of Sophia town and District Six (Cele, 2010: 11). It was the first site identified in Durban where integrated housing and community development were interlinked in a formerly reserved area in a massive reconstruction and development project. The project served as an example for other

major inner city development initiatives and projects (EU Final Report, 2003). As part of this process, land claims where lodged in terms of the Land Restitution Act (No. 78 of 1996), by former owners of the area.

External funding was a major factor in the potential success of these exemplary projects. For this reason, Cato Manor received a large portion of the local government's attention and resources, along with external funding mainly from the European Union (Cato Manor Social Development Strategy Review, 2005: 1). The Cato Manor Development Programme (CMDP), which was under the CMDA, reflected the type of political change that was unfolding in South Africa. This change was associated with integrating the 'previously disadvantaged' with the mainstream development of the nation (Cele, 2010: 11). The CMDP aimed to provide the following to the Cato Manor area:

> "*…affordable housing and security of tenure; the development of Cato Manor's infrastructure, including bulk services to reduce disparities created during apartheid; the improvement of access between people's homes and places of work, social facilities and shopping sites; the establishment of safe and secure living and working environments; the provision of jobs and extensive economic opportunities; and the integration of Cato Manor into the eThekwini Municipality spatially, politically, economically and socially.*"

Source: Cato Manor Development Project Review, 2002:1

According to the EU Final Report, the CMDA managed to achieve most of its goals in terms of planning and providing infrastructure, as well as securing investment by 2002 (Cele, 2010: 12). From 2003 onwards, the continuing development initiatives in the area have been managed through the Area Based Management Programme Office of the eThekwini Municipality, and the focus has shifted slightly towards social and economic development (Cele, 2010: 12). Cato Manor's Local Economic Development Programme aims to provide the people of Cato Manor with a skills base that will empower them to access economic opportunities. The programme hopes to increase investment in the area through innovative projects that will address poverty, and that can be replicated in other areas (Cele, 2010: 12). Urban agricultural projects, such as the one proposed in this study, fit perfectly into the development focus of the area. In fact, urban agricultural projects were evident in the CMDA's plans from the beginning. By 2002, according to Robinson *et al* (2004), 75 urban

agricultural projects (ranging in size) where developed, with a further 90 in progress. These included (but not exclusively) fruit tree projects, community gardens, and slope gardens for stabilising soils on steep slopes. The planting of fruit trees occurred in playgrounds, local parks and they were also given to homeowners, along with a planting kit (Robinson *et al*, 2004: 126). As part of the Local Economic Development programs, local residents were trained to utilise steep slopes for the planting of food crops that would stabilise the soils and prevent soil erosion, while also providing these farmers with an opportunity to generate a small income (Robinson *et al*, 2004: 130). A total of 165 urban agricultural practitioners were trained in various skills related to urban agriculture (55 female and 45 male) and provided with tools, as part of the local economic development initiative in Cato Manor. This training was not exclusively for slope gardens, but also community gardens and various other projects[8] (Robinson *et al*, 2004: 323).

4.2 CATO MANOR'S ECONOMIC STATUS

Economically, Cato Manor is not considered affluent. Nearly 50 per cent of the Cato Manor population lives on less than R 500.00 per month, which is on below the per capita poverty line (Set at R476.30) (Cele, 2010: 13). Therefore Cato Manor is considered a poor area. Unemployment is another concern impacting on the development of the area. Current statistics show a profile where only 44 per cent of the population are economic active; with 27 per cent of Cato Manors population involved in the informal sector and the remaining 29 per cent unemployed (Cele, 2010: 13). The majority of the unemployed and those in the informal sector live in the informal settlements that are spread throughout the area. Those living in formal housing seem to make up the majority of the 44 per cent of the employed in general. Educational levels between the two class divides are also uneven in favour of the formal areas (Cele, 2010: 13).

Interestingly, the 1996 population census revealed that Cato Manor has a high number of female-headed households, with as many as 40 per cent of the households in the area being headed by a female. In these households, the female head of house had a number of children and elderly that depended on them, placing further economic pressure on these women (Cele, 2010: 13). This fact is relevant to this research, as urban agriculture is a tool that these women could use not only to feed their dependents, but also an opportunity to raise a small additional income.

8 Robinson *et al* (2004) does not go into depth on the success or failure of these projects, however this section provides a narrative account of the intentions that the CMDA had for the area in terms of urban agricultural projects.

4.3 SOCIAL ANALYSIS

Socially, Cato Crest is divided into two classes. The formal housing found in the area makes up the middle-class residents. Across the reservoir, there is a large informal settlement, making up the lower-class residents. These two classes rarely mix, however they can both benefit from urban agriculture in different ways. Also in close proximity to the study area are two primary schools and the University of KwaZulu-Natal (UKZN). These institutions could also benefit from Urban Agricultural activities in the area, especially in the form of a community or educational garden. This could be a critical component of future 'urban agricultural hubs'.

4.4 PHYSICAL ANALYSIS

Cato Crest is generally quite flat which contrasts with Cato Manor, which is hilly and undulating. This will be favourable to the implementation of urban agricultural practices. Within the study area there is an unused sports field (Mandene Sports Club), right next door to a water reservoir. This makes it an ideal site for a community garden. It is also placed within walking distance of both the middle and lower class residents, thus accessible by everyone. There are roads along three boundaries to the field, linking the residential area, the informal settlement, the reservoir and the sports club. This adds to the proposed gardens site's accessibility. KwaZulu-Natal's subtropical climate provides the area with enough rainfall to support such a garden. However, during drier times, there is a reservoir close by to access water[9].

4.5 RESEARCH METHODOLOGY

In order to analyse the study area (Mandene Sports Club and the surrounding area of Cato Crest), to assess resident's perspectives of urban agriculture, and to assess the potential introduction of urban agriculture to the area, various tasks have been undertaken. The research used for this dissertation employs a methodology that is both quantitative and qualitative. Its methodological approach includes the use of structured questionnaires, interviews, and observation studies. This section will explore and unpack the perceptions and attitudes of those living within the case study area and explore their concept of, and attitude towards urban agriculture. In its analysis, the research will explore the acceptability of the creation of an urban agricultural hub amongst the participants. An

9 Due to the reservoir's location on elevated ground (in relation to the proposed community garden site) it is possible to tap into this source and have water gravity fed to the proposed community garden in times of need. Water from water harvesting techniques would however be preferable when possible.

assessment will be made of resident's preferences in terms of the kinds of crops they would like to grow in their own backyards and roofs (if and where possible), as well as those they would like to be grown in the community garden. The research aims to provide a professional understanding of the feasibility of establishing an urban agricultural hub in Cato Manor and the suitability of the site identified in Cato Crest. These professional perspectives will be undertaken by conducting interviews with planning and development professionals and experts on local economic development initiatives. The hub is an area where various types of urban agriculture are being practiced, for the purpose of benefiting the local community. Further interviews were conducted with former members of the Cato Manor Development Association, in order to gain information on any previous urban agricultural projects in the area.

4.6 A Physical Analysis of Mandene Sports Club and Cato Manor

The first step in this research was to conduct a physical inspection of the case study area in order to determine the feasibility of the proposed urban hub and to identify a site for its implementation. A drive and walk around of the area was done, during which time a number of photographs and land use analysis was undertaken in order to gain a more intimate understanding of the area, its needs and shortcomings, as well as its potential ability to host various forms of urban agriculture. The social, economic and spatial aspects of the study area was also analysed, revealing two separate classes of people living next door to one another, with a sports field in the middle, which was ideal for this study.

4.7 Literature Review and Conceptual Framework

The next step of this dissertation was to gain access to relevant literature on urban agriculture. Various sources were used and included published literature, books, journal articles, legal documents, news articles, the worldwide web, and grey material in the form of official reports and feasibility studies. Pertinent models and methods from practice and case studies were analysed. The conceptual framework outlines the various concepts and theories that inform this study and urban agriculture in general. The literature review helped the researcher to understand the perspectives and terms used in urban agriculture, which assisted in formulating the focus of this study as well as outlining existing knowledge of the given topic. The various sources used assisted in formulating the literature review and conceptual framework chapters of this dissertation. These chapters assist in outlining the procedures of urban agriculture, as well as the various laws and policies that affect urban agriculture in this province. These chapters also highlight controversial

issues that surround the concept of urban agriculture, and how they relate to or are external to current approaches in planning and development.

4.8 QUESTIONNAIRE SURVEYS FOR THE LOCAL RESIDENTS OF CATO MANOR

This research made use of three different questionnaire surveys. The first questionnaire was intended for use at the local level where residents within a three-kilometre radius of the proposed community garden site (The former Mandene Sports Club) were interviewed. A four-page survey form was developed, and was designed to structure interviews with a sample group of 60 people who reside in the immediate area, as they will be most affected by any change in the area[10]. Thirty residents from the middle class homes who live directly opposite the proposed community garden site were interviewed. These residents are presumed to fit into the middle class category as they live in formally built houses, with full access to services and with recognised street addresses. The remaining 30 residents interviewed reside in the informal settlements, which are located on the other side of the reservoir. These residents are also within three-kilometres of the proposed community garden site. A sample size of 60 was chosen based on recommendations on minimum sample sizes for dissertations. This recommendation was to have a minimum sample size of 30, therefore it was felt that doubling this number, and including two class divides, would be appropriate. A copy of this survey questionnaire is included in this dissertation as Appendix 1.

The reason for the division of survey interviews was to gain an understanding of the needs and wants of the two different types of residents who may gain differently from urban agriculture. Every second home was asked to participate, and if for any reason one was not available or unwilling to participate, the adjacent house on the left was used, and so on. If those living in the home were willing to participate, they were asked the questions on the survey in an informal manor, to resemble more of a conversation than an interrogation. This was done to keep the participant comfortable and it resulted in more accurate answers. This technique of selection occurred in both the middle class formal housing area, and the informal housing area on the other side of the reservoir. A Zulu translator accompanied the researcher while conducting interviews, as too assist in any language barriers that were encountered. A comparison of the different responses between these two groups (middle and lower class) will also be made later in this dissertation. These

[10] It should be noted that the name and address of those interviewed were not asked for, for ethical reasons and in order to keep those involved anonymous for their own comfort.

understandings are important if there is any hope of such a project to be successful. This part represents the quantitative aspect of the research.

4.9 THE QUESTIONNAIRE SURVEY FOR INTERVIEWING THE PROFESSIONAL EXPERTS

A second questionnaire was used to guide face-to-face interviews conducted with six professionals in related fields[11] (see Appendix 2). These professionals where selected by the 'snow ball effect 'and by availability. This occurs when a professional interviewed may suggest another who is knowledgeable on this topic and so on. These professionals where interviewed to ascertain their understanding of the benefits and challenges of urban agriculture, and to gain some advice on how to proceed in this research. The professionals where selected from the fields of Architecture, Planning, and Horticulture, with two from each field being interviewed. Interviews were arranged and then conducted at the offices of the professional as not to inconvenience them any further.

4.10 THE QUESTIONNAIRE SURVEY FOR INTERVIEWING PREVIOUS MEMBERS OF THE CATO MANOR DEVELOPMENT ASSOCIATION

During this research, it became apparent that there were previous urban agricultural projects in the area of Cato Manor. These projects were developed and supported by the Cato Manor Development Association. These projects however seem to have either failed or ended for unknown reasons. A third questionnaire was developed to guide interviews with previous members of the CMDA to ascertain what happened to these projects, if they failed and why[12]. This information is important to this study, as it will provide examples of what is required for the success of such projects. It will also highlight possible factors that this study may have overlooked, that will need to be addressed for further urban agricultural projects. Finally, such information potentially highlights who should be managing such projects. These interviews were conducted telephonically due to time and distance constraints.

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11 The above applies for the professionals interviewed as well

12 Again, the names and addressed of those interviewed were not asked for, for ethical reasons and in order to keep those involved anonymous for their own comfort.

4.11 DATA CAPTURE AND ANALYSIS

The data obtained from the various studies, surveys, questionnaires and interviews were analysed. The results have been tabulated in order to determine numbers and percentages of the various responses and attitudes of the local residents. The use of tables, graphs and photographs are used to support the findings. The results were then analysed to determine the attitudes and responses that the participants had towards urban agriculture. The responses of the two groups of local residents were compared to evaluate the similarities and differences between them. It was anticipated that the survey results would indicate how the local residents will want their community garden to be run, and what its purpose will be through what is grown in this garden. The analysis of the results also helped determine if enough people in the area would be interested in participating, which will determine the likelihood of the potential success of the garden and the urban agricultural hub.

4.13 CONCLUSION

In conclusion, it is stated that Cato Manor is a very suitable place for this research. Firstly, the areas typography and history with market gardens proves that it is possible in the area and makes it an idea starting point for urban agricultural activities. Secondly, the area is home to many poorer informal settlers who could benefit greatly from the food security benefits of urban agriculture, many of which are already involved in limited amounts. Thirdly, urban agricultural projects and community gardens will bring people from different groups together who have historically been divided, working together for the common good of the people in the area. More so, the many underutilised sports fields and unused open spaces provide idea locations for start-up community gardens and associated markets. Given the area's history, a project such as an urban agricultural hub has the potential to support internal efforts by residents to uplift the community.

This chapter has also briefly discussed the methods and procedures that where employed in order to conduct the research in the case study area. The data obtained through the research via questionnaires, interviews, and maps were thereafter analysed to propose recommendations for the future research and for future potential applications of urban agriculture or gardens in the area.

CHAPTER 5: RESULTS AND FINDINGS

5.0 INTRODUCTION

Will the introduction of an urban agricultural hub be feasible in Cato Manor? This chapter sets out to answer this very important question by assessing if there is a space for this practice, if people are interested in participating, how many people are already involved in some for of urban agriculture and if the local residents and relevant professionals support the practice of urban agriculture in general.

5.1 OBSERVATION STUDY

The heart of the study area chosen for this dissertation is the Mandene Sports Club. This sports club has become run down and over grown, with little to no sport being played here[13]. The fences that once surrounded the grounds have been broken down and in some sections they are missing altogether. The buildings that once housed squash quarts and a clubhouse have been abandoned and are derelict. This site is however perfect for the use of a community garden. The area is completely flat, it is large, and the buildings can be easily restored for other uses such as an office, storage facility and an educational centre. Electricity and water supply are available. The climate of KwaZulu-Natal, along with a reservoir just across the road, makes this location ideal. Adjacent to this sports club are the middle class local residents of Cato Manor. On the other side of the reservoir, within walking distance of the sports club, is a large informal settlement. These two groups of people will benefit from a community garden in different, yet similar ways. There are many small roads linking the sports club, the middle class housing, the reservoir, and the informal settlement. This makes the sports club very accessible. The following plates numbered 7 to 10 provide a pictorial impression of the current state of the unused site.

[13] This assumption was made based on many site visits during the research period, on various different days of the week and at different times, with no sport been seen to be played. The question of whether or not sport is played here should however have been included in the questionnaires, which represents a limitation to this study.

Plate 8: The Proposed Community Garden Site

Source: Researcher, 2014

Plate 9: The Proposed Community Garden Site

Source: Researcher, 2014

Plate 10: Abandoned Club House/ Administration Offices

Source: Researcher, 2014

Plate 11: Abandoned Club House/Administration Offices

Source: Researcher, 2014

Plate 12: The Abandoned Squash Court

Source: Researcher, 2014

Plate 13: The Abandoned Squash Courts

Source: Researcher, 2014

Plate 14: Overgrown Tennis Courts

Source: Researcher, 2014

Map 12: Proposed Layout of Community Garden Site

Source: MHP GeoSpace, 2015

The proposed community garden site is 41,575.69 m^2. The proposed food garden sites within the community garden site represent where food could be grown either directly in the ground or in raised beds. These areas collectively occupy 18,533 m^2 of space for food production. In addition to this, there has been space made available for the establishment and care of seedlings prior to planting. The abandoned club house/ administration building could potentially be converted to the training facility and administration offices of the proposed community garden. The abandoned squash courts could similarly be converted into a storeroom for tools, inputs and any other equipment required. The old tennis courts could potentially provide a good space for the establishment of a weekly market. Being already hardened, flat, fenced, and near to the entrance all contribute to its ideal location. Parking should also be available on site if a market is to become established, and therefore it is proposed that a section of the field be allocated for this (approximately 1318 m2). The second tennis court could potentially be used as the space to experiment or set up a hydroponic or aquaponic farm if enough funding and expertise could be acquired. These require stable, level ground (despite these systems sometimes relying on gravity fed water systems) and with the old tennis courts being fenced, would assist in securing these systems. This vision for the community garden site is just an example of many layouts that could be applied to the site, and in no way needs to look like this. It is mealy a suggestion based on the available space and configuration.

5.2 SURVEY QUESTIONNAIRE FOR LOCAL RESIDENTS

All those interviewed were between the ages of 18 and 61 years. This age range has been chosen to gain a broad prospective across all cohorts who would have an interest in or knowledge about a community garden. Within this age group it was possible to establish a range of interviewees who would be capable of answering the survey questions comprehensively but from different perspectives. Cato Manor, and more specifically homes within three-kilometres from the proposed community garden site, was the chosen survey area. These homes included both the formal and informal settlements on each side of the proposed community garden site. Thirty residents were interviewed from the formal housing, and a further 30 from the informal housing. This spilt in survey respondents was undertaken to gain an even perspective of the different residents within the study area, their needs, wants and constraints. The results of the resident's responses to the questionnaires are outlined in more detail as follows. They constitute the research findings of survey 1:

5.2.1 The Residents Perspective of Urban Agriculture

As discussed earlier, the concept of urban agriculture can be understood in different ways and from diverse viewpoints, therefore a single definitive definition of urban agriculture is difficult to pinpoint. Therefore each person interviewed was asked what urban agriculture meant to him or her, not to define the term. Their answers were then ranked according to their level of understanding and what they included or left out in their descriptions

Table 1: Local Residents Perspective of Urban Agriculture

GROUP	NOT SURE		MODERATE UNDERSTANDING		HIGH UNDERSTANDING	
	Number	**Percentage**	**Number**	**Percentage**	**Number**	**Percentage**
Formal	9	30 %	19	63.3 %	2	6.7 %
Informal	22	73.3 %	8	26.7 %	0	0 %
Total	**31**	**51.7 %**	**27**	**45 %**	**2**	**3.3 %**

Source: Researcher, 2014

Just over 50 per cent of the total group had no real understanding of the term urban agriculture. Many people admitted that the term urban agriculture meant nothing to them as it was the first time they have heard of it. This finding is interesting because it includes people who had vegetable gardens in their back yards. It shows that there are people who are engaging in forms of urban agriculture without them realising the term used for it. For these people, urban agriculture is just an activity they engage in to grow some food; to save money or make use of their gardens, or to some it may be a survival strategy. They do not realise the broader context of the activity they are taking part in, and its potential to improve their lives.

The survey findings show that 45 per cent of the total group had a moderate understanding of urban agriculture. This group of people understood the basics of what urban agriculture looks like, but not so much about its potential. These people viewed UA as mostly small home gardens or roof top gardens within the city. The group, combined with the 50 per cent that had no real perspective on

the term urban agriculture, represent a large portion of the population that are yet to realise the potential of the activity.

Only two out of the entire group of 60 (3.3 per cent) gave answers that indicated a high level understanding of the term and its potential. This highlights a need for education on the potential positive impacts UA can have for the local residents. In an urban agricultural hub, an education centre could be included in the facilities provided at the community garden site. This educational centre could not only teach local residents improved farming and gardening techniques, but also about urban agriculture and it's potential to uplift communities.

5.2.2 Socio Economic Benefits of Urban Agriculture

When asked if they believed urban agriculture would be beneficial or not, both the informal housing and the formal housing groups agreed almost to the exact number of "yes" and "no" answers. The vast majority of the respondents believed that even small home and roof top gardens are beneficial for providing food security, protecting the natural environment, beautifying an area, creating diversity in an area and providing an income to a family. More than 85 per cent of the total group agreed with all the above qualities of urban agriculture. These results are reflected in Table 2 on the next page.

The biggest difference noticed between the informal housing group and the formal housing group was the answer to the question of "can home and roof top gardens provide an income to a family?" Only one out of 30 respondents from the informal housing group disagreed (3.3 per cent). In comparison, seven from the formal housing group disagreed (23.3 per cent). This could be due to the difference in cost of living between the two groups, and the fact that the informal housing group may be more aware of the reality of food insecurity. In order to maintain a lifestyle associated with those living in middle class formal housing requires a larger income than those living in informal settlements. Small-scale urban agriculture may seem to some a bit juvenile as a moneymaking practice for some. These may include those who are higher educated and who are in a stronger socio-economic position that ensures them access to other opportunities. For those in need however, it is clear that it is a viable option to make extra money.

Table 2: Number of Residents that believe Urban Agriculture has Socio-Economic Benefits

SOCIO ECONOMIC BENEFITS	FORMAL				INFORMAL				TOTAL			
	Yes		No		Yes		No		Yes		No	
	No.	%	No.	%	No.	%	No.	%	**No.**	**%**	**No.**	**%**
Providing Food Security	26	86.7	4	13.3	27	90	3	10	**53**	**88.3**	**7**	**11.7**
Protecting the Natural Environment	28	93.3	2	6.7	25	83.3	5	16.7	**53**	**88.3**	**7**	**11.7**
Beautifying an Area	26	76.7	4	13.3	28	93.3	2	6.7	**54**	**90**	**6**	**10**
Creating Diversity in an Area	27	90	3	10	25	83.3	5	16.7	**52**	**86.7**	**8**	**13.3**
Providing an Income to a Family	23	76.7	7	23.3	29	96.7	1	3.3	**52**	**86.7**	**8**	**13.3**

Source: Researcher, 2014

5.2.3 Current Participation by Local Residents

Table 3: Local Residents taking part in Urban Agricultural Activities

GROUP	YES		NO	
	Number	**Percentage**	**Number**	**Percentage**
Formal	16	53.3 %	14	46.7 %
Informal	16	53.3 %	14	46.7 %
Total	**32**	**53.3 %**	**28**	**46.7 %**

Source: Researcher, 2014

Nearly half of those interviewed in both groups currently, take part in some form of urban agriculture. These forms of urban agriculture ranged from a few herb pots along windowsills right to the keeping of livestock and extensive urban gardens in people's back yards. This is a good sign as it proves that people are interested in gardening and growing some of their own food. For those who do not, many did seem interested in participating in a community garden. This enthusiasm to participate showed by local residents will make the introduction of an agricultural hub easier to implement. The results illustrate the point that whilst not everyone understood the term urban agriculture, they do understand what it is to grow some of your own food at home. This indicates that there is potential for the establishment of an urban agricultural hub and that it is likely to have the support of the community.

Table 4: Types of Foods Grown By Those Participating in Urban Agricultural Practices

TYPES OF FOOD	FORMAL		INFORMAL		TOTAL	
	Number	**Percentage**	**Number**	**Percentage**	**Number**	**Percentage**
Basic Vegetables	8	50 %	16	100 %	24	75 %
Fruits	0	0 %	2	12.5 %	2	6.25 %
Livestock	0	0 %	4	25 %	4	12.5 %
Herbs/ Luxuries	10	62.5 %	2	12.5 %	12	37.5 %

Source: Researcher, 2014

There is a large difference in the types of agriculture/ farming or gardening that takes place in the formal and informal group. Out of those who take part in urban agriculture in the informal group, the vast majority grow basic vegetables. In the formal group there is a preference for growing herbs and luxuries (such as chillies, pepper dews, curry leaves or flowers). The informal group were also the only ones who kept livestock (mainly chickens and goats) as a source of protein (eggs and milk). 25 per cent of those that do take part in urban agriculture from the informal group stated that they kept chickens or goats. This difference could be attributed to the necessity to feed themselves, and

in the difference in cultural backgrounds. Those living in the informal settlement may be less interested in using up gardening space for herbs and flowers when they could be growing nutritious vegetables or raising livestock. This is not a problem though, as an agricultural hub will be more successful when there is a greater variety of crops and food types being produced. Community gardens are also spaces where different crops can be grown, and a space where livestock can be kept can be provided. Plates 11 to 15 illustrate the range of vegetables, fruit and livestock found in the study area indicating that there is a based upon which a community garden or agricultural hub could stem from.

Plate 15: Cabbages Grown in the Case Study Area

(Source: W Banks, 2014)

Source: Researcher, 2014

Plate 16: Green Peppers grown in the Case Study Area

Source: Researcher, 2014

Plate 17: Corn Grown in the Case Study Area

Source: Researcher, 2014

Plate 18: Various Vegetables and Herbs grown in the Study Area

Source: Researcher, 2014

Plate 19: Banana Trees in the Case Study Area

Source: Researcher, 2014

Plate 20: Livestock in the Case Study Area

Source: Researcher, 2014

Table 5: Money Saved by Gardening

SAVINGS	FORMAL		INFORMAL		TOTAL	
	Number	**Percentage**	**Number**	**Percentage**	**Number**	**Percentage**
Little to None	12	75 %	4	25 %	**16**	**50 %**
Moderate	4	25 %	7	43.8	**11**	**34.4**
Large	0	0 %	5	31.3	**5**	**15.6**

Source: Researcher, 2014

Currently, only a small number (15.6 per cent) of those growing their own food are saving what they believe to be a large amount of money. Exactly half of those who grow food at home say they save little to no money at all from their gardens. It is encouraging however to note that 34.4 per cent are saving some money from their gardens. For some this saving, even though modest, can make a large

difference at the end of each month. However, it is clear that currently urban agriculture has not yet met its potential in this area. The introduction of an urban agricultural hub could drastically change the results of this question. With access to a market, support, marketing and training, local residents in an urban agricultural hub would be able to turn their small farms into a second income source.

5.2.4 Constraints

Table 6: Main Constraints Restricting Residents Participation in Urban Agriculture

CONSTRAINTS	FORMAL		INFORMAL		TOTAL	
	Number	Percentage	Number	Percentage	Number	Percentage
Space	2	14.3 %	10	71.4 %	12	42.9 %
Time	9	64.3 %	4	28.6 %	13	46.4 %
Lack of Interest	2	14.3 %	2	14.3 %	4	14.3 %
Negative perception	1	7.1 %	0	0 %	1	3.6 %

Source: Researcher, 2014

Another great difference between the two groups interviewed was the difference in what was restricting them from participating in urban agriculture. From the informal group, 71.4 per cent of those that did not grow any of their own food attributed the fact to a lack of space available to them to do so. Those who did not grow any of their own food from the formal housing group seemed to be more restricted by time (64.3 per cent). Time and space where by far the two biggest restricting factors. As much as 90 per cent of those interviewed blame time or space as reasons why they do not grow any of their own food at home. These factors can however be overcome. Once provided with a space, in the form of a community garden, or several sites for gardens, people will have the space they need to grow food and keep limited numbers of livestock. Time will be a slightly more complicated restrictor to combat. It is often a mind-set change that will need to occur. Growing

vegetables does not require a large amount of time. If automatic watering in the form of an irrigation system can be set up, then turning these on and off, along with the occasional monitoring is all that is needed. Education and an opportunity are requirements that will be needed to reduce the issue of time for many people.

Only five people (three from the formal and two from the informal) stated that they lacked interest in gardening, or they had a negative perception of urban agriculture and that's what was restricting them from engaging with the activity. This is not concerning since the numbers constitute a very small percentage of the total interviewee group. Furthermore, once an exciting and new project like an agricultural hub is introduced, and it is managed and marketed well, more people will begin to gain an interest.

5.2.5 Future Needs and Wants in an Agricultural Hub

The results from this question mimic those from question three discussed. It would appear that residents are cultivating basic vegetables and have indicated that these crops are preferable for any future gardens. Luxuries (such as flowers, paprika and other chilli's, pepper dews, curry leaves and other such crops) and herbs are favoured by those living in the formal housing, yet are popular enough to include in any agricultural hub. Luxuries are referred to here in the sense of them not being staple fruits or vegetables, but rather flowers[14] or crops that add flavour to a dish, as opposed to simply being nutritious. This is not to say they wont have any nutritional value, because they do. Fruits and the keeping of livestock in the home garden are the least popular, possibly indicating that these should be left to the community garden or elsewhere, with home gardens focusing on basic vegetables and herbs. The types of vegetables and herbs mentioned by the local residents can all be grown at home with relative ease.

[14] Flowers at the proposed community garden could be used for sale, or for personal use if grown at home.

Table 7: Favoured Food Types for Future Gardens

FAVOURED FOODS	FORMAL		INFORMAL		TOTAL	
	Number	Percentage	Number	Percentage	Number	Percentage
Basic Vegetables	20	66.7 %	30	100 %	50	83.3 %
Fruits	3	10 %	4	13.3 %	7	11.7 %
Livestock	0	0 %	4	13.3 %	0	0 %
Herbs/ Luxuries	15	50 %	6	20 %	21	35 %

Source: Researcher, 2014

Table 8: Interest in a Community Garden within their Area

INTEREST	YES		NO	
	Number	Percentage	Number	Percentage
Formal	22	73.3 %	8	26.7 %
Informal	30	100 %	0	0 %
Total	**52**	**86.7 %**	**8**	**13.3 %**

Source: Researcher, 2014

As anticipated, the vast majority of those interviewed from both groups indicated that they would like to have a community garden within their area. A major difference noticed is that the formal housing group had more people who indicated that they do not want a community garden in their area. From this group, 26.7 per cent answered no to the question "Would you like to have a community garden in your area?" In comparison, all 30 from the informal housing group answered

yes to the same question. Despite this, the observation can be made that the majority of people living within the study area are interested in having a community garden in their area. As a matter of interest, of those who said they would not be interested in having a community garden in their area, only one was under the age of 30, were as 7 were older than 30 (with an average age of 52 years old). This difference could be due to age, as old people may be more critical of such projects.

Table 9: Participation at the Proposed New Community Garden

GROUPS	WOULD PARTICIPATE		WOULD NOT PARTICIPATE	
	Number	**Percentage**	**Number**	**Percentage**
Formal	18	60 %	12	40 %
Informal	27	90 %	3	10 %
Total	**46**	**76.7 %**	**14**	**23.3 %**

Source: Researcher, 2014

The numbers between those who indicated that they would like to see a community garden in their area and those who said they would participate are slightly different. It would seem that even though many recognise the benefits a community garden can have, not everyone is willing to participate. The number of those willing to participate in a community garden within the study area are however high enough for one to work (from a participation point of view). Of those interviewed, 60 per cent from the formal housing group and 90 per cent from the informal housing group indicated that they would participate if a community garden were to be established. From the survey results, it is proposed that similar findings would be reflected if this trend carried throughout the community, resulting in many hands willing to assist in the success of such a project. Those from the informal housing group were 30 per cent more interested in participating in a community garden for its many benefits it will have for them and their families. This reflects the difference in motivation between the two groups. The informal housing group may be more motivated due to urban agricultures ability to improve their food security and potentially earn them an additional income or at the very least save them money. These numbers may however be inflated compared to the reality. This is because some of those interviewed may be impressed by the idea and in

theory be interested in participating, but change their minds when it comes to actually participating. These numbers do however provide insight into the interest local residents have in participating in such projects, and may require further motivation or incentive to actually participate if such projects are to become successful.

Table 10: Food Types Residents Want at Proposed New Community Garden

FOOD TYPES	FORMAL		INFORMAL		TOTAL	
	Number	Percentage	Number	Percentage	Number	Percentage
Basic Vegetables	22	73.3 %	29	96.7 %	51	85 %
Fruits	8	26.7 %	9	30 %	17	28.3 %
Livestock	0	0 %	15	50 %	15	25 %
Herbs/ Luxuries	12	40 %	1	3.3 %	13	21.7 %

Source: Researcher, 2014

Producing a variety of food products from this community garden will also be necessary for its success, as indicated in the above table 10. Basic vegetables were the most common types of food crops that people wanted to grow in their community garden should one be provided, which is in line with what people favoured for their homes as well. The growing of fruits and the keeping of livestock increased in popularity when it came to keeping them at the community garden as opposed to the home. Fruits were the next most common choice of food type to be grown in such a community garden, after basic vegetables. Both the formal housing group and the informal housing group agreed with this. The keeping of livestock in this community garden was however far more common and supported amongst the informal housing group, with 50 per cent of those interviewed in this group indicating that they would like to keep animals or poultry at the community garden. In comparison, no one from the formal housing group included livestock in their choices. The same could be said for herbs and exotic flowers. Herbs and flowers were listed by 40 per cent of the formal housing group as something they would like to have growing in the community garden. In

comparison, only one interviewee from the informal housing group listed curry leaves (herb) as something she would like to grow at a community garden. This differential result can be attributed to the importance placed on the production of produce, herbs and flowers in the different community groups. For the informal residents the community garden would represent a chance to develop and improve their chances for local economic development opportunities and strengthen survival strategies through improved food security. Residents from the formal housing area are less economically vulnerable and therefore could consider the option of flowers as opposed to merely considering food for survival.

5.2.6 Current Sources of Food

Table 11: Main Sources of Food for Local Residents

MAIN SOURCES	FORMAL		INFORMAL		TOTAL	
	Number	Percentage	Number	Percentage	Number	Percentage
Supermarket	30	100 %	15	50 %	45	75 %
Market	0	0 %	11	36.7 %	11	18.3 %
Home	0	0 %	4	13.3 %	4	6.7 %

Source: Researcher, 2014

As expected, the supermarket was the most common supplier of food for those interviewed in both groups. This supports the discussion on the reliance on the global food system that was presented earlier on in this dissertation. Without the local supermarket or fast food outlets, many people would not know where to turn to gain access to a steady food supply. There was however a relatively large group of people that indicated that they get the majority of their food from a vegetable or farmers market. Nearly 50 per cent of those interviewed from the informal housing group indicated this. None from the formal housing group indicated the same. Convenience is king for those who can afford it. Furthermore, 13.3 per cent from the informal housing group indicated that they get most of their food from growing it themselves. This shows that it is very possible to grow enough food to supply your family just from a home garden. The introduction of a community

garden will assist these four urban farmers in producing a surplus that can be sold or given to extended family members.

Table 12: Monthly Expenditure on Food

INCOME	FORMAL		INFORMAL		TOTAL	
	Number	Percentage	Number	Percentage	Number	Percentage
R1000 or Less	3	10 %	18	60 %	21	35 %
R1000 – R2000	6	20 %	9	30 %	15	25 %
R2001 – R3000	4	13.3 %	3	10 %	7	11.7 %
R3000 Plus	17	56.7 %	0	0 %	17	28.3%

Source: Researcher, 2014

The results from this questionnaire are as expected. Those interviewed from the formal housing group spend a far greater amount of money each month on groceries. Over 50 per cent of those interviewed from the formal housing group spend above R3, 000-00 on average each month just on groceries. Some interviewed spent as much as R10, 000-00. None from the informal group indicated that they spent R3, 000-00 or more. In fact, 60 per cent of the informal housing group indicated they spend less than R1, 000-00 a month on groceries. Furthermore, this likely represents a higher percentage of their monthly income than it does for many of those in the formal housing group. According to the World Health Organisation (2000), poorer households tend to spend a greater share of their income on basic necessities such as food (WHO, 2000: 36). This could be why the informal housing group were more interested in urban agricultural practices in general; as they seem to have more to gain from the income and food security benefits that urban agriculture has to offer.

Table 13: Those who believe Urban Agriculture can provide for a Family and Save Money

	YES		NO	
	Number	Percentage	Number	Percentage
Formal	28	93.3 %	2	6.7 %
Informal	30	100 %	0	0 %
Total	**58**	**96.7 %**	**2**	**3.3 %**

Source: Researcher, 2014

The results of this final question of this questionnaire overwhelmingly represents that people across both classes interviewed agree that growing some of your own food can at least save money and provide a family with a source of food. If this were the only value urban agriculture had, it would be worth perusing as a survival strategy for many urban dwellers. This is the most basic yet the most important advantage that urban agriculture has for those involved. With little and cheap inputs required, some basic knowledge and a bit of space and sun, urban agriculture is a very viable option in cities across the globe, but especially so in Southern Africa and in particular, the east coast. For this reason alone, urban agriculture needs to become recognised and promoted by planners and city officials as a tool for survival and community upliftment strategies.

An area such as this study area, with 50 per cent of the residents already involved in some form of gardening, an ideal climate, and many indicating an interest in a community garden, an urban agricultural hub should thrive here. What will be needed is support (both private and municipal), a 'champion' to start and carry through and manage such an initiative, funding, training and marketing.

5.3 PROFESSIONAL'S QUESTIONNAIRE

The professionals interviewed for this research are currently working in the fields of town planning, architecture and horticulture. During this research process, two professionals from each field were interviewed. The number of years each professional has been working in the field ranges from five

years to 39 years. This represents the qualitative aspect of the research. The names and work places of these professionals were not included as to keep their identities confidential.

5.3.1 Professionals Perception of Urban Agriculture

When asked, "what does urban agriculture mean to you", most professionals had a moderate to high understanding of the term. Some of the answers given included the "taking over of unused spaces for the growing of food" such as rooftops, roadsides, verges, rail servitudes and allotments. Others indicated that they believed urban agriculture was the self-sustaining growing of one's own food in the built environment. All of the above understandings are accurate in defining urban agriculture, however a definition given by a horticulturalist encapsulated urban agricultures potential the most. He stated that urban agriculture is "*A conscious effort to culture and cultivate diverse plant material which will support a diverse population of fauna for a sustainable future life on this planet. This can be done aesthetically and profitably with nutritional benefits to the practitioners and the greater community*". This definition rings close to those given earlier in this dissertation, representing the potential of urban agriculture to not only provide food, but to provide local economic benefits while remaining environmentally sustainable.

5.3.2 Professionals Participation in Urban Agriculture

From the six professionals interviewed, five currently take part in some form of their own urban agriculture at home. All five who took part in home gardening grew some basic vegetables and herbs, however some of the professionals did more. A professional interviewed claimed to also have a fruit tree in their garden. Another professional claimed he kept chickens at his home for their eggs. Another professional interviewed described her complete set up tunnel garden, which recycles water and uses solar power, which powers pumps that move water through the system. This is a remarkable system. Water is places at the top of the tunnel, which is at a slight angle, resulting in water making its way through the garden and out the bottom end. This water then drips into a fish tank. The fish feed off the excess particles and defecate into the water, essentially fertilising the water. This water is pumped back up to the top of the tunnel garden system to start its journey all over again. This system is completely self-sufficient when powered by solar panels, and requires far less water than any other gardening system. A system such as this one adopted in homes could eliminate constraining factors such as water availability and time. The issue with this system and other hydroponic systems is that they are initially expensive, and require a level of

knowledge to start and maintain. These constraining factors can be mitigated to a degree, but the issue of expense will remain.

5.3.3 Potentials of Urban Agriculture

Table 14: Professionals Opinions of Urban Agriculture

1-Strongly disagree

2- Disagree

3- Neutral

4- Agree

5- Strongly agree

Please indicate your opinion about the following statements, by stating the score that presents your feelings					
Statements	**1**	**2**	**3**	**4**	**5**
Home, roof top and community gardens are effective tools that can be used to increase food security among urban dwellers	1	0	1	1	3
Community gardens can be a more efficient alternative to open space	1	0	1	2	2
Community gardens have the potential to bring people in the same area together to create a better sense of community	0	0	0	2	4
Urban agriculture on a larger scale will assist in reducing CO_2 in the area and thus aid the reduction of greenhouse gasses in the atmosphere	1	0	1	1	3
Urban agriculture can be a useful means of gaining an income for poorer families	0	0	2	1	3
Growing some or all of your own food can be a cheaper and healthier alternative to the super market	0	0	0	2	4
Urban agriculture should be an important part of planning in the future city	0	0	1	1	4

Source: Researcher, 2014

As seen from table 14 above, four out of the six professionals interviewed either agreed or strongly agreed to the statement that home; rooftop and community gardens are effective tools that can be used to increase food security among urban dwellers. Only one from the six disagreed with this. For this professional, urban gardens where seen to be more of an environmental or aesthetically pleasing practice, not so much for producing food. The majority however do believe in the ability of these gardens to feed those involved.

Open spaces in urban areas serve a very important environmental and aesthetic purpose. For this reason, they are included in many spatial plans and often have development bans restricting development from taking over them. The professionals interviewed were asked if using these open spaces for the cultivation of food would be more efficiently using these spaces. From those interviewed, three agreed and two strongly agreed that using open space for urban agriculture would be a more efficient use of the space. This they argued would remain true as long as farming here remains organic and sustainable, and not similar to the mass scale, input intensive, mono-cropping style of agriculture. This was also a concern of the one professional who strongly disagreed with this statement. For this professional, agricultural practices may take away from a very important point of open spaces, and that is the preservation of the environment within urban areas. This however need not be the case. Smart and considerate agricultural practices, the use of organic rather than chemical fertilisers, water saving techniques and so on will therefore be important aspects of these gardens if they wish to remain environmentally friendly.

Urban agriculture has a number of environmental benefits as discussed earlier on in this dissertation. One such quality is the ability plants have to convert $C0_2$ into oxygen through the process of photosynthesis. The professionals agreed with this fact, but more importantly four of the six agreed or strongly agreed that on a larger scale, this quality of urban agriculture will assist in reducing CO_2 in an area and thus aid the reduction of greenhouse gasses in the atmosphere. The one professional who disagreed with this statement did not necessarily disagree with the underlying fact. The fact that plant life converts CO_2 into oxygen is uncontested; however the professional who disagreed with the above statement pointed out the any plant life (green plant life in particular) has this quality, not only food products. In fact, many none food plants with larger leaves do this better. For this reason, the professional disagreed with the statement that urban agriculture, as a food source will be the most effective carbon dioxide reducer. The fact however still remains, that urban gardens producing food on a larger scale will reduce CO_2 and other greenhouse gasses in our

atmosphere (even if at a moderate rate). Food gardens serve to assist in the preservation of the environment, yet their focus will be best served in producing food.

Of the professional survey group, five out of six (90 per cent) believed that urban agriculture could be used as an effective design tool for improving the aesthetics and biodiversity within urban areas. The concern raised by one professional that did not share the same view is that he believed agriculture tends to be more mono-cropping style therefore will not bring in a great diversity of ecosystems. This again need not be the case. Home and community gardens are not characteristically mono-cropping style; instead, they often support a variety of food types and other fauna (flowers, trees, shrubs and so forth).

All of the professionals agreed that community gardens have the potential to bring people in the same area together to create a better sense of community. This is especially true when an urban agricultural hub is established in that area. Urban agriculture's wide range of benefits attracts participants from various class divides. A central community garden that everyone is willing to participate in and is easily accessible will bring the community together. Interaction amongst divergent groups in a common project could lead to more tolerance amongst these groups. This goes a long way in supporting the social development of a community.

The research done on the local residents of the study area showed that 86.7 per cent of the total group agreed that urban agriculture could be a useful means of gaining an income. The professionals agreed, with four out of the six interviewed agreeing with this, especially so for poorer families. This quality of urban agriculture represents the other side to the food security coin, as food security is as much about availability as it is affordability. Profit from selling surplus produce can be used to improve or diversify an individual or families diets. This quality of urban agriculture will also assist to uplift a community, especially those suffering with poverty.

The professionals all agreed that growing some or all of your own food could be a cheaper and healthier alternative to the super market. As discussed earlier in this research, the supermarket is the most common source of food for the local residents of the study area. It also accounts for a large portion of their incomes, especially for those in the informal housing group. Also discussed earlier on in this dissertation, supermarket food has recently come under scrutiny concerning the

quality of their foods, contamination issues in meat, and health hazards across a range of produces causing public panic or the sweeping of products off the shelves. These facts combined could account for why the professionals strongly agree that growing one's own food provides people with fresh, healthy and organic foods. Involvement in a successful gardening project contributes to the development of self-confidence in residents, because individuals or a group from the local community manages the process of growth. Self-grown food is also unsusceptible to food price hikes due to the increased price in oil. All the professionals agreed strongly with the suggestion that urban agriculture should be an important part of planning in the future city. Approximately 67 per cent (four of the six) respondents interviewed agreed strongly with this statement, with none of them disagreeing.

5.3.4 Constraints of Urban Agriculture

All 6 professionals interviewed agreed that yes, it is possible to grow food on the roofs of buildings. This however is not without conditions. A few of them had some concerns that would need to be addressed before hand. For one, water will be an issue on rooftops. Rooftops used for agriculture would need to be water proofed to withstand standing water, which is different to the type of waterproofing used for running water, which is more typically found on homes. Standing water requires a stronger type of waterproofing. Drainage of this water will also need to be available, off the sides of the roofs.

The professionals interviewed seemed to agree that it would be more difficult to grow food on one's home rooftop than on larger buildings in the city. Four of the six agreed that it was possible, and two believed that it is not. The biggest issue expressed by the professionals interviewed was that of weight, waterproofing and structural issues on steep roofs. Wet soil and the weight of people walking along the roof constantly while planting and harvesting crops may pose a safety issue according to one of the professionals. Waterproofing was another issue raised. Many of our homes today have waterproof roofs but they are designed for running water, not for standing water. Lastly, many of our homes today do not have flat roofs, and they are often too steep for planting crops. All of these issues can however be addressed, for this reason four out of the six professionals interviewed agreed that it is possible with the right modifications. Despite these concerns, all six professionals interviewed agreed that it is possible for a family to grow a substantial amount of their own food in their home gardens or roof top gardens.

The professionals interviewed highlighted a number of other challenges that could hinder the application of urban agriculture in a given area. The biggest of these was the issue of space. This mirrors the issue of space that has been highlighted by the local residents of the study area. Hosting a number of community gardens within an area will require land, which is expensive to purchase or already allocated to another land use. This represents probably the most important reason why urban agriculture needs to become a vital part of future plans for the city and suburbs.

Access to inputs is another concern. Seeds, water, soil or compost, pots, forks and so on are just a few inputs used for growing food. These inputs may be cheap for some, but not for others. Agricultural knowledge is another important input. Many urban dwellers don't have experience with farming or growing food; therefore they may make mistakes that are environmentally destructive or that hamper their gardens productivity. Access to these inputs, especially agricultural knowledge, will need to be provided if urban agricultural projects are to be successful in an area.

The professionals interviewed also highlighted administrative issues. If buildings have gardens on them, who would manage, maintain and benefit from these gardens? These answers are not always a given at the start of such projects. Confusion may lead to conflict, and thus further disruptions. These questions will therefore need to be addressed from the outset of any rooftop gardening initiative in order for such gardens to have purpose. The same goes for community gardens. Will the food grown be sold for a profit, or will it be donated to local residents? Will the farmers be paid or will they be volunteers? If the farmers get paid a salary, who will be covering this cost? These are just a few questions that will need to be clearly understood before the start of any such project.

Crime is another constraint. The stealing of crops or the destruction of infrastructure such as fences or community garden centres or educational centres could all hinder progress made by these projects. Other constraints highlighted by the professionals are more to do with the individual mind-sets, pre-conceptions and lifestyles of many individuals. If these are negative, it may hinder their interest in participating in such activities. Many do not believe it is possible to grow enough food to save money or provide for a family; therefore the effort required for gardening successfully may seem to some as too much effort for very little return. Others may have attempted gardening some of their own food or flowers, and failed, discouraging them from trying again. Some may just be too comfortable in the way they are currently living to make a drastic change. Still more may not be

interested in participating in anything to do with their community. These constraints will be the most important, yet the hardest to overcome.

5.3.5 Managing Urban Agriculture in Communities

There are many laws and policies that affect urban agriculture, as a practice in the urban context, however there are no policies directly encouraging it. None of the professionals interviewed indicated that they were aware of any such policies. Policies encouraging urban agriculture would go a long way in assuring its success in any given area, and represents another reason why future planners and officials will need to consider urban agricultural practices for the future city.

Table 15: Who Should Be the Main Character/s in Driving This Trend?

CHARACTERS	NUMBER OF PROFESSIONALS WHO AGREE
Government	4
Public	1
Private Stockholders	1
NGO's	3
Other	3

Source: Researcher, 2014

The professionals interviewed seemed to agree that the government should be the driver of urban agricultural trends, more specifically, local government. Their reasons for this were that government has the resources to get the process started, by putting policies in place that encourage these types of developments. Setting up urban agricultural hubs will also require local government's assistance in requiring space, and minor construction such as fencing and small buildings for offices or education centres that will be an important feature of an agricultural hub. Local government can also be great motivators for their supporters, getting more people interested in such projects.

The professionals also deemed architects, designers and planners as important drivers of such trends. Their inputs into the planning and layout of community gardens and urban agricultural hubs will be important in its success. Planners are especially important; as such projects will need to be included in, or allowed for in various zones (especially residential zones) and precinct plans to further ensure their efficiency, especially on a larger scale.

Other important drivers in urban agricultural trends are the media, town councillors and traditional leaders. Traditional leaders will be especially important in these projects that are on the outskirts of the city, in smaller towns' further inland and in informal settlements and on land that is located on Ingoyama Trust Land. A community in these areas may trust their traditional leaders more than outsiders and therefore their importance will be in promoting urban agriculture and by assisting in communicating any issues or ideas to the community.

Table 16: The Management of Community Garden

CHARACTERS	NUMBER OF PROFESSIONALS WHO AGREE
Government	2
Public	2
Private Stockholders	1
NGO's	3
Other	2

Source: Researcher, 2014

Local NGO's were favoured the most by the professionals interviewed as suitable managers of community gardens. Government, and more specifically local government, along with the public themselves were the second most favoured. Each of these three options comes with their own positives and potential downfalls. Collaboration will therefore most likely be the best option. Furthermore, a champion or leader will be required to maintain such projects. This champion or

leader will need to have the best interest of the community in mind, and not his/her own. This champion may be a member of the community (public) or they may be part of an NGO.

5.4 PREVIOUS URBAN AGRICULTURAL PROJECTS

During this research, it became apparent that there were previous urban agricultural projects in the area of Cato Manor. These projects were developed and supported by the Cato Manor Development Association. These projects however seem to have either failed or ended for unknown reasons. Research was conducted, with the assistance of a guideline questionnaire, to guide interviews with previous members of the CMDA to ascertain what happened to these projects, if they failed and why. The findings from this research however, raised more questions that it answered. Key members of the former CMDA were selected for this portion of the research, however, no clear answers could be obtained from them as to the status of these previous urban agricultural projects, and to why they either failed or ended. This may be due to the fact that after these projects were implemented, the CMDA handed over control of the area (and the development projects) to the local council, therefore no longer remaining directly involved with them.

From those interviewed, only one was able to shed light onto some of the projects that took place. These included a community garden in Cato Crest and two in Wiggins. These projects apparently began very successfully and did serve their purpose for some time. There was also a food garden project that was meant to stabilise soil along steep banks within the informal settlement. This project had a multi-beneficial purpose, which was to stabilise the soil in the attempt to reduce erosion, to provide food crops to residents, and to improve the aesthetics of bare slops within the area. Another project highlighted was the fruit-tree per home project. This project involved providing new homeowners with fruit trees and a planting 'kit' that provided them with everything the needed to plant these trees. This was a fantastic idea, especially if everyone in a neighbourhood had fruit trees in their garden, growing a variety of fruits, and then sharing them amongst each other.

As great as these projects sounded, and despite there potential and the varied success they achieved, these projects seem to have faded away and disappeared from the Cato Manor landscape. The community gardens no longer exist, fruit trees and planting kits where not given to the majority of homes and cannot be seen in abundance (however there are some evident within the study area). Slopes within the informal settlement have some remnants of food gardens, but more so for individual shacks and not on 'common land' and not for the purpose of creating soil stability. These

small patches of gardens look more as if individual residents set them up for themselves. What then happened to all the elaborate and grand policies and plans set out by the CMDA with regard to urban agriculture? These plans had the best intentions of the community at heart, but then why do they no longer exist today?

It is assumed that the failure of these projects is attributed to a lack of follow up and management after the CMDA handed control of the area over to the local municipality. This it not to blame the municipality, however, it shows the importance of constant follow up and maintenance for such projects to survive. Another issue raised was an example of an abuse of power. According to one of those interviewed, a former community leader harvested all the crops from a community garden in Wiggins, and sold the produce for his/her own profit. This left the community in shock and disappointment, which created a sense of discouragement. This could be detrimental to future projects, if the community does not trust the leader of such projects.

What this process proved is that firstly, urban agricultural projects have been successfully implemented before in Cato Manor. Secondly, it showed that without proper management and constant follow up, these projects would not survive. It also highlighted the need for a trustworthy leader, one that the community will trust. These communities also need a direct stake in the community garden, with will ensure their continued support. This is an example of how grand policy and plans, no matter how beneficial they may sound to be, will not succeed without proper management, follow up, and continued support from the community.

5.5 CONCLUSION

This chapter sought to discover whether or not the introduction of an urban agricultural hub would be feasible in Cato Manor. The simple answer is, yes it would. Firstly, the proposed community garden site (Mandene Sports Club) is ideal. The site is run down and in need of a facelift, as it is currently just serving as an eyesore and at the very least, a waste of valuable space. It is close to a reservoir, the climate in the area is ideal and the site is close to a broad spectrum of residents who would potentially participate in a community garden. The site is also close to a primary school, a University and a Technicon, which represents future opportunities for the proposed community garden.

Secondly, the professionals interviewed and 85 per cent of the local residents who answered the questionnaire, agreed that urban agriculture in its many forms has the potential to benefit them and their community in the following ways:

- By providing them with improved food security
- By improving the quality of the natural environment
- By improving the aesthetics of the area
- By creating diversity in the area in terms of land use and in terms of flora and fauna
- By providing some of those involved with an alternative income, even if small.
- And by saving them money on food each month (96 per cent of residents agreed with this, especially seeming as 75 per cent of all food bought by the community comes from the supermarket)

Thirdly, 53 per cent of the local residents already take part in some form of food gardening and some even keep livestock. Therefore, the introduction of an urban agricultural hub in the area wont be something new, it would just be improving on what is already happening, assisting those involved with extracting the full potential of urban agriculture for themselves and the community.

Fourthly, the types of food people are already growing and the types of foods they would like to have grown in their community garden are all foods that grow well in our climate, and have the potential to thrive with the correct care. This also includes the keeping of livestock. Fifthly, almost all of the constraints identified by the research can be overcome with a bit of effort and some basic ingenuity to make an urban agricultural hub successful in the area. Finally, and most importantly of all, this research identified that 87 per cent of the local residents would like to have an urban agricultural hub in their community and that 77 per cent of those interviewed indicate that they would be willing to participate. This is very important because if people where uninterested in such a project, it would simply not work, no matter what the benefits could be.

The professionals interviewed also highlighted a number of important points. Firstly, they agreed that community gardens could be a more efficient alternative to open space. They also agreed that community gardens have the potential to bring people in the same area together to create a better sense of community, which would greatly benefit an area such as Cato Manor given its history.

Finally, the professionals agreed that urban agriculture should be an important part of planning in the future city, and that while the local government should be driving urban agricultural initiatives, NGOs and the public themselves should be managing them.

The interview process involving former members of the Cato Manor Development Association raised some encouraging and discouraging points. It showed that urban agricultural projects have been implemented successfully before in this area, which is a positive sign. This process however also shed light onto some of the potential constraints these projects could face. In conclusion however, it can be said that the most important lesson learned from this process is that there needs to be a strong, trustworthy leader, that the community need to have a stake in the community gardens, and that there needs to be constant follow up, maintenance and training for such projects to remain succeed.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.0 INTRODUCTION

The main question this dissertation intended to address is, 'can urban agriculture provide increased food security and uplift the community of Cato Manor?' In order to answer this question, a number of smaller questions needed to be answered first. For instance, what are the social, economic and environmental benefits of urban agriculture? Could urban agriculture increase food security among the urban poor? What types of urban agriculture can be used? Will an urban agricultural hub be feasible in the chosen study area? Will local residents be interested in participating to make the agricultural hub successful? What policies and initiatives need to be put in place for urban agriculture to be successful? The social, economic and environmental benefits of urban agriculture and its ability to provide those involved with food security are all covered in the literature review and conceptual framework chapters of this dissertation. This dissertation highlighted these various benefits extensively. In conclusion it can therefore be said that yes, urban agricultural practices can in fact provide those involved with improved food security and generally upliftment of a community. This can be illustrated in the examples given on Cuba, Detroit and Zimbabwe in the Literature Review Chapter.

The types of urban agriculture that will be possible within the study area were determined through the physical analysis of the area, as well as through professional opinion during the guided interviews with the various professionals. Initiative ideas and the discussion of related policies were answered by these guided interviews.

The research conducted for this dissertation answered the questions of 'will local residents be interested in participating to make the agricultural hub successful', as it proved that yes the majority of them are. It also proved that yes, the application of an urban agricultural hub will be feasible in the chosen study area. The research indicates that there are enough willing participants, that there is space in the form of an unused sports club, and that the climate is conducive for farming. The constraints identified in the research can be overcome by methods indicated in this dissertation.

Therefore the aim of this research was to provide empirical evidence that the introduction of an urban agricultural hub would be possible in the Cato Manor study area, and that this can be used as

a tool to uplift the community and increase food security. In conclusion, it can be said that this research provided the evidence it set out to provide.

6.1 THE LIMITATIONS OF THE STUDY

Due to time constraints, this study was not able to include a number of institutions in the research. These include the two primary schools, the University and the Technikon, and the Clinic all within study area. These institutions may have shed more light onto the various applications, benefits and purposes of urban agriculture within the study area. They would have also provided more depth to the study.

Other limitations to this study include the size of the sample groups. Although 60 is a sufficient sample group to get an indication of the views of the rest of the community within the study area, a larger study group would provide findings that are more accurate. The involvement of more professionals and their opinions would also be beneficial. This would have provided clearer trends in the opinions of professionals in the related fields. Innovative techniques such as tunnel gardens mentioned earlier, would go a long way in improving the efficiency of resident's gardens and in increasing the chance of success of such projects.

The lack of roof top gardens within the study area represents another limitation to this research. At the start of the research, roof top gardens, home gardens and a community garden where all indicated as types of urban agriculture that would make up an urban agricultural hub in the study area. However, during the research it was found that roof top gardens did not exist, and that they would be difficult to incorporate in this area. This does not take away from the potential success of any agricultural hub; however an area that can support this element of urban agriculture would have made the research more dynamic.

There are also limitations to the questionnaire used during the research. These limitations include questions that were not directly asked during the research that would have been beneficial in clearing up issues and in establishing more direct conclusions. The first of these can be found in questions relating to the number of residents that believe urban agriculture has socio-economic benefits. This table was based on 'yes' or 'no' answers and did not allow for an explanation. It would have been beneficial to allow for more of an engagement with the questions relating to this

topic, or to have more in-depth questions. The second limitation to the research questions is the lack of the mention of an 'urban agricultural hub'. The application of an urban agricultural hub into the area of Cato Manor is imperative to the suggestions made by this research and proving its viability is part of the aim of the research in the first place. Having directly ask if residents would like to see an urban agricultural hub in their area would have been a vital question to ask. Similarly, the question "would you be happy to see Mandene Sport Club be converted to a garden or not?" should have been asked. While it's a fair assumption that most people would like to see something positive (such as a community garden) happen on this site, it would have been fare more beneficial to have asked the community directly.

The forth limitation to the questionnaire used in the research is the fact that while monthly expenditure on food was established for those who participated, their household size was not established. This is important information when considering if the household has enough money to feed everyone in that household.

The fifth limitation to the questionnaire is that it does not ask question that would have highlighted if those involved in urban agricultural practices currently, and those who wish to be involved in the further, if their gardens/ farms resemble, or would resemble, the current industrial model of agriculture. Questions like:

- Are you aware of ecological implications of growing locally?
- Where do they get their water to grow crops?
- Would they use GMO seeds/ crops?
- Do they know how oil is linked to commercial food production?
- Would they grow food or cash crops?
- Do they/ would they use chemicals fertiliser or pesticide in their garden?

These questions would have been beneficial to highlight the local residents motives or intentions in keeping their gardens/farms environmentally sustainable, organic and ultimately different from the current world model of agriculture.

A further limitation to the research in general relates to previous urban agricultural initiatives in Cato Manor. These initiatives appear to have failed after being handed over from the CMDA to the

eThekwini Municipality. An interview with someone who had been in charge or who was overseeing these failed initiatives' would have been beneficial for this research in determining why they failed and what new initiatives could learn from these failures.

6.2 SUGGESTIONS TO IMPROVE THE STUDY AND FOR FUTURE RESEARCH

Including all of the institutions mentioned above (the Primary Schools, University, Technikon and Clinic) would improve the study. These institutions will play important roles in the formulation of an agricultural hub. Each of these has the potential to gain from urban agricultural practices, while also benefiting local residents. Primary schools would be the ideal location for young school children to start learning the basics associated with their diets, how food is grown, and basic gardening techniques. The food grown in these school gardens could also be put to good use. For instance, it could feed the cleaning and maintenance staff. Alternately, vegetables grown in these gardens could be used in lunches that are provided for the children. Either way, school gardens have potential benefits for both the school and the children that attend. School gardens are potentially important aspects of an agricultural hub. Universities have similar benefits to gain. Here, food could once again be used to feed the staff and their families, or be used in healthy, fresh cafeteria food. The rooftops of the University of KwaZulu-Natal are already being used on a small scale for such gardens. Involving the University and Technikon would also open up rooftop gardening to the research, which is an element that lacked in this research.

Clinics may benefit differently from schools. Food gardens at clinics could be used to feed the vulnerable and the sick. Education on improved diets, gardening advice and tips for growing vegetables that boost our immune systems could be given to those in need, with a practice example right outside the doors. Seed sharing of such vegetables could also occur at these clinics. These types of gardens represent another potentially important aspect of an urban agricultural hub.

Another suggestion to improve this study would be to increase the sample size of the study group. This will provide accurate findings about the opinions and attitudes of the local residents. Involving more professionals, especially those who have worked within the study area, would further improve the study.

Including the Household Dietary Diversity Score (HDDS) in ones study of measuring food security of homes would be a great way to track changes in food security at a household level as it changes after urban agricultural initiatives have taken place. The HDDS of a community can also assess the need for such initiatives. This would therefore be a valuable tool in any further research on food security.

Finally, improving the questionnaire to include all the questions that were not ask, as highlighted in the limitations to study section, would be recommended for any further research regarding urban agricultural and Cato Manor.

6.3 CONCLUSION

Urban agriculture in its various forms will undoubtedly become a more prominent feature of the future city, with or without the assistance of planners and officials. Already all around the world in virtually every major city there are people growing their own food in their backyards, local community gardens or on their rooftops. With a bit of innovation and motivation, these gardens truly have great potential, especially so with the assistance of planners and officials.

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APPENDIX 1: QUESTIONNAIRES

The Questionnaires used in this study are as follows:

PROFESSIONAL'S QUESTIONNAIRE

Town planners/ horticulturalist/ architects

1) Name: _____

2) Area of expertise _____

3) Number of years working in your field

_____

4) What does urban agriculture mean to you?

5) Do you take part in any form of urban agriculture at your own home? (Roof top garden/ home garden)

Yes	No

6) If so, what kind?

7) Do you think it is possible to grow food on the rooftops of buildings?

YES	NO

8) If not, why?

9) Do you believe it's possible to grow food on the rooftops of people's homes?

YES	NO

10) If not, Why?

11) Do you think it's possible for a family to grow a substantial amount of their own food in their home gardens or roof top gardens?

YES	NO

12) If not, Why?

13) Please indicate your opinion about the following statements, by stating the score that presents your feelings.

1-Strongly disagree 2- Disagree 3- Neutral 4- Agree 5- Strongly agree

	1	2	3	4	5
Home, roof top and community gardens are effective tools that can be used to increase food security among urban dwellers					
Community gardens can be a more efficient alternative to open space					
Community gardens have the potential to bring people in the same area together to create a better sense of community					
Urban agriculture on a larger scale will assist in reducing CO_2 in the area and thus aid the reduction of greenhouse gasses in the atmosphere					
Urban agriculture can be a useful means of gaining an income for poorer families					
Growing some or all of your own food can be a cheaper and healthier alternative to the super market					
Urban agriculture should be an important part of planning in the future city					

14) Do you feel that urban agriculture can be used as an effective design tool for improving biodiversity within urban areas? (The variety of plant and animal life in an area).

15) Are you aware of any relevant policies encouraging or discouraging these types of developments?

16) Who should be the main character/s in driving this trend?

Government	
Public	
Developer	
Architects/ Designer/ Planners	
Other	

17) In relation to your answer for Question 16, why do you think so?

18) If a community garden is established in an area, who should be managing it?

Government	
Public	
Private Stakeholders	
NGO's	
Other	

19) In your opinion what are the major challenges that would hinder the application of urban agriculture in a given area?

20) Any further comments

URBAN AGRICULTURE SURVEY QUESTIONNAIRE

1) Age: _____
2) In what area do you live_____

3) What type of dwelling i.e. (House, Block of Flats, informal etc.)

_____

4) What does urban agriculture mean to you?

5) Do you believe home and rooftop gardens are beneficial in the following areas?

	YES	NO
Providing food security		
Protecting the natural environment		
Beautifying an area		
Creating diversity in an area		
Providing an income to a family		

6) Do you take part in any form of home or community gardening?

YES	NO

7) If yes, what type?

8) If you answered yes to question 6, how much do you believe you save from growing some of your own food?

Little to none	Moderate	Large

9) If you answered no to question 6, what is restricting you?

10) What types of crops would you like to have growing at your home?

11) Would you like to have a community garden in your area?

12) Would you participate in the growing and caring for of the crops in these gardens?

13) What types of crops would you like to have growing in these gardens?

14) Where do you get the majority of your food?

15) How much a month do you spend on groceries?

16) Do you believe that growing some of your own food could assist you in providing for yourself and your family, as well as save you money?

QUESTIONNAIRE FOR PREVIOUS MEMBERS OF THE CATO MANOR DEVELOPMENT ASSOCIATION

1) Can you describe the types of agricultural projects that have previously been implemented in Cato Manor?

2) In your opinion which of these where successful?

3) What made those that succeeded, succeed?

4) What made those that failed, fail?

5) Who should be managing such projects?

6) If there were to be a new urban agricultural project in the area, such as an urban agricultural hub/ community garden, what do you believe is vital for its success?
(e.g. Funding, Participation, good governance, etc)