

Exploring private urban agriculture and its integration into high density housing

Towards the design of high density housing with an Urban Agriculture hub in Pinetown

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DECLARATION

This dissertation is a presentation of my original work, and is carried out by myself. Where contributions of others are involved, every effort is made to acknowledge this clearly, with due reference to the literature and discussions.

This dissertation is being submitted to the College of Humanities, School of Built Environment and Development Studies at the University of KwaZulu-Natal, in partial fulfilment of the requirements towards the degree of Master in Architecture.

This dissertation has not been previously submitted for any examination or degree at any university.

Signed:

Luke Bentley Standen

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DEDICATION

I dedicate this Dissertation to my parents, Dave and Barbara Standen, who have supported me and helped me through my studies. Without whom this would not have been a possibility.

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ABSTRACT

The research looks at how the architecture of residential design can encourage the practice of urban agriculture, from the approach of the environmental, social, physical and dietary benefits to the residents and related urban environment. The research takes the standpoint that a change in the design of urban residential architecture to enable and encourage urban agriculture is important in order to improve food sovereignty and the relationships that urban residents have to food and nature, as this is shown to improve people's health. The Theory of Social Practice was used to look at the success of private urban agricultural practices and how they rely on the interaction of practitioners or external support and how this can be used to improve residential design for the practice of urban agriculture. The research looks at using Social Practice Theory and Ecological Design (with supporting concepts) to inform the design of high density residential units. Local case studies are explored and analysed to identify how existing urban agricultural practices have been integrated into the city framework. Along with local and international precedents being analysed to determine appropriate responses and opportunities and where opportunities have been missed. The research has been done to inform a set of principles to be used in the design of high density housing which integrates natural systems and benefits of urban agriculture, whereas modern high density housing generally separates people from nature. The research suggests that in order for architects to be able to design for the future cities they need to design for the inclusion of agriculture. The findings suggest that the industrial revolution not only had negative impacts on the way buildings are designed for humans, but it is now negatively influencing how the buildings of the future are incorporating nature in an industrialised manner. Further removing the physical, social and mental benefits urban agriculture provides to residents.

KEYWORDS:

Agricultural Urbanism, Social Practice Theory, Ecological Design, Ecosystem Services, High Density Residential.

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1 INTRODUCTION

1.1 BACKGROUND

The world population is set to increase to over 9 Billion by 2050 and urban populations are forecast to increase from the current more than 50%, to more than 60% of the world population in the next 15 years (United Nations 2004). With current food shortages and insecurity increasing with global climate change and droughts affecting much of the world's arable land, new solutions to food security are needed. Urban agriculture is viewed by researchers as one possible solution. Currently research on urban agriculture revolves around two options for food production in urban areas; the vertical farm (industrial scale farming inside buildings) and traditional land based agriculture. The current high costs of vertical farming mean that consumers often cannot afford the higher prices of urban food. Those who live outside of cities often grow food to supplement what they are able to purchase, so too, within the urban context, there is a need for this small scale personal food production.

It can be more difficult for city residents to produce food, while living in high densities without a backyard for agricultural practices. The options that are available to city residents are; balcony gardening, roof top gardening and guerilla gardening. These methods don't allow much space for growing, aren't always available or are positioned outside of the urban farmer's control. These positions can also place the cultivation and production of raw food at large distances from the production and consumption spaces within the residence. The focus of commercial urban farming is shifting towards vertical farming and buildings with advanced new technologies and production methods. It may be possible for aspects of these concepts to be used in differing scales to benefit private individuals farming within the urban environment. Locally, a shift to urban agriculture is being supported in popular media (Ryan 2016) to promote families growing their own food due to a current drought. An increase in the organic produce and an interest by the public in organic methods has led to private agriculture championing the organic movement through promoting methods of organic production and a healthier lifestyle. Ryan (2016) states that South Africa is not the same as other countries, and that what works elsewhere might not necessarily work here. Following from this therefore, an exploration of what will work in South Africa is needed. This need for an exploration of Urban Agriculture and what will work in South Africa is the reason for this research.

The research will explore options of designing with whole building system integration, such as the concept of Ecological Design which stems from the theory of the same name (the main researcher of which being Yeang). The incorporation of Yeang's Framework (1999: 64 – 67) into the building design benefits the surrounding ecosystem and incorporates the surrounding natural systems into its design. The building can then become a net zero design or even positively affect the people's lives and environment.

1.1.1 Motivation of the study

The future of Agriculture has been said to be within the urban environment, removing the distances from “farm to fork”, Farm to fork, initially a concept by A. Waters, of Chez Panisse, was an attempt to remind people where their food comes from and highlight local farms while re-establishing the link between the seasons and the food (Kummer 2015). This move links to the decentralization movement occurring within different services provided to cities, in order to become more resilient and increase sovereignty of the cities. The decentralization promotes differing scales of the services and individual and communal system resilience and sovereignty.

To incorporate agriculture in the city without increasing urban sprawl, it is necessary to look at incorporating the agricultural practices into a holistic design of the city, its spaces and buildings. Within the South African context it is understandable that the major agricultural producers are not going to be moving production into cities, as there is almost a surplus of land available for traditional land based agriculture at sufficiently low cost. With the current drought and other economic factors increasing the price and availability of food, individual consumers are starting to produce some of their own food. With the local residential market becoming interested in self-production of food there is a need for development of appropriate methods and incorporation of these into current and future urban residential developments.

This study will look into existing ways of how people have developed methods or adapted spaces for productive private urban agriculture in the spaces available to them. The end goal being to create more suitable architectural designs and spaces for the incorporation of urban agriculture of private individuals into high-density developments.

1.2 DEFINITION OF THE PROBLEM, AIMS AND OBJECTIVES

1.2.1 Definition of the Problem

It is calculated that the land mass currently used for crop production worldwide is the same size as the South American continent. With the calculations showing that by the year 2050 crop production will need an additional landmass the size of Brazil, in order to continue crop farming in the current way (Despommier. 2010: 82). Existing literature and research shows the need for new methods of agriculture to produce enough food for people within the next few decades, and how integration of agriculture into the architecture and buildings of the city can be a solution. Most of this literature focuses on large scale agricultural practices and the incorporation of these practices into multi-storey greenhouses in the city, using its own by-products and some from surrounding buildings in the production processes. While these concepts are well researched and feasible, in countries like South Africa where land is still an abundant resource, these concepts will not be taken up readily by the large corporations while access to large swaths of land is still available and commercially viable for agricultural production. This leaves the small-scale farmer and private agriculture practices with the

choice to engage in urban agriculture. The small-scale farmer needs little more than to rent a flat roof where they are able to produce sufficient crops. Meaning the one agricultural producer in need of assistance is the private individual, the “backyard gardener” without a yard to garden in. With the current downturn in the local economy and the drought both impacting on the availability and cost of agricultural produce in the local market, the backyard gardener is becoming more prevalent. This puts more strain on the individual in the urban context “without a yard to garden in”, and this problem is an opportunity for Architects to rethink urban residential developments, and how they can help the individuals living in them become more self-reliant, by designing for food production within the home in these developments.

1.2.2 Aims

The aim of this study is to explore how architectural design can integrate agriculture into urban high density housing.

This research is being conducted in order to produce principles, which can inform the design of architectural design for spaces for the practice of urban agriculture by private individuals and their families.

The Research aims to identify specific design interventions needed in high density residential architecture design for the integration of urban agriculture.

1.2.3 Objectives

To describe why people practice personal urban agriculture in Pinetown.

To identify how spaces are adapted to suit the current methods of urban agriculture.

To develop principles for an architecture that allows for, and promotes, urban agriculture, for private individuals’ personal consumption.

1.3 SETTING OUT THE SCOPE

1.3.1 Delimitation of Research Problem

The researcher understands that the scope of this dissertation reaches far beyond architecture, having social and economic impacts. However, this will not be the focus of the research, and the literature will be delimited to that which is relevant to architecture. That is to say literature that considers space and place as well as built form and the relations between them along with the environment, that being elements of lighting, air and water.

While the theories and concepts have a broad range of applications they will be used and focused towards that of the built environment, incorporating urban agriculture within high density housing.

1.3.2 Stating the Assumptions

For this dissertation the assumption is made that in the future, the urban environment is going to play a role in agricultural production. Although, in order for it to be taken up by large corporations, it first needs to prove itself on smaller scales. The occurrence of urban agriculture within cities is largely a middle class practice, with the poorer residents not having security of tenure or space and time to partake in what is often observed as a wealthy pastime or hobby. Subsistence farming in Southern Africa is considered the domain of women while commercial agriculture is the domain of men. These ideas need to be challenged in order for Urban Agriculture to take root in the future of urban development.

1.3.3 Research Questions

1.3.3.1 Key Question:

- How can high density residential architecture effectively integrate private urban agriculture, while retaining the lifestyles associated with both the city and agriculture?

1.3.3.2 Secondary questions:

- Why do private individuals/ families participate in urban agriculture?
- How are available spaces provided by buildings adapted for use in urban agriculture?
- What are the methods used in the spaces provided by buildings?
- What architectural design principles can be developed to respond too and enable private urban agriculture?

1.4 CONCEPTS AND THEORIES.

1.4.1 Introduction

The dissertation is structured such that the existing literature is used to inform the concepts and theories, which then are used to support the findings in the research. Through existing literature the following concepts and theories have been identified as valuable to the research.

The concept of Biophilia explains the positive benefits one receives through interaction or observation of nature, which is explored through the 5 types of gardens identified by Kortright and Wakefield (2011). They have a common theme of the aesthetics of plants and nature, and the appreciation of it by those gardening. Biophilia also recognises the importance of fractals in human surroundings and the benefit the inclusion of fractals in designs has on occupants. Ecological Design presented by Yeang (1999),

provides guidelines as to the implementation of green design in high-rise buildings. The guidelines serve to theorise a building that is ecologically designed, not necessarily with all the “green” aspects possible, but rather those that provide a positive impact both on the building and by improving its surroundings i.e. where the building not only has no negative impact, but provides a positive impact on its natural surroundings. For a system like Yeang’s Ecological Design approach to be implemented the designer needs to go beyond designing only the built form, and include the design of the built forms surroundings, such as incorporating the natural environment into the development. Agricultural urbanism aims to redefine urban design to include sustainable food and agriculture systems in the urban networks focusing at a community level, thus creating a more resilient urban community.

1.4.2 Key Theory

1.4.2.1 Social Practice Theory.

The theory links practices to three core elements: Skills, Images and Stuff. The core elements are considered to hold all practices together. When parts of a practice relating to, or even just one of the elements, becomes damaged or is removed from the practice, it no longer continues to function and can completely disappear. While the removal or damage to an element of the practice can result in its demise, the moving of a practice or change of location/ social structure results in a “successive, localized (re)invention” of the practice (Shove and Pantzar, 2005:43).

1.4.3 Key Concept

1.4.3.1 Ecological Design.

A theory by Ken Yeang, Ecological Design, suggests that a sustainable and ecologically responsible building needs to do more than be a technical combination of sustainable or green technologies. The concept gives guidelines to the implementation of green design in buildings (with his focus being on skyscrapers). These guidelines propose designing buildings that are ecologically designed, not necessarily with all the “green” aspects possible, but rather those that provide a positive impact both on the building and its surroundings where the building provides a positive impact on surrounding ecological systems and biodiversity.

1.4.4 Supporting Concepts

1.4.4.1 Agricultural Urbanism.

A concept and a movement, Agricultural Urbanism aims to redefine urban design, to include sustainable food and agriculture systems in the urban networks, focusing at community level.

1.4.4.2 Eco-mimesis.

Eco-mimesis is similar to the widely known bio-mimicry in focusing the design approach to mimic nature. Eco-mimicry design focuses on whole natural systems to imitate how they work together, interact with and build on or provide for each of the other processes. This concept supports the concept of ecological

design inasmuch as the outcomes of eco-mimesis is precisely the intention of ecological design. Its focus being on the function of systems and their outcomes, and integration and interactions between the man-made and natural.

The approach to Eco-mimesis is informed by the Resilience concept. This concept is derived from nature, where systems have built in redundancies that help them to survive disasters or changes and can help in restoration of systems. Taken from this, the concept suggests that multiple options and reserves, or redundancies built into systems serve to support them and help to continue after the occurrence of a negative impact. In the built form this would be used in the design of multiple access ways, service supplies etc.

1.4.4.3 Ecosystem Services.

Ecosystem services are a list of natural services, divided into four categories that perform certain functions for either leisure or supporting the occurrence of life.

The first three ecosystem services (provisioning, regulating and supporting) are crucial to a working ecosystem. So in designing the architecture along the ecological design concept it is crucial to understand these systems and how they are related and interact. It also becomes important to analyse the existing services on site and how any building would impact on these services and the ecosystem.

1.5 RESEARCH METHODS AND MATERIALS.

1.5.1 Research Methods.

The Methodological approach to this research study was in Grounded Theory, a qualitative study into the understanding of the occurrence and practices of private urban agriculture. Due to a lack of existing research and literature regarding the architectural integration of urban agriculture into residential design, the research focused on analysing similar ideas and relating theories, critically analysing them to be able to apply them to the design of urban residences with incorporated urban agriculture. The research encompassed interviews with participants, observations of the interaction between architecture and the urban agriculture practices and include texts and other similar studies on urban agriculture in relation to buildings and architectural spaces. The interviews and observations were to take place in private urban agricultural sites, as well as community gardens and guerilla gardening sites within the Highway area of eThekweni. However after conducting interviews in private urban agriculture sites it was the researcher's view that enough data had been collected relating architecture to urban agriculture. The researcher also believed that community and guerilla gardening sites would not be able to provide more data relating to architecture and urban agriculture. The intent of the interviews was to gain a broad knowledge how architectural spaces shaped and in turn were shaped by the systems, methods and technologies used in urban agriculture.

1.5.2 Research sample and location.

The sampling strategy for the research was non-random probability sampling, as the sample needed to be specific to ascertain a greater knowledge of urban agriculture and more specifically private urban agriculture. The initial sampling was done using purposive sampling to source the individuals, within suburban and higher density residential areas, with the required information that will be relevant to the study. The individuals in the Highway area were located and contacted through the vegetable gardening social group, linked to Pinetown Presbyterian Church. This would be followed by snowball sampling, as the individuals being interviewed held the information necessary and would then be able to inform the researcher of other individuals who would also be able to help with the research on urban agriculture. The sample size would be approximately 10 to 15 (ten to fifteen) participants, or until saturation is reached.

1.5.3 Primary Data Collection.

The interviews would be semi-structured, based on the interview schedule as found in Appendix 1. Access to the different urban agricultural sites would be gained through the participants, with each of the individual participants providing access to their own urban agriculture sites.

1.5.4 Secondary Data Collection

Secondary data was collected through texts focusing on how architecture was used for and integrated with urban agriculture. This included books, journal articles as well as newspaper articles and columns.

1.6 Outline of Document

The document follows the process of firstly identifying the theories and concepts used in the research. This is then used in analysing the history of agriculture in relation to the city and urbanism, following from this the researcher analyses South African and International precedents relating to urban agriculture and high density residential design. A case study in Durban is then analysed as to its appropriateness and its affect and desired outcomes, as well as looking at it through the view of the concepts and theories outlined in Chapter 2. Continuing with the primary research the Researcher then proceeds with an analysis of interviews conducted with practitioners of Urban Agriculture. The following and concluding chapter of the document highlights the researcher's conclusions to the research along with both specific and general recommendations for High density residential design with the inclusion of urban agriculture.

2 THEORIES AND CONCEPTS

2.1 Identifying relevant theories

The literature has been informed by the following theories and concepts. Kortright and Wakefield (2011) identified 5 types of gardens, these gardens link to the ecological services that are provided by gardens for cities and their inhabitants. This concept of Ecosystem Services leads to the concept of Ecological Design which looks at how buildings work with their surroundings through an integration of their systems and a supporting concept of Resilience which mimics how ecosystems become resilient through inclusion of redundancies of services. Ecological Design presented by Yeang (1999), provides guidelines as to the implementation of green design in high-rise buildings. For a system like Yeang's Ecological Design to be implemented the design needs to go beyond a single built form and include the concept of Agricultural Urbanism. Agricultural Urbanism aims to redefine urban design to include sustainable food and agriculture systems within the urban networks, focusing at a community level, creating resilient urban communities. For high density housing to achieve this it needs to be implemented with whole-building systems design to create a sustainable, ecological and resilient built form where agriculture is an integral feature of the design of the buildings.

The observation of a consistent pattern in the urban agriculture led to ideas building on from the basis of Social Practice Theory. The theory, however, focuses on urban agriculture and the communal aspects of this. In order to be able to design a building based on the research, it is necessary to not only use a theory about gardening or agricultural practices but to look into built form. For the purpose of this dissertation and the design that will be based on it, it was the researchers' view that the inclusion of additional approaches that considered the natural environment were necessitated. This has resulted in the key theory of Social Practice being important to the formation and continuation of the practice of Urban Agriculture, with the supporting concepts focusing on the environmental aspects of the design.

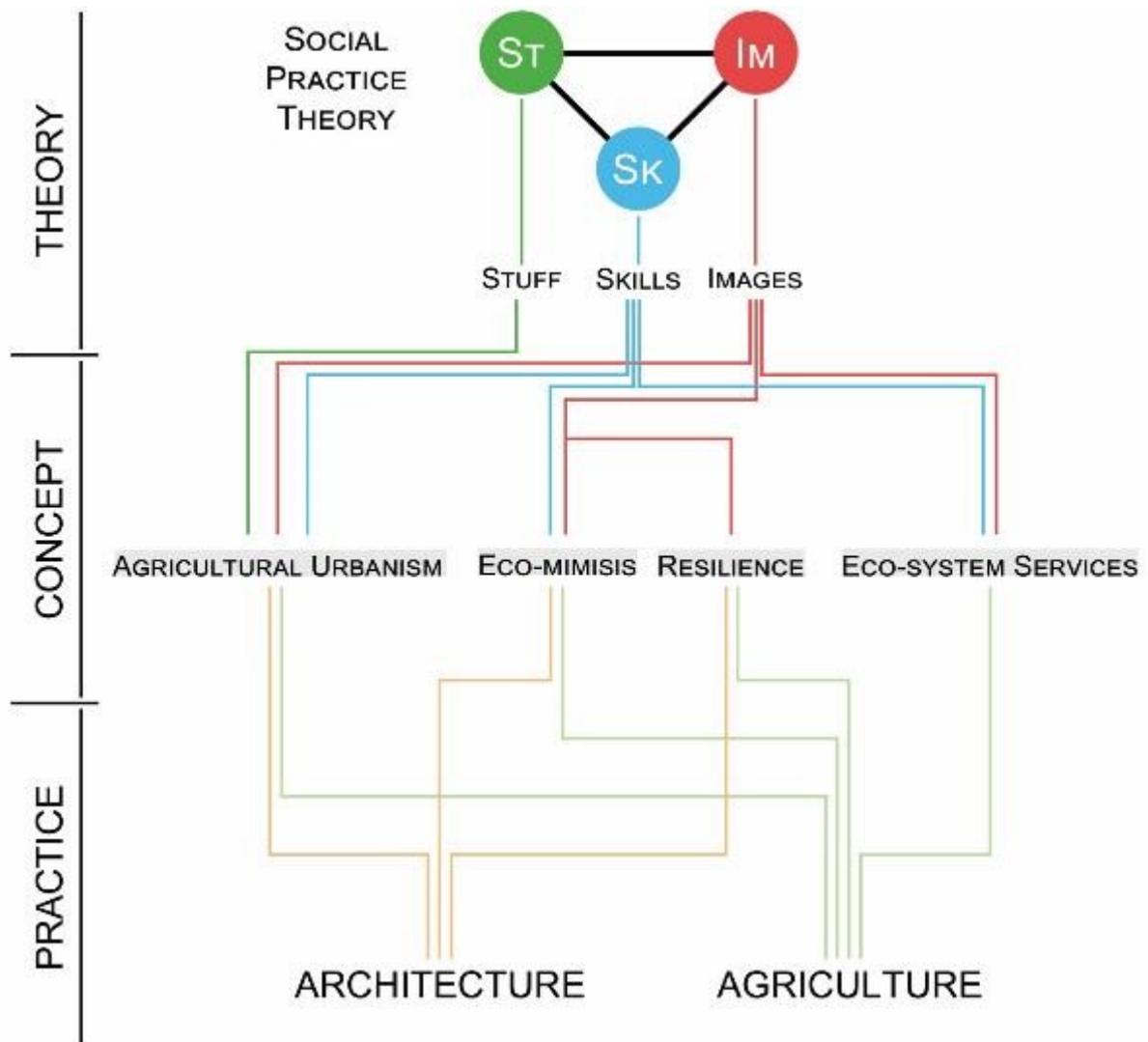


Diagram 2.1.1.
Theories and concept relationships
(Diagram by Author)

2.2 Key theory

2.2.1 Social Practice Theory.

2.2.1.1 Understanding urban agriculture through social practice theory.

The Theory has three core elements that make up a practice: skills, images and stuff.

ELEMENTS	Explanation	As seen in Urban Agriculture
Images (meanings)	Socially shared ideas/concepts associated with the practice, giving it meaning. i.e. Reasons to engage in the practice	Organic produce, environmental stewardship, money saving, recreation.
Skills (competencies)	Learned routines, know-how.	Knowing when to plant and harvest, knowing how to grow food, traditional methods, general gardening skills.
Stuff (materials)	Objects, tools, hardware, infrastructure, the human body.	Gardening tools, pots/containers, plants/seeds, gardening books,

Table 2.2.1.1.

Images, skills and stuff

(Shove and Pantzar 2005, Scott et al. 2011: 283)

and their relevance to Urban Agriculture

(table modified by Author)

Southerton et al. (2004) argue that to promote pro-environmental behaviour it is not enough to educate or persuade individuals to change and make the different choices, but rather that the practices need transformation into more pro-environmental practices. How can this be done and how does this relate to the architecture? The answer lies, for architecture, in the three elements; *Images*, *Skills* and *Stuff*. It's well understood that our surroundings can affect us and our actions. This is shown through the Biophilia Hypothesis (Ulrich, 1984) that shows how links to nature through the design of a building with views to nature or even fractals, similar to those found in nature (trees, leaves etc.), can have positive effects on people's health and mental state. The key for architecture is to design for a change in current practice to a more pro-environmental practice. In reference to urban agriculture this would be to design the buildings for the practice of urban agriculture (*Stuff*) and the socially communicated aspects of the practice (*Images*). Through these design features and the provision for education/ social interaction (transfer of *Skills*) it is possible for architecture to promote the practice of Urban Agriculture. The traditional "kitchen" or "back yard garden" is related to and has been translated into Urban Agriculture

and that of private agriculture in and on buildings, as Shove and Pantzar (2005: 43) argue that a practice is not diffused but rather becomes a “successive, localized (re)invention” when taken into new areas, situations etc. This shows how one practice does not necessarily spread, but rather is adapted over time and in different spaces through the three elements of Social Practice Theory. In the case of the adaptation of agriculture it is through “Stuff”, the materials used, which get translated from the available ground to pots and planters. These are either provided in the design, or through the intent of the practitioner by bringing pots to balconies, window sills, staircases etc.

Social Practice Theory goes beyond the individual practitioner, needing multiple practitioners to constitute a practice. Reckwitz (2002: 256) highlights the acts of people in practices and the mind/body which carry and carry out the social practices. Kuijer (2014: 30) in speaking of mind/body as carriers, states practice-as-entity is dependent on its continual performance by people in order for its existence. It is through this that the performer of a practice (the practitioner) who is actively integrating the elements and there by reproduces and continues the practice, while also transforming the practice.

In the context of the Victory Gardens of the World Wars, Toulaitos (2011) highlights that the end of the war and the re-emergence of industrial agriculture and global trade lead to a decline in household food production and a deformation of the practice with the resulting links between the three elements being broken. In this case it was the *Image* that was removed as there was no longer a societal need or drive for household production of food.

If the Architecture could provide this *Image* for the practitioners as is proposed in this research then the practice could potentially continue as a result of the suggestive visual impact from the design of the buildings.

2.2.1.2 Agriculture as a social practice.

Looking at the framework of Social Practice Theory which indicates that, the creation of social structures are formed by the actors, through practices that they sustain and reproduce. This is to say that the social structures are formed and perpetuated by practices of multiple people. Warde (2005) says that consumption activities are generated by practices. Warde also indicates that consumption habits don't generate practices. This then leaves the question of how the practice of private urban agriculture is generated and sustained. This data suggests that rather than the formation of the practice being a result of social and communal interaction that the interaction is a result of the practice and does not separate itself from the practice but sets itself up to confirm and build the practice.

Literature on the subject of urban gardening continues to link both health and social benefits to the practice of urban agriculture. These social benefits are more focused in highly dense populations in cities where most social interaction is observed at places of employment. The social benefits that they speak of are the initial benefits of practising urban agriculture within the city environments, where the practice is more confined to community gardens. The research into the social benefits in these contexts doesn't look into the relation of the social back to the practice. If one is to observe the history of the

urban agriculture practice sites where the research has been conducted you would see growth not only on a social scale with numbers of participants but also the production of the agriculture and its size. The practice often outgrowing its initial site, and then its subsequent affects in the surroundings, with other urban agriculture sites being created in nearby locations.

2.2.1.3 The importance of social interaction.

For contemporary Urban Agriculture there is a distinct link between the social acts relating to the practice and its persistence and growth in society. This highlights an important link in urban agriculture, the positively reinforcing link between social interaction and private urban agriculture practice.

This theory suggests that in the design for urban agriculture on any scale, if it is to be for private individuals, social needs should be taken into account. Current needs, as suggested and highlighted by respondents to the research were; learning areas, places for exchange of seeds/plants, places for recreation and places for aesthetic appreciation of the agriculture. These spaces have been observed in varying scales from small scales in private gardens to larger scales at events and club/public gatherings. The old adage “no man is an island ” comes through here even to say that no urban agriculture practice/site is an island on its own, all are connected through community and social interaction for the benefit of all.

2.3 Key Concept

2.3.1.1 Ecological Design.

Ecological Design came out of the space age design era where Architects, Designers, Engineers and Biologists worked together towards designs that could support life indefinitely in space, on the moon and on other planets. This resulted in many test facilities with technologies being tested that would be the beginning of the movement of building design, towards ecologically friendly designs. This led to the Architects and Designers thinking of the building as the ecosystem we live in, leading to a systems-based approach that would become Ecological Design Theory (Anker 2005).

High density high-rise buildings and skyscrapers use more material and energy resources during their entire life-cycle from construction, through use, to demolition, than other types of buildings (Yeang 2007: 411). This suggests that although the use of high density high-rise buildings benefits the surroundings by its use of a smaller footprint, allowing cities to be more compact or for introduction/restoration of nature within cities, these buildings can be worse for the environment than smaller buildings. This may not be an option in the foreseeable future with increased urbanisation and the ubiquitous urban sprawl seen, as suburb's spread out across the country side from the cities claiming what often had previously been agricultural land. With most countries having positive birth rates and growing populations this "problem" will continue to grow. This creates an opportunity for Architects to find alternative solutions where the high density of cities does not have to result in excessive energy and material usage or large waste streams leaving the buildings and cities, destroying the surrounding ecosystems. An idea by Ken Yeang, Ecological Design, looks at this opportunity and proposes ways of finding solutions to these problems. Yeang (2007: 413) says "we must not be misled and seduced by technology. There is a popular perception that if we assemble in one single building enough eco-gadgetry... ..we will instantaneously have ecological architecture." Rather, ecological design is where the built environment is designed as a system that is integrated into the natural environment and ecosystem the building is positioned within.

Yeang (1999: 64-67) in his book "*The green Skyscraper*" gives guidelines as to the implementation of green design in buildings (with his focus being on skyscrapers). The guidelines propose designing buildings that are ecologically designed, not necessarily with all the "green" aspects possible, but rather those that provide a positive impact for both the building and its surroundings. Where the building can then provide a positive impact on surrounding ecological systems and biodiversity.

2.4 Supporting Concepts

2.4.1.1 Agricultural Urbanism.

A concept and movement, Agricultural Urbanism aims to redefine the design of the urban environment to include sustainable food and agriculture systems in the urban networks focusing at a community level. The focus of the concept is highlighting the whole food system (all the elements from growing,

processing and packaging, to distribution, sales, cooking and consumption). It looks to educate all who are part of the system. The main outcome of Agricultural Urbanism is to merge the two historically separated aspects of the food system; the food and the city.

The goals of Agricultural Urbanism according to agriculturalurbanism.net are to:

- *“Integrate a significant food system productivity and value into all aspects of urban planning and design on a project, in a neighbourhood or in a city.”*
- *“Harness development investment through its program, financing and other elements to aid the local food system’s sustainability performance (e.g.: endowments; trust ownership; etc....)”*
- *“Design and program the project to provide many educational elements related to a sustainable urban and regional food system – both formal and informal as well as increase the partnerships and social capital / relationships around food.”*
- *“Promote developments that increase the overall sustainability performance of the larger community.”*

(Agricultural Urbanism. 2016)

For the integration of the two separated aspects it is identified that there is a need for new or altered built infrastructure for the education production and resale of urban agriculture. In order to merge the two aspects, the focus is placed on community and linking the community and the food production. This is embodied in different ways for the three different styles of development; high density, suburban and rural edge development. In high density the focus is on creation of community and farming/ gardening opportunities, increasing the visibility of the food system and processing. While in suburbs and the new edge developments that are compromising and removing farmland, Agricultural Urbanism works to preserve farmland where possible and to increase the density of the developments positioning them on the least desirable land (Agricultural Urbanism. 2016).

A related and supporting concept that sits within Agricultural Urbanism is an emerging term Artisan Agriculture. The term describes the emerging approach of farming that is not only compatible with the urban context but is designed to benefit from its adjacency to a large and varied population (Agricultural Urbanism. 2016).

2.4.1.2 Eco-mimesis.

Eco-mimesis like bio-mimesis (bio-mimicry) is designing to mimic nature (Yeang 2007). Unlike bio-mimicry, eco-mimesis is a process whereby, the designers design to imitate complete natural systems. This concept supports Ecological Design inasmuch as the outcomes of eco-mimesis is precisely the intention of Ecological Design. Although they share an intended outcome eco-mimesis does not go as

far as ecological design. Eco-mimesis, as a concept, helps in the design of systems similar to those surrounding the design site and the integration of the man-made systems into the natural systems. With its focus being on the function of systems and their outcomes, and integration and interactions between the man-made and natural. The concept encourages the architect to think of all the systems in a building and how they work and can work together, how different aspects can feed each other or feed of the “waste” produced from another process or system. This concept also works at the larger urban scale to provide design support for agricultural urbanism and the systems needed. It allows for the design of the systems to be intentionally integrated into the workings of the city and other surrounding systems to support the urban agriculture and the sustainable goals of agricultural urbanism by working with natural systems and flows of resources. This suggests that for urban agriculture to be integrated into a high-density residential development, keeping to the concept of eco-mimesis the approach to the agricultural component should be linked to the permaculture ideas that attempt to mimic nature and work with natural flows of energy and nutrients.

2.4.1.3 Resilience.

The Resilience Concept is derived from nature, where systems have built in redundancies that help them to survive disasters or changes and can help in the restoration of systems (Spirn 2011; Wu & Wu 2013). Taken from this, the concept suggests how multiple options and reserves or redundancies built into systems serve to support systems and help them to continue and rebuild after the occurrence of a negative impact to a system. This concept also helps to design for multiple systems to occur and work together in order to lessen the load on one system spreading loading and size across multiple systems. This allows individual designs to be at smaller, more human scales.

What this means for building design, is the inclusion of redundancies and options for the residents in regard to all aspects of the building. This doesn't mean the inclusion of all people's ideas into a design, if one were to be designing with community engagement, as there are infinite options (in most cases) for different aspects of a building. Resilience proposes that there are multiple options and that the linking within a system is done such that the system won't collapse in the case of a single event. This would mean that there are multiple options of access to levels with the possibility of multiple routes to one apartment. In the case of electrical supply it would also mean multiple sources which, if a building were off-grid, would require such alternatives as; photovoltaic panels, wind turbines, biogas generators (that have the ability to run on multiple fuel sources). This would also require the power to not only go to one storage and conversion unit but to be distributed among multiple units as well as having an additional backup supply for emergencies etc.

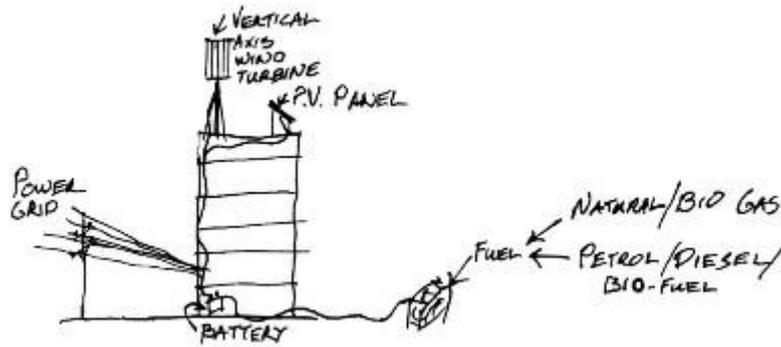


Diagram 2.4.1.a.

Diagrams showing examples of resilience in buildings -

Electricity

(Diagrams by Author)

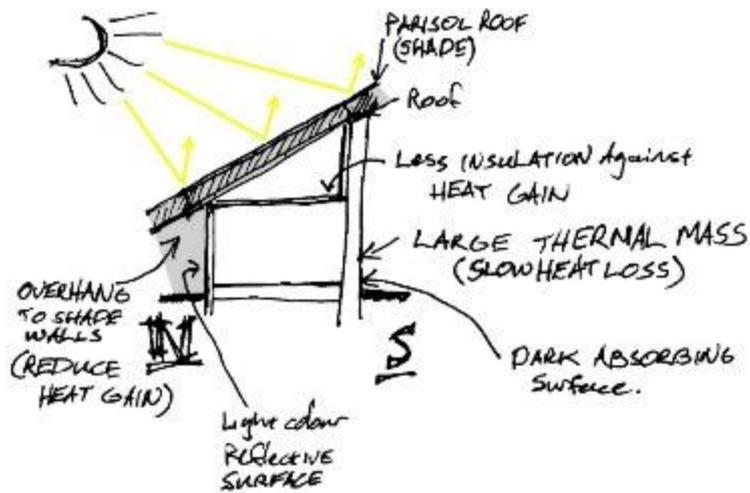


Diagram 2.4.1.b.

Diagrams showing examples of resilience in buildings –

Passive heat control

(Diagrams by Author)

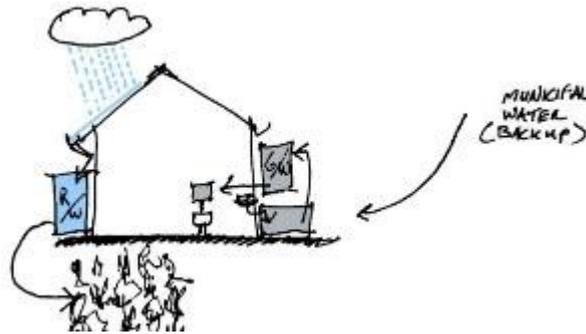


Diagram 2.4.1.c.

Diagrams showing examples of resilience in buildings –
 Water collection/ use
 (Diagrams by Author)

2.4.1.4 Ecosystem Services.

Ecosystem services are a list of natural services, divided into four categories, which perform certain functions for either leisure or supporting the occurrence of life in certain areas (Sarukhan & Whyte 2005. 6-10).

The first three services are crucial to a working ecosystem. So in designing along ecological design theory it is crucial to understand these systems, how they are related and how they interact. It also becomes important to analyse the existing services on site and how any building would impact on these services and the ecosystem.

Service Name	Provisioning Services	Regulating Services	Support Services	Cultural Services
Service Description	These are products provided by an ecosystem	Regulating process benefits	Services for the production of other ecosystem services	Non-material benefits, mostly for humans.
Service Example	<ul style="list-style-type: none"> • Food • Timber (fibre, firewood) • Fresh water 	<ul style="list-style-type: none"> • Flood water attenuation • Climate regulation 	<ul style="list-style-type: none"> • Nutrient cycling • Habitat provision 	<ul style="list-style-type: none"> • Recreation • Social interaction • Spiritual enrichment

Table 2.5.2.1

Ecosystem Services categories
 (table by Author
 based on Sarukhan & Whyte (2005))

3 AGRICULTURE AND THE CITY

3.1 INTRODUCTION

While studies have proven the environmental, social and physical benefits of agriculture in cities, current urban residential architecture doesn't include agriculture. A change of urban residential design is important in order to improve food sovereignty and peoples relationships to food and nature. In the East in non-colonial countries Urban Agriculture has long been a tradition, continuing up till this day (Mougeot, 1998; Mok et al. 2014), but in recent decades there has been increasing interest in developed countries (Mougeot, 1998) and the West. There has been an overlapping research interest in urban agriculture from multiple disciplines although the architectural discourse seems to be lagging behind with the focus remaining predominantly on production of green walls, rooftop gardens and rooftop greenhouses (Specht et al. 2014). This speaks more to the addition of "green" activities onto a building rather than integrating them into a complete system design approach to the building. Having the agricultural practices being part of the building on all levels and surfaces, with the systems of the building being designed for use with the agriculture and taking advantage of the ecosystem services provided by the inclusion of agriculture and the resulting increase of biodiversity. This literature review looks at the history of agriculture and the city and how current ideas are attempting to bring agriculture back into the city. These ideas are mostly large scale ideas, either being community size projects or commercial. They will be analysed according to how they fit with the architecture and how they can and do relate to the theories and concepts that form the basis for this research.

3.2 HISTORY OF URBANISM AND AGRICULTURE.

Man first settled when he was able to farm food and their lifestyle could change from a hunter-gatherer to a more agrarian lifestyle with farming the land and raising livestock. Historical cities, such as Byzantine Constantinople and some Mayan cities, were known for the inclusion of agriculture and animal husbandry within and surrounding the city (Barthel, Isendahl, 2013). In recent decades, the practice has seen a resurgence and increased interest in the West (Mougeot, 1998).

Cities grew in size and number during the industrial revolution the towns and villages subsequently either were absorbed or disappeared. The residents who previously lived agrarian lifestyles changed their lifestyles looking for work in the cities earning money and rather than producing their own food they began to buy food from others. The cities having become economic centres, forced agricultural practices outside of their limits. Slowly this has meant that fewer people grow their own food and work for money in order to be able to buy food they once would have produced themselves. The production of food, which was once something achieved by the masses has now shifted to the hands of few. Those who are still able to own large plots of land still farm and buy neighbouring farm land, while the smaller farmers in the peri-urban regions have been integrated into the urban lifestyle seeking other means of income in order to buy the food. This has meant that food security and sovereignty is at risk whenever there are natural disasters; disease, drought, insect infestation etc. The results of those risks get passed on to the consumer in the form of high prices and shortage of locally available food, with foods being

imported from other regions or countries in order for sufficient to be available. Yet still some go hungry with an estimated 794.6 million people being undernourished around the world, nearly 11% of the world population, with the estimate for Southern Africa being 3.2 million and above 5% of the population. (FAO, the state of food insecurity in the world 2015: 8).

The unchecked growth and industrialisation of towns and cities has resulted in poorer living conditions throughout the developed and developing world with the pollution and related health hazards affecting the populous (McDonough and Braungart 1998). Ecological Design looks at remediation of these problems and changing the future of city and building design to create healthier places for people. Not only does this work through the inclusion of nature for its Biophilic properties (improving mental health the inclusion of natural system helps clean the air, toxicity of soil and affected ground water) but it also provides services to mitigate the negative effects of natural disasters like that of flooding through biological rain water attenuation.

3.2.1 TOWN PLANNING AND THE RISE OF THE MODERNIST CITY

Although town planning existed previously when towns, cities and whole regions were planned by rulers and states, such as the Romans and Greeks, the focus here is on the Modernist planning and the resulting planning and problems it has led to.

The ideas of the Modernist planning were a result of the “post -1850 urban industrial period” (UN Human Settlements Program 2009: 47). The planning resulted in specific plans and zoning imposed in a top down approach by government/ governmental organisations. These plans sought to separate functions by zoning them (UN Human Settlements Program 2009: 49), the initial intention to separate the industrial and working areas from the residential areas along with separating areas for the sick people from the healthy.

Planning was seen to have three essential components to it during the Twentieth Century (UN Human Settlements Program 2009: 49):

- An exercise in the physical planning and design of human settlements, responding to social, economic and political situations while not, intended to intervene in them.
- Master plans of what the resultant city should look like, in its ideal state
- A task to be driven by a set of values, describing the ideal living environment and being for the “public good”.

The resultant planning from these views was such that it harked back to the general planning of the European and English villages in medieval times.

While the planning of the Twentieth Century looked at human health and well-being along with the “ideal living environment” it still lacked the fundamental inclusion of ecosystems into the design.

3.2.2 The Garden City and its influence.

The Garden City (a concept by E. Howard. 1902) was one of the ideas that most influenced modern planning. This planning represented the utopian socialist movement of the time and a conformed nostalgia and longing for village life. Howard’s objectives were twofold: social and aesthetic. Socially Howard was attempting to preserve a traditional village life through a restricted size of town growth and aesthetically by re-introducing the nature and beauty of the countryside into everyday life (Figure 3.2.2.1). This concept included some benefits of a natural environment and sought to limit the size of towns and cities so that they would not burden the environment. In nature when an environment is burdened that system either reacts through one of its methods of resilience or self-destructs and rebuilds a new system in its place removing the burden or working a way around it.

Some believe that the “social agenda” (Able 2010: 20) of Howard's Garden City plan was stripped from the concept when it was taken up by other planners and resulted in far lower densities than what was intended. The result of this was planning from others such as Le Corbusier and Wright who took the garden aspects of the concept and formed their own plans, which were considered to be informed by the Garden City Concept.

- Le Corbusier proposed designs that would include the demolishing large parts of cities (mixed use, slums and narrow streets) replacing them with “boulevards”, tower block residences and mono-function land use zones(UN Human Settlements Program 2009: 50).
- Wrights design of houses in low density dispersed cities, allowing each family to have their own piece of land. This planning is also a result of the modern technology and relied upon it to work connecting everything via roads for the personal car each family would have.

This is believed to be where the origins of suburbia lie and thus the origins of suburban sprawl that has plagued city and urban planning since (UN Human Settlements Program 2009: 50).

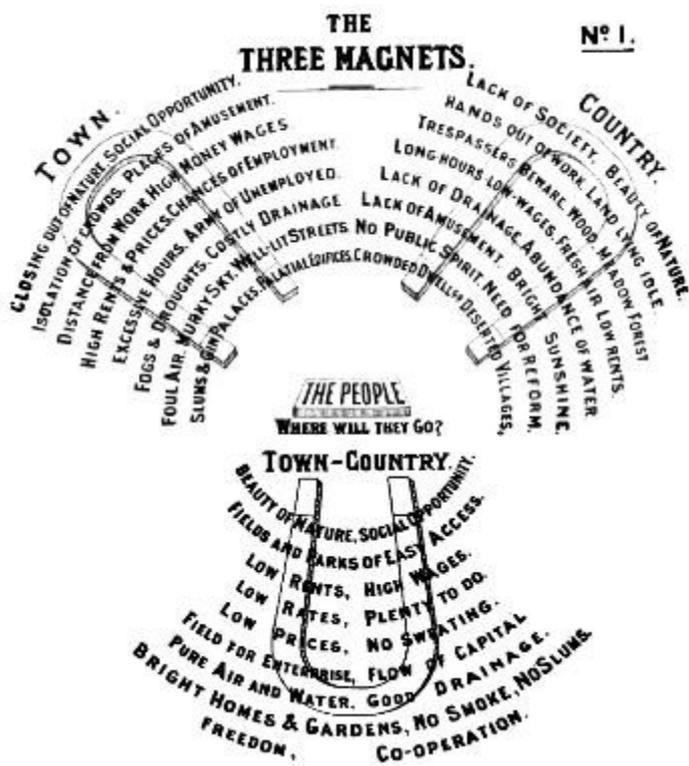


Fig 3.2.2.1.

The Three Magnets.

(Garden cities of to-morrow, 1902: 16)

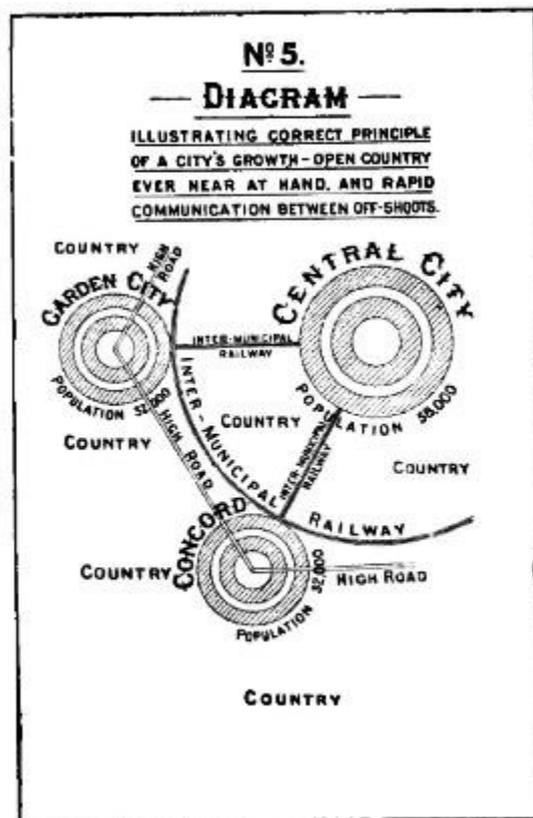


Fig 3.2.2.2.

Garden City Growth.

(Garden cities of to-morrow, 1902: 128)

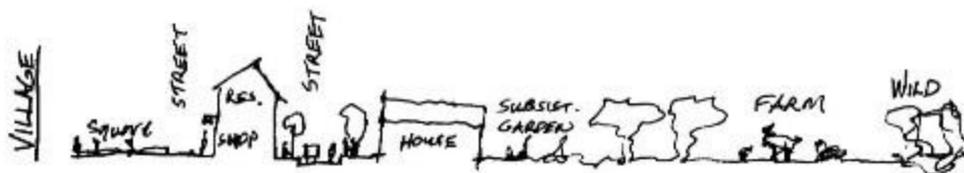


Diagram 3.2.2.1.a

Village

(Diagram by Author)

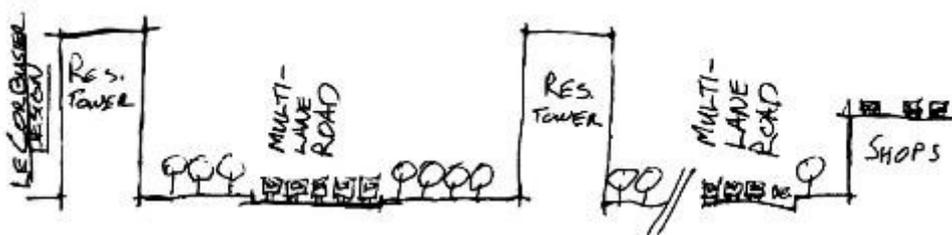


Diagram 3.2.2.1.b

Le Corbusier design, observation of controlled nature without interaction.

(Diagram by Author)

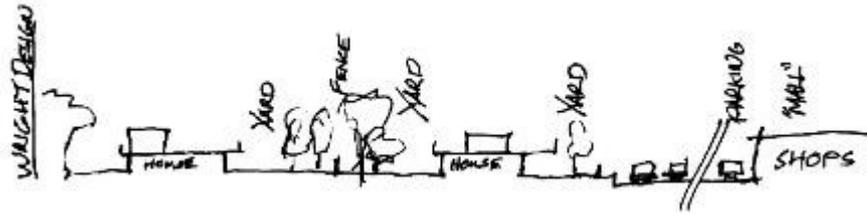


Diagram3.2.2.1.c

Wright design, interaction with disjointed nature and separated from city.
(Diagram by Author)

3.2.2.1 Conclusion.

The history of residential layouts and urban/town planning is as varied as there are countries. Although, in recent history much has changed and conformed to a single view, being modernist planning. Modernist planning however was a western reaction to the industrialisation of their cities and towns and the rapid growth that was subsequently seen, as people moved from the countryside to towns. This resulted in what Howard attempted to accomplish with the garden city concept, bringing the old village/country feel into the town/city. As with many ideas, this was misused by others and resulted in generic designs, painted over the city with broad and indiscriminate brush strokes, at times favouring only one class of resident. However, the social and aesthetic aspects of Howard's concept can still be seen in many designs albeit not as well executed as he intended.

In recent times, with focus shifting to regional concepts and sustainable designs, including an awareness of climate issues and the need for biodiversity, more aspects of the initial concept are finding their way back into planning in a positive way. This includes social and density issues which were ignored during the modernist era, where the suburban sprawl originated and tall towers surrounded by parkland were dotted around cities, giving the illusion of integration with nature/ the countryside.

The concept of Garden City offers a starting point for Architects to theorise new ways of designing the city and designing in it. The inclusion of the village lifestyle, while different from the current city model, can be incorporated into the design of the city. This can be done through creating a walkable, human scale city. What that means for architecture is the need to engage the public in the architecture, not just through talking but, through the built form and the creation of buildings that the public and users alike can engage and interact with. For a walkable city to function and remain safe, there needs to be the presence of people twenty-four hours a day. For that to be accomplished, high density inner-city living that remains connected to the streets and public realms needs to be achieved. Both the Garden City concept and historic village designs give insight into the opportunities and typologies needed to accomplish this. Through inclusion of mixed use multi story residential units of the historic "middle-class" with shops on the ground and residences above. To provide the increased residential densities can possibly, like in modernist planning, force the gardens and nature to become separated from the residents. This should not be the case, these residential buildings should be designed to accommodate the inclusion of nature through design of spaces and opportunities for the residents to grow plants and

food. Much like that of a village where residents were able to engage with nature on a daily basis while going about daily activities.

3.2.3 THE NEXT INDUSTRIAL REVOLUTION

McDonough and Braungart published a paper in 1998, “The next Industrial Revolution”, in which they analysed the industrial revolution and the eco-efficiency movement as two industrial revolutions. They state that the eco-efficiency concept, while well intended “works within the same system that caused the problem” (McDonough and Braungart, 1998) only slowing it down with moral intent and punitive demands. They consider that the conflict between the environment and industry is a design problem. This design problem is an opportunity for new ways of design to be brought in to solve not only how industry and society works but to attempt to reverse the negative effects of the previous industrial revolutions.

3.2.4 AGRICULTURE’S RELATIONSHIP TO THE CITY

3.2.4.1 THE GARDENERS OF WAR

During World War I food produced in North America was being sent to the allied troops fighting in Europe. A National War Garden Commission in USA was set-up which used posters, cookbooks gardening manuals etc. (“*Stuff*”) to promote people growing food increasing their food security and play a role in patriotism (“*Image*”) by joining the war effort (Mok et al. 2013: 22-23, Mougeot, 1998). These gardens were relied upon during the Great Depression that followed in the 1930’s. The subsequent World War II brought the emergence of Victory Gardens (based on previous war gardens). Which, by 1944, were producing forty percent of the fresh vegetables in USA and numbered around 20 million gardens. Touliatos (2011) highlights that the end of the war and the re-emergence of industrial agriculture and global trade lead to a decline in household food production and a deformation of the practice with the resulting links between the three elements of Social Practice Theory being broken. The (Modernist) Industrial city struggles to include natural environments since the city fundamentally opposes the processes of the “cradle to cradle” cycle of nature where the waste of one system works as food for another within a continuous loop.

3.2.4.2 HOMESTEADING

Homesteading was promoted in the cities during the times of war relating to the war gardens and victory gardens. With collapse of industry, such as in Detroit where families were unable to afford much after losing jobs, the practice of homesteading included agriculture into cities by recreating the farm on the plot of land you live on, no matter how small. Some of these homesteads are extremely profitable and continue to this day in places like Detroit and California. The Urban Homestead is one such example having videos on YouTube and its own website (urbanhomestead.org). The promotion of homesteading has created an interest in agriculture within the city, mainly in suburban areas though. It has resulted in sustainable technologies being taken up by residents and the designing or altering of homes to allow for maximum agricultural area.

3.2.5 COMMUNITY GARDENING

Bellow follows recent developments in agriculture, identifying methods that have become integrated into current urban agriculture, linking the international developments of urban agriculture to the local context.

3.2.5.1 MARKET GARDENS

Market Gardens are, historically, similar to allotment gardens. This is except for the market gardens having the express purpose of being agricultural production for the sale of food through markets or barrows, trucks etc. as a means to transport the goods direct to consumers. Agriculture has played a large role in the history of South Africa, starting with the “Company Gardens” in Cape Town and later indentured Indian labour being introduced to farm the sugar cane plantations. Thus market gardens became an opportunity for those who had skills inherited through the South African history to become self-employed and earn money.

Market Gardens were a means during Apartheid times by which the Indian population, especially in and around Durban, were able to make a living. Selling what they grew either at the original early morning market or by travelling around with their produce in residential areas. These Market Gardens were placed near the cities and suburbs where they sold the produce. The Market Gardens were ideally positioned, at or near the edges of the cities for which they served. This closeness meant convenience for both the farmer who sold his own produce and the consumer who received produce that had travelled a short distance and was delivered fresh on the day of harvesting. This idea of close proximity between the farm and market has been taken up by the Agricultural Urbanism concept attempting to reintroduce agriculture to the people

3.2.5.2 COMMUNITY GARDENS

The allotments are large pieces of agricultural land, generally placed outside of the cities, divided up into manageable small lots for families or groups to farm. Community gardens have taken the principle of large shared agricultural spaces and brought it into the cities. The community gardens are often located in unused or underutilised properties within the city, close to or within residential areas. In some countries where community gardens have been practised for many years, where there is traditionally a strong link to agriculture in the home environment, community gardens have become part of town planning.

While here in South Africa they have been created by the citizens, fought and petitioned for by the communities themselves. Julia road garden in Durban is one such example along with other gardens in the Durban and Berea area, these were originally started as Guerilla Gardens but have become integrated into the mainstream as they have matured, attracted the support of the community and challenged the legal system (van der Walt 2016 a). Initially the city didn't accept the Julia road project as it was located on public land and therefore against certain municipal by-laws however, the case was considered and eventually accepted. This happened at roughly the same time as the priority zone

garden project was being developed. Although this project has been accepted there are still no municipal run/owned community gardens or allotments available within the city. Community and allotment gardens are available mostly outside the city, those available within the city are mostly run privately by individuals or companies.

Internationally it is common practice to reclaim derelict land and abandoned properties within cities, (like London and Detroit) for community gardens for food and Wildscapes. Locally, a derelict mansion in Umbilo Road, Durban has become such an urban oasis, known as Green Camp (van der Walt 2016 b).

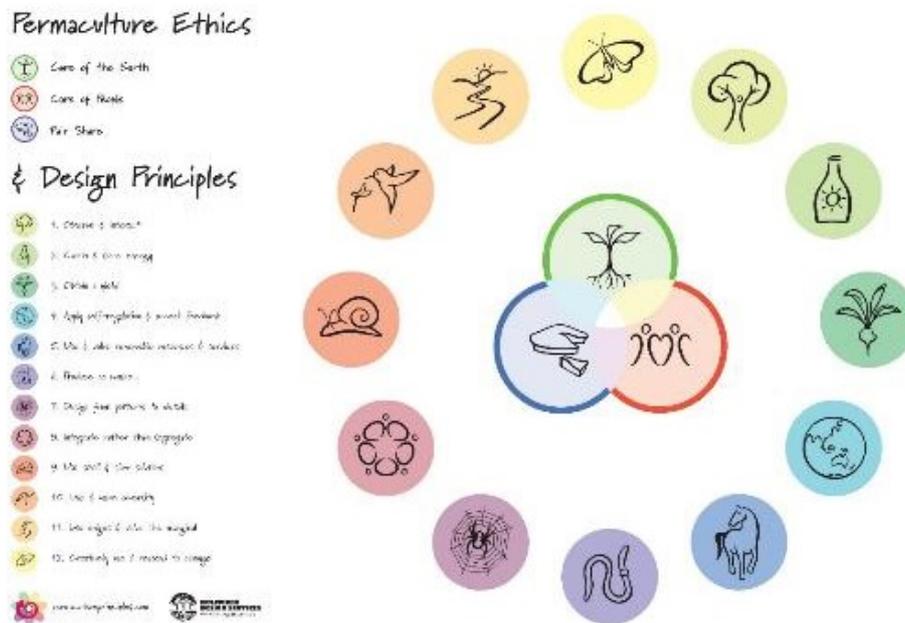
3.2.6 PERMACULTURE

The term Permaculture or Permanent Agriculture is a term coined by Bill Mollison and David Holmgren in the early 1970's while developing an "interdisciplinary earth science... ..with a potential for positivistic, integrated and global outreach" (Mollison. B 1988: ix). It is a concept of using, maintaining and mimicking natural ecosystems for the agricultural benefit of a farmer or land owner (Mollison. B, 1988: ix). Permaculture as Mollison saw it is a whole system design that looks at both the architecture of the residence property and agriculture surrounding the architecture. Traditionally this system is applied to land based agriculture where one is either on a farm size plot or can simulate a farm environment on a smaller piece of land. As the permaculture concept becomes more popular among the eco-friendly population who grow their own food, it is slowly being adapted to smaller, more constrained environments and smaller properties not located on large farms with unrestricted access to wild natural environments. Using ideas from the systems and designs of permaculture it should be possible to integrate the concept into the design of higher density housing, using private and communal realms of gardening/ farming. Through the current adaptation of permaculture to smaller urban properties it has further potential to get integrated into multi-storey residential units, where the design considers differing scales of activities linking through the building and incorporating the surrounding land. The Permaculture system, which works by mimicking the natural occurrence of multiple ecosystems working with and overlapping one another, has the potential to work on multiple scales. This is seen in examples where it is used in urban environments such as the Birches School in Sarnia (South Africa, The Good News. 2014).

Permaculture is a lifestyle and whole property design tool to promote self-reliance and living with nature; from the garden designed to work with nature, to the design and locating of the buildings and their links to the activities of food production, storage and consumption. Permaculture is designed such that the home and its goods production, work as one large system with their surroundings and in harmony with nature. This is one aspect of urbanism that is lacking and has resulted in negative outcomes from cities; like the urban heat-island effect, soil contamination through waste and dump-sites/landfills, sewage being directed into rivers and the increased reliance on the personal motor vehicle for transport.

The hard landscapes of the cities both in the public and private realms through roadways and paved areas result in rainwater run-off and less ground water recharging. This places more burden on the rivers and water systems in and surrounding the cities. These are all considerations that are taken when permaculture design is used in property design. This has greater potential, at the larger scale where it can be introduced into residential, neighbourhood and city design to have positive impacts on the ecosystem and the services they provide (spoken about more directly in chapter 2 under supporting concepts).

Fig 3.2.4.1.



Permaculture ethics and design principles.

(Holmgren, D. 2016)

3.2.6.1 Design process.

Permaculture’s design process and guiding ideas serve as a starting point for designing a farm like environment. This farm not being traditional in that the consideration of nature and natural systems outweighs man made systems and technology. This approach lends itself to the inclusion of Ecological Design when approaching a permaculture inspired and led development or building. It considers that life-cycles are important for all aspects from building materials to services and their generated waste streams, and how these are dealt with. In contemporary architecture and lifestyles (perpetuated by modernism and the global West) these waste streams are dealt with through dumping, incineration etc. Though through the re-evaluation of the design approach, considering the ethics of permaculture and the sixth design principle (produce no waste), the design process looks at Eco-mimicry with the objective of reducing waste and finding alternative uses for waste like the “cardboard to caviare” cycle of Graham Wiles (Ted Talks, 2011).

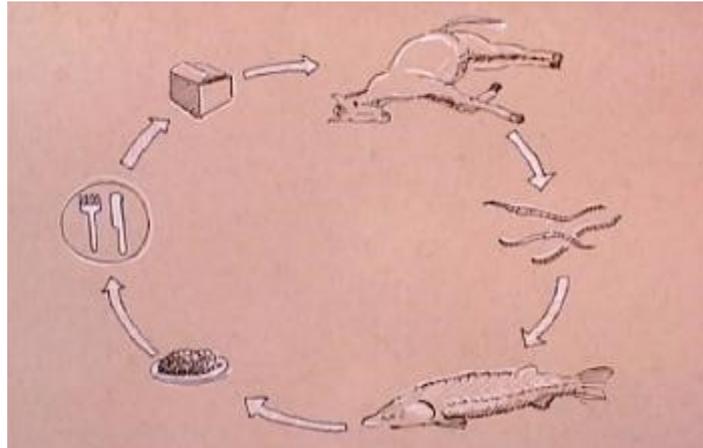


Figure 3.2.4.2.

Cardboard to caviare, G. Wiles.

Image taken from video clip.

(Figure from Ted Talks. 2011)

This is an example of how waste streams become the input for the next part of a life cycle design. Placing this within the realm of architecture, it is important to design a building for a life-cycle beyond the initial designed use, this can be through; adaptive reuse of the structure, design for disassembly of modular/ re-usable parts. Thinking beyond the structure, the design for the use of spaces and technology, creating reuse cycles within the building. Thorough waste water management and reuse, use of “waste” cool air from hot water heat pumps for cooling of buildings.

McDonough and Braungart note three categories of concern for design in the next industrial revolution “Equity, economy and ecology” (1998), these three concerns relate directly to the three ethics of permaculture (as translated to architecture in chapter 7): “equity refers to social justice” linking with “fair share”, “economy refers to market viability” linking with “care of people” and “Ecology... refers to environmental intelligence” linking directly to “care of the earth”. The relationships between the three categories and ethics to the concepts of Ecological Design and Agricultural Urbanism highlight the need for an appropriate response to the current city that will include the natural environment into all aspects of design, from industry to residences.

3.3 BENEFITS OF AGRICULTURE IN THE CITY

Agricultural Urbanism proposes the inclusion of visible agricultural practices within the urban environment increasing accessible natural environments. The inclusion of natural environments within cities has been studied and linked to improvement in the health and well-being of urban residents (Wakefield et al. 2007; Armstrong 2000). The spaces offered to residents through urban agriculture and the inclusion of other natural environments adds to the mental health of residents through Biophilia while giving opportunities to relax and socialise in a natural environment removing the stresses and pollutants of cities. It also improves the physical well-being of residents through the opportunities afforded by walkable environments and physical activity (Abraham et al. 2010).

3.4 THE FUTURE OF URBAN AGRICULTURE.

A thorough observation of the media in recent years shows an increasing interest of people in cities and suburbs in growing/farming their own produce. Advocates of private agriculture mention multiple reasons for this increasing interest, although the main reason seems to be that of rebelling against “big Agriculture” (a reference to the ubiquitous statement “big brother is watching”) and consumerism. This shows the growing concern of urban residents with where their food is coming from, the processes and chemicals involved in the production of their food and the impact on the environment and their health.

3.4.1.1 Urban Agriculture and Architecture:

The architectural designs used for urban agriculture focus on medium and large scale activities and seem to neglect the needs of the individual, within the urban communities. Residents in the urban environment have an inability to produce food in “backyard gardens”, in order to improve their food sovereignty and security, while living in multi-story buildings. According to Kortright and Wakefield (2011: 39) little research has been done to examine household food gardens and by extension this includes personal urban agriculture. The limited research done has little to no focus on balcony, rooftop and indoor gardening. Indoor gardening while not entirely new, with windowsill plants and kitchen herbs being commonplace, faces challenges of lighting. With many authors and researchers suggesting different artificial lighting techniques (Mok et al. 2014: 26; Despommier 2011: 236). Despommier (2011) suggests that the ideal vertical farm, would be to create a completely transparent building, for the specific use of natural daylight. This would allow for problems associated with the design of people centred buildings not being the optimum design for plant growth, as the entire building could be naturally day-lit.

Within popular culture and media, there has been a growing interest and resurgence into private agriculture for many reasons. This is achievable in varying degrees, by most urban residents, although many live in accommodation that doesn't allow for much more than a window or balcony garden with some herbs and possibly some salad plants. Where these people, internationally would find space to grow other food, is in places such as community or allotment gardens. Such garden spaces are uncommon within South Africa and more specifically the Pinetown area. Thus, when the urban residents do use such spaces, there is often a large distance of travel involved. This, countering the lower ecological impact of growing one's own food. With proposals for improvement and densification of the residential aspects of the inner city of Pinetown, it may be necessary to include spaces for and ways by which the new residents could produce their own food, and more than just herb and salad plantings on windows and balconies. This suggests that the design of the buildings needs to not only allow spaces for private urban agriculture, for supplemental or subsistence farming but should integrate the urban agriculture into a systems based approach to the architectural design.

3.4.1.2 Private Urban Agriculture:

Kortright and Wakefield (2011) identified five types of backyard (urban agriculture) gardens:

- Cook's Garden
- Teaching Garden
- Environmental Garden
- Hobby Garden
- Aesthetic Garden

While each of the five garden types had a different reason for being, the respondents of each listed benefits, including human links to nature and its benefits, and the production of food. A third of the respondents were self-sufficient in some foods they produced increasing their food security and resilience. Food security and food sovereignty can become a key factor to the resilience of a city, with climate change affecting crop production and food prices as well as availability of fresh food.

Both the Biophilia and Resilience concepts are an important part and reason for urban agriculture, also being reasons to sustain and promote the practice of urban agriculture. There has been little further focus on private agriculture within the study of urban agriculture as "*backyard food gardening represents the smallest scale of urban agriculture*" (Mok et al. 2014: 25) while Mok et al. (2014) states that backyard food gardens, do influence and improve food sovereignty for their practitioners. In the production of urban agricultural spaces, research has shown that it provides for individual and social needs linking with the concepts of Biophilia and resilience (Mok et al. 2014; Specht et al. 2014).

3.4.2 VERTICAL FARMING.

There are both commercial and private residential aspects to the growth in vertical farming in the urban environment. An open source international community project, window farms, which was conceived by Britta Riley saw the use of the term R&DIY (Britta Riley. 2016) and crowd-sourced development to create the final workable product (Ted Talks. 2016). The project was to develop a method of farming in a typical window that would be easily and cheaply made and cheap to run. It developed into a vertical hydroponic system that could be placed into a window of an apartment anywhere in the world and could produce many food items for the residents. This solution, like most small scale private urban agricultural projects for apartments has the problem of blocking light and views for the people inside of the building and/ or also not being of sufficient size to completely provide food for a family.



Figure 3.4.2.1.

“Brooklyn’s first window farm”.

(Source: NPR. 2010)

The commercial Vertical Farm and indeed the main theories and concepts behind this idea were proposed by microbiologist and author of “The Vertical Farm” Dickson Despommier (2010). His conceptual model for the Vertical Farm takes the conventional farm and brings it into a city skyscraper filled with technology, systems and people. While the idea is worth considering and building upon, there are some who oppose this method of farming completely (Cox, S. Van Tassel, D. 2010. Alter, L 2016). This method of farming is meant to be a sustainable alternative to conventional farming, being less resource hungry, though what Despommier has proposed and all the examples he has given have large expanses of glass much like a greenhouse and are like laboratories and factories in how the plants are grown, pollinated and processed. The Urban agricultural factories that he has proposed are sterile environments within which no insect or organism that is not needed or wanted by the “scientists” controlling the factory are omitted, this is to the point that it is suggested that the pollination is done by people. This is much like in China (Williams 2016; Partep & Ya 2012; Allsopp et al. 2008) and other places around the world, except that they are doing so out of necessity as the bees and other pollinators have died out or are insufficient in number to effectively pollinate the crops. It is the researchers’ view that this Industrialised response to the “food crisis” is far from what is needed. The world biodiversity is decreasing and more and more fauna and flora are going extinct, this is evident in the cities where nature has been systematically removed since the dawn of the industrial age, with nature and agriculture being pushed out of the cities due to it being unclean (Govender. 2014). The removal of nature from agriculture, like the removal of nature and agriculture from the city, could result in further loss of biodiversity in the city and its surroundings. Thus becoming more sterile, much like the urban agricultural factories proposed within them.

The introduction of vertical farms in the city and adaptation of existing buildings to integrate forms of farming and agriculture, has a responsibility to the inhabitants of the cities to not just provide food for human consumption. As the UN (World Hunger. 2015) have already shown that there is enough food produced internationally to feed all people worldwide, yet it is through waste that all people don’t get the available food. The responsibility of those who choose to farm in the city and those who start vertical

farms is to the environment, as that is one of the main reasons for bringing farming into the city and high-rise buildings, to enable the currently farmed lands to return to nature and become inhabited by wildlife that is becoming threatened by human intervention. It also has a responsibility then to the wildlife of the cities, to provide habitats for them and aid in improving the biodiversity of the cities and improving the lives of all inhabitants in the city, not only in the production of food but also through the environments created.

The vertical farm then has an opportunity through the creation of environments and habitats by the creation of specifically designed buildings to take from the waste streams of the city and use what it can through recycling and treatment of waste water, to improve the quality of the waste and lessen the harmful impact on the environment by the city. This is proposed by Despommier (2010) for his theorised vertical farms, albeit contained within the building itself. The opportunity to reconstitute and create new wetlands to treat and purify waste water from the city for use in urban farming, while creating “Wildscapes” to benefit biodiversity in the city, has such great promise and ability to supply additional ecosystem services for the city. It is negligent for designers to overlook this opportunity in preference of a mechanical system or system contained within a building with much fewer opportunities and whole system benefits. The concept of the vertical garden and integrating the functions and services needed by a building into the services and functions of agriculture show opportunities for the combination of the two. While the vertical farm concept of Despommier is a starting point for this to happen, the concept needs more development to truly integrate into the city. As mentioned the inclusion of agriculture in the city has benefits for people and the structures of the city along with wildlife. The creation of industrial, sanitised and enclosed farms in the city while reducing “food miles” does little else to benefit the city, needing more structures and services to support it. Services that could benefit the city if the vertical farm design wasn’t so resource hungry. To work with the concept of vertical farming and include it in the design of buildings where it is able to be interacted with and benefit the city in more varied ways needs to be looked at. This would mean the retrofitting and designing of new buildings, from offices to residences. The inclusion of vertical farms on the North side (in the southern hemisphere) becomes a solar shading device, but to design it for this limits the opportunities for the agriculture. The inclusion of agriculture and general wildlife/nature can benefit directly from the waste streams of the buildings, growing off the waste water and nutrients produced in the building. While the inclusion of plants is known to reduce the urban heat island effect by the creation of micro-climates and transpiration, it can also benefit from the wasted “hot” air full of carbon dioxide expelled from the buildings. This can either create a specific micro climate where the warmer air passes plants needing the warm air are located, thereby cooling the air before reaching the other plants while still having an increased carbon dioxide level. The inclusion of agriculture in residential building design can go further, creating a system that benefits the residents in terms of food production in close and convenient proximity to the residence while also providing ecosystem benefits and those mentioned above.

3.5 SUMMATION.

Research has shown a strong link between the inclusion of nature into the everyday life of urban residents and their physical and mental health and well-being. This along with case studies that have shown improved health and choices of healthy foods by residents who are engaged in urban agriculture. This highlights the benefits of Agricultural Urbanism on the physical, mental and dietary health of the integrated communities. While most cities don't have nature integrated into their plans, historical town planning has shown an interest in including nature into city design on multiple scales. Through the realisation of the research into the benefits of urban agriculture and nature integrated into in cities along with a historical awareness of the interest in integrating nature and village like environments it is suggested that the idea of McDonough and Braungart is the best way forward. Who better to begin this "revolution" that those who would benefit most, the residents? As the benefits of urban agriculture and the inclusion of nature into cities would benefit the residents most. This can be established through adaptive reuse of buildings and spaces in an activist manner much like Guerilla Gardening or the window farms of Britta Riley. The Revolution can also be lead through a "top down" meets "bottom up" approach where urban planners and architects alike listen to the client, the urban resident, and begin to design appropriate housing, buildings and urban areas where nature and agriculture become incorporated into the city fabric.

4 PRECEDENT STUDIES

4.1 Integrating Agriculture and Ecology into Housing.

The previous chapters have looked at theories and concepts relating to residential design and how urban agriculture could be integrated through design. Analysing the reasons behind agriculture and nature being removed from the city, along with research that promotes the re-inclusion of agriculture and nature into everyday life through integration in the city fabric. Additionally they analyse how the Theory and Concepts contest or encourage these ideas/concepts surrounding urbanism.

In this chapter the Theory and Concepts are being critically applied to existing buildings and new design proposals as well as concept designs which aim to change residential design by reintroducing agriculture and nature into cities of all scales both in South Africa and Internationally. The chapter analyses the precedents according to how the designs integrate nature and agriculture into the residential components of the city. This can be through bio-mimicry, eco-mimicry or simply the design of the building allowing for planting for agriculture or landscape/nature.

4.2 South African Precedents



Map. 4.2.a.

World Map indicating location of South Africa

(Image by Author)

4.2.1 The Green Shack – Touching the Earth lightly.



Map. 4.2.1.a.

Map locating Cape Town in South Africa

(Image by Author)

Fig. 4.2.1.a.



The green shack.

(Image from food Jams. 2013)

The Green Shack is a conceptual idea for a new shack typology developed in Cape Town. While mostly concerned with the environmental conditions faced by shack dwellers and hazards, such as shack fires, this project includes agriculture into the design of the shack. This inclusion has a twofold effect on the shack and if implemented across a settlement would greatly reduce the spread of fires (Design Indaba. 2013). While the construction is comparatively resource hungry to generic shacks, by adding a raised

floor, it is designed for the local conditions and environment. Considering the cooling effect of the raised flood and it being less at risk during flooding

4.2.1.1 Housing Integrated agriculture

The design for the garden is simple in that it is a vertical wall as space is a premium in these settlements with their high densities. The vertical gardens cover the sun facing walls which benefits the dwelling by both providing the plants with natural light and shading the outer wall of the shack with the vegetation. Additionally, it provides cooling through the drip irrigation of the garden and the micro climates created by the plants themselves. Including the agriculture in the design of the shack the designer has included the provisioning, regulating, support and cultural services of Ecosystem Services. The positioning of the garden means that the surrounding residents and other public passing view the produce, necessitating some form of security (provided through clear roof sheeting creating a greenhouse on the wall). This also provided inspiration to the other residents in the case of the “re-blocking” of Mshini Wam, who proceeded to then create their own gardens, in courtyards created during the re-blocking process (Kieuw, W. 2013). This indicates the potential success of this project through the understanding of Social Practice Theory and the initial catalyst providing both the initial “Image” and “Skills” to the area and people who then begin to garden themselves and continue with the practice.

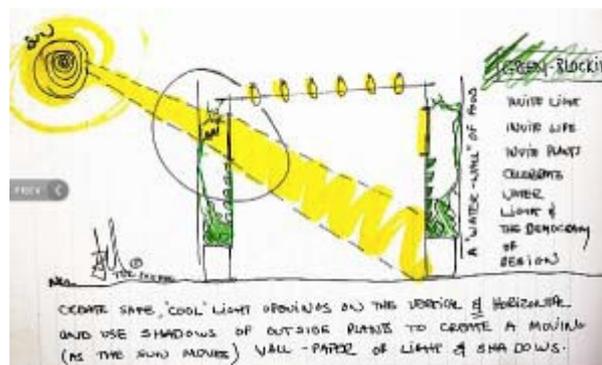
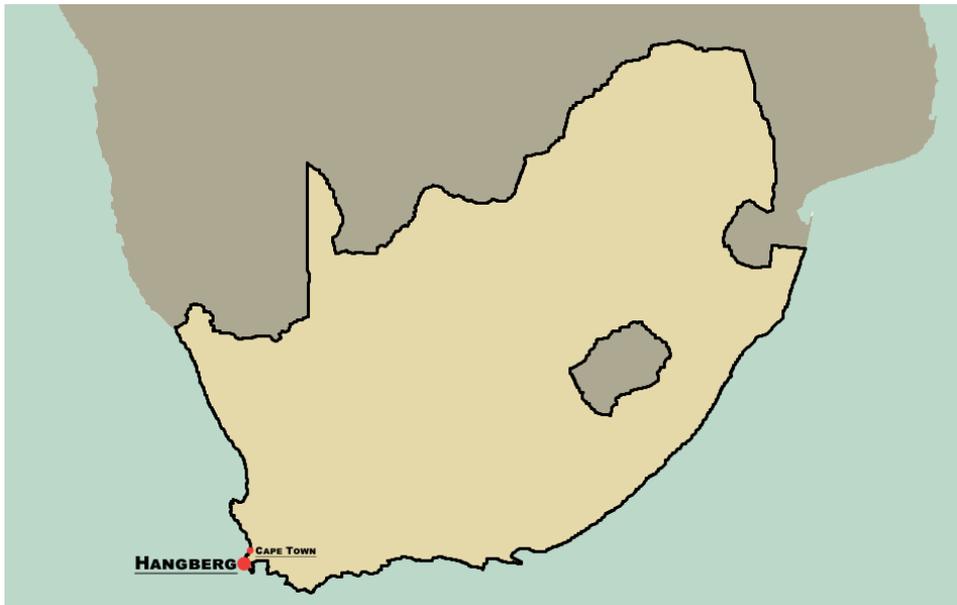


Fig. 4.2.1.b.

The green shack

(Image from Kieuw, W. 2013)

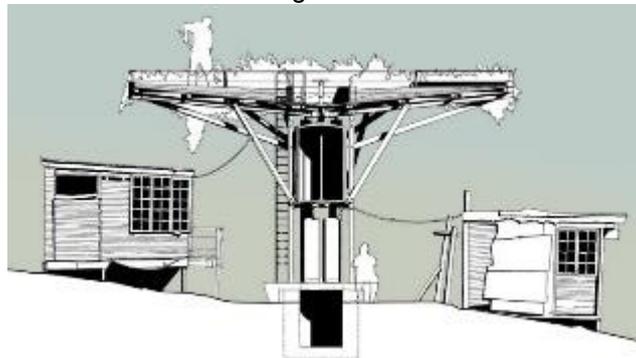
4.2.2 Productive Republic, Hangberg – Neuro Architects



Map. 4.2.2.a.

Map locating Cape Town in South Africa
(Image by Author)

Fig. 4.2.2.a.



The “Tree Machine” by Neuro Architects.
(Image from Neuro Architects. 2016
modified by author)

The productive republic is an invitational exhibition, where architects from around the world were challenged to respond to a theme (for the MAXXI museum in Rome) of “energy, architecture and landscape” through commissioned research that would have a spatial outcome. Neuro Architects’ research focused on the inequalities and the resulting rift that will “increase rather than diminish in the future” (Neuro 2013: 16). The objective was to explore spatial forms that would be shaped by the new productive infrastructure at both the household and community scales.



Fig. 4.2.2.b.

“Tree Machine” integration with mid-rise housing
(Image from Noero Architects. 2016
modified by author)

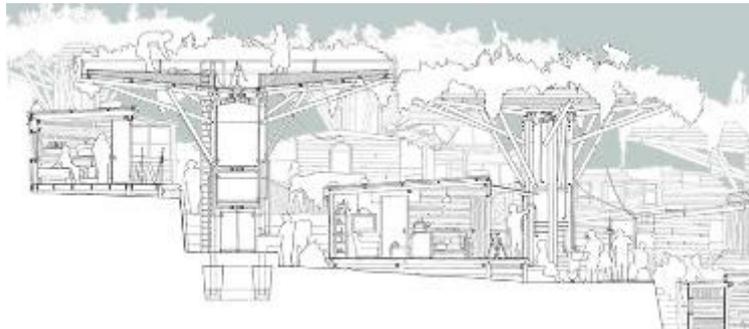


Fig. 4.2.2.c.

Informal settlement upgrade with “Tree Machine”
(Image from Noero Architects. 2016 modified by author)

4.2.2.1 Eco-mimicry.

Noero Architects decided, through their research, that rather than planting Hangberg with trees separate to supplying infrastructure they would propose a combination. They proposed a design of tree like structures that are machines which generate energy through biogas digesters and provide shelter like that of trees while also providing space (a highly contested commodity within informal settlements) for agriculture. They provide three typologies for the “tree machine”: the street, housing and public space typologies.

4.2.2.2 Housing

The integration of housing into the “tree machine” as seen in fig 4.2.2.b. links high density housing units directly to the “tree machine”, through location and services while still providing for communal/social gathering space outside the houses below the “trees”. The street typology (figure 4.2.2.d.) integrated the provision for informal trade which is indicated through their design as relating to the agricultural production of the tree canopy. The integration of the built form into this machine highlights the possibilities of rooftop urban agriculture and related services, either naturally provided (ecosystem services) or human derived services (eco-mimicry) and their future integration into high density residential designs.

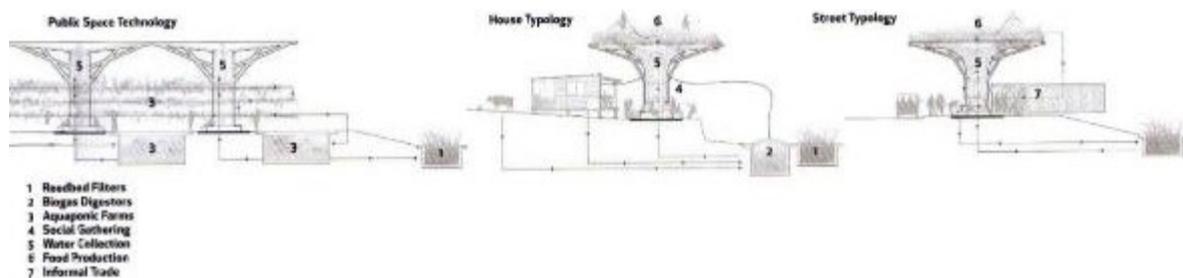


Fig. 4.2.2.d.

“Tree Machine” typologies

(Image from ARCH SA vol. 62,Neoro 2013: 17)

4.2.2.3 Results.

While this conceptual design intervention proposes an in-situ installation of structures independent of existing housing, the design and features lend themselves to integration with the housing. They also provide clues as to how housing projects can be thought of and designed to integrate services and agriculture (along with its required services), either as additional structures or through new residential designs. Linking this concept with the previous conceptual design for the green shack holds greater potential for individual and community gardening, on both a subsistence and small scale commercial level, while being wholly linked to the residences within high density urban living conditions.

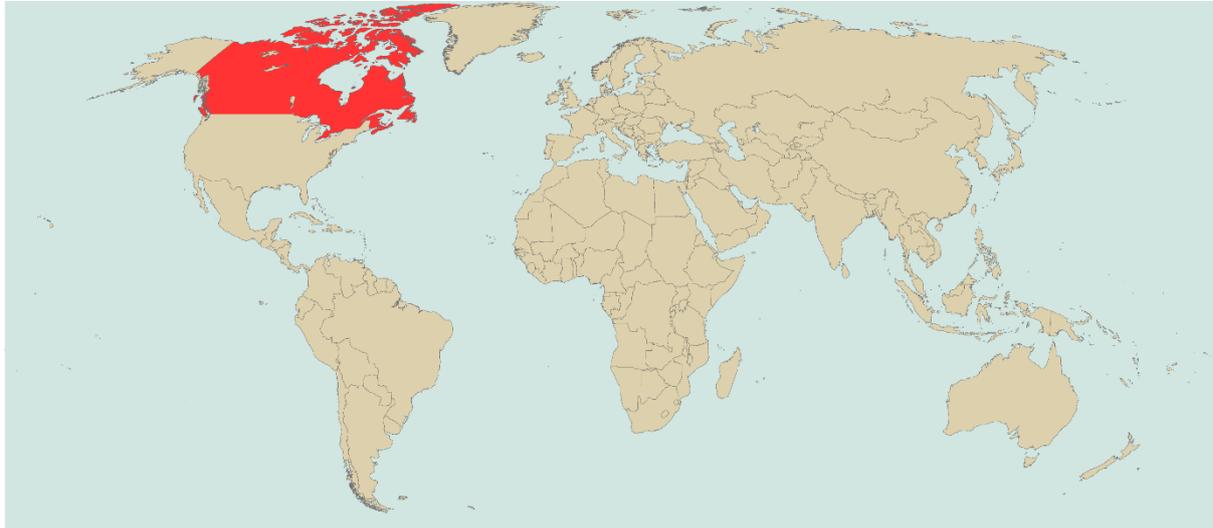
4.2.3 Summation.

While the direct inclusion of agriculture into the architecture is minimal the precedents studies presented here have analysed the different opportunities relating agriculture and its related services to residential design. The “bottom up” approach of the two conceptual projects shows potential for the integration into housing and the inclusion of the agricultural urbanism concept. They acknowledge the opportunities provided by both the agriculture and residences and the potential for them to work with each other in a closed cycle in similar way to how natural ecosystems work, building upon each other. The inherent eco-mimesis of the designs provide opportunities to develop and test how residential architecture can be designed with integrated agriculture that not only provides the physical, mental and dietary benefits that people gain from nature and agriculture but additionally the benefits to biodiversity and natural

systems, including the regulating and support services of ecosystem services. These two projects provided examples of how the residence can be designed with opportunities for integrated agriculture practices while remaining linked to its services and functioning, being more than just an agricultural plug-in, by integrating into the structure and functioning of the residences providing services and being provided for by the residences.

4.3 International Precedents

4.3.1 Toronto 2.0 – BIG.



Map. 4.3.1.a.

World Map indicating location of India

(Image by Author)

Fig. 4.3.1.b.



Map locating Toronto in Canada

(Image by Author)

4.3.1.1 Designing for Location.

Bjarke Ingles of BIG states that in designing this building they aimed to find an alternative to the “tower and podium you see a lot of in Toronto” and take ideas from Safdie’s Habitat 67 (also a Canadian building), placing this almost utopian experiment in the heart of the city (www.big.dk). The design much like Safdie’s is made up of “pixels” (BIG. 2016), each being the size of a single room. These pixels are rotated 45 degrees to the perimeter, to maximise on natural light exposure. The apex’s of each interconnected tower of pixels differs creating an undulating, hill like topography. The undulating “roof” is designed to allow light to penetrate the internal courtyards, one of which is landscaped with a forest. While the design is not specifically created for urban agriculture the intention was to provide balconies and roof top spaces for terraces, with an “abundance of green space normally reserved for the suburbs”. The design provides for communal shared areas and “potential for urban farming” (BIG. 2016).



Fig. 4.3.1.a.

Render of Habitat 67 inspired Toronto 2.0
(Image from Rosendield, K. 2016)

4.3.1.2 Integrating Nature

This project, while not indicating the integration of “urban farming”, suggests that it could be practised in terraces provided. It also acknowledges peoples longing for Village/ Country life, which was incorporated into the Garden City Concept and taken up by Wright in his designs (mentioned in Chapter 3), while finding a way to integrate this into inner city high density mixed use design. The proposal doesn’t attempt to attach every available sustainable option to the building and doesn’t highlight any additions of sustainable technology much like how Yeang states in Ecological Design it is not best practice using every available method or technology but rather be selective while still being responsive to the surroundings. It does consider the basics of climate related design, with orientation of the individual units and rooms for maximum solar exposure and for natural lighting to reach internal courtyards. While this design can be considered an exercise in form making, it is clearly designed to consider the inclusion of nature, through the provision and orientation of balconies and terraces (rendered with vegetation, figure 4.3.1.a.). As seen in Figure 4.3.1.b. the interior social spaces are

visually related to and directly linked to/ flow onto the outdoor spaces with their vegetation and the related aesthetics (it is an opinion of the author that this was a part of the original intention of Howard's "Garden city" concept as noted in Chapter 3).

4.3.1.3 Adaptability for Urban Agriculture

If a resident were to change the planting on the terrace to include agriculture the location is conveniently related to the kitchen/food preparation area and the dining area. Along with being visually linked to the living/social spaces for aesthetic appreciation of nature/agriculture. The inclusion of additional agriculture related services could be done through a retrofit of the apartment through a grey water system from the kitchen sink directly to the garden space (the filtration of organic/food solids through mulch/wood-chips that can be used in a worm farm or other composting technique). There are additional opportunities for integration of decentralised power generation, waste treatment (at least through grey water recycling) and rainwater harvesting for irrigation. So while the design of the building includes many "eco" aspects and design considerations it doesn't consider Eco-mimesis, provision of, or relation to Ecosystem Services which become a crucial part of Ecological Design (Yeang 1999: 64-67).



Fig. 4.3.1.b.

Render of interior of Toronto 2.0

(Image from BIG. 2016)

4.3.2 Almere, Netherlands. – Various Architects.



Map. 4.3.2.a.

World Map indicating location of Holland

(Image by Author)



Map. 4.3.2.b.

Map locating Almere in Holland

(Image by Author)



Fig. 4.3.2.a.

Render of neighbourhood development.

(Image from Fastcoexist. 2016)

While not being a high density residential master-plan, this development moves away from the typical notion of a suburban lifestyle, by creating a “neighbourhood-slash-farm” (Fastcoexist. 2016), relating to the original village idea that inspired Howard’s “Garden City” Concept. The agriculture works with current advanced methods such as aeroponics, aquaponics, permaculture, and food forests (Fastcoexist. 2016). The planning of the development incorporates a whole system approach in an eco-mimicry fashion, looking at how all systems can feed into and off of each other where waste from one process becomes “food” for another. Almere city has become a host for many design ideas and implementations of projects for the inclusion of urban agriculture (Wageningen. 2016, Fastcoexist. 2016). In the justification Ehrlich gives for the new neighbourhoods (fastcoexist.com), he says “If everybody... wants the same kind of suburbs that we’ve been building so far, the planet’s not going to make it”. In that statement Ehrlich highlights the need for a change from suburban sprawl that is fast taking over arable farmland, to more appropriate high density urban housing with integrated agriculture. The question then becomes, does this proposal match the claims and the justifications? It does, partly so, as it considers the need for becoming autonomous and decentralising food production and services including waste treatment and energy generation conceptually relating to Agricultural Urbanism in locating the whole agricultural process within the city (Agricultural Urbanism. 2016). It falls short, in the images supplied, showing vast tracts of land with sparsely populated individual (and typically suburban sited) homes that are far from the density required to meet any goal that would link up with the justification of changing the status quo of the suburbs.



Fig. 4.3.2.b.

Render of residence attached greenhouse
(Image from Fastcoexist. 2016)

4.3.2.1 Housing Design

There is much to be learnt from design of the individual housing units, which integrate the food production directly into the design of the building. However the design integrates a greenhouse into the residence much like the design a sun-room, yet with the express purpose of planting food crops (figure 4.3.2.b.)with the floor slabs having voids allowing for planting directly into the ground and not requiring pots or containers allowing for trees (that don't become stunted in size).

4.3.2.2 Location appropriate design.

The design of the housing using the concept of the sun-room to include a greenhouse into the design of the house while appropriate for the harsh cold winters experienced in the Netherlands could not easily be replicated in the context of this research. However through methods explained in Social Practice Theory, the relocation of practices and subsequent changes to it can allow for parts of this design to be re-appropriated and adapted to suit the climate of this study's context. This can be changed by the use of shade cloth as used locally in designs of agricultural tunnels for the production and protection of food crops (figure 5.2.4).

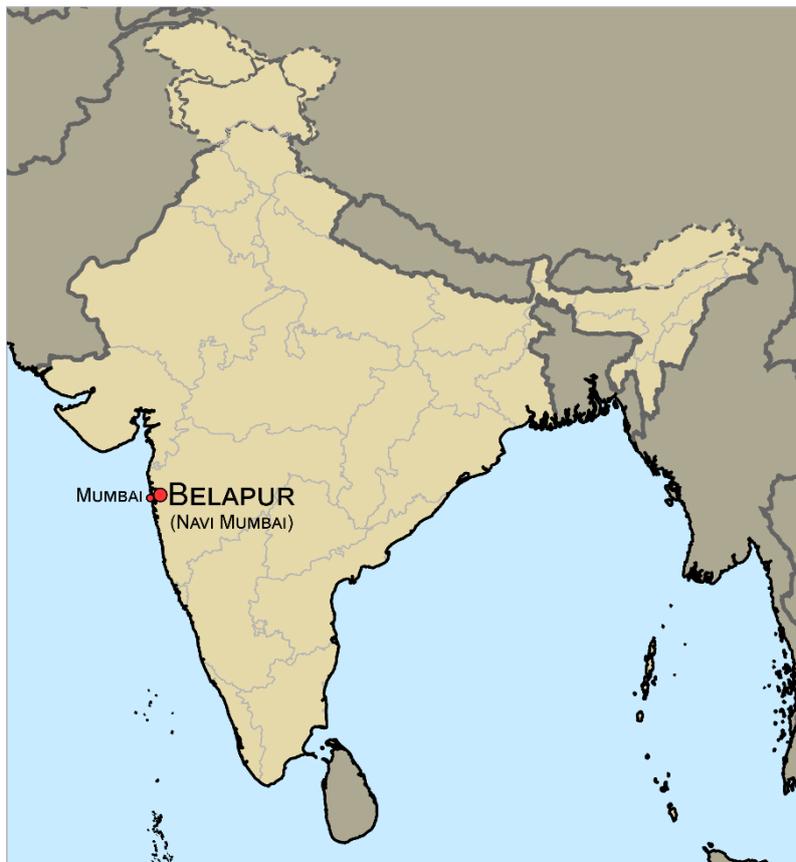
4.3.3 Belapur – Charles Correa



Map. 4.3.3.a.

World Map indicating location of India

(Image by Author)



Map. 4.3.3.a.

Map locating Belapur in India

(Image by Author)

Correa was concerned about the regional context and designing for the people and climate, calling globalisation as a “joke” (The Wire, 2015) in reference to modernism and the International style which places identical buildings anywhere no matter the location or context. Before its popularity Correa was a believer in climate appropriate sustainable designs coining the phrase “form follows climate” in a lecture he gave in 1980 (The Wire, 2015). His ideologies of design closely relating to climate and social ideas is highlighted in the design of his housing. An example being the design for housing in Belapur, where a design reminiscent of mandalas was planned like a fractal, with the design having multiple courtyards from small private areas for each home gradually linking to larger spaces for public gathering. All of this was designed in, what is referred to as, a master plan which houses approximately 500 people per hectare on six (6) hectares of land (Ebuild. 2016). Correa stated that “all well-designed buildings are regional, and require no self-conscious effort” (The Wire, 2015).

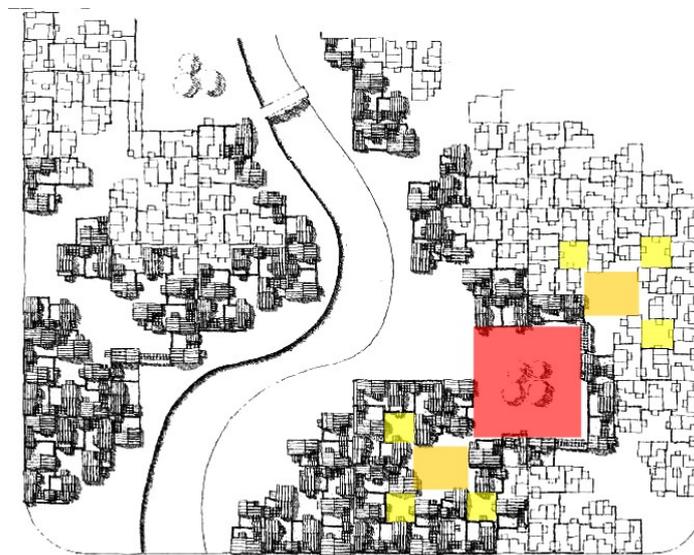


Fig. 4.3.3.a.

Phase 1 layout showing scaled courtyards.

(Image from Airoots. 2008 modified by author)

The masterplan layout, for Correa's design of Belapur, shows an understanding of the local culture (mandala design) and the fractal nature of ecosystems and eco designs. This eco-mimicry of fractals for the layout is seen in the creation and linking of scaled courtyards relating to the individual units, groupings of units and the clustering of the groups in successively larger scales of community (figure 4.3.3.a.).

4.3.4 Summation.

The international designs and concepts discussed here were chosen for the different aspects of the research that they relate to; High density urban housing, social interaction and residential integrated agriculture.

The inclusion of terraces for multi-storey buildings is not new or unique, while BIG claimed inspiration from Safdie's Habitat 67 and the "pixels" that it was made up of, the original design of Safdie's aimed for the same terrace design allowing for suburban living in high density urban high rise apartments. The inclusion of social spaces in Correa's designs mimic fractals of nature in their layout creating scaled spaces for different sizes of community and social gathering. Recognising the need for social interaction to take place in and around the home in different scales, while allowing for the relation to human scale, not imposing multiple large barren areas. The design mixes the high densities of urban residential design with the scaled spaces more accustomed to suburban areas.

The plan for Almere considers both the suburban or village lifestyle with the presence of agriculture and the high density living within cities in its concepts but falls short of the possibilities with the images supplied. The images created for the project propose the same existing relationships of those in suburban areas with minimal density implied.

If urban residential design is to be integrated with agriculture, aspects of these precedents need to be considered, but the failings of the projects must be noted and kept in mind in order not to repeat the past. The integration of agriculture and the aesthetics of nature showcased in the Almere design should be considered with the density and indoor-outdoor relationship proposed by BIG to properly integrate architecture and agriculture. While the social and locally relevant designs of Correa should serve to inspire a critical regionalism approach to the design, lest we repeat the failings of the Modernist era attempting to provide a single solution on a global scale.

Contemporary architectural design generally recognises context and a regional approach to design, this should be incorporated in designing within natural ecosystems and for their inclusion through remediation of natural habitats to promote and provide interaction for all urban residents with natural spaces as well as opportunities for agricultural production. The designs should also consider the residents social needs including the social interaction in urban agriculture highlighted by Social Practice Theory. Designing for socialising can, in the case of Correa, be on the ground or as suggested by BIG (for Toronto2.0) be integrated on all floors of the building. The design of these social spaces can (like the agriculture) have smaller spaces closely linked to the residences in the building with larger spaces on the ground floor and surroundings promoting social interaction between residents in the building and between residents of neighbouring buildings as well as visitors or the public. This being like those of the larger public spaces provided for in Correa's design for Belapur and the courtyards in the ground floor of Toronto 2.0 preserving public footpaths across the site and integrating them into open public spaces on the ground floor of the building.

PRIMARY RESEARCH

5 CASE STUDY

5.1 Introduction.

Urban agriculture is not common place in South Africa, and so to find examples on a scale large enough to consider for a study takes time and may not fit exactly with what is being looked at. However there are enough pilot projects and community projects that when looked at can be combined to analyse them as a whole. Within eThekweni there are two initial projects that stand out as urban agriculture projects; Priority Zone rooftop project - a pilot project for the city, and the Green camp Gallery project – a community led initiative where they grow and sell fruit and vegetable produce. Both these projects mentioned are in Durban city, one in the heart of the CBD and the other on the edge of the industrial area to the South West of the CBD. In conjunction to studying the Priority zone (a pilot project agri-hub) it is important to study existing residences where agriculture is practised in the urban context (this will be done through the interview process). This study will show how agriculture has already begun to be integrated into the city and residential environments along with highlighting possibilities of future integration and improvement upon existing structures along with new structures.

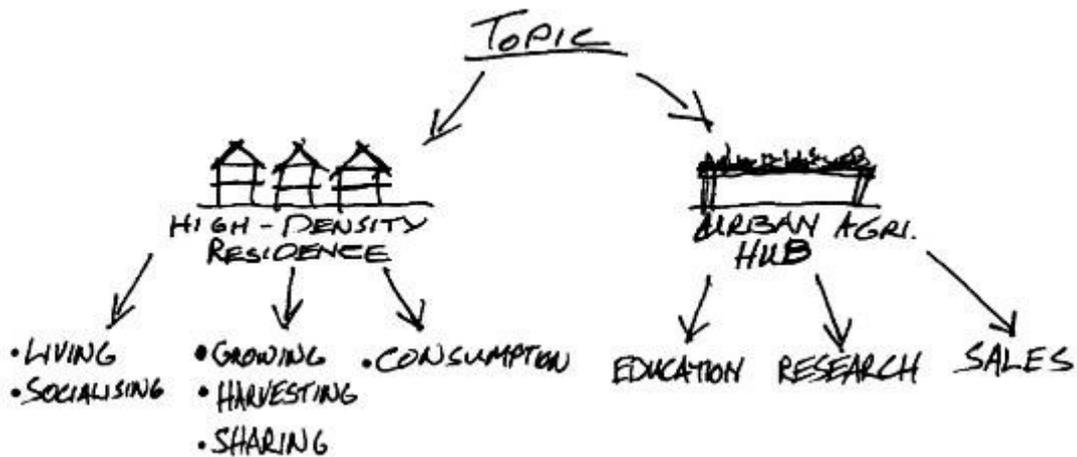


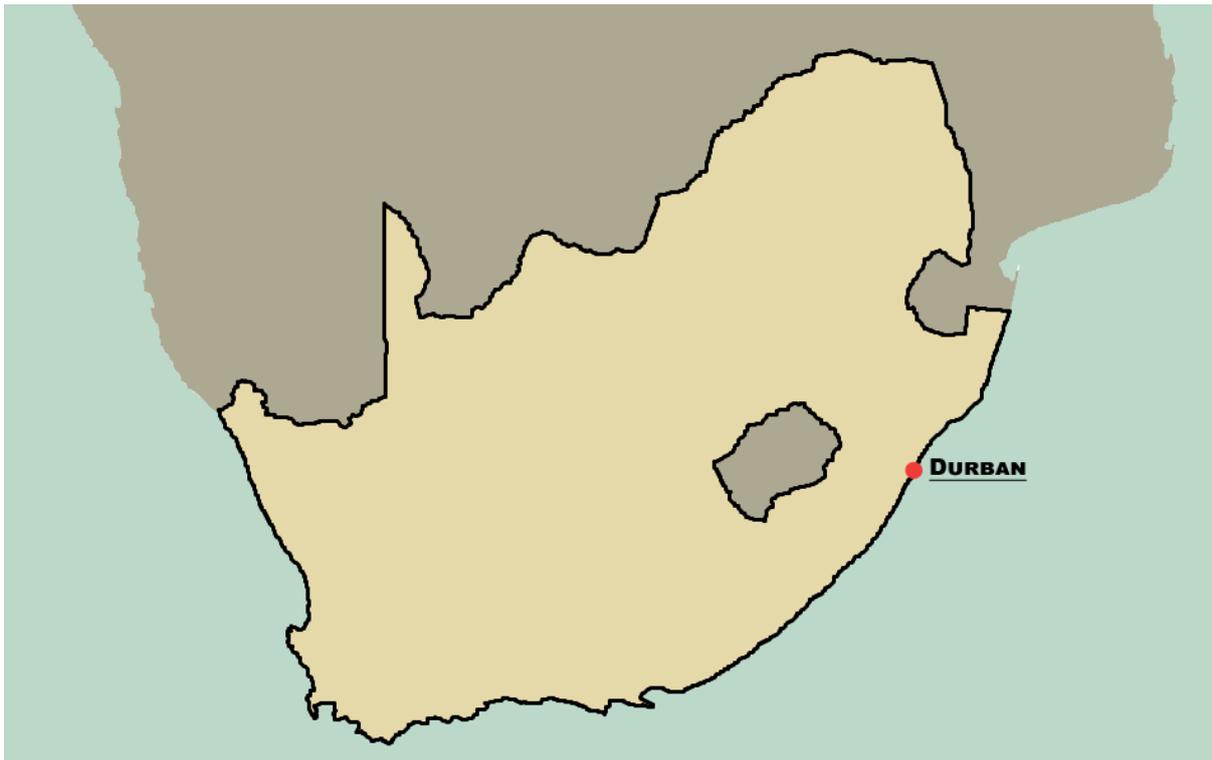
Diagram 5.1.a.

Diagrams showing different relationships to urban agriculture of residential and Agricultural hub buildings.

(Diagrams by Author)

The chapter looks at the case study according to how it integrates nature and agriculture into the urban environment and promotes urban residential agriculture. This is assessed through bio-mimicry, eco-mimicry or simply the design of the building allowing for planting for agricultural purposes or landscape/nature as well as sustainability aspects and education of the public aiding in lowering the barrier to begin urban residential agriculture.

5.2 Priority Zone roof top project.



Map. 5.2.a.

Map locating Durban in South Africa

(Image by Author)

The Priority Zone roof top project was chosen as a case study for its appropriateness of methods used in the project where they could be reused by visitors in their own urban Agriculture projects. The roof garden has been a project which showcase urban agriculture to the public to try and increase the participation of the public in urban agriculture.



Fig. 5.2.1.

Main feature wall in Essex Road Durban.

(Image: Google Maps. 2016)

5.2.1.1 Background.

The Priority zone roof top garden was initiated in 2010 (Cuizine.2014) by eThekweni municipality Architecture department and managed by Drake and Scull Facilities Management (Urban Earth. 2012). The intention of the garden was to provide food for the needy, educate the public on matters of sustainability and food security while hopefully inspiring companies in Durban to follow suit. All of the produce in the garden is grown organically, with fertiliser in the form of worm tea coming from a worm farm situated below the access stairs. There are two subsequent urban garden initiatives that have been spawned from the Priority zone; the Mr Price groups head office in Durban and at the Municipality's engineering department's offices. While there aren't any studies showing the impact that the Priority zone has had on urban agriculture, it can be seen to have had an impact on the city through Social Practice Theory, having inspired the two other initiatives previously mentioned.

The Priority Zone's role in the city is to "look after the assets of the city and the food gardening has been the cherry on top" according to Ngcobo (Urban Earth. 2013).

5.2.1.2 In Exemplar.

The Priority Zone as a hub for education and instruction of urban residents on urban agriculture and the many methods and alternatives fits its mandate as a pilot project to inspire and educate. With an open door policy and clear instructional and informative posters explaining and describing the methods involved public have great opportunities to learn.

5.2.1.3 The courtyard.

The design of the garden starts to understand the creation of micro climates and the interpretation and understanding of what to do with and in the different areas the architecture creates, highlighting options and solutions for all areas in and surrounding existing buildings. They have also taken advantage of the courtyard by introducing clear roof sheeting to enhance the existing micro-climate producing more of a greenhouse-type environment, creating a more natural under canopy, forest-like environment. It does appear that they didn't find the true potential of the courtyard where it was mostly different types of vertical gardens. Although the potential is seen and has been used creatively, it has a greater potential to feature more types of plants and growing methods. Unfortunately the vast majority of what is grown in this micro-climate is ornamental and not edible plants. In the case of urban agriculture this is a missed opportunity to highlight to visitors different food crops and the different micro climates that can be used for agriculture.



Fig. 5.2.2.
Access through courtyard.
Ornamental plants, no food value.
(Photo by Author)

5.2.1.4 Landscaping for biodiversity and ecosystem services.

Once on the roof there is a medium-sized pond that originally had fish in it, they have since been removed as they were being killed by birds. Ironically this was designed and intended to be a watering hole for the wildlife in the area and was meant to encourage and provide habitat for them. The inclusion of wildlife habitat is encouraging for urban agriculture, acknowledging the role that nature plays and the need for those ecosystem services provided.



Fig. 5.2.3.
Roof top pond for urban wildlife, birds in water feature
and tree aloe.
(Photo by Author)

5.2.1.5 Education of community.

The roof garden is intended as a show garden, providing ideas of what could be done and to be used to inspire residents of other buildings in the area to do the same. The access to the roof seems to contradict the intention and limit its ability, as the entrance is confusing and appears to be the garage

area. For the building to become better in its intended role for community upliftment this needs to be rethought in much the same way that communities and individuals have unrestricted access to the Highline, clearly though the Priority Zone needs control as it is part of an office building. But with two gardeners on staff working there, there is potential to leave guests unattended on the rooftop with only the oversight of the garden staff. For a community project to work you need community buy-in and further than that, they need access to it and to feel that it belongs to them, if not it becomes an extension of “the tragedy of the commons” similar to what too often happens with guerilla gardens. The great intentions of the Guerilla Gardener planting food producing plants are met by the greed of individuals who similarly use the same opportunities that afforded the gardener to plant there to either uproot the plants or to pilfer the produce with little concern for the community and no recourse.



Fig. 5.2.4.

Alternative construction demonstration tunnels
(Photo by Author)

5.2.1.6 The Apiary:

There was mention on a website (<http://www.eco-friendly-africa-travel.com/>) that an urban bee hive was included, however the health department had shut that down as they claimed it was “a danger to the residents in the area” (this was told to the author by V. Sookdeo during a tour, 20/07/2016). This may be true, and based on the suggested position of the beehive during the tour, it is possible that the beehive actually didn’t conform to the municipal by-laws regarding positioning as the area shown to have previously had the hive was the corner of the roof at the boundary of the property and directly next to the neighbouring building. The eThekweni by-laws (durban.gov.za) state that “No person shall keep or allow or permit to be kept any hive or swarm of bees on any premises of which he is the owner or allow or permit any swarm of wild bees to settle and remain on any such premises in either case so as to be a source of nuisance or danger to persons residing in the neighbourhood or to members of the public.” It is advisable that the implementation of any urban farming practices conform to municipal regulations and as such in the case of an agricultural hub that is there to educate people implementation

needs to be done professionally with on-site access to professionals/municipal officials to advise the public on such installations.

5.2.1.7 Sustainable alternatives.

The building its self is mostly off grid, running off of P.V. panels and has two different solar water heaters and a heat-pump along with rain water harvesting (with municipal water backup). While the building has all these green features, nothing is mentioned about the collection and reuse of grey water, which being an office environment still has potential to produce grey water that could be used for the plants even if only for the inedible and after filtration.

While the garden is watered from the rainwater tanks it is supplied by a pump running of solar power, a small portion of the garden area has potential to be watered by the use of a manual pump which is also an exercise machine. Although if one were to use this in an exercise routine you would no doubt over water the plants wasting the harvested water and potentially kill the plants. This could be better improved by using it to pump to a header tank higher up with a tap that could then be used to control the time that the water sprinkler system is on. Although, as a demonstration unit it works well.



Fig. 5.2.5.

Exercise pump and small water tank.

(Photo by Author)

5.2.1.8 Integration.

The Implementation of this garden and its expansion down the stairs to the courtyard shows the potential of planting and agriculture to be integrated into most areas of the building. The use of the rainwater and the different methods of pumping indicate the hi-tech (electrical) and low-tech (manual/mechanical) responses to the need of moving water. This shows and educates the public as to the variety of methods for moving water. In reference to the Ecological Design Concept of Yeang (1999: 64-67) this building has implemented as many “green” aspects as possible but has little to no effect on its surroundings. Additionally with the limited provision of rain water collection tanks and (visually determined by the researcher) 50% of the roof being covered by planting and soil it is likely that the rain that falls on the roof on average would not be contained within this site and reused. The majority of the rain would most likely overflow the system and be released into the pre-existing rainwater system joined

to the municipal storm water drains. This shows how retro fitting an established building or complex can be difficult and end up being referred to as “green washing” as the systems, while being good for the environment, are limited by the higher cost involved and more difficult implementation of sustainable alternatives and roof top agriculture.

5.2.2 Summation.

5.2.2.1 The hub as driver and glue of the Practice.

As an experimental system and a show-piece for the city as to what can be done, and what will need to be achieved in the future, this is a great example. The integration of the agriculture and general plant growing has shown great potential and shows increased opportunities for those in the urban environment (specifically Durban). The concept of this rooftop garden as a show-piece for the public of what can be achieved creates an “*Image*” for people to become engaged with urban agriculture. The individual methods observed and examples, of how this garden has been achieved and used, teach residents and visitors of the “*Stuff*” that makes up the practice. Although one can get a brief guided tour of the facility the opportunity to provide “*Skills*” through education, training and resources has been missed in the facility. The building offers a good basis for the creation of urban agriculture through Social Practice Theory, but neglects the training or transfer of knowledge and skills between people. Thus, the practice has not taken root in the city, as a crucial part of creating and sustaining practice is missing. This was highlighted in Social Practice Theory under Chapter 2 where the researcher cites Toulaitos (2011) highlighting the collapse of urban agriculture in the USA after the “*Image*” driving the practice was removed.

5.2.2.2 Lack of integration

As a show-piece for urban regeneration and urban agriculture there needs to be a greater street presence dedicated to the project. In order to improve the feasibility and implementation of an urban agriculture hub that intends to educate the public the facilities in the building need to be directly related to the agriculture it is promoting. The integration of the building with its surrounds and permeability of the building from the street, for public access and to invite the public in, is important and was not featured in this design. To better educate the urban residents and encourage them it would be beneficial rather to have an on-site food outlet, using the produce from site, than to sell produce to other outlets where the public aren’t aware of the origins. Education of the Public, in the case of a practice like agriculture, needs to have more than just examples creating awareness but ongoing training or places for continuous exchange of knowledge (highlighted in the previous paragraph on Social Practice Theory).

6 INTERVIEWS

6.1 Introduction

The research was approached through a Grounded Theory, this was used with the intention to gain a qualitative understanding of the relation of architecture to the occurrence and practices of private urban agriculture. The researcher used interviews with participants, observations of the residences designs agriculture, and included texts and other similar studies on urban agriculture. Through the interviews and observations which took place in private urban agricultural sites, within the Highway area of eThekweni, insight into the relation of architecture to the methods, systems and technologies used within urban agriculture were gained. The interviews showed how architectural spaces are able to shape and in turn get shaped by the practice of urban agriculture. While the sample size for this research was small, the cross section of Urban Agriculture represents a large variety of Urban Agriculture practices.

6.1.1.1 Initial view

This research, having been conducted in Pinetown, South Africa, was conducted in a location where most urban agricultural practices are conducted on private land by individuals or immediate family living together. This was highlighted by one respondent, in contrast to their experience in the Netherlands where they experienced that the majority of agriculture happens in community gardens (Taylor, 2016). This indicates that the practice of private urban agriculture is not reliant of a group actively practising together but rather that even in the individual nature of practising urban agriculture it lends itself to the formation of communal and social links. These links, when created, seem to suggest the continuation of the practice and a growing success within the practice by the individual practitioners. All respondents' interviews highlighted the social and communal links in their urban agricultural practice.

6.2 Results.

6.2.1.1 Themes.

The interviews were recorded and transcribed, these transcriptions were then analysed and parts were highlighted. These words or phrases were selected as they revealed something of interest to the researcher or had been highlighted by the interviewee as important, either through implicitly stating so or through the observation of the interviewee and their body language or their tone of voice when mentioned. Words and phrases that were repeated by the interviewees were also selected. These words and phrases were then described in shorter words or phrases by the researcher. From the phrases assigned by the researcher they were then categorised and placed into broader themes. There were nineteen themes that were identified during this process, all of which were considered relevant and were used in the analysis of the interviews to understand completely what was important to the interviewees and their understanding of Urban Agriculture.

The themes can be grouped together in much broader groupings showing how they link together and how they relate to each other. This is indicated by Table 6.2.1, grouping the themes into broader

understandings of the individual themes. This grouping gave the insight into the social aspect of the practice, discussed further on in the analysis.

The groupings show the most referred to aspects of urban agriculture by the participants, not necessarily the most important aspects of the practice though. These can rather be gained through a more in depth analysis of each of the themes and how they were spoken about by the interviewees during the interviews. Diagram 6.2.1 shows the relation between the groups shown in Table 6.2.1

Grouping	Theme	Percentage of total
Social	<ul style="list-style-type: none"> • Community • Education • Family • Sharing • History 	23%
Health	<ul style="list-style-type: none"> • Health • Organic 	5%
Natural environment	<ul style="list-style-type: none"> • Eco-system services • Fowls • Micro-climate • Nature • Pests 	22%
Built environment	<ul style="list-style-type: none"> • City • Government • Sustainability 	22%
Psychological	<ul style="list-style-type: none"> • Recreation • Aesthetics 	10%
Economic	<ul style="list-style-type: none"> • Money 	4%
Convenience	<ul style="list-style-type: none"> • Convenience 	14%

Table 6.2.1
Grouping of themes
(Table by Author)

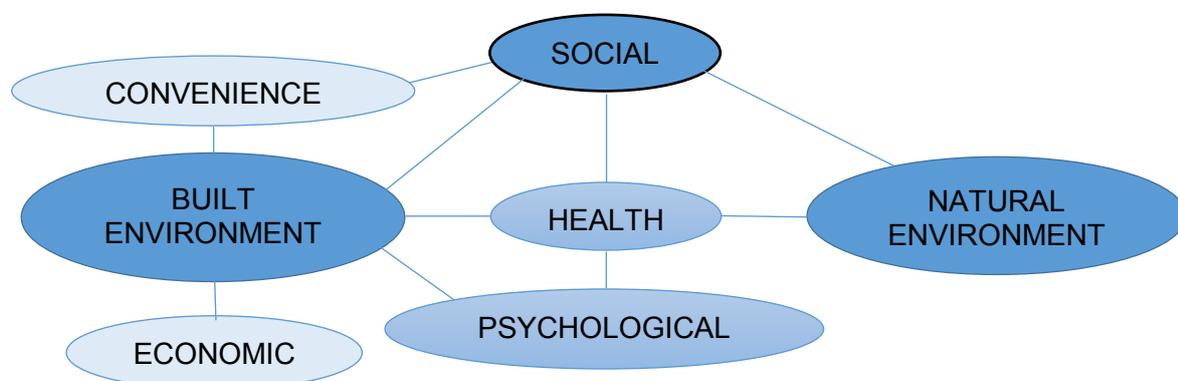


Diagram 6.2.1
Relationships of groups
(Table by Author)

Themes	Occurrence	Percentage	Position
aesthetics	19	4.46%	9
city	36	8.45%	4
community	31	7.28%	6
convenience	59	13.85%	1
eco-system services	14	3.29%	12
education	34	7.98%	5
family	5	1.17%	17
fowls	2	0.47%	18
government	6	1.41%	16
health	15	3.52%	11
History	18	4.23%	10
micro-climate	42	9.86%	3
money	15	3.52%	11
nature	25	5.87%	7
organic	8	1.88%	15
pests	12	2.82%	13
recreation	22	5.16%	8
sharing	11	2.58%	14
sustainability	52	12.21%	2
Grand Total	426	100.00%	

Table 6.2.2

Themes and their occurrence during interviews.

Top five occurrences highlighted.

(Table by Author)

6.3 Analysis/ Discussion.

6.3.1 Reasons for the practice.

The reasons for the practice of Urban Agriculture can be divided into two sections, those that were stated by the interviewees and those that were interpreted from the analysis of the transcripts from the interviews. The responses from the interviews were mostly a mix of two reasons; the recreational value of gardening and its beauty and the production of home grown organic and natural foods. One interviewee's response was that they "love the process" and they think growing their own food "teaches [them] an appreciation for Mother Nature's gifts" (Southey. 2016). This sentiment was repeated in another response that one of their reasons for producing their own food was for "environmental stewardship" (Smith. 2016). There is a common thread among those who practice Urban Agriculture on

an appreciation of nature; this was shown through the interviews with all interviewees speaking of the aesthetics of nature and three interviewees who spoke of being “outdoor people”.

One respondent said he started his practice as a result of the church he attends starting a veggie club, which inspired him (Kinsey. 2016). While other interviewees mentioned family heritage of private Urban Agriculture, members of community gardens and farmers.

This indicates that the reasons that the participants start their own Urban Agriculture practices aren't singular for them, and while there are commonalities between the respondents of this research they all had different histories and influences in their lives, from their childhood, through youth and into adulthood. Many of the interviewees, when asked about things that could be done to encourage Urban Agriculture practice, spoke of the education of the public through municipal/ government initiatives. From the results of the coding of the transcripts it highlights the importance of education in and for the practice, with education ranking fifth among the themes. Education being only one of two, in the top five ranked themes, that speak of others and isn't predominantly focussed on the interviewees own practices. The other theme being that of the city, this theme was expected as the questioning surrounds the concept of agriculture being practised in the city/ urban environment

6.3.2 Methods for urban agriculture.

The methods are divided into those practised and those that the interviewees expressed interest in. The interviewees practice a variety of methods from traditional gardening, growing in pots and recycled containers, to hydroponics. These were practised away from, next to and inside of their residences.

The interviewees showed great interest in alternate methods of agriculture, referring to practices that they are interested in and have researched or are intending to try. These practices are as varied as their current practices: aeroponics, aquaponics, wetlands, poultry, and an attached greenhouse off of kitchen {referred to as a “living pantry” (Parker. 2016)}. They also spoke of the advantages of having livestock, producing eggs and milk. One interviewee mentioned wanting to use permaculture principles and zones that group the different agricultural practices. Some of these principles have been intuitively applied to the practices of other interviewees, the main idea behind the division of the zones is the proximity of the garden to the residence. The zones are divided up by the number of visits per year by the practitioner, that is the number visits for harvesting and tending to the plants/ animals. With the most intensive practices being closest to the residence, the number of visits gradually decreasing the further from the residence. The interviewees having located the most used plants closest to the access from the residence, in most cases this meant the herbs position was closest, although one interviewee noted that they used the herbs less and thus they had been positioned further from the residence.

6.3.3 Adaptation of the methods and spaces to each other.

The majority of the interviewees noted that the use of pots for growing was beneficial to the growing of plants as this allowed for movement of their practice between locations or to better locations with relative ease. It was also noted that it allowed for them to locate different plants/crops in different micro-climates that benefited the plants. With the two interviewees who had practised in Europe this allowed for their plant locations to change according to seasons. They did note that this would not be as necessary in the Pinetown climate although one interviewee expressed a possible need for shade-cloth to counter the almost excessive sun that the South African climate gets.

The enclosure of the gardening practices was a common theme among the participants, although for varying reasons, a main one being for the protection of the crops from pests such as monkeys, moths and worms. The majority of enclosures used or proposed were made with shade-cloth, while one was suggested as a greenhouse having been inspired by an international trip where the interviewee had seen relatives using a greenhouse. One of the suggested uses of a shade-cloth enclosure was that of a tunnel, this having being influenced from the interviewee's history in the horticultural trade.

The interviewees who spoke of alterations to their buildings mostly described additions that were for recreational and aesthetic reasons, while still being of some benefit to the agriculture. The inclusion of decks where plants could be located in pots and gardens could be surveyed from were noted along with water capture and re-use. Rain water harvesting and grey water re-use is noted as an important part of urban agriculture and suggests that it is important for the future of the built environment.

6.3.4 Community.

While reviewing the interviewee's responses, it was observed that the interviewees spoke of the community links to their gardening practices. These links range from trading of seeds and produce, to discussions with and teaching other practitioners about methods and plants. Table 6.2.2 shows the themes that the interviews were coded into and the percentage of each occurrence of a theme throughout all the interviews. While the main discussion point in this part of the research is on the community aspect of the research, it is important for the researcher to point out at this stage that aspects of community interaction are not only placed under the theme of community but also were placed under other themes like that of education. While at first appearance community doesn't appear the most important outcome from the interviews it needs to be re-evaluated and a second table is needed to show the true occurrence of positive communal interaction. Before such a table is compiled, it is important to note the combined percentage occurrences of the broader themes of; education, community, family, sharing and history, to get an initial understanding of the discussion surrounding the impact of the person's surroundings and communal impact on their private urban agriculture practices.

While in table 6.2.2 the total occurrence of discussion around community is only 7.28% the combined total suggested previously, that would indicate a more accurate occurrence of the community aspects

of urban agriculture, is much higher at 23% of the interview (Table 6.2.1). Table 6.2.1 shows the themes have been placed into common groups around central ideas. The relationships between these groupings has then been shown through the diagram, Diagram 6.2.1.

6.3.5 Interviewees Residences.

In addition to interviewing participants the researcher observed their practices, drawing diagrams of the property highlighting relevant spaces and amenities. In the case where access to the property was not available (a previous residence of both Taylor’s in the Netherlands) they were asked to draw up a basic diagram of the unit, this in addition to photographs supplied by the interviewees was used to draw out the relevant diagrams. While the one residence is positioned outside of the study area it has significance to the research from the standpoint that the practitioners used knowledge gained within the study area. This instance also relates to the Social Practice Theory in how Shove and Pantzar (2005: 43) argue that a practice is not diffused but rather becomes a “successive, localized (re)invention” when taken into new areas, situations etc. Showing how the practice, while always site specific, can change and adapt to the “*stuff*” in how the practitioners reinvent the application of the “*skills*” while the “*Image*” remains constant. The other differences in practice and location of the practice relate to Shove and Pantzar’s argument, although it is highlighted better through the example of the Taylor residence.

Through the existing practice of agriculture inherited through generations of practitioners before, those who practised in villages and on farm lands etc. a language of agriculture design and layout exists. Through the diagram (6.4.a.) it is shown how the understanding of the existing language agriculture practice can and (in the case studies presented here) has been translated to exist in new contexts where traditional agriculture would not be suited.

6.3.5.1 Residence Layouts.

In the following diagrams, to more easily highlight the practices and relating services, colours have been included in specific areas of the diagrams to denote the activity. The diagrams as represented here aren’t to a specific scale and may not be similar scale to each other, they were however drawn to scale and as such are proportional. Thus distances and the sizes of items drawn can be appropriately gauged.

	Rain water tanks
	Agriculture
	Composting/ Worm farms

Key for diagrams

6.3.5.2 Residence 1.

Jeremy Smith:

An ex horticulturist with a passion for gardening and eating healthy nutritional natural food.

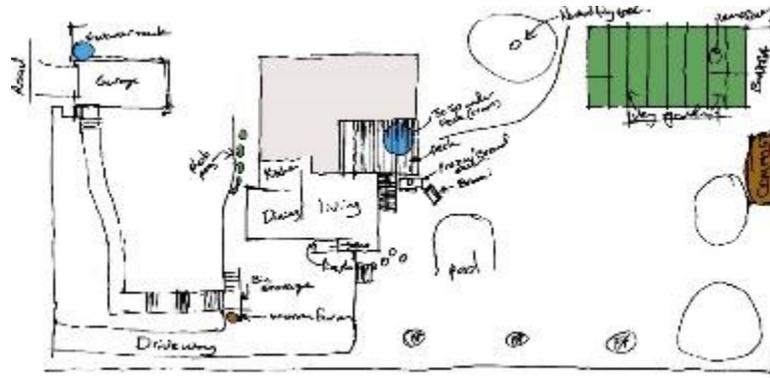


Diagram 6.3.5.a.
Smith residence
(Diagram by author)

The Smith residence (Diagram 6.3.5.a.) has undergone alterations and in addition the locations of services and practices have been changed to work better with the dwelling. Appreciating the aesthetics of gardening and nature, they have included a deck to the south overlooking the garden and agriculture

Images	Skills	Stuff
<ul style="list-style-type: none"> Natural produce Environmental stewardship Recreation/aesthetics 	<ul style="list-style-type: none"> Traditional gardening Farm based techniques Outdoor/ seasonal 	<ul style="list-style-type: none"> Traditional tools Ground based planting Herbs in pots

practice. While for convenience of use have positioned a “cook’s garden” of herbs and spices in pots directly outside the kitchen. Additionally the worm farm has been positioned within a short distance from the kitchen, to easily dispose of kitchen waste. The deck is also used for meetings, when hosting the “veggie club”, in a position that they can view the garden while talking. The position and use of the deck for the meetings and for relaxation highlights the communal aspect and integration into the design of the residence while relating to the agriculture practice.

6.3.5.4 Residence 3.

Alex Parker

A medical practitioner who works from home, who enjoys nature and the outdoors while understanding the need for healthy nutritious food. She combines her nutritional knowledge with her love of nature in keeping a “cook’s garden” as a hobby.

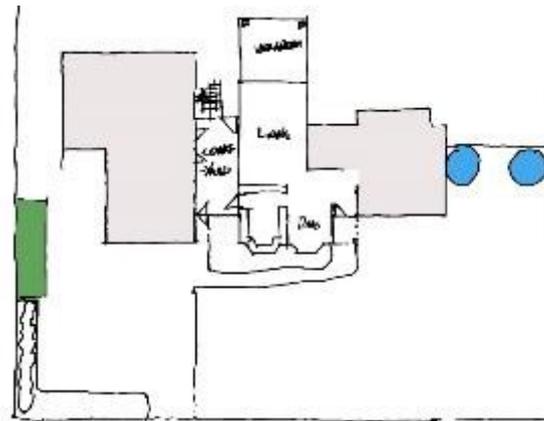


Diagram 6.3.5.c.
Parker residence.
(Diagram by author)

Images	Skills	Stuff
<ul style="list-style-type: none"> • Natural produce • Environmental stewardship • Recreation/aesthetics 	<ul style="list-style-type: none"> • Traditional gardening • Container based techniques • Outdoor/ seasonal 	<ul style="list-style-type: none"> • Traditional tools • Container based planting • Enclosure

The garden of the Parker residence while being a “cook’s garden” and “hobby garden” is not located directly outside the kitchen area (Diagram 6.3.5.c.). The garden is, for convenience, located nearest to the office area allowing for the practitioner to see and interact with the garden during the work day (as they work from home). While located for convenience, the position had been trial and error with the current position having separate micro climates. The location against the east wall facing west but on the South of a hedge creates a shaded cool area in the North and an exposed full sun warm area to the South. The garden, grown in containers, is covered by a shade cloth housing protecting it from pests and majority of insects while keeping it from being over heated by the sun and the wall to the East reflecting light and heat.

Although being a trial and error process, the practitioner has had advice from other practitioners through the “veggie club” and research via the internet. In addition the experience of other practitioners methods has inspired them, wanting to convert the courtyard outside the kitchen (on the route to the office) into a green house or as they termed it a “living pantry” (Parker, 2016).

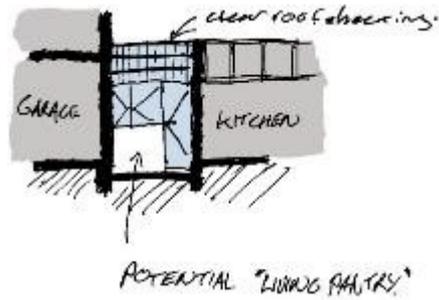


Diagram 6.3.5.c.1.

Possible greenhouse/ "Living pantry"
 (Diagram by author)

Much like other urban agriculture practices, where space is at a premium, this practice is not restricted to one dimension (Figure 6.3.5.c). Provisions for growing on the vertical surfaces of the wall and hanging from the structure for the shade cloth have been included to maximise the effective growing area in the limited space available (positioned at the edge of a parking area).

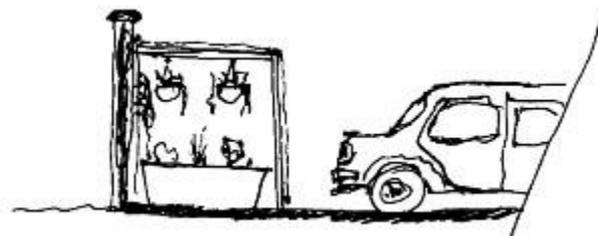


Diagram 6.3.5.c.2.

Section of growing space.
 (Diagram by author)



Figure 6.3.5.c.

Container garden with hanging and vertical growing spaces provided.
 (Source: A. Parker)

6.3.5.5 Residence 4.

Jess Southey:

A third generation gardener, who has a love and passion for nature and detests the negative impacts of society on wildlife and nature.

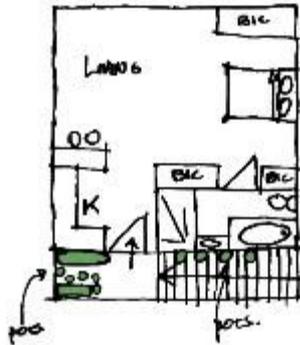


Diagram 6.3.4.d
Southey residence
(Diagram by author)

Images	Skills	Stuff
<ul style="list-style-type: none"> • Natural produce • Environmental stewardship • Recreation/aesthetics 	<ul style="list-style-type: none"> • Container based techniques • Outdoor/ seasonal 	<ul style="list-style-type: none"> • Traditional tools • Pot based planting

Being a “granny flat” positioned above a double garage, on another person’s property, doesn’t allow this practitioner much space for agriculture. To add to this the only outdoor space available, along the stairs, is shaded by a nearby hill. This meant that the plants needed to be in pots to allow for movement of the plants to identify the correct placing for them, the practitioner noting that sun loving plants were placed higher up the stairs and on the landing. It was also noted that they would prefer a different location of the stairs to allow for more light and a balcony for more space for planting. The reasons for the practice are that it provides healthier natural food and teaches the practitioner an appreciation for the food. The physical link between the agriculture and spaces of food preparation/ consumption in this case were forced by what was available. However, having been offered space in the garden of the property owner the practitioner opted to continue with the current practice in pots near the unit. This can be observed to be both for convenience in its location and time as maintenance can be carried out while passing the plants on the way to or from the unit. While this practice doesn’t allow for community gathering, outside of the normal living space, the practitioner interacts with others via social media and visiting other practices and attending courses, lectures and workshops.

6.3.5.6 Residence 5.

Craig & Graham Taylor

Scientific researchers with an appreciation for nature and a maker mentality that they use to re-imagine their surroundings to enable them to practice their agriculture hobby wherever they live.

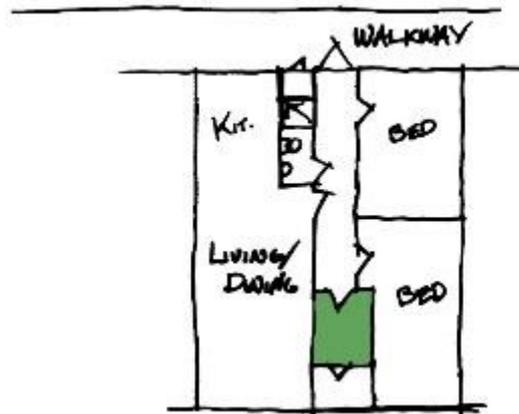


Diagram 6.3.5.e

Taylor residence (Netherlands)

(Diagram by author)

Images	Skills	Stuff
<ul style="list-style-type: none"> Natural produce Recreation/aesthetics 	<ul style="list-style-type: none"> Container based techniques Artificial nutrient delivery Indoor/ non-seasonal 	<ul style="list-style-type: none"> New technology & tools Container based planting Indoors Natural and artificial light

As noted earlier and in the primary research the Taylor's practice has spanned two continents, practising urban agriculture in both Pinetown South Africa and in the Netherlands. While in the Netherlands, they used what they had learnt from their practice of hydroponics in Pinetown on the veranda of their parents' house. The flat they stayed in had an extra room, most likely intended as a study, this was re-appropriated as a growing room where they set-up a hydroponic system using the natural light from the balcony and supplementing it with grow lights they made themselves (C. Taylor. 2016). Not having been designed with agriculture in mind, they noted that, they often had problems with water on the floor as there was no drainage (additionally it had timber flooring). Noting that when working with water and draining their hydroponics system they drained it onto the balcony, which in turn drained out the rainwater spout to the ground below.

6.3.5.7 Summation

The cases here were able to inform the researcher about the ingenuity of the practitioners and the “out the box” thinking that enabled the practitioners to adapt their practice to the conditions presented them. While all the cases presented here observe and attempt to overcome challenges in their locations, services and available space, the initial architectural designs hadn’t taken into consideration provisions for agriculture on any scale. Although Shove and Pantzar (2005: 43) argue that a practice becomes a “successive, localized (re)invention” of the initial practice, it is important to note that the practices all have similarities and that the lack of provisions in the building design has hindered the agriculture but hasn’t stopped it outright. The locations of all the agricultural practices were positioned only after the initial building had been built, this lead to the position not always being linked to the residence for aesthetics. Although through the inclusion of food plants in the general garden and alterations carried out on the buildings, the aesthetics of the garden and agriculture can be appreciated by the practitioner and others. A common occurrence appears to be that the practitioners use movable containers in order to maximise on the positioning of plants for micro climate conditions and to maximise production of food in the often limited spaces available. While the observed practices weren’t all located in high density environments they were selected for the variety of methods within the city and suburban areas (for the research urban includes suburban, in order to maximise the available typologies that can be observed and researched). These practices also serve to highlight the translation and adaptation of the agricultural languages, as indicated through Diagram 6.4.a. This translation and adaptation to the available spaces, provided for by the built forms, is chosen and applied by the individual leading to the idea that a single design forced on all residents would not be the answer. Rather, this existing ingenuity and practitioners ability for adaptation suggests that the practitioners need only be provided the basic services and support structures, upon which they can construct and place their own interventions for their urban agricultural practice.

The design of architecture for the integration of agriculture needs to accommodate the two aspects of the agriculture; the technical (growing, harvesting and related services) and the aesthetics of the agriculture and its appreciation by the practitioners and others. In order to design architectural forms for the inclusion of agriculture and their technical/functional aspects, special consideration needs to be made firstly to the ecosystem services needed for plants, being that of; light, air, water, air movement, pollinators, soil/nutrients etc. In designing the architecture for the inclusion of these natural services, it is important to provide for the activity, and the effects of it, through provision of dirt/mud rooms and cleaning areas along with appropriate drainage and filtration of the (waste) drain water for recycling of water and capture/separation of organic solids and soils from the water. In the design of residential architecture to accommodate for (personal) agricultural practices, there needs to be a consideration for the storage of the harvest, in the case where the garden is not used by the practitioner as a “living pantry” with continual small harvests as needed.

Through the observations of practices presented here, it was observed that there are marked differences in the practices, even when provided with similar situations i.e. Residence 2 and 3.

Locating the agricultural site appears to be as important to the practice as the practical knowledge of the practice and related tools. The situating of the practices in the case studies was for a variety of reasons, although all were positioned for convenience, locations were close to food production and consumption areas as well as having parts of all the agriculture visible from social spaces of the dwelling (including dining/eating areas). Thus the location of the agricultural practice needs to be located near food preparation/production, and storage areas. While for aesthetic appreciation reasons as well as integration of “community” into the practice they should also be visible and accessible from the social areas of the residence. In the case of farm like agriculture, such as in the suburbs and with use of permaculture methods the agriculture can be divided into different sections which would be provided for both by the architecture (in and on the buildings) and the surrounding land. In terms of integrating into high density residences the zones of the permaculture practice can be taken into consideration to design the building to incorporate parts of the practice in and on the residence while other aspects can be positioned further from the residence (based on needs and usage).

6.4 Relationship to Theories and Concepts.

6.4.1.1 Social Practice Theory

The practitioners acknowledge the three elements of Social Practice Theory and their relation to urban agriculture. This is expressed through their interest in other methods, researching where ever possible, communicating with other practitioners and going to courses etc. all to learn about and find new and different “skills” and “stuff”. The practitioners highlighted the need for some type of agricultural extension from the municipality in order to educate and advise them on methods, practices and laws regarding growing food, animal husbandry, apiary and agriculture related services such as rainwater harvesting and use and grey water reuse both in the home and garden.

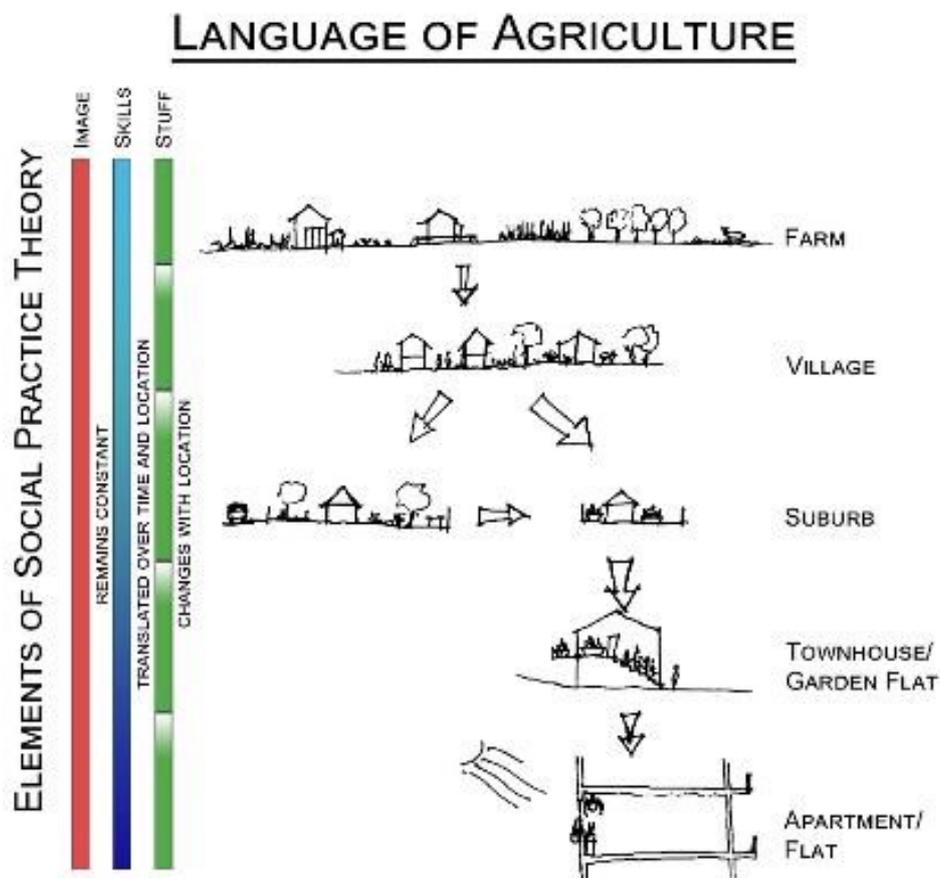


Diagram 6.4.A.

Agricultural language translation

(Diagram by Author)

6.4.1.2 Ecological Design

For the practitioners ecological design is an important issue that they integrate intuitively from the standpoint of their environmental stewardship responsibility. This leads them to adapt their dwellings

and design for inclusion of helpful technology, systems and ideas that would benefit them, their agriculture and environment and not for the express purpose of being “green”.

6.4.1.3 Agricultural urbanism

The interviewees spoke of the education of individuals and the integration of agricultural processes within the city limits. They also spoke about the acknowledgement of the “farm to fork” distance and reducing it, a key component in the concept of Agricultural Urbanism and its education of urban residents in agricultural processes and reduction of distances that food travels before reaching the fork or table.

6.4.1.4 Eco-mimesis

In the provision of supporting systems for agriculture and the design of the practices, including aspects of permaculture the practitioners intuitively or indirectly mimic natural processes. This through collection and distribution of water (rivers, lakes, wetlands), filtration of water from one system before entering another (being the very nature for the existence of wetlands and marshlands) and companion planting and other techniques of traditional and permaculture agricultural practices.

6.4.1.5 Ecosystem Services

The concept of Ecosystem Services directly relates to the two main reasons for the participation in urban agriculture through Provisioning and Cultural services, those being the production of food and the aesthetic appeal and appreciation of the plants and animals. Resulting from related practices of the agriculture, the participants provide for or participate in the remaining services of regulating and support services.

6.4.2 Summation.

Through the process of interviewing practitioners and observing the varied private urban agriculture practices presented here, the researcher was able to better understand the practice, how it is formed and how it relates to the built environment that it is practised within. The researcher acknowledges that the participants in the study have generally not been aware of the theories and concepts that were used in the research, in order to not influence the research they were not made aware of them (during the research) by the researcher.

The intuitive reaction of the participants to apply technologies that would help them and the environment comes from their more informed link to the natural environment through their immersion in the natural environment by their practice of agriculture and awareness of its links to the greater environment outside of their direct control. This coupled with their views of a responsibility for the environment, which informs and is informed by their practice, to grow healthy natural foods, leads them to be aware of our link to the natural environment.

When faced with challenges in their agricultural practices the participants appear to inform each other or seek out others who would be able to advise or help to overcome these challenges. The practitioners appear to feed off each other's knowledge and drive for practising urban agriculture regardless of the challenges faced. In some cases this leads to transfer and adaptation from one type of gardening to another (i.e. in ground to balconies). The practitioners of urban agriculture have been and are able to adapt their practices to their conditions and still belong to the practice of urban agriculture without losing the identity or link to the practice. The researcher notes that while the practice has remained autonomous (for the most part) from its inherent link to architecture and architects, It would be advantageous for architects to help in providing adequate and appropriate spaces and services for urban agriculture.

In order for architects to better serve the practice of urban agriculture, there needs to be an education and awareness of the practice and its needs. Currently additions and adaptations to the built environment, for the practice of urban agriculture, rely strongly on the knowledge and desires of the home-owner/ agriculture practitioner. With the previously mentioned limited knowledge of the theory and concepts used in this research by the practitioners of urban agriculture, the end result of working with architects will remain under-informed and not to the scale that will help and promote the practice. Architects, who may also lack that same understanding and knowledge of appropriate theories and concepts that drive, inform and build the practice will result in projects where the practitioners will (generally) remain reliant on their own, limited knowledge and ability to adapt existing and provided spaces to better serve their agricultural practice. The architectural industry acknowledges that the role of the professional architect is to listen to the wants and desires of the client and to then provide appropriate and informed design of spaces and services that will be of a benefit to the client and their desires for the building. This primary research has shown that the average client is not as well-informed as needed, with regard to the concepts and theories, and may have an understanding that they possibly are unable to communicate adequately to the architect regarding the concepts and theories informing and working with their practices. The result is that it is the architects role and duty to become informed, in order to better provide a service for the client, where the result doesn't become an application of green technologies that may or may not result in better systems and provisions for urban agriculture.

7 CONCLUSION AND RECOMMENDATIONS

7.1 CONCLUSIONS

The research has shown; how and why urban agriculture is practised in Pinetown, how the agriculture practices and spaces available are adapted to suit each other and finally that principles are need to be developed for an architecture that allows for and promotes urban agriculture for private individuals and families for their consumption. Through the work presented, based on primary and secondary research, the researcher showed how the architecture of residential design informs and interacts with urban agriculture and how these interactions are opportunities that can be worked with for better integration in initial the design. Through Social Practice Theory and concepts of Ecological Design, Agricultural Urbanism and others, presented in chapter two, the researcher was able to identify and express methods of how the practice is developed and transferred between areas, adapting to the conditions presented. The theory and concepts were used to identify and analyse different sections of the research, being; social, ecological, systems/services.

The aim of the study was achieved by identifying how architectural design can be used to integrate urban agriculture into residential settings. The participants of the research spoke of the relationships between the different rooms within the houses/ buildings and their agriculture practices, while also speaking of how the buildings were able to provide services and climatic conditions for the agricultural practices. A set of principles has been developed through the research, both general principles and specific principles, for the design of residential architecture with integrated urban agriculture which are spoken about in the following section under recommendations.

The responses from the interviewees highlighted the main reasons for their practices. The reasons provided in their responses were: the aesthetics of nature, plants and animals, the recreational value of gardening and to produce home-grown organic natural and healthy foods.

The methods of practice varied between practitioners and locations, from growing in the ground to growing in pots and the use of hydroponics, while some wished to experiment and try new and different methods. The conclusion is that the methods vary as much as the practitioners themselves along with their locations and provisions of the built environment differ.

7.1.1 Appropriateness.

Urban agriculture has its champions and detractors. Some believe that the existence of urban agriculture is meaningless and shouldn't be encouraged as it is dangerous and wasteful (Cox and van Tassel, 2010. Alter, 2016). The research has attempted to show that urban agriculture on a private/family production scale benefits the individuals, the community and the environment. The health benefits from urban agriculture are shown to go beyond dietary benefits for humans, including social, mental and physical benefits. These benefits along with Ecosystem Services help the city become more resilient to the effects of natural disasters and mitigate the historic effects of Industrialisation which

continue to this day. Beyond the direct benefits to humans, the inclusion of nature and agriculture in the city, increases biodiversity by introducing “new” creatures and animals to the city and recreating natural ecosystems that self-regulate.

The research acknowledges that the practice of urban agriculture needs to be open to the environment in order for it to be of benefit and not completely enclosed inside a building, whether it is high-rise or not. Supplementary and supporting practices of urban agriculture at the private/family scale are able to be included in the property and relate directly to the feasibility of the practice and the services it provides along with services provided by the supplementary practices such as rainwater harvesting, attenuation, filtering and grey-water filtering and re-use on-site, along with on-site waste treatment and disposal/ re-use.

7.2 RECOMMENDATIONS.

7.2.1 Proposed methods for building integration

Taken directly from the recommendations and practices of the interviewees the researcher suggests the following methods, of use for the integration of urban agriculture into residential design. The main method of practice that needs to be considered for the design of Urban Agriculture is Permaculture and the design principles, ethics and zones. This would allow for multiple scales of agriculture to occur throughout the building and the property that it is located within. Permaculture having been spoken about in Chapter 3 relates not only to plants and animals but a whole lifestyle design that includes the design of the built form.

There should be allowances for aquaculture, aquaponics, hydroponics and aeroponics practices which should include drainage specifically intended for these practices and their usage of water. With the expressed interest of interviewees in; apiary, poultry and other livestock, provisions should be allowed for their inclusion. This should include petitions to the municipalities and governing bodies regarding the removal or alteration of laws and regulations which control such activities. This, in order to allow for private small scale practices within the urban environments, given the potential health, ecological and biodiversity benefits that these practices could have on the environment and the residents.

The built environment needs to include rainwater collection and grey water re-use for use in the agricultural practice to properly conserve the limited freshwater available (not only because of the current drought but also with it being a scarce natural resource). The water needing to be filtered can be filtered either using bio filters such as wetland filters (reed bed filters) or mechanical/ alternative filters, such filters include a mixture of bio and mechanical filters. As stated by one interviewee grey water is best separated at source, thus the plumbing of the integrated building needs to be designed with two separate systems one for grey and one for black water.

With the combined total of social/ communal aspects of urban agriculture, according to table 6.2.1 (in Chapter 6, Primary Research), being 23% of the response to interviews done by the author. This suggests that private urban agriculture might be created and sustained through social and communal interaction relating to the practice which is upheld by the ideas of Social Practice Theory.

7.2.2 Proposed principles for design.

The following principles for design come from a synthesis of the proposed methods and the groupings of themes from the coding of the transcripts. Below the researcher lists the proposed principles, for the design of high-density residential buildings with integrated urban agriculture, as an outcome of the research.

- Scaled spaces.

This comes from Permaculture design and its creation of the five zones, four productive agriculture zones and the fifth of wilderness and its supply of ecosystem services. Joining the zones placed further away from the residences together to create communal agriculture spaces including larger communities in each zone progressing away from the residences. While also relating to scaled social spaces (with agriculture promoting social inclusion and interaction).

- Integrated water capture, re-use and re-cycling.

Mimicking the provisioning and regulating services of natural balanced ecosystems the building needs to provide for collection, storage, filtration and redistribution of water for household and garden use. Both Rain water and Grey water should be considered for this. While the possibility of on-site black water treatment should be considered and implemented where possible for benefits of provision of nutrients, power (through biogas and generators) or the pre-treatment of waste to lessen the load on the centralised (or decentralised) waste treatment facilities.

- Passive lighting and ventilation.
 - Natural lighting (daylight)
 - Natural airflow/ventilation

Lighting and ventilation are an important part of both growing plants and people's lives. Through the concept of ecological design and the incorporation of nature that it suggests it becomes important to use natural lighting and ventilation wherever possible. This could be through modern

technology or vernacular designs observed throughout the world or future technologies or methods inspired by nature through bio-mimesis.

- Adjustable solar shading devices.

In the production of food through agriculture different bio-climatic zones are important for the different plants grown; this is incorporated into the practices by practitioners through identification and creation of micro-climates. These can be created through the selective use of solar shading. The solar shading devices can double as wind breaks for protection during storms etc.

- Ecosystem services:
 - Water attenuation
 - Habitat construction

The inclusions of ecosystem services are important for the urban environment to become resilient and mitigate historical negative impacts of urbanism while improving the health and well-being of the residents. This can be implemented through provision of habitat for animals, such as nesting sites for birds that don't negatively impact on the performance or aesthetics of the buildings or through inclusion of pockets of wilderness for wildlife. This can also be implemented in the provision of natural water management through wetlands that filter and attenuating storm water which decreases the flooding impacts of storms on people, buildings and services.

- Use of ecologically sensitive materials (where possible):
 - Sustainable sourced
 - Natural
 - Re-cycled
 - Up-cycled

Following ecological design and taking ideas from eco-mimesis the building should be built that it doesn't destructively add to or take away from its surrounding environment. That means that the materials used in its construction need to be ecologically sensitive in their use and response. Thus, re-use and recycling of material is important, the use of natural materials while important needs to be carefully curated that they are sustainable harvested/sourced and don't contribute to further destruction of natural ecosystems.

- Proximity of /accessible planting areas i.e. built-in planters and window boxes/deep sills for plant containers.

While providing agricultural spaces can be effective in aiding urban agricultural practices, the observation of placement of the practices by those interviewed and observed for the purpose of this research suggests the importance of the practices' location in relation to the residence. The importance of the location of the practice was in relation to the areas of production and consumption of food while also allowing for visibility from social and relaxation spaces.

- Agricultural specific area design.

Current designs of balconies for high-rise residential apartments provide drainage for the removal of rainwater in the event of storms. While this is helpful for cleaning up when gardening on balconies it lacks the capture of the water and separation of bio-solids (plant matter, compost, sand etc.) from liquids to then be reused in the agricultural systems similar to the “cardboard to caviare” projects reuse and up-cycling of cardboard to mimic natural nutrient flows of nature.

The design for Agriculture should not just be in provision for places to grow but the integrated services needed and ones that would improve the experience. This would include areas such as “mud rooms” to clean oneself or equipment after working allowing the bio-solids and wash water to be captured and reused on site, contributing less to urban waste streams.

It is advised that these principles are considered for site specific design and in conjunction with the permaculture principles (Chapter 3) as related to architecture below.

As with Yeang's theory of Ecological Design (1999: 64-67) it is best not to use all ideas and principles in one building if the outcome does not benefit both the user and the environment. The application of these principles need to be considered in conjunction with each other and the site specific conditions, to work with the (existing and proposed rehabilitated) natural ecosystems that are on the site or that would be of benefit to the site, the built form and the surrounding environment both natural and built.

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9 APPENDICES

10 APPENDIX 1

Interview schedule

Introductory statement to be read prior to interview:

I would like to begin by thanking you for allowing me time to meet with you to participate in my research. This research forms part of my masters in architecture research project, the objective of this research is to look at existing private urban agriculture and understand the reasons for it and the methods currently used. This research will then be used to identify how architecture in the city can promote and advance private urban agriculture. I would like this to be more of a conversation rather than a survey or questionnaire. Please feel free to tell me any information that you think is important or that I have overlooked. Please do not feel that you are required to answer my questions, if you feel uncomfortable with a question feel free to tell me to continue to the next question. If you wish, you may end the interview at any time.

If it is acceptable I would like to record the interview so that I can analyse it properly at a later time. The interview will not be shared with anyone and I shall ensure that it is kept safe. It is possible that I might quote some of what you say in my research report. Is it okay if I use your name when I quote you or would you rather I use an alias (or fake name), would you like to suggest an alias before we start?

Can I use real name Yes / No.

Rather, use alias _____

Suggest observing garden while doing the interview or having a quick look before continuing. A comfortable place will encourage the respondent to open up and answer more truthfully and freely!

ICE BREAKER: As we start, so that I can get to know you a bit better, can you tell me a bit about your background like where you are from/grew-up, what it was like there, what kinds of homes were there.

Note. Keep this discussion brief, maximum of 5-7 minutes.

INTRODUCE TOPIC: *With the current water shortage and drought in the country, along with a weakening currency the cost of buying food is going up. My research focuses on a possible solution. It has been suggested that a solution for agriculture is to bring it into the cities and to farm inside buildings. Urban agriculture and Vertical farming are being spoken about internationally as the future of food production.*

Q1: why did you decide to start growing your own food/plants?

- 1.1. Who are you growing the plants for?
- 1.2. How do you/your family and the neighbourhood benefit by growing your own food?

Q2. Do you feel cities and buildings can provide spaces appropriate for urban agriculture?

2.1. *If no,*

2.1.1. Please explain why, you feel, they cannot provide appropriate spaces for urban agriculture? (What would you do to address this?)

2.2. *If yes,*

2.2.1. Please explain how, you feel, buildings provide these spaces?

2.2.2. Are there any additional ways that urban buildings could possibly provide for urban agriculture?

Q3. Are you aware of the discussions on the different technologies for farming in cities (is this related to the ideas of ecological design – sun, waste water etc.)

3.1.1 If yes

Has this influenced the technologies you use?

Why did you choose the technology you use- what role did the spaces in and around the building/flat play in the choice of technology

3.1.2 If no...

Where did you find out about the technology you use?

Why did you choose the technology you use – what role did the spaces in and around the building/flat play in the choice of technology

Q4. *If farming in non-traditional means i.e. pots, balconies, roof gardens etc.:*

4.1. Do the spaces of your building/flat etc. limit you?

4.1.1. How have you reacted to/overcome these challenges?

4.2. How do you adjust to not having normal growing conditions with deep soil to grow plants in?

4.3. What are these specialised methods/techniques/technologies that you use?

4.3.1 How do these methods/techniques/technologies relate to your building (*house/room/flat*)?

Q5. Have you worked with the building in identifying or creating different zones/biomes/climates where you grow different crops/plants? (*i.e. cooler shaded areas, hot zones, winds etc.*)

5.1. Are there any methods, plants that you wish to use or grow in the spaces available to you?

Q6: How did you plan where you were going to place your food garden in relation to your residence?

6.1. Were there any other places you had considered, if so why did you decide not to use them?

6.2. Was the link to food preparation and consumption considered? If so, how?

6.3. How has the layout of your residence affected the position of the different aspects of your gardening?

6.4. What changes would you make to the building if you could to make it work better with the garden?

Q7. (If farming with animals.)

7.1. How does the building help or hinder the farming of your (animal)? E.g. Space, lighting, air, waste, water.

(If **NOT** farming with animals.)

7.2. How could you farm with animals within/ around your building?

Q8. (If farming bugs, grubs or insects)

8.1. How does the building help or hinder the farming of your (grubs)?

(If **NOT** farming bugs, grubs or insects.)

8.2. How could you farm with grubs etc. within/ around your building?

Q9. What systems could be put into place in cities to encourage or enable urban farming? Changes in bylaws? Allotment gardens in cities? Municipal grey water reuse? Composting facilities?

Q10. Concluding Question: Is there anything that you feel I have left out or need to look into?

(Note: continue discussion based on response. After reviewing interview, possibly add additional questions based on responses).

Thank the person for their time and willingness to be interviewed. Wish them well.

11 APPENDIX 2

Information Sheet and Consent to Participate in Research

Date: _____

Dear prospective participant.

My name is Luke Bentley Standen.

I am a Masters in Architecture student from UKZN Howard College.

Email: lbstanden@yahoo.com

You are being invited to consider participating in a study that involves research of private urban agriculture in high density housing and how it is spatially accommodated, in order to produce principles that can inform the design of an urban agriculture spaces for private individuals. The purpose of this research is to understand the reasons for personal urban agriculture and the methods currently employed by its practitioners within the Highway area of eThekweni. Additionally other methods of urban agriculture will be analysed as to their appropriateness for the personal urban agriculturalist. This research will then be used to inform on how architecture in the city can be adapted and designed to promote and advance personal urban agriculture. The study is expected to enrol approximately 10 (ten) to 15 (fifteen) participants throughout. It will involve the following procedure; observation and photography of participant's agriculture (food farming) including its relation to buildings, interviews on urban agriculture and the reasons for practising it. The duration of your participation if you choose to enrol and remain in the study is expected to be a maximum of 2 to 3 (two to three) months.

The study should not involve any discomforts. We hope that the study will create the following benefits; outcomes from the research include the possibility of new or different methods for urban agriculture that could be use by participants. Additional outcomes of the research include principles for architectural design to aid and improve personal urban agriculture within cities. Possible alternate options to study participation would be for the individual to conduct online research in order to find new or alternate ways of practising urban agriculture.

This study has been ethically reviewed and approved by the UKZN Humanities and Social Sciences Research Ethics Committee (approval number HSS/0424/016M).

In the event of any problems or concerns/questions you may contact the researcher at the above details or the UKZN Humanities & Social Sciences Research Ethics Committee, contact details as follows:

HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION

Research Office, Westville Campus
Govan Mbeki Building
Private Bag X 54001
Durban
4000
KwaZulu-Natal, SOUTH AFRICA
Tel 27 31 2604557- Fax: 27 31 2604609
Email: HSSREC@ukzn.ac.za

Individual participation in this study is voluntary and the individual may at any time withdraw from the study. An individual's withdrawal or refusal to participate in the study will not result in penalty or loss of benefits to which they are entitled. If the participant wishes to withdraw from the study they need to inform the researcher in writing and inform the researcher if they wish for the information collected from them to be removed from the study, unless otherwise informed the information collected will be used in the study. The researcher may terminate an individual's participation in the study if the individual is unable to provide relevant information to the study.

There are no foreseen costs to be incurred by individuals as a result of participation of the study, as the study will focus on existing urban agriculture practices and will not require participants to change or add to their urban agriculture practices. There are no incentives or reimbursements for participation in the study.

Confidentiality of participants is important and participants will be allowed to use an alias for the purpose of interviews and for any data that may be presented in the document at the end of the study. Individuals details, personal information and sensitive information will be kept confidential and not form part of any documents such that participants might be identified. All data shall be kept on either external USB memory disks and/or CD/DVD disks in a safe box by the researcher for a minimum of 5 (five) years, at which point the CD/DVD disks will be destroyed and/or USB memory disks will be securely erased so that data will not be retrievable (in a case where not possible the disk shall be destroyed).

The study entitled:

“Exploring private urban agriculture and its integration into high density housing.

Towards the design of high density housing with an Urban Agriculture hub in Pinetown.”

By: **Luke Bentley Standen**.

I understand the purpose and procedures of the study. I have been given an opportunity to ask questions about the study and have had answers to my satisfaction. I declare that my participation in this study is entirely voluntary and that I may withdraw at any time without affecting any of the benefits that I usually am entitled to. I have been informed about any available compensation or medical treatment if injury occurs to me as a result of study-related procedures.

If I have any further questions/concerns or queries related to the study I understand that I may contact the researcher at;

Email: lbstanden@yahoo.com

If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researchers then I may contact:

HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION

Research Office, Westville Campus

Govan Mbeki Building

Private Bag X 54001

Durban

4000

KwaZulu-Natal, SOUTH AFRICA

Tel: 27 31 2604557 - Fax: 27 31 2604609

Email: HSSREC@ukzn.ac.za

Contact details of Participant:

(This is optional but is purely for the purpose of requesting any further information the researcher may need, and will not under any circumstance be passed to any other parties.)

Email: _____

Contact: _____

Would you like to receive any feedback on the project after completion?
(Should you wish to change this answer after this interview you may contact the researcher at any time with the details provided on the previous page.)

Yes No