The role of rooftop agriculture on urban food security: A case study on the Priority Zone Rooftop Garden

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Abstract

Urban food security is a growing concern for cities, and Durban, eThekwini Municipality, South Africa is no exception. This study explores the impact of the Priority Zone Rooftop Garden (PZRG) on urban food security in Durban. Qualitative interviews were conducted with stakeholders from the PZRG as well as organisations which directly benefit from the initiative. The study showed that start up and maintenance costs of the garden were minimal, and its benefits exceed its limitations. With food security being addressed through food donations and the creation of individual food gardens, the PZRG contributes to food security and is worth expanding upon. By promoting rooftop agriculture in the city of Durban through the offering of incentives and enabling of by-laws, more buildings can start up initiatives like this one. Rooftop agriculture has the potential to play a major role in urban food security if it is further explored on a larger scale.

Keywords
Rooftop agriculture/gardens/farms, food security, food production, Priority Zone Rooftop Garden, food donations.

1. Introduction
Urban food security is a growing concern for cities, as food has to be brought into cities from surrounding farms. There is significant built-up area growth in the city of Durban resulting in land which could have been used for agriculture now being taken up for the construction of buildings (Greenstone 2009). Some of these growth projects include the Point Waterfront Development, the Centrum Government Precinct, the Cornubia integrated human settlement development and the Dube TradePort (Global Africa Network 2020). Nevertheless, Durban has many flat roofed buildings which would be ideal for rooftop agriculture to thrive on (Greenstone 2009).

“Rooftop agriculture is the production of fresh vegetables, herbs, fruits, edible flowers and possibly some small animals on rooftops for local consumption” (Resource Centre for Urban Agriculture (RUAF) Foundation 2019). The primary benefit of rooftop gardens is to improve food security. Other benefits for the environment could be the reduction of the urban heat island, reduction in storm-water run-off, building cooling, and a place where building residents can socialise whilst growing their own food (Greenstone 2009). Rooftop agriculture cannot fully be relied upon to ensure food security, but it certainly can play a major role in it. The concept can also be demonstrated and

taken further with the provision of enabling legislation to encourage it in the town planning scheme, bylaws and building permits.

The case study for this research is focused on the eThekwini area. No advantage is being taken of this new solution to address a fairly old challenge, but by analysing the PZRG which is literally one out of a handful of rooftop gardens located in Durban, we can try and map its benefits in terms of food security. Exploring the relationship between rooftop agriculture and food security may provide evidence for the city of Durban to replicate the concept of the PZRG, thereby increasing urban food security.

1.1 Objectives

- To gather and present information on rooftop agriculture and its limitations as well as benefits using a checklist of dos and don'ts that one should consider when creating one's own rooftop gardens.
- To display in a clear and concise manner the information from interviews with those involved in the project as well as representatives of those benefitting from the project.
- To come to a conclusion about the relationship between the PZRG and food security and move forward by making valuable suggestions.

2. Literature Review

The various authors define food security as the capability of a person to obtain an adequate amount of food every day (Du Toit, Ramonyai and Ntushelo 2011; Vink 2012). Furthermore, it is the access to "safe, nutritious, personally acceptable and culturally appropriate foods, produced in ways that are environmentally sound and socially just" (Nowak 2004). On the other hand, food insecurity can be defined as, "a condition in which households lack access to adequate food because of limited money or other resources, is a leading health and nutrition issue" (Gundersen and Ziliak 2015).

There are three dimensions to food security. First is food availability which means that, whether consider the city level as a whole or at an individual household level, you have food available to you. Second is food access, which is the ability of everyone to have access to food on a regular basis. Third is food use, which describes just exactly how citizens are using food in terms of nutritional value and whether they are taking the right sanitation precautions (Du Toit, Ramonyai and Ntushelo 2011). A study by Masipa (2017) concluded that about 35% of South African's were vulnerable to food insecurity, and 15% of households in KwaZulu-Natal had inadequate access to food.

Rooftop agriculture/farming is the main concept of this paper. "Rooftop agriculture is the production of fresh vegetables, herbs, fruits, edible flowers and possibly some small animals on rooftops for local consumption" (Research Centre for Urban Agriculture (RUAF) Foundation 2012). By simply taking advantage of the concept of green roofs through the use of succulents and plants that improve the aesthetic beauty of the rooftop and going a step further by producing fresh fruit and vegetables, the concept of rooftop agriculture is formed (Research Centre for Urban Agriculture (RUAF) Foundation 2012).

The benefits of rooftop farms can be separated into three main sections, environmental, economic and social benefits (Pillay 2017). The first environmental benefit is vegetation and planting on rooftops to replace glass, concrete and asphalt which tend to absorb heat. This effectively lowers the temperature in the immediate surroundings and counteracts the urban heat island effect. The second environmental benefit is the filtering of dust and pollutants in the air. Vegetation on rooftop farms absorbs pollutants and other harmful gases and releases oxygen as a by-product of photosynthesis, thereby making air in cities much cleaner. The third environmental benefit is the introduction of biodiversity into the city, as vegetation will attract many different species which in turn will aid in the conservation of both flora and fauna. The fourth environmental benefit is the filtering and reducing of storm-water run-off. This process starts with soil in rooftop farms filtering out contaminants. The trapped particles in soil can be used as plant nutrition. Rooftop farms also store about 90% of storm-water, this means that the burdens of storm-water management

are reduced, as are the chances of flooding in cities. Rainwater can also be collected in drums and used as irrigation for plants (Pillay 2017; Manríquez-Altamirano et al. 2020; Dubbeling and Massonneau 2014).

The first economic benefit is food production in the city. Food brought from outside of cities means that high transportation costs are incurred, however rooftop farms can provide food within the city whilst cutting down on transportation costs. The second economic benefit is the increase in property prices. Rooftop gardens not only increase property values by 20% but also improve the aesthetics of the city. The third economic benefit is the lowering of building costs. This refers to the reduced need of heating and cooling in buildings, as rooftop farms either absorb or reflect heat from the sun (Pillay 2017). The first social benefit is the provision of social meeting places for people to relax in and also to enable community gatherings. The second social benefit is aesthetic beauty referring to rooftop farms bringing colour into dull cities and providing a city that is more calming and appealing (Pillay 2017).

The limitations associated with rooftop farms in urban settings consist of four categories. The first limitation has to do with the start-up of a new business in the city - with respect to acquiring of loans, attracting appropriate labour and managing costs (Ackerman et al. 2014). Secondly, small farmers face common problems of pest control and the creation of marketing and distribution plans. The third limitation is specific to urban agriculture - the growth and yield of produce in a compact urban setting. The last limitation incorporates all of the challenges and includes the finding of a suitable site, management and operation of the rooftop farm, the acquisition of relevant permits, the procurement of funding, and financing construction (Ackerman et al. 2014; Specht and Sanyé-Mengual 2017).

3. Methodology

The study utilises a case study research methodology. Qualitative data was collected from six participants in the form semi-structured interviews with stakeholders in person and via e-mail. These stakeholders were individuals who participated and are currently involved in the initiative as well as benefiting from it. They included the caretaker, designer, ABM, architect and facility manager, Fundraising manager (TAFTA) and the Manager (Drop in Centre). The stakeholders were first phoned to notify them of the study and asked whether they would be willing to participate. Upon consent, a voluntary participation form was emailed to them with a tentative date for the interview. Considering the current Covid-19 pandemic, e-mail interviews were utilised where possible, and answers were coded and analysed in an anonymous manner. Findings were extracted from the data, and conclusions were drawn.

4. Results and Discussion

The qualitative data were analysed to identify themes emerging from the responses. These themes from the data collected were rooftop garden (startup, maintenance, food production), food security and factors for consideration. The diagram below (Figure 1) indicates the further breakdown of the emerging themes, and acts as a structure for the results.

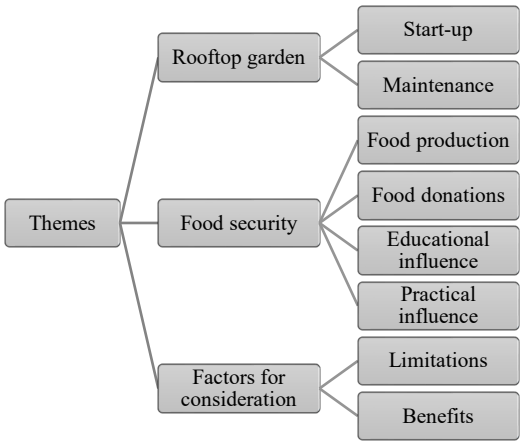

Figure 1: Emergent Themes (Researcher 2020)

This next section will present key findings under the given themes.

4.1 Rooftop Garden

The theme rooftop garden involves all points related to the planning of the PZRG (which is pre-start-up), start-up (which is the construction of the garden) and maintenance (which is the daily activities which keep the garden running).

4.1.1 Start-up

In the start-up process, engineers were consulted who recommended waterproofing as the major step before planting was possible. Secondly, engineers ensured that the underlying roof structure was strong enough to take the proposed loading (Respondent 1). Other considerations, when creating the PZRG, were the weight of people using the space. The weight of the soil and plants including the water that saturates the area also had to be taken into account. A maximum of 100kg per meter squared is required. The traffic of the garden also had to be considered, the provision of pathways gave the best access not only in terms of maintenance but to visitors as well.

A source of water was needed for the garden. The rooftop did not have any connection to a source of water, so provision had to be made for that to be possible (Respondent 4).

Selection and location of plants were carefully considered to ensure the benefits of "companion planting" and flowers such as marigolds allow for a naturally pest-free farm. Costs were kept to a minimum as drums, pallets and tyres were utilised as well as other recycled materials. This kept the start-up costs low (Respondents 4 and 5). Most of the costs incurred were from the fitting of solar panels which provide electricity to the building during load shedding (Respondent 2).

"Tunnels were used on the main roadside to protect crops from harsh winds coming from the coast just down the road. The open beds were placed on the opposite side so the surrounding buildings could protect them, and less water would be lost due to evaporation." (Respondent 4)

4.1.2 Maintenance

The current monthly costs to maintain the garden are hard to determine because sister departments (parks and agriculture departments) donate seedlings, compost and potting soil to the garden. Four individuals are required to maintain the garden, two of which are gardeners, while two individuals assist in cleaning up the garden (Respondent 1 and 2). Daily maintenance of the PZRG includes cleaning up, spraying plants for possible diseases, changing compost, watering of the plants, harvesting vegetables and planting new plants (Respondent 3).

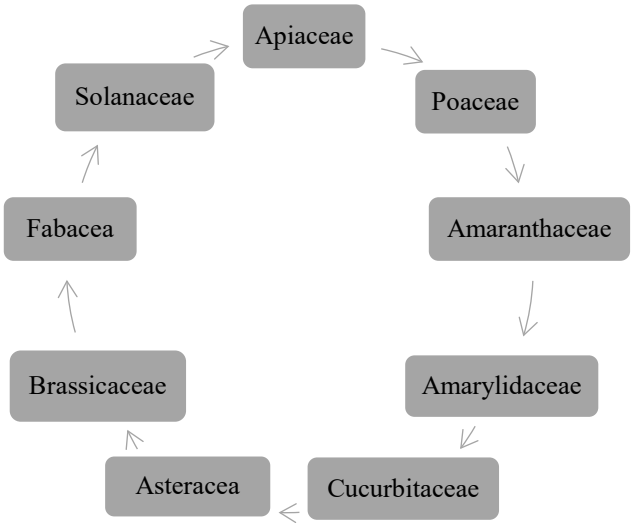

Figure 2: Crop Rotation at PZRG (Researcher 2021)

Poaceae	Asteracea	Amarylidaceae	Cucurbitaceae	Amaranthaceae
• Corn • Lemongrass	• Sunflowers • Lettuce	• Cabbage • Chives • Garlic	• Pumpkins • Squash • Melons • Cucumbers • Butternut	• Spinach • Beetroot
Apiaceae	**Lamiaceae**	**Brassicaceae**	**Fabacea**	**Solanaceae**
• Dill • Coriander • Celery • Parsely	• Sage • Thyme • Lavender • Mint • Rosemary	• Cabbage • Cauliflower • Mustard • Radish • Turnip	• Beans • Peas • Granadilla	• Potatoes • Tomatoes • Brinjal

Figure 3 Companion plants used in crop rotation (Researcher 2021)

Crop rotation is also an ongoing process at the garden. This can be seen in figure 2 and figure 3 above which are charts designed by the PZRG and illustrated by the researcher. These show crop rotations that is practiced at the garden and companion plants used in crop rotation with various vegetables that are grown at PZRG (Respondent 1 and 2). This assists in minimising soil exhaustion.

4.2 Food Security

The theme food security unpacks food production and explores future possibilities. Food donations look at various organisations and individuals that PZRG donates food to; educational influence looks at how PZRG provides hands on education to visitors. Practical influence unpacks how PZRG has influenced the construction of other rooftop gardens.

4.2.1 Food Production

Food production at the PZRG was and has been experimental, as different crop suitability was tested, and systems such as hydroponics and green-walls were introduced (Respondent 5). The food security only came into play for the planting program of the roof garden, as the garden was designed for biodiversity as well as urban farming. (Respondent 1)

A tunnel system is used at the garden to grow vegetables as it is the best design for the maximum amount of food yields. This is because of the sheltered environment and the irrigation system, as the open vegetable gardens are manually watered and are open to the elements, but can sustain larger plant material, or fruit (Respondent 4). Each tunnel can grow around two hundred vegetables at a time but it depends on what vegetable is grown. For example, fifty cabbages could be produced, two hundred beetroots, or two tunnels just for carrots. However, these vegetables vary as crop rotation is practiced (Respondent 2). According to Respondent 3, each vegetable takes a different amount of time. Spinach takes around three weeks, cabbage (Figure 4 and 5) between five to six months and beetroot around two months.

“That depends, spinach grows fast, maybe three weeks, cabbage maybe five to six months, beetroot also takes time, maybe two months.” (Respondent 3)

Table 1: Potential Crop Yields (Researcher 2020)

Vegetable type	Average yield (no. of vegetables)	Estimated yield time	Estimated yield for one year (no. of vegetables
Cabbage	50	5-6 months	100
Beetroot	200	2 months	1200
Spinach	200	3 weeks	3400

Based on the estimates provided in the study, Table 1 was drawn up to indicate potential yields. The 'average yield' column represents the number of vegetables produced in a single harvest. The 'estimated yield time' column represents the time that it takes for each vegetable to grow to full term. The Table indicates potential yields of cabbage, beetroot and spinach for an entire year, it is purely theoretical as it is based on the data collected from the respondents at the PZRG.

Figure 4: Tunnels at PZRG (Researcher 2020)

Figure 5: Cabbage Tunnel at PZRG (Researcher 2020)

The above Figures 4 and 5 show the tunnels where the vegetables were being grown. However, in Figures 4 and 5, there were just cabbages being grown.

In winter, the production of vegetables is much harder as they struggle because of the lack of rain as opposed to summer when there is more rain. Water storage does take place on the ground floor. Rainwater and tap water both have a different effect on the vegetables (Respondent 3).

4.2.2 Food Donations

Food donations play a major role as a function of the garden. The garden donates produce to multiple organisations as well as its two gardeners and the Extended Public Works Program (EPWP) top service cleaners (Respondent 2).

"We've got TAFTA the old aged home, we've got the Natal Old Aged Home which is the Nomvelo, we've got the soup kitchen which is just down the road in Victoria Embankment now called Magaret Mngadi and then we've got Safer Cities that we also donate to, and then like I said we've got the EPWP top up service cleaners if you've noticed wearing the orange overalls, they also benefit out of it." (Respondent 2)

These donations take place on a monthly basis. The Drop in Centre has been receiving these donations since 2018. The produce lasts a day as they have around 400 beneficiaries that attend their organisation on a daily basis (Respondent 7). TAFTA distributes their produce amongst the elderly who use it to prepare their own meals (Respondent 6).

4.2.3 Educational Influence

The Conference of Parties (COP17) of the United Nations Framework Convention on Climate Change (UNFCCC) and the seventh Meeting of the Parties (CMP7) to the Kyoto Protocol (UNFCCC COP17/CMP7 also known as COP 17) was hosted by Durban, South Africa, from the 28th of November to the 9th of December 2011. This brought local and international visitors to the garden. The garden has also acted as a source of education for many schools, not just in Durban, but other provinces as well such as Limpopo, the Eastern Cape and Gauteng (Respondent 1). For example, local schools bring their students to the garden on Arbour Day to learn how plant using basic recycled materials such as 2L containers, drums and tunnels (Respondent 2). Universities also bring students to learn from the garden and students doing research have also attended the garden. Many organisations have visited the PZRG in order to learn how to start a rooftop garden. Hotels along the coastline have also visited the rooftop garden for the same reason. They have seen that they too can start rooftop gardens with whatever little space that they have (Respondent 2). All of this was possible through word of mouth.

4.2.4 Practical Influence

Many of the schools mentioned above have started gardens after learning important skills from the PZRG. Due to the current Covid-19 virus, Mr Price Head Office started a rooftop garden in 2020 with what they had learnt from PZRG. A Rennies building has also started a rooftop garden after visiting the PZRG. The garden representatives not only promote rooftop agriculture but also encourage agriculture in any other possible form. This has influenced many others (Respondent 1).

Respondents 4 and 5 have designed and proposed a few other gardens:

(i) The rooftop garden at the Mr Price Head Office which supplied their canteen with fresh produce but was removed for the planting of succulents instead.
(ii) A vegetable garden for the Durban Hilton Hotel but due to the Covid-19 virus and a lack of maintenance it is non-existent.
(iii) A small indigenous succulent garden above a home office deck.
(iv) Above the storeroom of St Henry's Marist College.
(v) The Drop in Centre actually started a rooftop garden in 2019, it did not work out, but they are willing to try again with the aid of their beneficiaries.
(vi) TAFTA would also be willing to start their own rooftop garden.

"I have also proposed a roof farm for the Nedbank office building adjacent the ICC; but there has been no decision to proceed. This would be an ideal site, because of the potential to service the Nedbank Canteen, as well as the ICC and Hilton Hotel kitchens." (Respondent 5)

Moreover, rooftop agriculture has been identified as a viable option for other flat roofed buildings in the city of Durban because of its warm sub-tropical climate. This would not only provide a source of food (improving food security) but also create jobs, generate incomes and cut down transportation costs of produce. The only real issue is that building owners do not have incentives to encourage them and are not made aware of the possible opportunities (Respondent 5). Professionals in the field would be interested in carrying out more initiatives but only if the project is well funded, other skilled individuals are also involved and ingenuity and recycling are prioritized (Respondent 4).

4.3 Factors for Consideration

The section of the paper considers all the limitations, and ways in which these issues were resolved as well as all of the benefits accruing from the PZRG.

4.3.1 Limitations

The first limitation that had to be overcome was the short building lease of three years. An expensive, permanent set-up could not be implemented because of the uncertainty of what would happen once the lease was over. Furthermore, the elements of the garden needed to mobile in order to achieve a value for money approach. To minimize costs, most of the materials were recycled. These included drums, bins, palettes, shoes and so forth (Respondent 5).

Secondly, the in-house expertise in establishing the rooftop garden was limited when the project began in 2009. Fortunately, the eThekwini Environmental Department was simultaneously developing pilot projects for planting grasses on roofs, within the City Engineers Complex. Lessons were learned from that initiative, and also from private

sector landscaping experts who were co-opted to the PZRG project. This added experience to the team, including companion planting to reduce pests and more effective supplementary irrigation techniques, as well as worm-farms (Respondent 5).

Thirdly, leaks were found in the flat concrete roof by the Priority Zone Project staff. This was addressed using new high specification waterproofing being laid onto the roof which took into account increased exposure and run-off required from irrigation (Respondent 5).

Fourthly, a structural analysis of the building indicated that point loads needed to be avoided where possible, therefore, planter systems were designed to distribute weight. This meant that planting trays had to remain fairly shallow, and vermiculite was used to reduce the weight of soil. The rooftop garden also has a maximum capacity of 30 people (Respondent 5).

The fifth limitation was that the garden was designed "to make use of the large Durban rainfall, unfortunately the roof of the garden was unable to catch water due to the drainage system, so it was arranged and agreed that it would be collected from the neighbouring roof, the design was incorporated for the piping and water storage to be stored on the ground floor in the shaded areas where plants would not yield any crop (Respondent 4)."

"The Priority Zone Development Team approached various inner-city businesses to promote the benefits of roof farming. A few notable successes have followed, but not to the extent which is possible. New initiatives need to be initiated by the current managers in order to rekindle the spark and generate renewed interest in roof farms across the inner city." (Respondent 5)

4.3.2 Benefits

The PZRG provides fresh produce well in excess of expectations, for very little cost. It donates food to soup kitchens, old age homes and its own employees who need assistance. This directly contributes to urban food security. There is also a need for the decreased use of pesticides and increased use of organic gardening (Respondent 5).

"Organic gardening is always best but unfortunately a roof garden does not lift you up above pests and diseases, as these are in the soil and are a natural part of life however it is more manageable to isolate and treat the natural way." (Respondent 4)

The rooftop garden was started with the idea of greening the building which led to the decision to create a rooftop garden, thus bringing urban farming/agriculture to the city. It thereafter provided permanent employment for four people, which was not even a part of the initial plan (Respondent 1).

The rooftop garden helps bring biodiversity back into the city. Through the use of indigenous plants, wildlife that had previously inhabited the ecosystem prior to the building now have a place to seek refuge and, along with that, bring with them their beneficial qualities (Respondent 4).

The PZRG helps in the reduction of the volume of rainfall leaving the roof and acts as a filter and rainwater collection tank. This reduces flooding as well as storm water drain requirements. The green roof protects the roof structure and allows it to last three to four times longer than a conventional roof, as it reduces the roof's exposure to adverse weather conditions and UV rays (Respondent 4 and 5).

The rooftop garden aids in thermal regulation by retaining heat from the sun and releasing it as the air cools, which reduces heating and cooling demands. It also helps in the reduction of the urban heat island effect by cooling the surrounding air. It further improves air quality, as the vegetation filters pollutants and toxins from the atmosphere and in turn breathes oxygen into the air (Respondent 4 and 5).

The PZRG acts as a space where people go to relax, to the point where they have provided a gazebo with ample seating. This proved to be even more popular after the Covid-19 outbreak (Respondent 2 and 5). The design of the garden also encouraged visitors and provided a no-cost option for meetings and events hosted by the municipality such as COP17 in 2011. The garden also acts a venue for weddings, live television broadcasts, chefs and so forth.

Various educational facilities from primary, secondary and tertiary institutions also paid visits so as to learn how to practice rooftop agriculture (Respondent 1 and 5).

4.4 Checklist

A checklist was drawn up below using the PZRG as a blueprint for future rooftop gardens of that magnitude. The checklist records what must be considered when starting up a rooftop garden. This will act as a blueprint for future rooftop gardens as it breaks down the most important steps in creating a rooftop garden. The checklist contains two columns of 'Do's' and 'Don'ts'.

Table 2: Checklist (Researcher 2020)

Do's	Don'ts
•Ensure that skilled professionals are consulted when looking at design and engineering.	•Use a single waterproofing layer, rather use a waterproofing membrane to avoid leakage.
•Use a waterproofing membrane to ensure that there is no leakage.	•Use an expensive permanent set-up if the building is being leased. Instead use planters that can easily be moved if need be.
•Make sure that the underlying roof structure can withstand the weight of the garden. This includes knowing maximum weight capacity of the roof.	•Proceed with the start-up if professionals did not give the go ahead for the project.
•Make use of companion planting to aid in keeping pests away.	•Plant open bed gardens on the side of the rooftop facing the road, instead make use of open beds where they are protected from harsh winds. For example, in between buildings.
•Use recycled materials to keep costs at a minimum.	•Attempt to start-up the garden without properly researching rooftop gardens.
•Make certain that pathways are incorporated in the design as it aids in the maintenance of the rooftop garden.	
•Ensure that a source of water is available to the garden.	
•Try to implement a water catchment and storage system for drier months.	
•Utilise a tunnel system if the area where the garden is situated is windy.	
•Make sure that crop rotation is practiced.	
•Implement an irrigation system would be beneficial if manual watering of plants cannot be performed.	
•Employ caretakers because the rooftop garden needs daily tending to.	

6. Conclusions and recommendations

Urban food security is an increasing concern for cities as food has to be brought into cities from surrounding farms. The findings of this research were that there were minimal start-up and maintenance costs, food security was addressed through food donations as well as through educating those that visit the garden and through those that take what they have learnt and apply that knowledge by creating their own rooftop gardens. Limitations and benefits were discussed in-depth. For instance, the PZRG definitely contributes toward urban food security but cannot be solely relied upon. However, by promoting rooftop agriculture in the city of Durban, more buildings can start up initiatives like this one, as the benefits exceed the initial start-up costs and limitations of the garden. A simple checklist was created to direct those who wish to start their own rooftop gardens. Urban planning policies and systems can therefore directly incorporate rooftop agriculture as a strategy to aid in urban food security. A small list was drawn up of buildings

within the Durban CBD which would be ideal options for future rooftop gardens. With more rooftop agriculture in the city, the benefits found in this study can be amplified and will be able to play a larger role in urban food security.

Rooftop gardens, such as the PZRG can also be implemented on a larger scale for commercial purposes. By using the area ($\mathbf{1145}\boldsymbol{m^2}$) and approximate yield (figure 4) of the PZRG, we can see the potential for commercial rooftop farms. The PZRG has employed four employees to maintain the garden, and such a commercial rooftop garden has the potential to employ many more individuals because of the increased yield and size of the garden. Commercial rooftop gardens can also sell produce at a reduced price to traders at the Early Morning Market in Warwick, who usually buy their produce from farmers or the municipal bulk Market (Markets of Warwick 2019). The Brooklyn Grange is another good example of how such a garden can turn into business prospect. through the use of its rooftop areas (6039$\boldsymbol{m^2}$, 4181$\boldsymbol{m^2}$ and 13006$\boldsymbol{m^2}$).

Some buildings in the Durban CBD that have the potential for rooftop gardens are:

i. The DUT Baltimore Residence and the DUT Steve Biko Campus library, as it can provide meals to students. It was found that food insecurity is a contributing factor to students being overweight and underweight at DUT. Their accessibility to food was influenced by the price of food, money available to buy food and quality of food. A study conducted among 23 South African universities found that a third of students' experienced food insecurity, and the numbers were actually higher because some students might have been embarrassed to disclose that they were going hungry (Dunn-Coetzee and Foflonker 2019).
ii. The Beachview Mall has the potential for a commercial rooftop garden. The mall could potentially have rooftop markets to sell produce at a reduced price, or they could sell this produce around neighbourhoods of low income.
iii. The Addington Hospital, as it could contribute meals to patients. As the hospital is run by the government, the initiative could be funded by them in order to provide fresh produce and save on costs spent on meals for patients.
iv. Many of the homeless shelters in the Durban CBD have flat roofs and will be able to feed those that they take in. Many more homeless shelters had to be opened due to COVID-19 (Singh 2020). These shelters would definitely require help to provide food for the large numbers of people they have taken in.

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Biographies

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