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Forlee, Jolene

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PROCESS

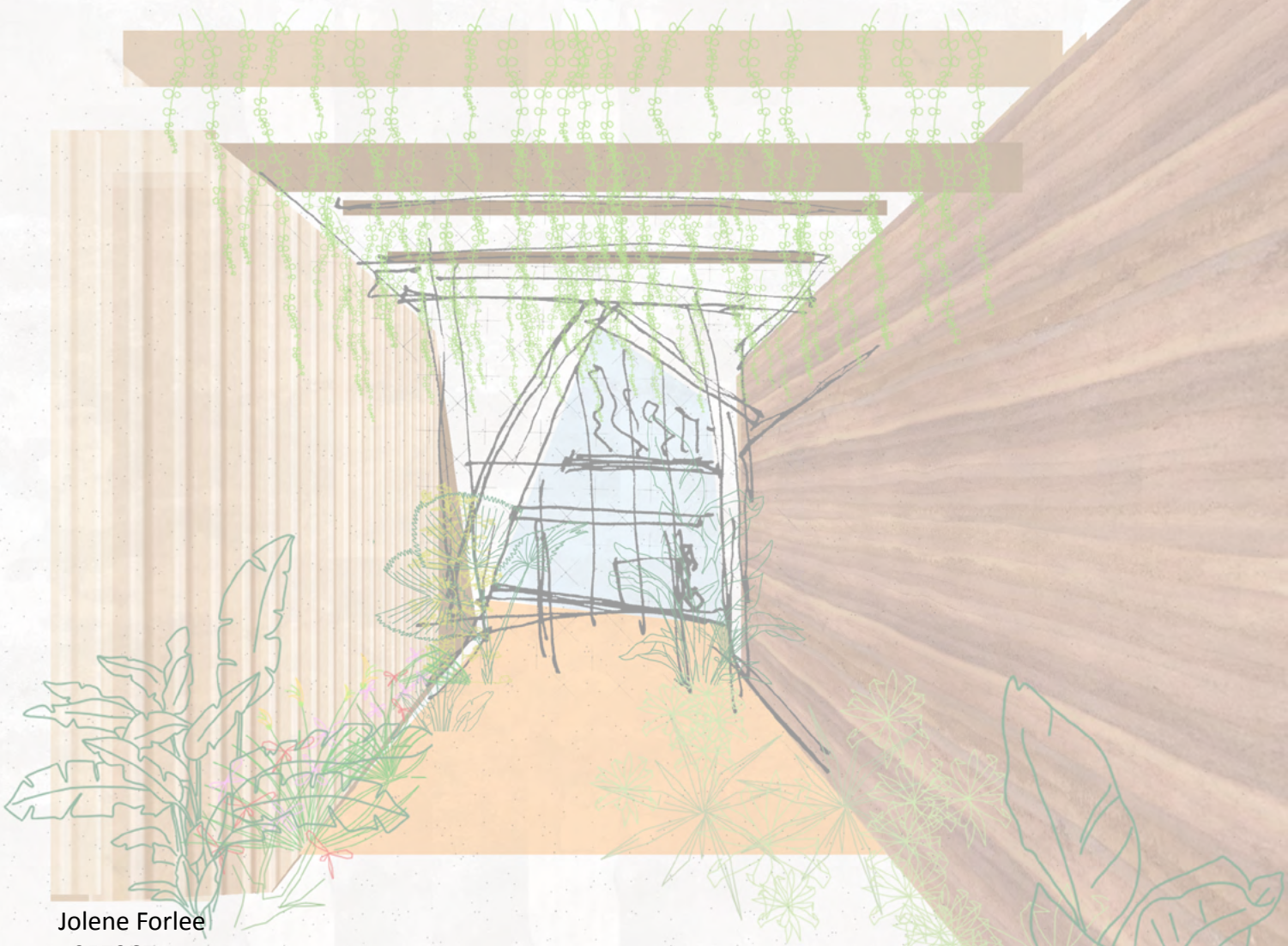
A HOLISTIC AND SUSTAINABLE FOOD SYSTEM; RESTAURANT IN FORDSBURG, JOHANNESBURG



Jolene Forlee
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PROCESS

A HOLISTIC AND SUSTAINABLE FOOD SYSTEM; RESTAURANT IN FORDSBURG, JOHANNESBURG



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This document is submitted in partial fulfilment for the degree:
Master of Architecture
(Professional) at the University of the Witwatersrand
Johannesburg, South Africa
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DECLARATION

I, Jolene Forlee (1057367) am a student registered for the course Master of Architecture (Professional) in the year 2020. I hereby declare the following: I am aware that plagiarism [the use of someone else's work without permission and/or without acknowledging the original sources] is wrong. I confirm that the work submitted for assessment for the above course is my own unaided work except where I have stated explicitly otherwise. I have followed the required conventions in referencing thoughts, ideas, and visual materials of others. For this purpose, I have referred to the Graduate School of Engineering and the Built Environment style guide. I understand that the University of the Witwatersrand may take disciplinary action against me if there is a belief that this is not my unaided work or that I have failed to acknowledge the source of the ideas or words in my own work.

Jolene Forlee
1057367
Supervisor: Deborah Kirkman

ABSTRACT

South Africa is heading towards a direction of increasing numbers of malnutrition, obesity, and non-communicable diseases. The intention of my study is to create a sustainable and holistic food system that meets a variety of needs. It aims to increase and encourage the consumption of a variety of vegetables rich in nutrition in South Africa.

The project is implemented on an underutilized parking lot of the Oriental Plaza in Fordsburg, Johannesburg. Program include an agricultural research centre, agro-processing station, culinary school, and restaurants/takeaways.

The project concept looks at the relationship between inside and outside and is addressed throughout the different scales and forms. It is exploring how one can bring the outside in and vice versa; making farming (which often happens outside) visible by presenting it in spaces people occupy daily, and showcasing the food production process, which is often unseen by the consumers. It is the relationship between the built and landscaped, private and public, on and above ground, and the hidden versus the exposed. Important design drivers are landscape, thresholds, and engaging with the senses.

The architecture expresses the variety and natural health through the influences of urban farming initiatives, Islamic gardens, optimising rainwater collection, organic waste reuse systems, and natural building materials.

THANK YOU.

Thank you to my parents for everything that you do.

Thank you to my supervisor, Deborah Kirkman, for all the advice and guidance throughout the process.

Thank you to all my studio classmates, especially to Nabeelah, Joshil, and Hashim for sharing their knowledge and experience about Fordsburg. Thank you for being my tour guides and for creating the memories in Fordsburg.

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I appreciate you all.
Thank you once again for being part of my journey.
Thank you.

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CHAPTER 1
INTRODUCTION

BACKGROUND

I come from a background of living savvy and saving, recycling, and farming. Perhaps the lifestyle was due to my parents being Chinese immigrants. Home-cooked meals containing a variety of leafy greens, meat, and rice was the tradition. For a very long time, I always thought that this was how it was in everyone's family.

Only later in my high school days did it register as to what my peers around me were eating and the comments they made on the lunch I would bring; "Healthy", "You always have lunch", "copa met-se" (give me water) – I always had a bottle of water with me, never juice. Every day, they would run to the tuckshop coming back with a Coke, pie, and chips as a snack.

The project proposes a holistic and sustainable food system to encourage a rethinking of our relationship with food to a healthier, and more nutritious variety of plant-based foods.

The program includes facilities involved in the food production process and will be located in Fords-burg, Johannesburg. It includes an agricultural research centre, culinary school, agro-processing centre, public seed library, restaurants/takeaways, retail, urban farms, and open green public parks.

WHY ARE WE NOT EATING HEALTHY? WHY CAN'T WE JUST CONSUME OUR COKES, PIES AND CHIPS DAILY?

ISSUES

Looking into current statistics of eating habits in food and health, South Africa seems to be going towards a direction of increasing numbers of malnutrition, obesity, and non-communicable diseases (Pereira, 2014).

With the world's rapid increase in population, so does the demand for food increases. This results in negative environmental impacts caused by the entire food-making process.
26% of the global greenhouse gas emissions are caused by the food sector, 50% of usable land is dedicated for agriculture where 77% of it is used for Livestock (Ritchie & Roser, 2020).

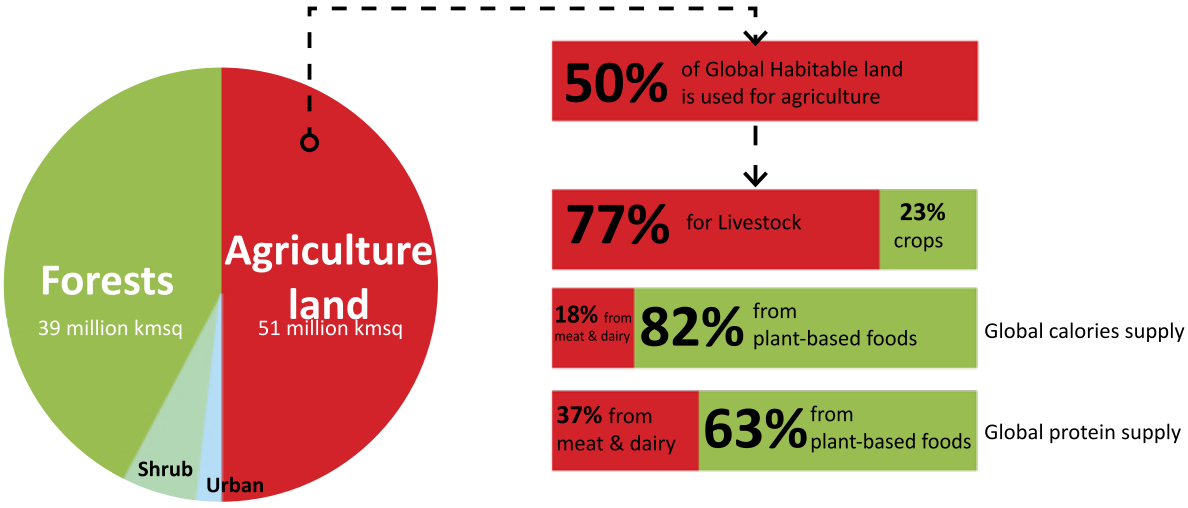


Fig 1 - Habitable land distribution (Ritchie & Roser, 2013)



Fig 2 - Total CO2 Gas Emissions throughout entire production process graph (Ritchie & Roser, 2020)

The amount of carbon emissions and energy required to produce animal-related food are extremely high and the demand is increasing. The carbon emissions of plant-based foods emit 10 times less than most animal-based products (Ritchie & Roser, 2020).

Looking at the percentage of food consumption changes from 1994 to 2012, South Africans have consumed 40% more meat, and 6.3% less in fruits and vegetables. The consumption change of cereals remains fairly the same at 0.4% (Ronquest-Ross et al., 2015).

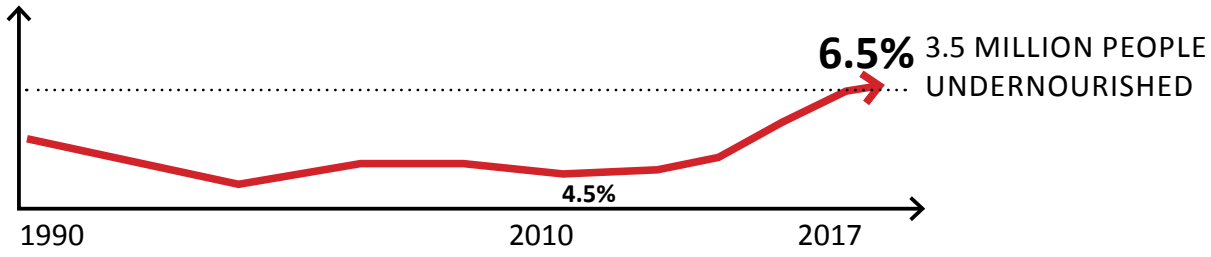


Fig 3a - South Africa's prevalence of undernourishment (Ronquest-Ross et al., 2015)

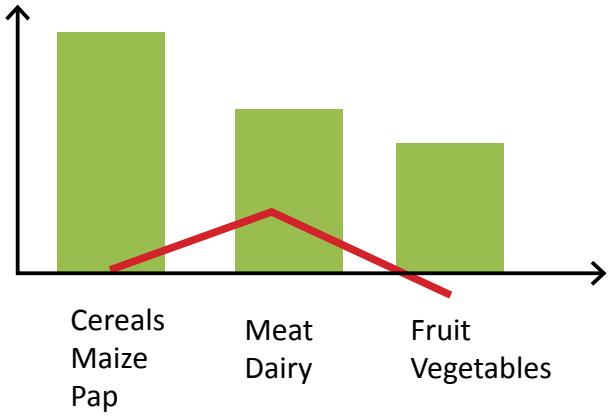


Fig 3b - Consumption pattern in South Africa (Ronquest-Ross et al., 2015) Green indicates the total consumption value in kg, while the red line indicates the change in consumption percentage differences from 1994 to 2013.

This shift towards an increase in meat consumption is because of the change in policies during the early post-apartheid period, making meat more accessible in South Africa. One of the aims of the project is to increase the consumption of a variety and nutrient-dense plant-based foods by making them more accessible within the city.

Looking at the consumption pattern in SA overtime (Fig 3b), there has been an increase in meat/dairy consumption and a decrease in fruit/vegetable while cereals have remained the same.

HOW CAN WE CREATE A HOLISTIC AND SUSTAINABLE FOOD SYSTEM TO ENCOURAGE A RETHINKING OF THE RELATIONSHIP WITH FOOD TO A HEALTHIER, MORE NUTRITIOUS VARIETY OF PLANT-BASED FOODS?

AIMS AND OBJECTIVES

The aim is to create architecture that encourages an increase in the consumption of plant-based foods as this can decrease environmental impacts, save valuable resources and energy, and decrease individual health issues.

The site decision criteria was to find a location that already had a diverse culinary offerings in Johannesburg. The thought is to first change/ influence the existing influential precincts which can aid in the growth of other similar precincts. I've identified Fordsburg as one of these precincts and the South Parking Lot of the Oriental Plaza as my site. The reasoning for this decision is discussed in Chapter 3.

The program involves multiple sectors found in the food production process from farming to processing, distribution, and consumption. The intent is to design a space where all of these operate close to one another and connected through landscaping, urban farming, and organic and water waste reuse systems. The program entails an agriculture research centre, culinary school, rent out retail and restaurants, and a public park. The research centre and culinary school provide resources and research on nutrition which can increase the knowledge on foods to assist in the increase of consumption of plant-based foods. The restaurants, retail, and public parks allow this information and food to be distributed and consumed.

METHODOLOGY

The project approach was phased into the following stages:

1. Understanding the cause of the issue. Research, statistics and readings in food nutrition, the meaning of healthy eating and how it affects the body was looked at to understand the importance of nutrition.

2. The history of farming was looked at to understand what influenced South African's eating habits. Urban farming initiatives and different farming typologies were analysed by looking at the advantages and disadvantages which then assisted in the design decisions.

3. Programmatic case studies were presented as precedents to understand what was needed to change trends in the diet.

4. Site analysis was conducted to ensure the design relates to the surrounding urban context.

5. The breakdown of the design brief, concepts, and program was presented to give a better understanding of the building usage and operation.

6. Precedents on landscaping, waste reuse systems and materiality was explored to strengthen the design concept.

7. The design progression was explained through various mediums with notes on the thought process expressed.

8. The final design is then presented through architectural drawings, models, and explanation diagrams.

CHAPTER 2
NUTRITION AND FARMING

This chapter is split into 3 parts.

Part 1 looks at the meaning of healthy eating and discusses the importance of nutrition. It also looks into the causes of malnutrition and what can be done to assist the issue.

Part 2 looks at the history of farming in South Africa discussing the farming methods and technologies, location, and crop types throughout the periods; the beginning, VOC, Great Trek, discovery of natural minerals, commercial farming, early post-apartheid and current.

It then continues into discussing the existing urban farming initiatives within Johannesburg and analysing the different farming systems such as intensive agriculture, hydroponic, aquaponic, and aeroponic systems.

Part 3 looks at potential programs focusing on access and providing education can assist in changing diet trends.

PART 1

WHAT IS HEALTHY EATING? WHY IS FOOD NUTRITION IMPORTANT?

If we consider healthy foods as foods that feed and nourishes our bodies with the necessary nutrition for our body to function, then unhealthy foods are foods that do not contain the vital nutrients. Our body extracts 51 known essential compounds from foods that it cannot produce to keep it functioning. There are hardly any foods that contain all the nutrition our bodies require therefore consuming a variety of different food types is essential for a healthy body (Martins et al., 2011)

WHAT IS NUTRITION?
WHAT IS MALNUTRITION?

"Nutrition is the study of nutrients in food, how the body uses them, and the relationship between diet, health, and disease." (Newman, 2020). "Without good nutrition as a foundation to build on, it can lead to many problems such as depression, leaky gut, gum diseases, headaches, and children do not grow properly because of malnutrition" (Sprankles, 2019, 00:08:49-00:09:15). Being healthy starts with good nutrition. Pharmacist, Troy Albright, realized that the problems of his patients started with the foods they are eating which lacked good nutrition. He runs a successful business, Tower Garden Aeroponic Farm, in order to provide the people with good nutrient dense foods (Sprankles, 2019).

Malnutrition comes in all forms and affects around 2.4 billion adults and children in the world (WHO, 2020). Malnutrition is a term to express poor nutrition and it is split between being either overnutrition or undernutrition. Overnutrition is excess consumption of nutrition which leads to health issues. Key overnutrition indicators include adult obesity, adult high blood pressure, adult overweight, and childhood overweight. Undernutrition is having a lack of nutrients or deficit in one particular nutrient caused by not having enough food for growth (Claydon, 2018, p. 11).

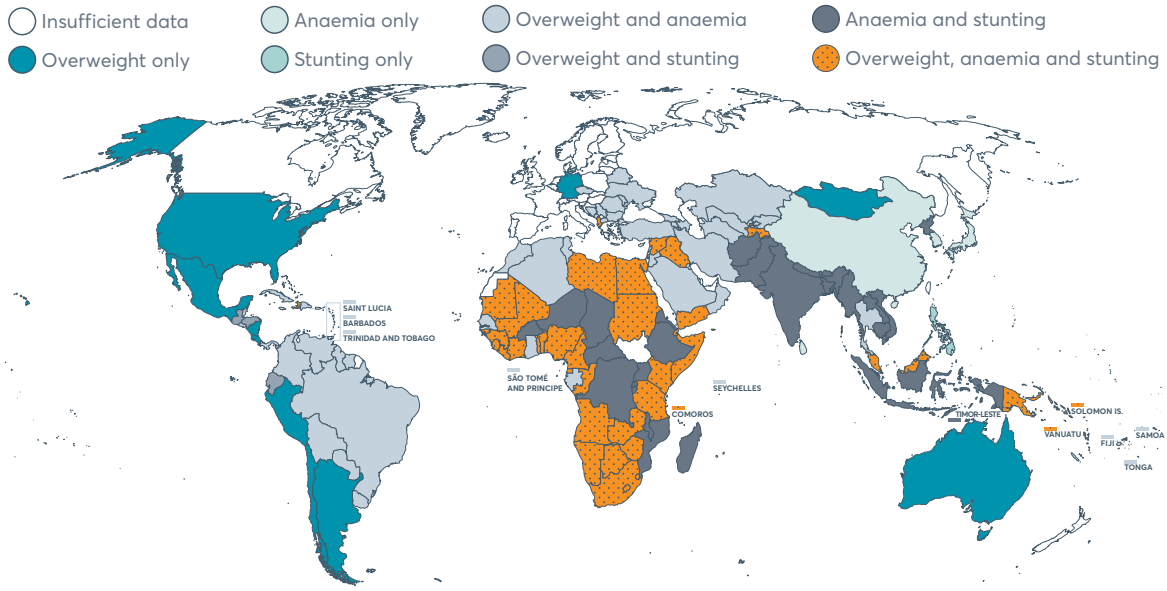


Fig 4 - Map of countries showing overlapping forms of childhood stunting, ammonia, and overweight in adult women, 2017 and 2018 (Claydon, 2018, p. 43)

LONG TERM EFFECTS OF UNDERNUTRITION

Undernutrition has a large impact on child development and can affect an individual's physical growth, emotional and psychological development, and behavioural development (Karratti, 2018). It influences their education as well as the economy overall. The effects on children will be the focus of this section.

BMI tests are used as a general indication of an individual's health.

BMI = mass (kg) / height $(m)^2$

A score under 18 is considered underweight, a score over 25 is considered overweight.

Observable characteristics of undernutrition can be seen in the form of wasting, stunting, and underweight.

Wasting is when children have low body weight and appear thin for their height because of disease or lack of food intake. It can be measured using the mid-upper arm circumference test or weight-for-height nutritional index (Claydon, 2018).

Stunting is a growing failure that develops over time where their body size does not correspond to their age. It weakens brain functions resulting in poor school performance. This can be measured using the height-for-age nutritional index (Claydon, 2018).

PHYSICAL GROWTH

A low BMI can relate to a weaker body with less physical labour capabilities. Light activities such as planting crops are manageable however heavy activities such as loading boxes onto trucks or construction work might not be manageable as it requires body mass (Martins et al., 2011).

EMOTIONAL DEVELOPMENT

Undernourished children, ages 5 to 10, had a higher resting heart rate compared to normal children. These high rates can result in them being more stressed which can lead to poor appetites, low concentration spans, anxiety, and even lead to strokes or deaths (Martins et al. 2011).

BEHAVIOUR AND PSYCHOLOGICAL DEVELOPMENT

A research conducted by D. E. Barrett (1981), a psychologist, reported his findings on "Unstable emotions of children tied to poor diet" in The New York Times written by J. Greenberg (1981). Children and their parents were given different nutritional supplement levels from birth and observed until they were 4 years old. What was found was that children with better nutritional supplements were more active, interactive, and less anxious. They were more likely to express their emotions whereas the children who had low nutritional supplements were uninterested and withdrawn (Greenberg, 1981).

The undernourished children interacted less with their peers and were more dependent on adults. They were more unfriendly and sadder (Greenberg, 1981).

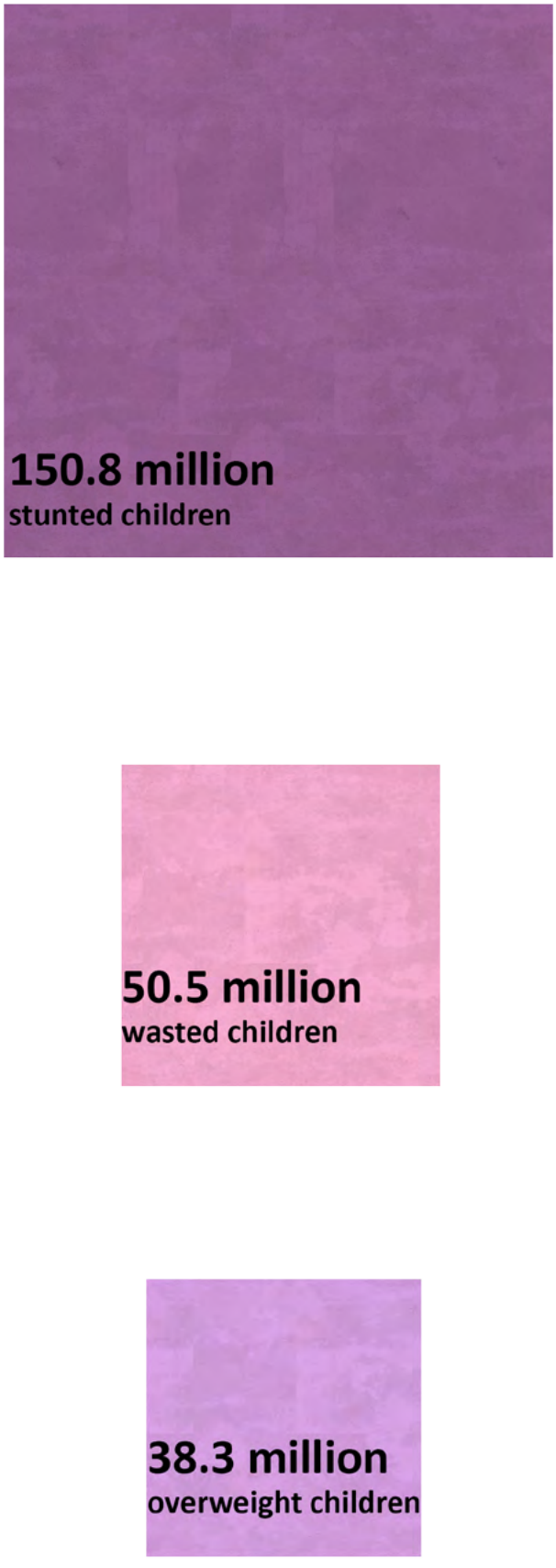


Fig 5 - Diagram of child malnutrition in the world (Claydon, 2018, p. 12)
Mapping of numbers into squares to get a visual comparison amongst the 3 malnutrition found in children.



Fig 6 - African children suffering from malnutrition (Al Bawaba, 2019)

EFFECTS ON EDUCATION

There has not been enough research to show any intellectual differences when comparing undernourished children and the other peers. However, school teachers have reported subjective observations that children had an increase in "concentration, alertness, and learning" (Michael C. et al., 1971, p. 1313) if they had a snack, lunch meal, or breakfast that day. This positively impacted their overall school performance.

EFFECTS ON THE ECONOMY

A malnutrition person is more vulnerable to death and infections and may result to increased spending on medical-related costs, therefore lowering their standard of living. This then affects the economy overall; increases poverty and diseases (Martins et al., 2011).

CAUSES OF POTENTIAL MALNUTRITION

Food security is when people have access to foods that are safe, and nutritious, appetizing, and financially affordable regularly. If people do not have food security, it affects their food consumption patterns and increases the risks of malnutrition (Biesalski, 2013).

The pillars of food security are availability, access, food quality regarding nutrition, and affordability (Biesalski, 2013).

Food availability is the availability of a certain food, whether it is imported or locally produced. Transportation and distance is a factor in the cost of foods. Long transportation may also alter the enzymes in vegetables as it reacts with external climate conditions. By the time it arrives for consumption, the product may be old and have lost most of its initial nutrition. Essentially, the full nutrition of the produce is lost (Sprankles, 2019).

Access to food means that it can be acquired from where they reside. If the food is too far away and requires large transportation expenses, the food will seem inaccessible.

Within townships, some access to fresh produce is scarce therefore results in them purchasing processed foods found in their local supermarkets. Often, these items are not adequate to fulfil their nutritional requirements.

HOW CAN WE ASSIST IN MAKING MORE NUTRITIOUS FOOD MORE ACCESSIBLE?

The 2018 Global Nutrition Report (Claydon, 2018) mentions 5 actions that can be taken to reduce malnutrition. These actions include having a holistic view of malnutrition, take action in creating healthy diets, invest in critical data collection, financing, and delivering better commitments.

A HOLISTIC VIEW ON MALNUTRITION

All stakeholders (donors, government, nutrition, and non-nutrition communities) need to shift their mindsets and realize the need to address malnutrition together and work cohesively. Instead of having each stakeholder tackle the issue by themselves, information and feedback from other stakeholders could aid their plan better.

TAKE ACTION IN CREATING HEALTHY DIETS

There is a role for each sector in improving the quality of the world's diet. Programs and policies should aim to encourage everyone to adopt healthy diets. Commercial private sector businesses can affect eating patterns. Frequently eating out and being in certain enjoyable context can lead to the development of weight gain and obesity. Eating out includes street foods, takeaways, and restaurants. 48% of adults in South Africa have eaten outside their homes. 28% of those eat out monthly, 20% more than once a month, 19% more than once a week, and 28% weekly. The private sector's mindful and sensitive approach as to what foods they are selling will greatly improve people's health. The private sector also need to consider the prices of their products as it is the leading factor in influencing grocery shoppers' choices in purchases (Shisana et al., 2013).

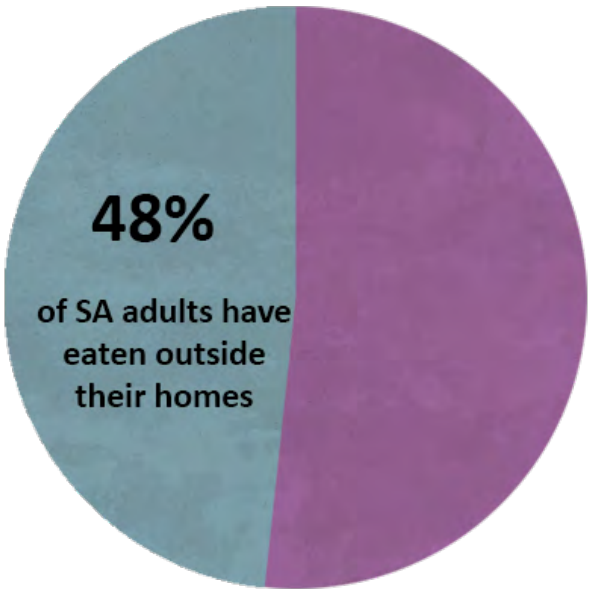


Fig 7 — Adults who have eaten outside their homes (Shisana et al., 2013)

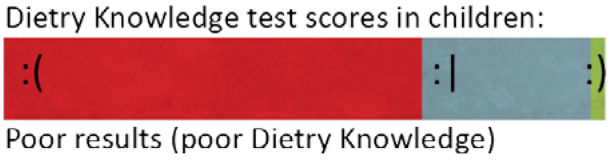


Fig 8 - Test score results on Dietary Knowledge in children (Shisana et al., 2013)



Fig 9 - Tower Garden Aeroponic Farm (Juice Plus, 2018)

INVEST IN CRITICAL DATA COLLECTION

Through a test conducted amongst South African children regarding dietary knowledge, 71% scored low marks regarding general nutrition knowledge (Shisana et al., 2013). The lack of knowledge in nutrition can lead to unhealthy food pattern choices, leading to malnutrition and other health problems.
With sufficient data on various avenues regarding eating patterns, malnutrition, etc. NGOs and other organisations can use the information to educate and distinguish what is important to tackle (Claydon, 2018).

CONCLUSION

Malnutrition is an issue that affects the entire world. Healthy eating and consuming the required nutrients our body needs are extremely vital to both the individual and the economy.

This research is used to assist in the way I structure the system and layout my project for each sector to work cohesively. The importance of nutrition is shown through making the food process visible to the public and through education in my project.

PART 2

HOW HAVE WE GOT HERE? WHAT HAS CHANGED?

Food habits and patterns are shaped by external environments, economic, social, religious and political influences. Food carries powerful physiological, economic, psychological and political meanings. The political history in South Africa tells us a lot about how food preferences and patterns are shaped (Harbottle, 1997).

This section looks at the history of farming on how it started, and how it has developed thus far. It looks at the activities happening during the period, the foods are eaten and produced, and the tools/technologies used to assist the farming process. Knowing the history of farming will assist me in using a suitable farming method for the design.



Fig 10 - African small hut villages where cattle are kept in the centre (Shooter, 1857)

HISTORY OF FARMING

THE BEGINNING

In the beginning, the edibles (indigenous plants) on the African land fed the people. Before recorded history, exotic species from Asia (most noticeably rice, bananas, and sugarcane) immigrated to Africa, integrating itself to many African lifestyles below the Sahara (National Research Council, 2006, p. 1).

Indigenous vegetables referred to in this document are plants that are native to Africa, mostly referring to the vegetables not usually found in the supermarkets but rural areas. Examples are amaranth, cowpea, okra, and bambara.

Common vegetables are referred to as those that are found in almost every commercial supermarket in South Africa. These include spinach, cabbage, bell peppers, tomatoes, carrots, etc.

Around 10 thousand years ago, African people from the northern parts of Africa, below the Sahara, travelled and arrived in the eastern areas of South Africa where the Khoikhoi people lived. They travelled to this region for the summer rainfall as it is good for growing crops. They introduced farming and the Bantu speaking people knew how to make tools by extracting iron and copper from rocks (South African History Online, n.d.).

African farmers from around 10 thousand years ago lived in small hut villages where cattle were kept in the centre. Cattle were seen as a sign of wealth. Cattle were used for marriages, bags, shields, dung was used for hut construction, and it was a source of meat, milk, and butter (South African History Online, n.d.).

The farmers grew on small pieces of land, just enough to feed themselves. Food grown were ‘watermelons, pumpkin, beans, mealies, and sorghum’ (South African History Online, n.d.).

VOC (1652 – 1795)

In 1652, the Dutch East Indian Company (VOC) established a refreshment station for ships sailing between Europe and Asia (Kyle, 2005).

The Khoikhoi people only grew enough food to sustain themselves. The VOC then started to provide the Boer population (Afrikaans speaking people) with farmland, establishing a "loan farm" system. The farmers would grow and sell crops for the VOC at a fixed price while keeping enough food to feed themselves (Kyle, 2005). The tradition of planting small patches of a variety of different species shifted to mass farming of one particular crop in excess for it to be sold, this is termed as mono-culture farming. It shifted from simply growing food to sustain oneself to producing as a form of business.

The non-native plants from the Western seaboard introduced American crops to South Africa were "maize (corn), cassava (manioc), peanut (groundnut), sweet potato, tomato, common bean, chilli peppers, and pumpkin" (National Research Council, 2006, p. 1). These plants showed productive growth and slowly got integrated into Africa. Naturally, the local/ indigenous plants in certain areas were neglected (National Research Council, 2006).

As the population expanded, it increased agricultural demand. Microclimate changes like drought resulted in the soil containing less moisture. This made some lands unsuitable for wheat farming. As a result, more stock farming (animal farming) were seen (Kyle, 2005).

By 1814, almost all the land in the Cape Colony were farm land (approximately 176 farms) (Kyle, 2005). People lived in harmony to these farms. It was their source of food and to many, also their income.

GREAT TREK (EARLY 1800 – 1867)

British colonisation took place.
1835 - 1846: The Great Trek took place. This was when the Boer farmers from the Cape moved inland, on their Ox wagons, away from British colonisation, and taking land from the indigenous people.

During 1856 - 1857, a Xhosa prophetess convinced the villagers to believe that if they burnt all their crops and killed their cattle, their ancestors will help them put an end to their sufferings caused by the colonials. The social structure was destroyed where the chiefs of the villages could not provide for the people, leaving many to seek work in surrounding farms. Large pieces of land were left for the settlers (South African History Online (b), n.d.).

DISCOVERY OF NATURAL MINERALS

The discovery of natural minerals, diamonds (1867) and later gold (1886), had a significant impact on the operations of South Africa. People fled here in search of wealth, people wanted cheap labour to work in the mines, and the agricultural sector shifted to commercial farming. What aided this shift could also be the development of transportation infrastructures such as railways connecting harbours to the city centre and the mines. By 1898, all national tracks linked up creating a national transport network (Van Wyk, 2015).

The "Hut Tax" was imposed onto the indigenous people by the British colony as an indirect strategy to gain control and cheap labour for the mines. The tax amount was increased significantly and only coins were accepted. This increased by of African people working in the mines (South African History Online (b), n.d.).

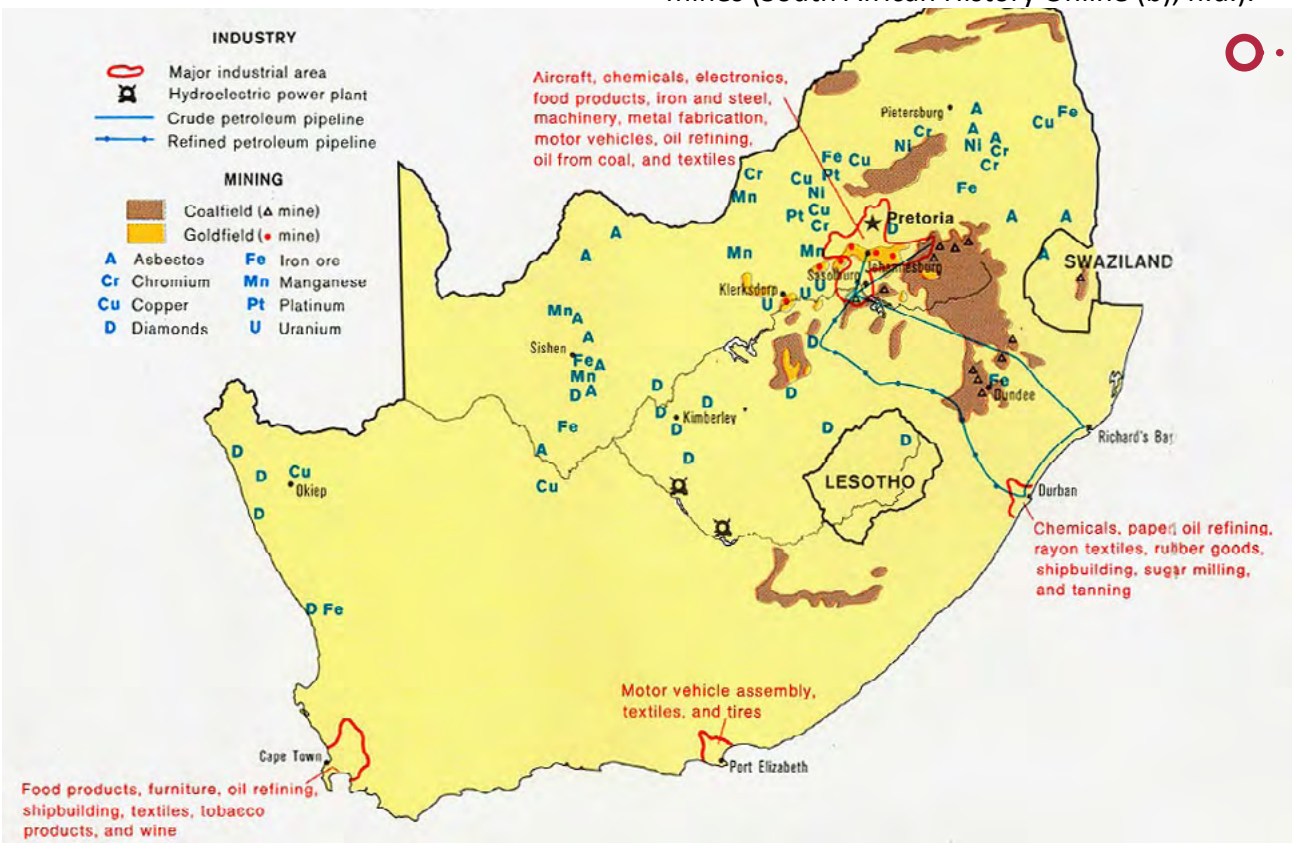


Fig 11 - Industry and mining map in 1979 (U.S. Central Intelligence Agency, 1979) Indicating where different natural minerals, diamonds and gold are found in South Africa



Fig 12 - Photograph of maize field around 1980s (Agri Limpopo 2017)

COMMERCIAL FARMING

Air transportation developed around 1910 to 1950, making international trade possible (Van Wyk, 2015). Goods naturally needed to be transported to different locations, which expanded road developments (Van Wyk, 2015). This development and agro-processing made it possible for food to come from far-off farms, eliminating the need and desire to maintain farms close to their living place.

The discovery of natural minerals led to the development of large machinery used for commercial farming. Around the late 1970s, the increased farming production costs left many farmers in debt (Kirsten et al. 1994). Small farmers could not compete and had to search for alternative work in the mines.

Machinery replaced the traditional way of farming; “crop rotation, liming and fertilizing with animal manure or producing diverse crops in case one fails” (Pappas, 2016). Oil-based chemicals and artificial fertilizers were used for the 1st time to keep plants growing and to prevent pests and weeds. This damaged the soil, over extracting the nutrients and inserting harmful chemicals (Pappas, 2016).

During 1980 to 1990, production included maize, sugar cane, sorghum, sunflower seeds, dry beans, and soya beans (Kirsten et al., 1994, p. 22).

From 1985 to 1990, meat products such as beef and mutton were largely imported as South Africa’s “local production is not sufficient to satisfy local consumption” (Agriculture, Forestry & Fisheries, 2018). It was noted that as the economy in South Africa grew, so did the demand for meat. This could have led to higher feeding prices which made local meat production less competitive to international markets (Taha & Hahn, 2015). Many of the imports came from Botswana, Namibia, and some European countries. “Red meat, coffee, rice, vegetables, animal fats and vegetable oils” were the most important imported produce (Kirsten et al., 1994, p. 22-23).



Fig 13 - Photograph of Hydroponic rooftop farming in Johannesburg inner city (Wessels, 2019)

EARLY POST-APARTHEID (1994 –)

Many of South Africa's primary foods, including leafy greens, were imported during the 1980s to around 2010. This could be due to South African climate conditions. South Africa has a total of "100 million hectares of land available for agriculture" (Greyling et al., 2015). Only 13% of the area receives sufficient rainfall as this is a particularly dry country. Irrigation in agriculture therefore plays a significant role as it is needed for 87% of agricultural land. (Greyling et al., 2015). With the development of new agricultural technologies, and new systems can tackle the issues of water, the lack of largely agricultural land, and the increasing feeding demand due to the growing economy.

The SSI report of 2018 (Agriculture, Forestry & Fisheries) showed that from 2010 to 2017, meat and chicken produce were still highly dependant on imported products due to its consumer demand. From how I see it, if we could increase food production within the city and increase the knowledge of alternative foods that are not commonly known to many (such as indigenous vegetables), this could increase the demand for vegetables. Knowing these alternatives could help decrease the demand for meat products, thus decreasing imports. The constant importing of products could mean that the economy is dependant on external partners. Importing isn't particularly bad, however, I think that if a country is self-sufficient, it can increase the value of an economy by providing employment, fewer expenses are spent on transportation, and short distances can have a positive impact on the environment.



Fig 14 - Mapping of urban initiatives in relation to Fordsburg site (Forlee, 2020)

CURRENT

From what I've observed, urban farming initiatives and stakeholders in South Africa started to increase around the late 20th and 21st century. These were addressing issues on health, access to nutritious foods, sustainable agriculture, employment and training in the agricultural sector. An interest in the research of indigenous vegetables also started to rise.

It seems like past farming structures (such as having farms close to point of consumption as seen during the VOC period) are being used to address the issues mentioned above with technology.

I had the opportunity to visit Siyakhana Food garden last year and gained some information about it through public group interviews with the founder. He then also mentioned iZindaba Zokudla as a networking source. I have attended two iZindaba Zokudla Farmers Lab events, which introduced me to local agro-processing businesses, farmers markets, and other agricultural businesses.

Siyakhana Food garden and iZindaba Zokudla Farmers Lab are the initiatives that I will be further analysing.

1. 2005 Siyakhana Food Garden	Urban Farm focusing on providing access to healthy foods
2. 2006 Bambanani Inner City Farm	Urban farm assisting people from rural communities in Jo'burg. Educating children on farming
3. 2013 iZindaba Zokudla	Agriculture Stakeholders platform
4. 2015 Wits Inala Forum	Urban Farm tackling hunger amongst students
2017 Urban Agriculture Initiative	Roof Hydroponic Farms within the city
2017 Khula! App	A mobile application that allows farmers to sell their produce to formal markets

URBAN INITIATIVES ACCORDING TO ESTABLISHED DATES

URBAN FARMING INITIATIVES

SIYAKHANA FOOD GARDEN

Siyakhana, located in Bezuidenhout Park, was initially a dump site.
The founder, who is a doctor, was concerned in the health of South Africans and has successfully transformed it into a food garden that supplies many children and people with food.
The garden is a role model as it collaborates with many different agricultural-related researchers in trying to find new innovative, and sustainable technologies involving the people in assisting them to grow foods and eat healthily. The diagram below shows the layout of the Siyakhana farm and the variety of programs and services it offers.

IZINDABA ZOKUDLA FARMERS LAB

iZindaba Zokudla is a research project working with multiple stakeholders to create urban agriculture opportunities using sustainable food systems. The iZindaba Zokudla Farmers Lab are talks that are held every quarter where independent entrepreneurs get to promote themselves, network, and educate themselves further to grow their own business. These talks are held on the University of Johannesburg Soweto Campus and are open to the public for free.



Fig15 - Mindmap of activities at Siyakhana (Forlee, 2019)

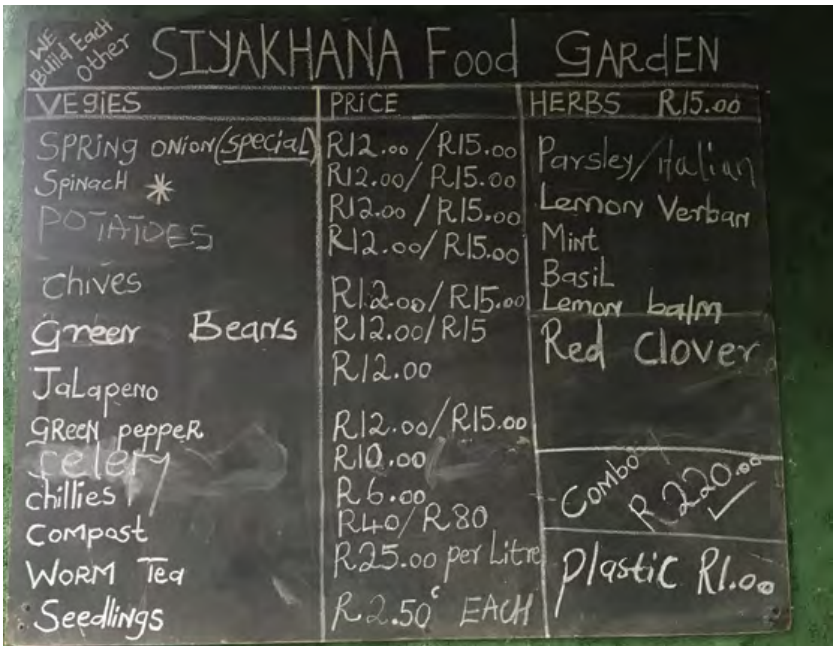
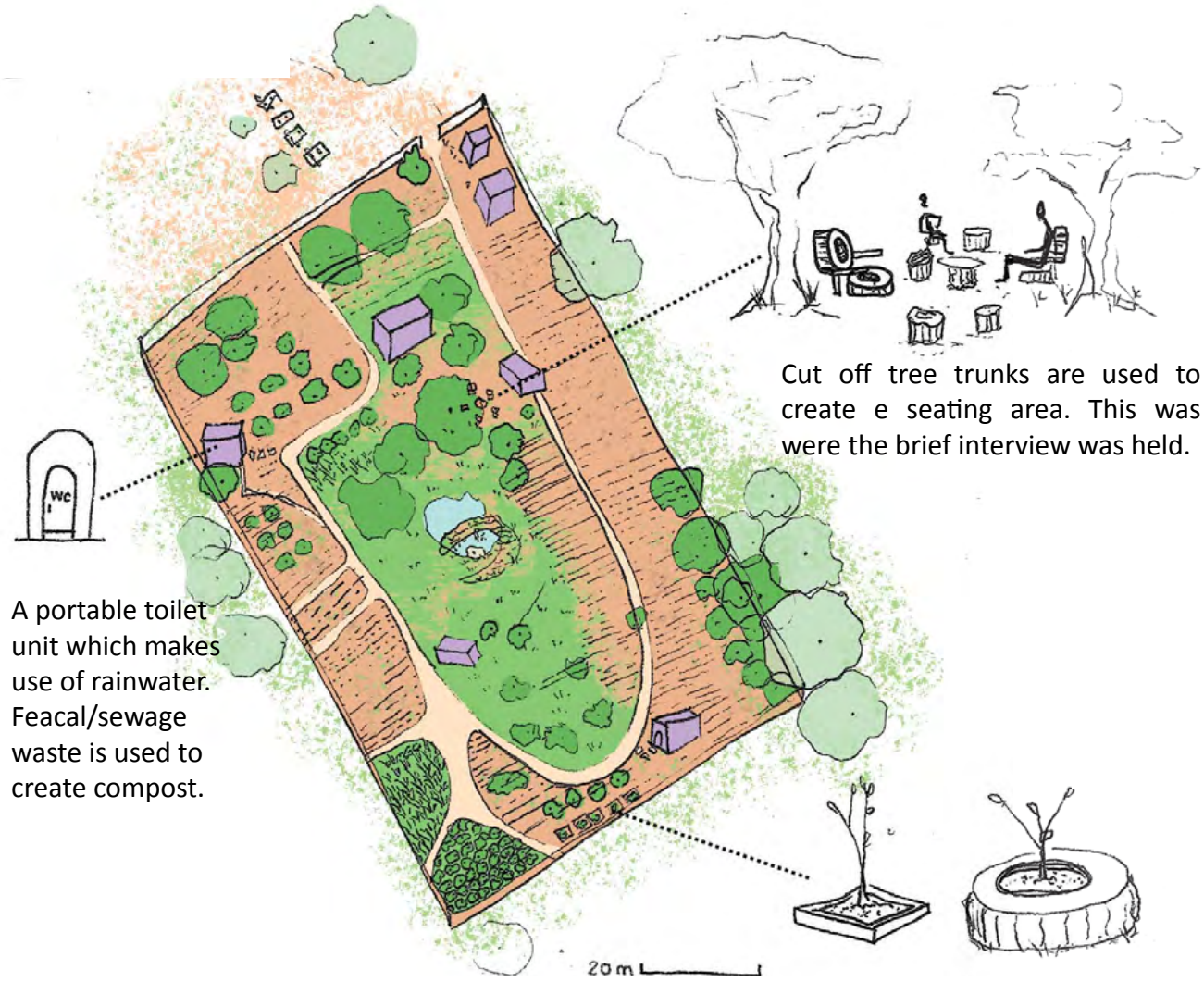


Fig 16a - List of what Siyakhana Food Garden grows,sells prices in 2019 (Wessels, 2019)



Cut off tree trunks are used to create e seating area. This was were the brief interview was held.

A portable toilet unit which makes use of rainwater. Feacal/sewage waste is used to create compost.

Fig 16b - Sketch Plan layout of Siyakhana food garden with sketches of what was seen there (Forlee, 2019)

FARMING TYPOLOGIES
URBAN FARMS

WITS INALA FORUM

Urban farms are farms within a dense city that focuses mainly on growing food for selling as to growing food for personal consumption (Haileyesus, 2019). I am specifically talking about recent history; the late 20th and 21st century. These farms are often small (less than 1 hectare of land) and plant a variety of fruits, vegetables, and flowers. The products are sold directly to restaurants and customers. It focuses on organic food production and promotes healthy eating.

Each typology is analysed through existing interventions, looking at how it works, its advantages, disadvantages and when it is appropriate to use.

The farm is built on a small unused plot in Wits University's main campus in Braamfontein.

Urban farms often start through the desire to assist in a social cause. 30% of South African students are food insecure. The Inala Forum was started to assist the students of Wits. The farm is managed through student volunteers. These volunteers can take home the produce they grow while the rest goes to the Wits Foodbank where meals are made and given to these students.

DISADVANTAGES

The disadvantages often found in community voluntary farms like this is that it can be difficult to motivate people to maintain the farms frequently as there is no individual sense of ownership (Wits BAS Honours, 2019).

SUITABLE PLANTS

Any form of horticulture or field crops can be planted all depending on the space provided.

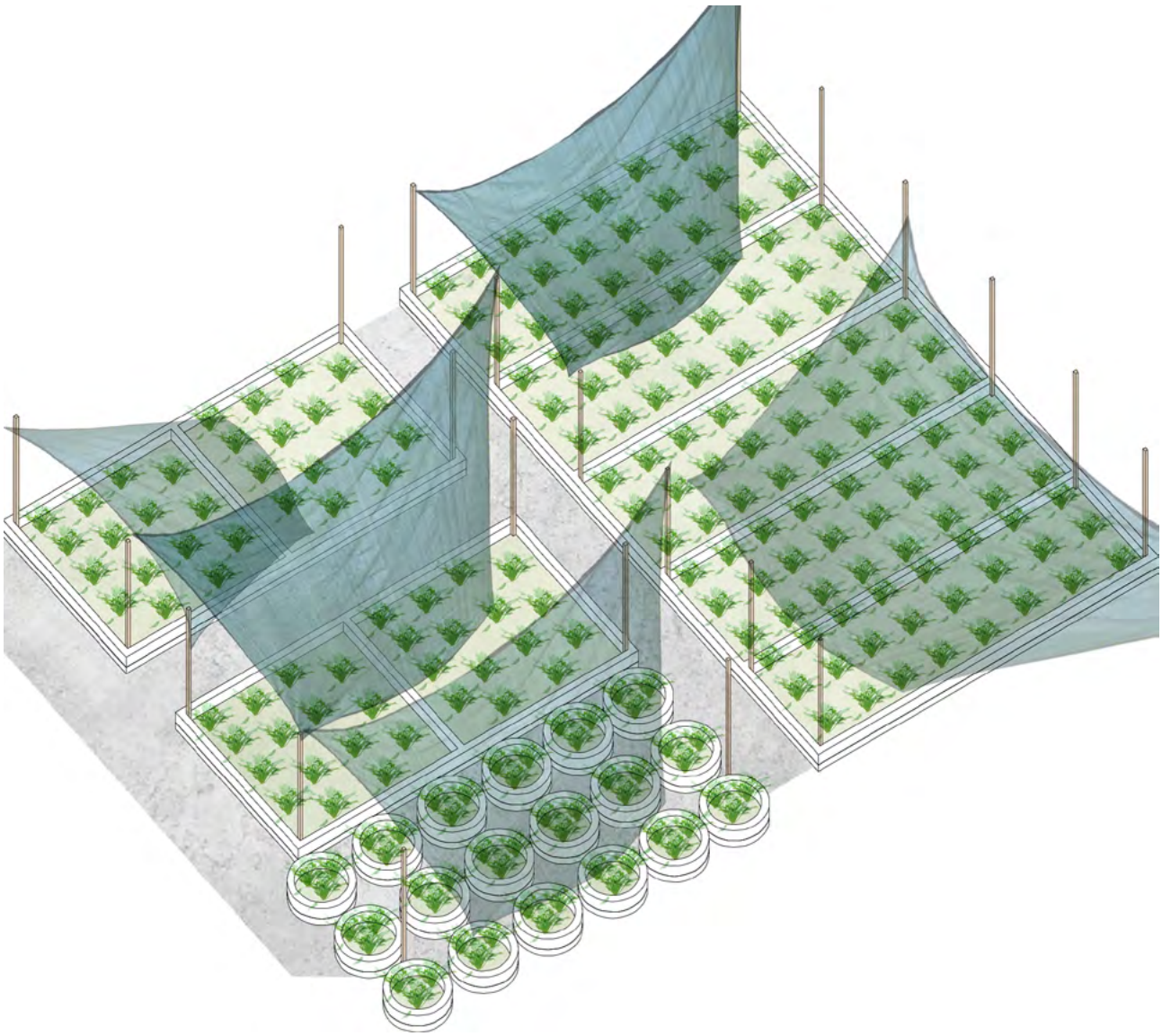


Fig 17 - Layout of Wits Inala Forum (Wessels, 2019)

The materials used to build the farm are cheap or recycled materials. Here, old broken tires are used as planter boxes, and broken bricks are used to build the border of the plant bed.

A protective structure made of old leftover timber was constructed through volunteers and nets are placed above to protect the plants from harsh weather conditions.

Main produce planted are onions, broccoli, spinach, cabbage, and bell peppers.

CONTAINER FARMING

Container farming is a farming method where raised beds or portable containers are used. Seeds are scattered in the beds in all directions. This method of farming produces more food in a smaller area compared to traditional farming.

Less water and soil is needed. As the plants start growing, leaves shade the plants next to it as it is so tightly spaced, retaining and reducing the water needed.

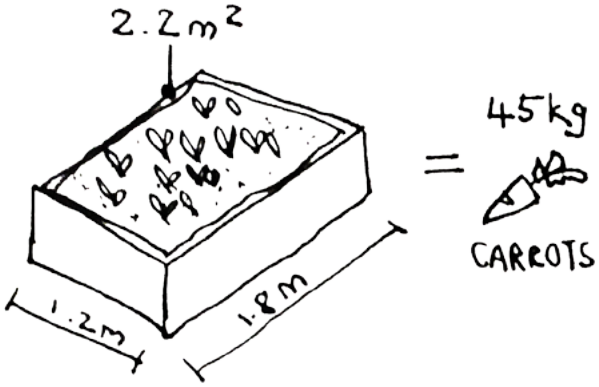


Fig 18a - container farm estimated production (Forlee, 2020) adapted from (Philips, 2013)



These values may differ depending on the choices selected, farming method, and climate (Philips, 2013).

What is good about this method of farming is that it can be done by using any container available and there is no need for exterior soil spaces. Therefore, it can be done at home balconies or areas where soil conditions are not fertile.

Fig 18b - estimated production of how much vegetables can be produced and feed how many people in $1m^3$ container (Philips, 2013)



Traditional
(equally spaced seeds)



Intensive Agriculture
(scattered seeds)

Fig 19 - Farm type sketch (Forlee, 2020)

RIVER PARK FARM

The River Park Farm is a farm in New York City where they grow and supply fresh produce to the Riverpark restaurant.

In 2011, they made use of a 4500msq plot where construction was temporarily suspended. They planted their produce using 7000 portable milk cartons using the intensive agriculture method. In 2012 when the construction resumed, they were able to relocate their farm within 24 hours without interfering with the plants.

The mobile farming method demonstrates how every space can be productive.

DISADVANTAGES

It can reduce the farming space required in the horizontal direction however it is not as suitable for vertical farming (Philips, 2013).

SUITABLE PLANTS

This method is suitable for any herbs and vegetables (spinach, carrots, cabbage, onions) including potatoes. Orchards are not suitable (Philips, 2013).



Fig 20 - Container farming method used at River Park Farm, NYC (Philips, 2013)

SOILLESS SYSTEMS

The advancements of technology in the agricultural sector have introduced alternative farming methods that do not require the use of soil. Because plant roots are not in the soil, it gets a lot more oxygen and therefore grows faster. Soil attracts pests and weeds and often results in the use of pesticides or other solutions. Without the use of soil, there is no need for it (Sprankles, 2019).

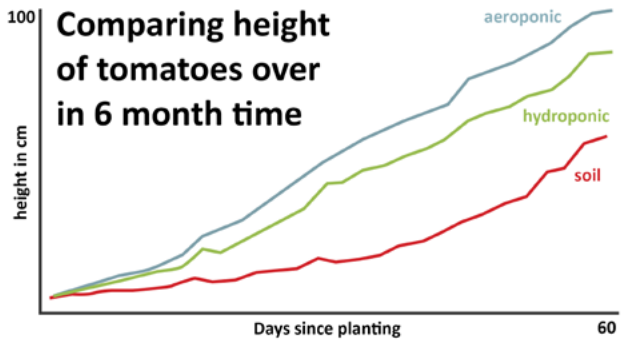


Fig 21 - Tomatoes height comparison (Smashley, 2011)

Hydroponic, aquaponic, and aeroponic are the 3 farming systems that do not use soil. These systems also do not require large open spaces and are good for the pockets of existing unused spaces in cities such as rooftops. With around 95% of the water used being circulated and reused to water the crops, it reduces water consumption (Davie, 2018).

For each farming system, seeds are first grown in containers that are not soil, coconut chips, rockwool, polyurethane foam or closed-cell foam are often used. Once it is grown to around 25mm tall, it is then transferred to the system.

DISADVANTAGES

The disadvantages in using these systems are that the produce are limited to herbs and some vegetables. It is not suitable for root vegetables such as potatoes, carrots, and yams as the systems do not provide enough space for it.

The initial costs to purchase the system may also be relatively costly and requires some knowledge as to how to operate them as these technologies are still relatively rare in South Africa. This option is only viable if the intention is to produce a surplus.

SUITABLE PLANTS

This system is suitable for planting small leafy plants like herbs (Basil, Green Mint, Lemon Balm, Tarragon, Oregano, Peppermint, Oregano, Sage, Stevia (Wickison, 2020), and leafy vegetables: Bok Choy, Celery Cucumber, Lettuce, Spinach, Tomatoes (Wickison, 2020).
It is not suitable for root vegetables as the produce may often get stuck in the system containers (Sprankles, 2019).



Fig 22 - Seedlings (Angela, 2019)

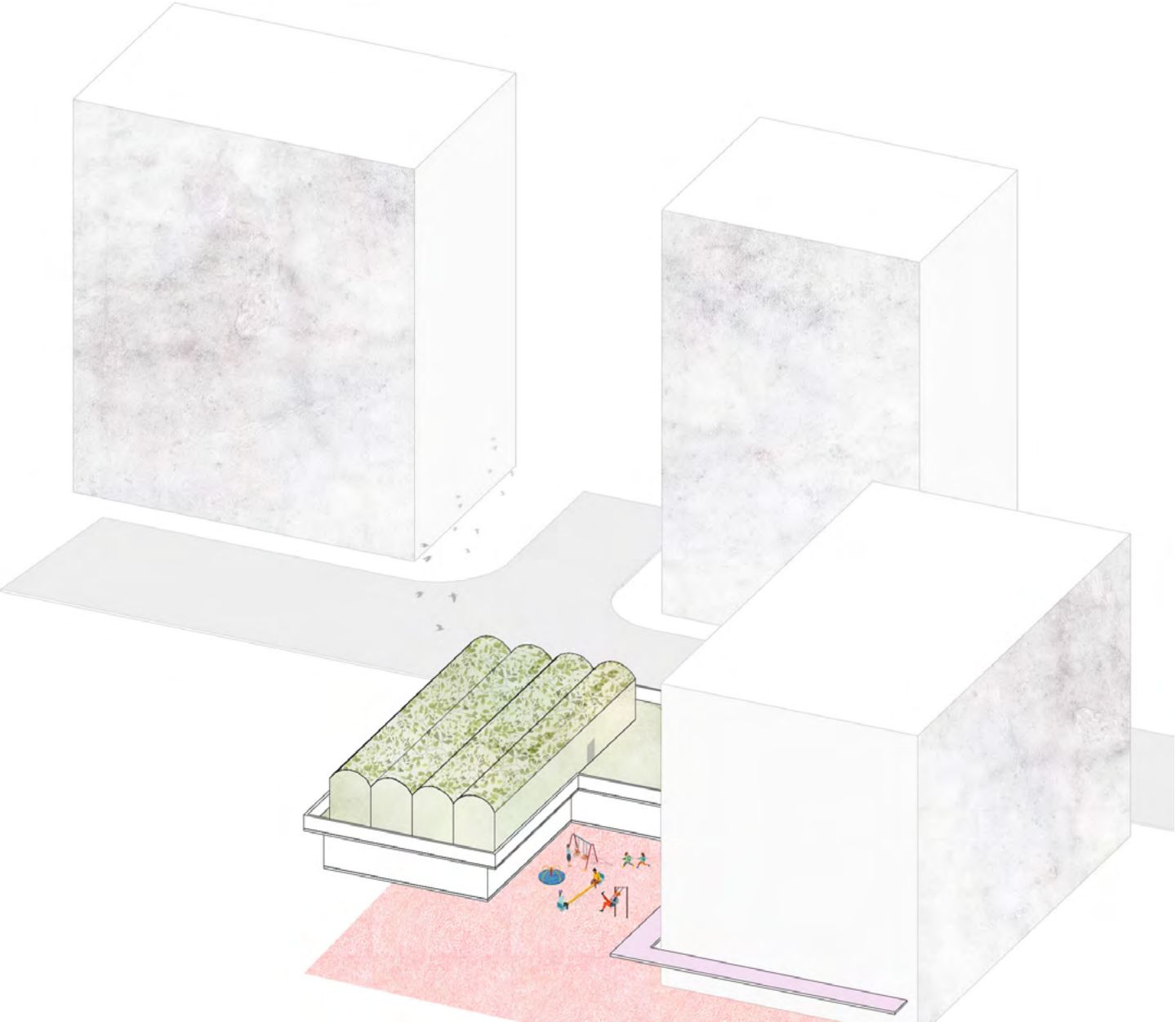


Fig 23 - Diagram of Outreach Foundation Rooftop Hydroponic Farm in Hillbrow (Wessels, 2019)

HYDROPONICS



Fig 24 - Growing lettuce with roots in coconut chips (Wessels, 2019)

Hydroponic farming system is the use of horizontal pipes with openings for plant location where nutrient water flows through the roots to water the plants. The water is then filtered, and pumped back into the system continuously.

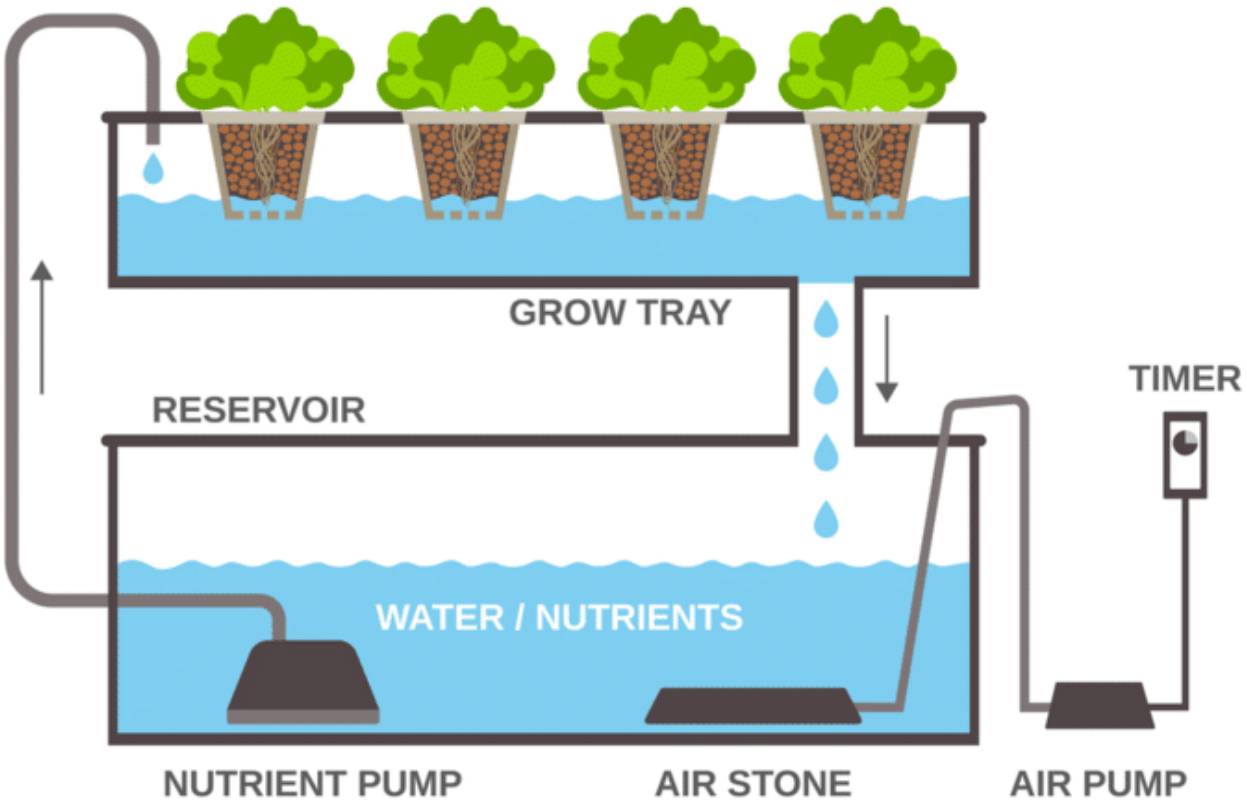


Fig 25 - Diagram showing how Hydroponic system works (Turan, 2020)

URBAN AGRICULTURE INITIATIVE (UAI)

The Urban Agriculture Initiative (UAI) aims to bring in urban agricultural ecosystems by re-purposing disused spaces "to produce agricultural produce for Johannesburg's inner-city communities" (Davie, 2018). At the same time, it addresses the city's unemployment and food insecurity while regenerating neighbourhoods (Minerals Council South Africa, 2017). The current focus is on using the hydroponic farming system on city rooftop spaces.

"The UAI has been developed by the Johannesburg Inner City Partnership (JICP) with support from the City of Johannesburg, the Department of Small Business Development, the Small Enterprise Development Agency, and SAB WIBC (Would It Be Cool) is a project that aims to create jobs through urban agriculture supporting black farmers. "They are given their starter packs of seedlings, pots, irrigation systems and pumps, they have to present a business model, with financial support from the WIBC" (Davie, 2018).

Looking at one of the existing businesses from this initiative called Gegezi Organics, they can produce 110kg of basil in 21 days on a 66msq roof space.

A-shape racks with 10 shelves hydroponic system layout are used. The farm is protected in a plastic sheet roof tunnel, keeping it warm in winter and protecting it from storms.



Fig 26 - A-shaped hydroponic system containing up to 600 plants (Jansen, 2019)

AQUAPONICS

Aquaponic systems are similar to hydroponics systems. The difference is instead of using nutritional water it uses the ammonia excreted by fish (Taba, 2019).

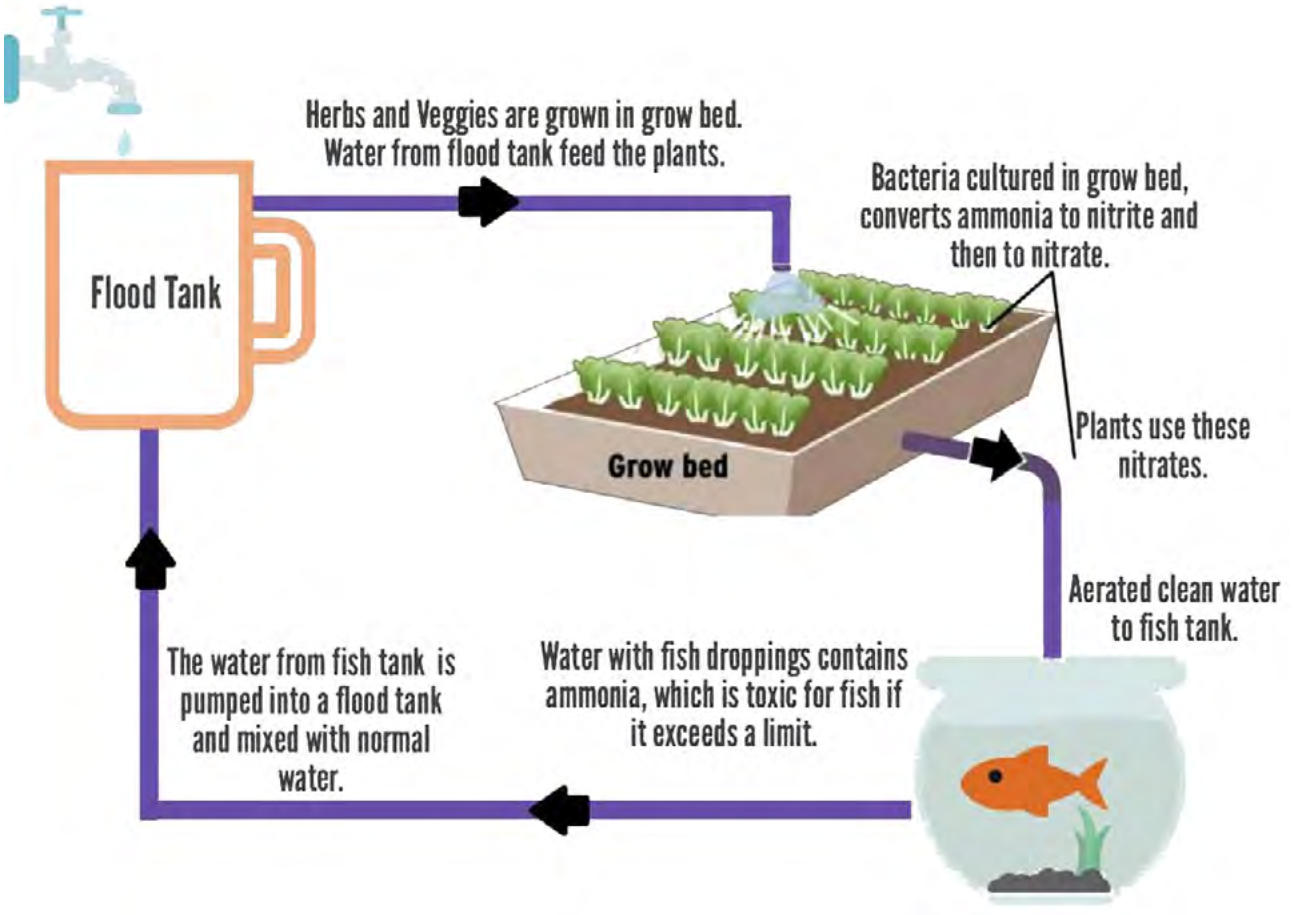


Fig 27 - Aquaponic system diagram (Taba, 2019)

COMCROP

Singapore imports 95% of its foods. The context is dense. Comcrop is the 1st aquaponic rooftop farm in Singapore founded by Allan Lim who has a degree in Engineering. He uses his skills to find ways to advance agriculture technologies in hopes to guide Singapore to produce their own food instead of depending hefty on imports (Hermes, 2016).

The farm is located on the rooftop of a Hotel. Organic waste produced by the hotel is turned into liquid compost and reused as a nutritional liquid to water the plants at Comcrop (Hermes, 2016).

The farm can produce 150kg of produce per month, enough to be used for over 20 thousand plates at a restaurant for a year (Hermes, 2016).



Fig 28 - Aquaponic system at Comcrop (Angela, 2019)

AEROPONICS





Fig 29 - Vertical Aeroponic system (Tower Garden, 2020)

Instead of the water passing through the roots like hydroponic and aquaponics systems, the water mist hits on the plant roots. This system can be structured both horizontally and vertically. Vertical column systems use up to 90% less land and water and can produce 10 times more food compared to on land farming (Sprankles, 2019).

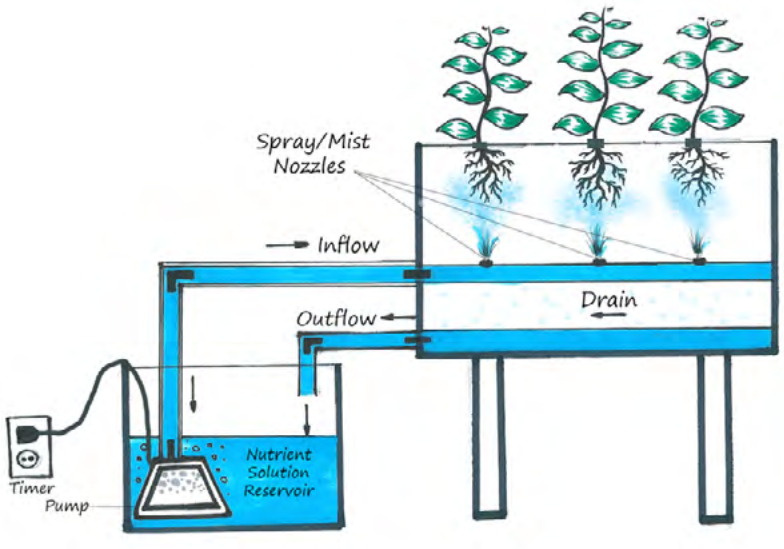


Fig 30 - Horizontal Aeroponic system diagram (Roth, 2020)

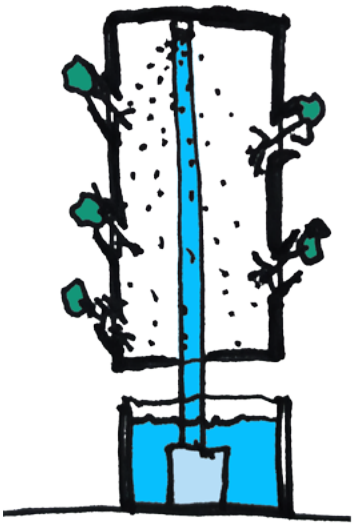


Fig 31 - Vertical Aeroponic system diagram (Forlee, 2020)

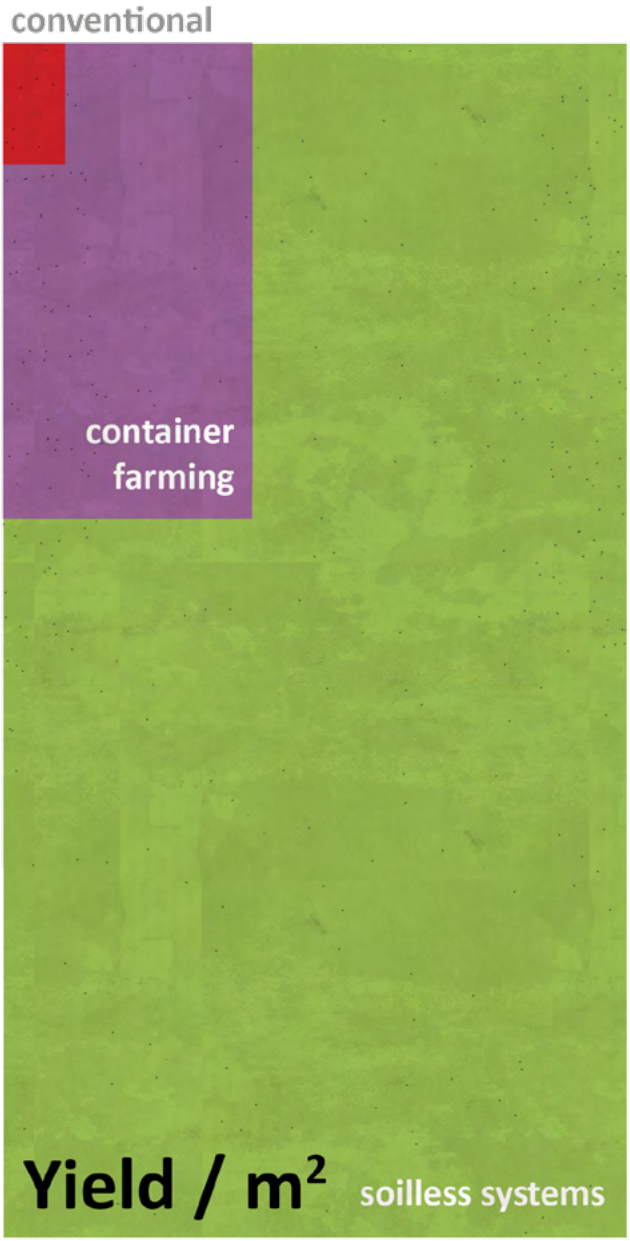


Fig 32 - Land area to potential yield. (Barclays Research, 2020) Comparing conventional farming, container farming and soilless systems

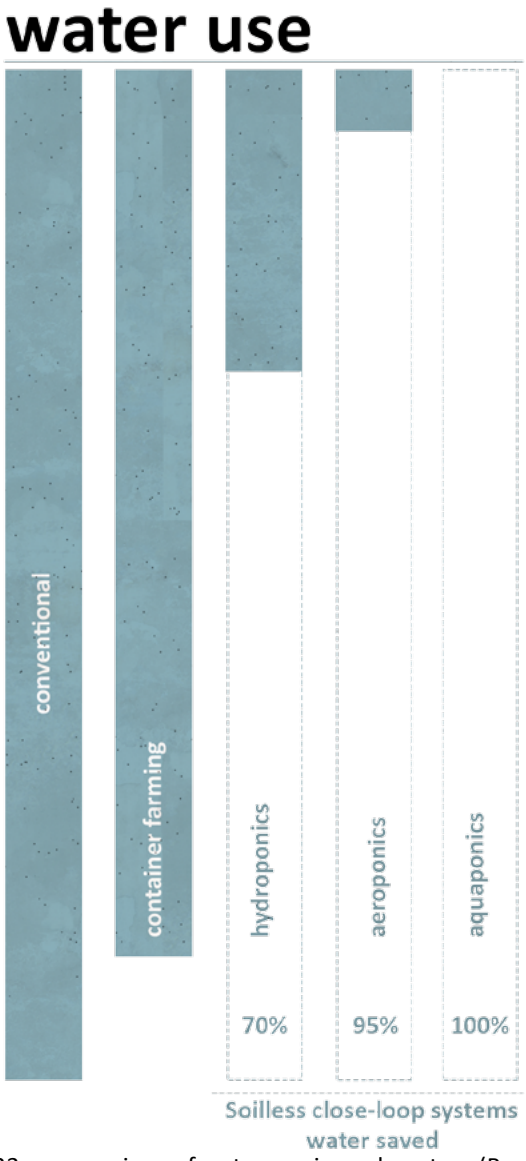


Fig 33 - comparison of water use in each system (Barclays Research, 2020)

CONCLUSION

Hunger is an issue that the whole world faces. Bringing urban farms into the city closer to consumers can aid in providing food security. An individuals food preferences and eating patterns are shaped by external environments which are shown by looking at the history of South Africa. Looking into the different urban farming typologies gave a better idea of why those systems were preferred to conventional farming as they took up less space, required fewer resources and may locate closer to the consumers. Each of the researched systems are incorporated in different areas in my project as where it's more suited for. This is shown later on Fig 123 in Chapter 7.

PART 3

WHAT IS NEEDED TO CHANGE TRENDS IN DIET?

The overall idea is to create a sustainable and holistic food system that meets many different needs. It aims to increase and encourage the consumption of a variety of vegetables rich in nutrition in South Africa.

I have decided to create a program that involves the entire food production from farm to consumption. It focuses on research, education, and access to the food and knowledge. The intention is for people to see and understand where food comes from and how it is processed before consumption as a way to be more mindful in what they consume.

The physical building programs include an agricultural research centre, agro-processing station, culinary school, and restaurants/ takeaways. Each program is analysed through existing case studies focusing on how they operate and how they can assist in the design.

AGRICULTURAL RESEARCH CENTRE

VEGETABLE AND ORNAMENTAL PLANTS SUBDIVISION (ARC-VOP)

Location: Roodeplaat, north-east of Pretoria
Farming method: traditional mono-culture farming on open land
Crops research: African indigenous leafy greens
Focus: Research, education, innovation, training

The ARC is a science institution that conducts research to develop and support the agricultural sector to foster innovation for a sustainable agriculture sector (ARC, 2014a).



Fig 34 - Context map of ARC (Google Earth, 2020)

The ARC-VOP implements "need-driven and environmentally friendly research, technology development and technology transfer on commercial vegetables, and African leafy vegetables" (ARC 2014b). One of the focus is on food and nutrition security. The research involves many disciplines including crop science and crop breeding which I will be looking at (ARC, 2014a).

The breeding program looks at the nutritional content, quality and taste of the crop. The process begins with scientists researching the crop, the information is sent to a team who packages the information for farmers. "The production in agriculture decreases in younger generations" (Greyling et al., 2015). The ARC engages with the youth through training and programs to excite them in agriculture. These include manuals, data-sheets, and material for training programs. Accredited qualification course options include agro-processing, fruit production, vegetable production and a course on managing soil and water for farming.
AgriSETA Accredited Short Learning Programmes offer programmes on introduction to vegetable production, hydroponic vegetable production, and plant protection (ARC, 2014a).

Information days are hosted with their partners for companies who sponsor the farmers and develop the crop product for businesses.
The in vitro tissue culture laboratory is one of the main spaces for the breeding program. The space is used to maintain genetic materials in vitro. It is used to eliminate viruses from tissue culture

materials and serves as a quarantine facility for imported materials to make sure it is disease-free. It is a facility that creates seeds that are sold to farmers.

Once a variety of crop alterations are bred, cooked samples are sent to events for stakeholders to test the products and eliminate undesired samples. Figure 37 shows Amaranth that was given to participants at iZindaba Zokudla Farmers Lab. Each participant had to rate five different variants of the product testing its taste desirability. The ARC uses the data to eliminate the undesired combination.
The final desired crops are sent to their partner, CSIR, who develop the product and research in food processing and packaging. Only then are these crops sold to the public.

A company in the Netherlands called Koppert Cress uses an interesting strategy to introduce new herb formulations to the consumer market, ensuring their products will sell.
Herbs are researched, experimented with, and planted at their farm. The samples are given to different chefs to experiment with, which are then consumed by customers of their restaurants. If there is high demand for the product, more production of that specific breed is produced and seedlings are distributed to other farmers.



Fig 35 - ARC product testing (Forlee, 2020)

This process keeps the business running, it allows for more farming opportunities as there are more crop varieties. It allows chefs to experiment with foods and introduces something new to consumers.
This is a strategy that I will be using in my design. The strategy is briefly summarized in the diagram below.

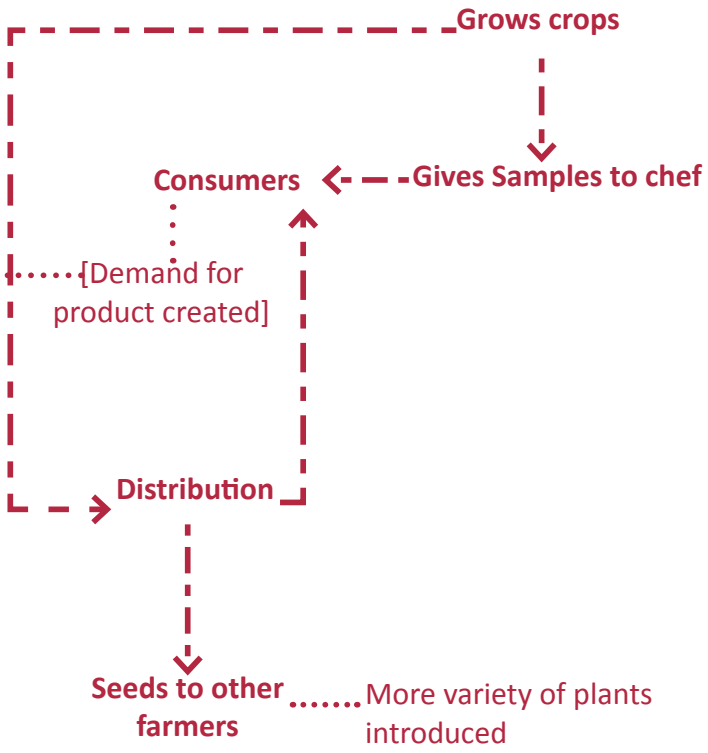


Fig 36 - Diagram showing the oporating strategy at Koppert (Forlee, 2020)

AGRO-PROCESSING

FOOD MASTERS SOUTH AFRICA

Food Masters SA has an agro-processing project held in Witbank where many females need financial help. They use a dehydration food processing system, which tackles the issue of wastage in South Africa.

Food Masters SA is an agro-processing and food destitution company. Their vision is to empower women from rural and low-income communities by training them to dehydrate fruits and vegetables, brand, package and run the agro-process.

Their goal is to partner with companies and the government to assist in removing barriers and to empower women in rural communities through the provision of agro-processing equipment, food gardens, skills development, and giving women access to formal markets (Manyeza, 2019).

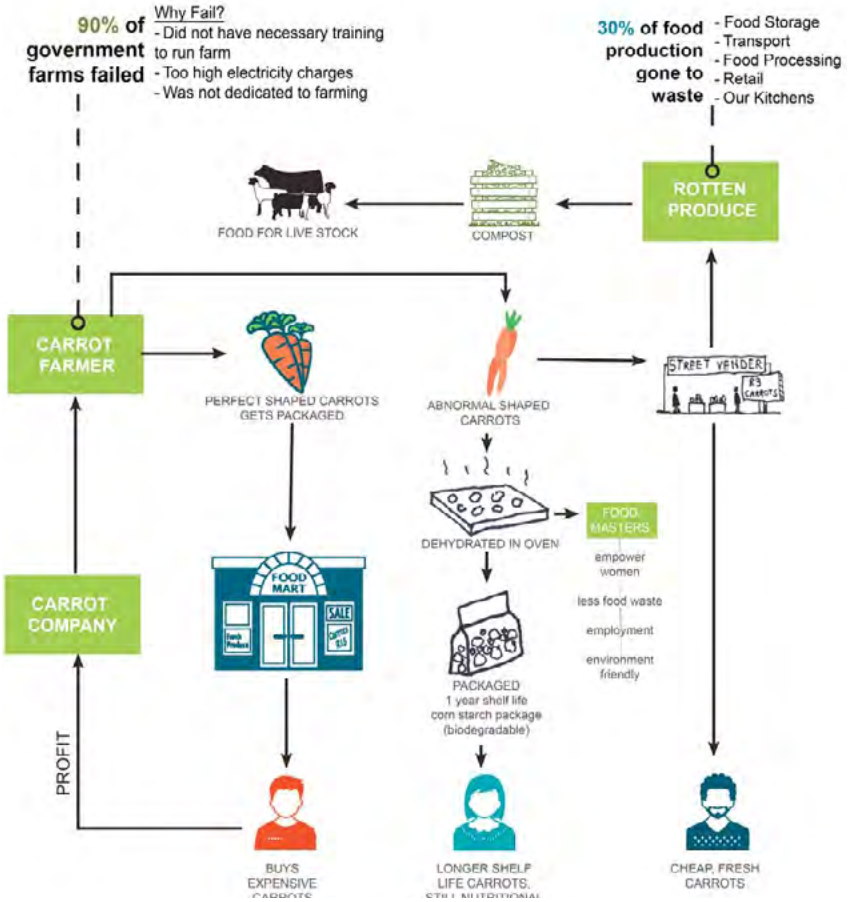


Fig 37 - Farm to table diagram (Manyeza, 2019) conceptualized by (Forlee, 2019).

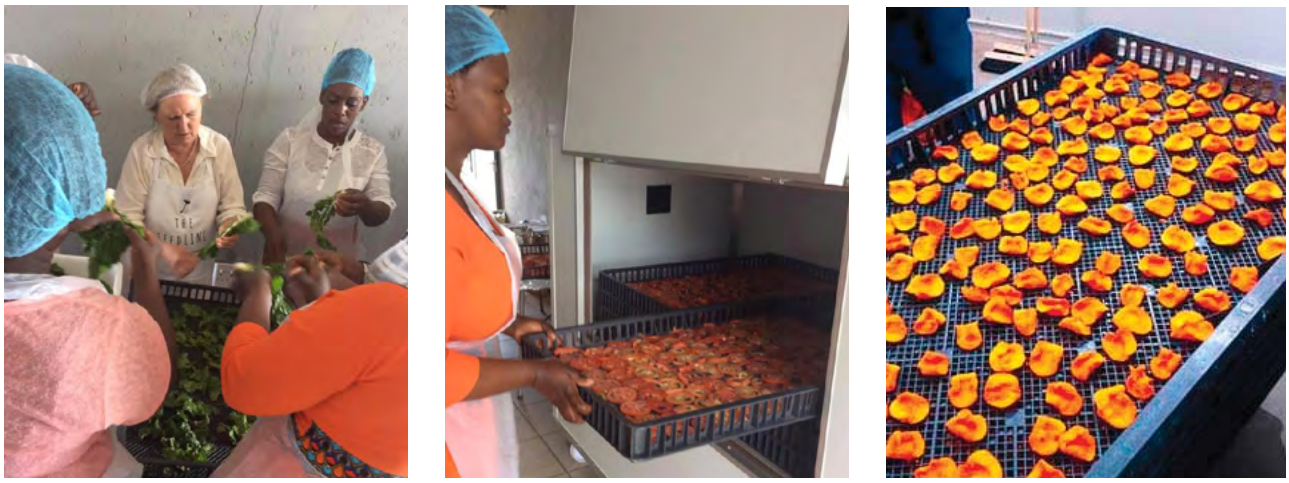


Fig 38 -Agro-processing at Food Masters SA (Manyeza, 2019)

PRESERVATION

The purpose of preserving vegetables and fruits is to have them available throughout the year as well as to prevent any potential food waste which may occur due to excess produce. Methods of preservation include drying, freezing, and bottling/canning.

DRYING

Drying is suitable for all fruits and vegetables. It takes up little storage space without electricity. This method involves washing, peeling and cutting as preparation. It is dipped in a sodium solution, place in an electric dehydrator for around 2 to 4 hours (depending on the produce) and then packaged in loose bags and stored in dry areas (Department of Basic Education, 2011).

FREEZING

Freezing is more common in vegetables such as beans, carrots, pumpkin, butternut, and spinach.
The method is to select good quality vegetables and prepare them by washing and cutting them. It is cooked in boiling water for 3 to 5 minutes, drained and cooled. These are packaged and then store in freezers (Department of Basic Education, 2011).

BOTTLING/CANNING VEGETABLES

Canned produce regularly found are canned pickles, chutney, sauces, and jams, used for soups, stews as a flavouring.
For vegetables, the products are sterilized in boiling water. It is preserved with vinegar and stored in containers.
For canned fruits, like berries, apricots, pears, peach, and apples, they are use sugar as a preservation ingredient. They are cooked in hot sugar syrup and poured into bottles filled with more sugar syrup (Department of Basic Education, 2011).

CULINARY SCHOOL

CULINARY ART SCHOOL BY GRACIA STUDIO

Date Completed: 2010
Location: Tijuana, Mexico
Floor area: 894 m²
Materiality: glass, wood, exposed concrete, steel

The program is split and grouped within 3 separate buildings. These buildings face each other creating a shared exterior courtyard space. Each space seems to be standing on its own as they are accessed through the exterior courtyard and not through a passage.

On the ground floor, the practical cooking workspace stations are in one building. The building opposite it contains the admin necessities like the offices, ablutions, library, and locker room. The third building is a small auditorium with the lunchroom next to it. Located on the 1st floor are lecture classrooms.

Regarding materiality, the ground floor walls are mostly glazed creating a visual connection between the inside and outside, making the spaces feel more open. The 1st floor façade plays with concrete and timber texture with little openings to the outside. It contrasts with the ground floor glazing making it seem like it is floating.
The materiality of the envelope are shown really simply with rectangular shapes which works in proportion to one another. The simplicity of the building geometry and material used emphasises on the clean environments required when cooking. This case study gives me an idea to how I can arrange the culinary school regarding its visibility of working stations and the public areas.

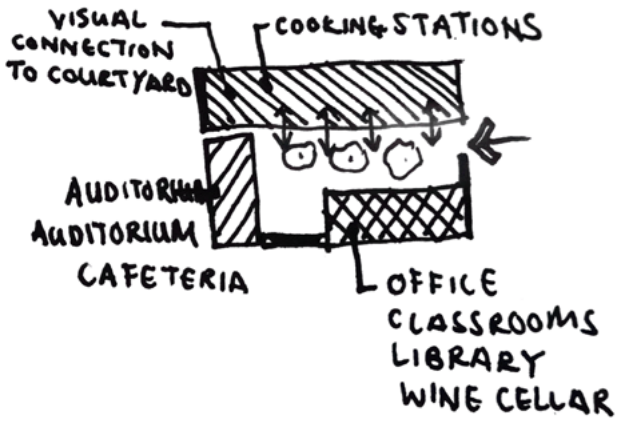


Fig 39 - Plan diagram indicating program (Forlee, 2020) adapted from (Gracia Studio, 2011)

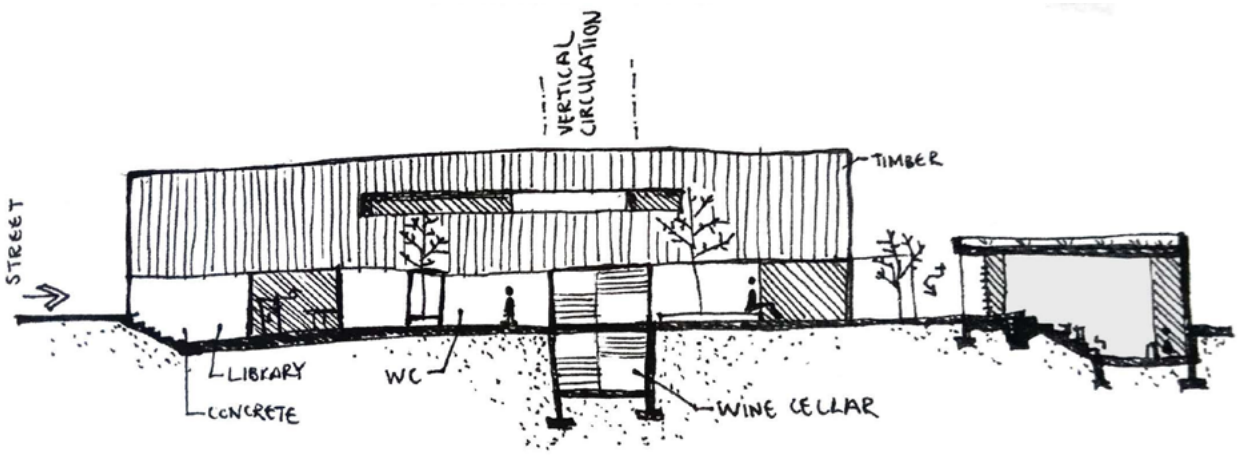


Fig 40- Section Elevation A-A (Forlee, 2020)

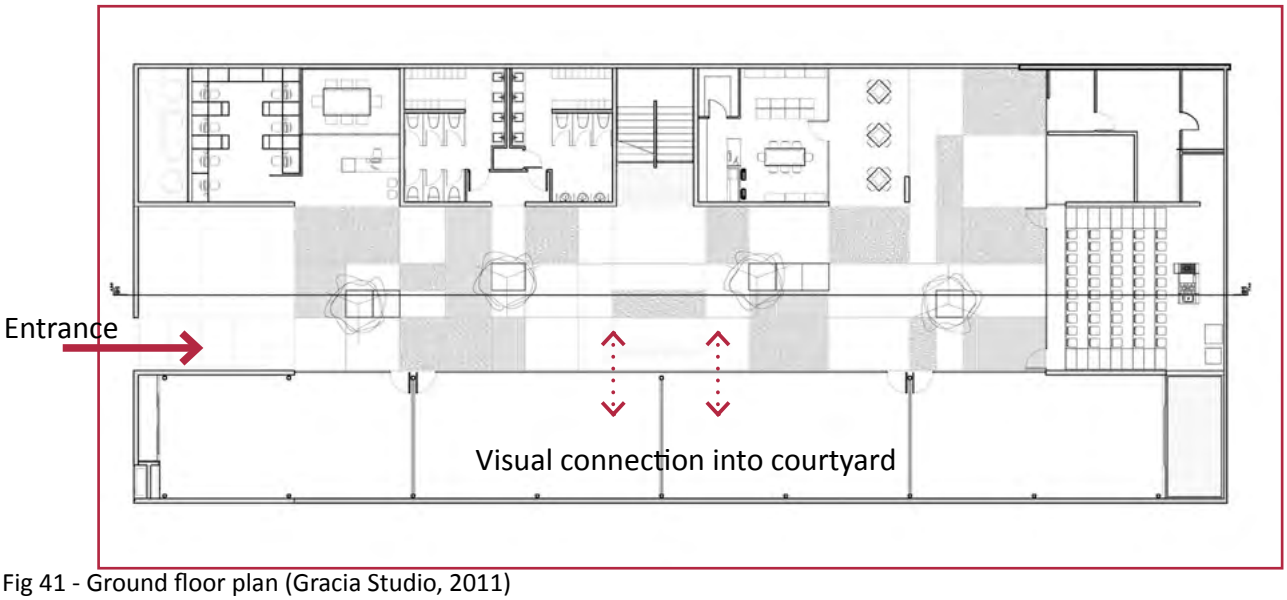
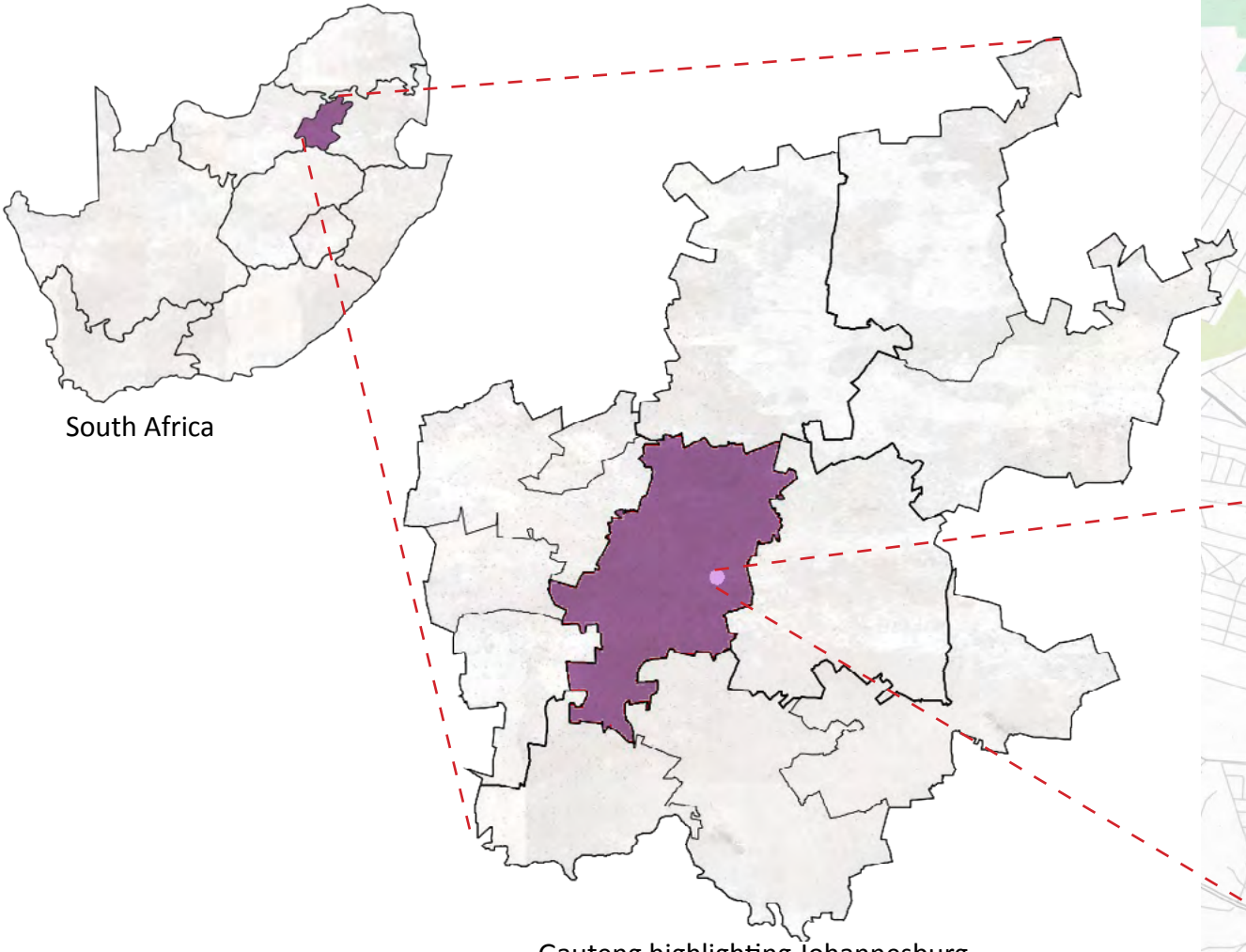


Fig 41 - Ground floor plan (Gracia Studio, 2011)

CHAPTER 3
SITE

This section presents the site location and reasoning for choosing it. The context and site is analysed and findings are represented in a series of maps, diagrams, photographs and sketches.

WHERE CAN I IMPLEMENT THE PROJECT?



Gauteng highlighting Johannesburg

For this project, I wanted to find a location that already had diverse culinary offerings in Johannesburg. The thought is to first change/ influence the existing influential precincts which can aid in the growth of other similar precincts. I've identified Fordsburg as one of these precincts. Fordsurg is known for its food. The cuisine found in the area is not something that is found commonly in all areas around Johannesburg as it's a place with diverse cultural and ethnic backgrounds. This diversity may help shape and influence in discovering new and healthier alternatives. It can emphasise the different nutrients one needs to keep healthy.

Fordsburg also has a

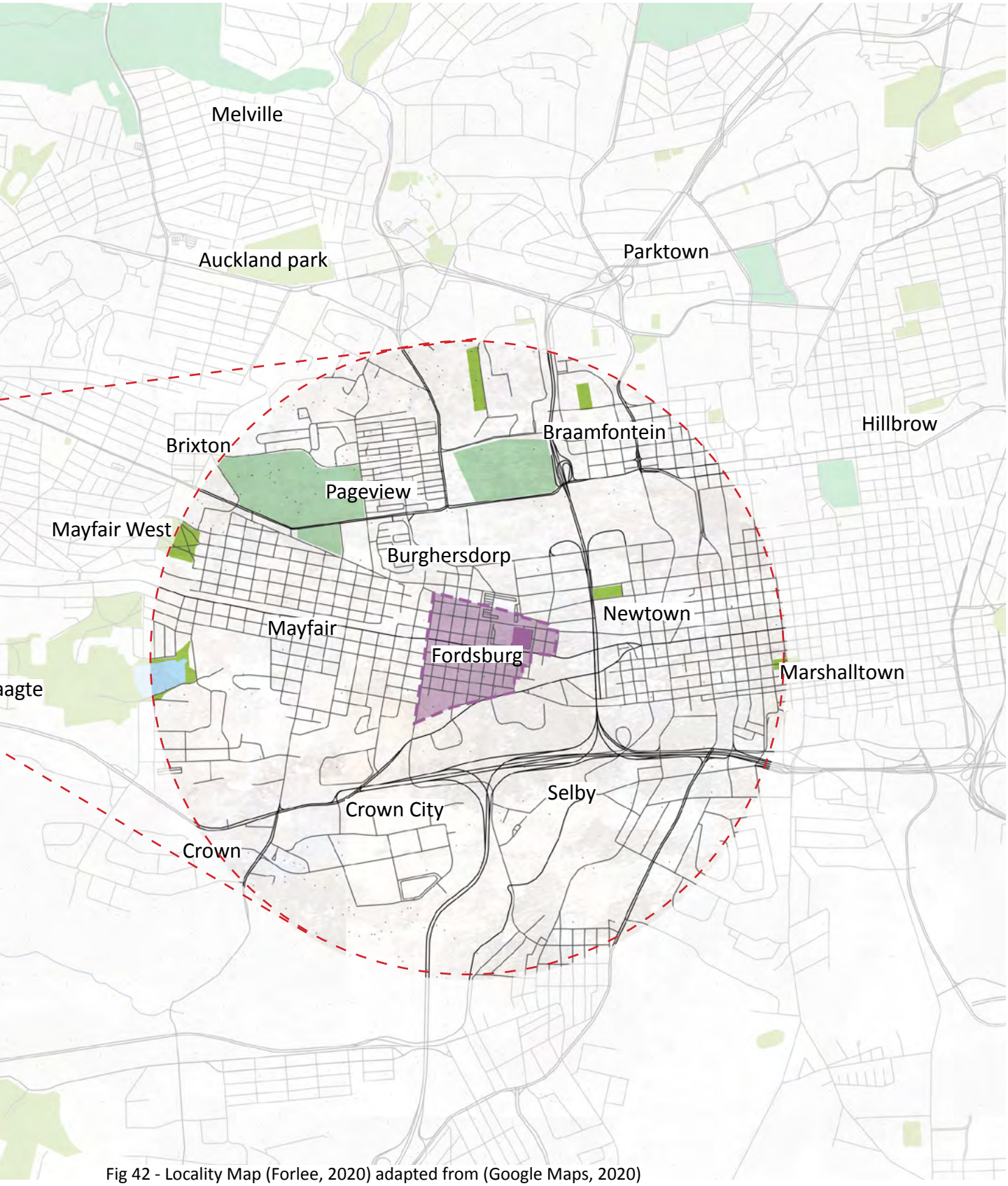


Fig 42 - Locality Map (Forlee, 2020) adapted from (Google Maps, 2020)

This timeline provides a brief history of the formation of Fordsburg, closely looking at the influence of Indians, other immigrants, and the formation of trade and flea markets. It also looks at how the Oriental Plaza came about and how it has impacted Fordsburg.

Understanding the history gives an insight into why Fordsburg is such a diverse racial area with immigrants and gives an understanding as to how one should approach the site.

HISTORY OF FORDSBURG

1634:
Indians first arrivals slaves during the Dutch Colonial era (Hanoman, 2017).

1690 – 1838:
Indians arrived as slaves until the end of slavery (Hanoman, 2017).

1800's:
Fordsburg was established on land which formed part of the Langlaagte farm. It was divided into smaller portions and sold to various members (Mayat, 2016).

1860:
People from western India started immigrating into South Africa at their own expense in search of new opportunities. They mainly came as traders and hawkers (Hanoman, 2017).

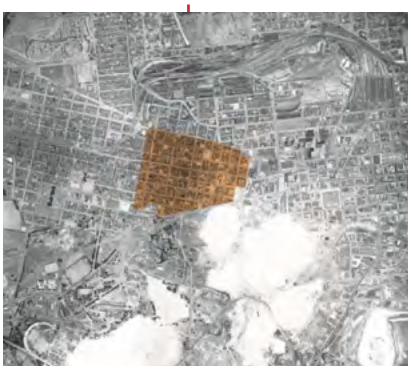


Fig 43 - Indian hawkers in Johannesburg Market Square (Mayat, 2013)

1886:
Gold was discovered resulting in large numbers of Indians immigrating into Johannesburg. Laws were established to separate residential and trading areas. Approximately 1000 licensed traders, hawkers, and peddlers operated in Johannesburg at the time (Mayat, 2016).


1935

1887:
The "Coolie" Location was established. It was the only area where Indians could legally own property. The high numbers of people migrating turned the area into a slum.


1941

1893:
The proximity to the mines attracted many of the poor. The Malay Location, later known as Pageview, was for the Cape Coloured people. Poor white immigrants moved to Vrededorp. Indians, coloureds and black Africans mostly lived in the areas along the Fordsburg Spruit (Yengde, 2016).

As time went on, trade in the Witwatersrand basin was succeeding resulting in a shortage of labourers. England, Australia, and Ireland labourers were brought in. The area attracted many people all over Europe in search of their wealth (Yengde, 2016). The area became a diverse working-class suburb attracting Indians, English, Afrikaans, Chinese, Lebanese, Jewish people, black people, and coloured people (Yengde, 2016).

Due to its proximity to the mines, Fordsburg became an area with residential accommodation, hotels, workshops, retail, and eateries (Mayat, 2016).
A horse-drawn tram route connecting to the mines was formed on Main Road. The Indians took this as an opportunity and developed the Road into a commercial spine. Fordsburg's own Market Square was established.


1968


1989

Fig 44 - Series of aerial photographs highlighting the development of Fordsburg (Mayat, 2013)

1897:
The Coolie Location was mainly occupied by hawkers. A study showed the business capacity of the area accommodated 96 stands and had a population of 4000 (Yengde, 2016).

1899: Anglo Boer War
1904:
People in the "Coolie" Location were forcibly removed. The area was burnt down and redeveloped as a commercial zone, renamed Newtown. They had to move to an emergency camp near sewerage works in Klipspruit, 30km south of Johannesburg (Carrim, 1990).

Many of the people who were evacuated started to move back into Johannesburg, mostly moving into small stands within Pageview.

1932:
Asiatic Land Tenure Act allocated Fordsburg, Denver, and Jeppe as designated areas for Indian businesses. People allocated outside these areas had to sell their land to the whites.

Social-cultural amenities started forming in Fordsburg representing the Indian Community found in Pageview. Amenities such as prayer facilities, schools, trading areas, cinemas, and community halls.

14th Street in Pageview was lined with Indian, Chinese, coloureds and other non-white traders. It was a lively street that attracted many all over Johannesburg, even the whites.

1960 – 1970:
1950 Group Areas Act declared Pageview as a white group area. All the non-white residents were forcibly removed which also destroyed the vibrant commercial 14th Street (Carrim, 1990, p. 91). These people were relocated into Lenasia. Many of the Indians were able to find alternative locations in Hillbrow and Mayfair as it was closer to Fordsburg already established Indian culture amenities. Mayfair was for the poor whites, Indians were willing to pay higher rentals so they stayed closer to these amenities. They couldn't be evicted unless alternative accommodation was found.



Fig 45 - Clothing shop on 14th street before the destruction under Group Areas Act in 1976 (Goldblatt, 1976)

1974:
The Oriental Plaza was established in Fordsburg to accommodate the lost Indian businesses in Pageview, 14th Street. It can be seen as a large shopping mall that has an Indian Architectural language imposing the urban fabric of Fordsburg. It was built as a political tool to satisfy the needs of middle-class shoppers, a tourist attraction for Fordsburg, and to have strict control over the Indians (Mahomed, 2007).



Fig 46 - Proposed site for oriental Plaza (Mayat, 2013)

1994:
Under the new democratic government, people started businesses of their own. Initially, the restaurants and retailers in Fordsburg only catered to the local Indians. Fordsburg became a migrant hub and soon, there was more competition and they started to cater to the other migrants. It was claimed that 90% of the population in Fordsburg were migrants. Many of the locals moved left aft er the end of Apartheid. The migrants were mainly from the South Asian Continents and different cuisines were introduced; South Indian, North Indian, Pakistani and Bangladesh (Yengde, 2016).

Locating my project in Fordsburg give the immigrants alternative employment options and allows them to increase their skills as empowerment.

Interestingly, the current commercial spine in Fordsburg resembles and operates similar to that of 14th Street in Pageview, 1935s – the public walkways were used to sell their products. Fordsburg has become a tourist attraction where different classes and ethnicities come and visit, similar to how 14th street was. The success of this model is due to the way the Asians traded and operated the space. They allowed bargaining to compete with other stores, and they opened their stores for longer hours, on holidays and late hours to accommodate the formal working classes (Yengde, 2016).

FORDSBURG AND ITS SURROUNDINGS

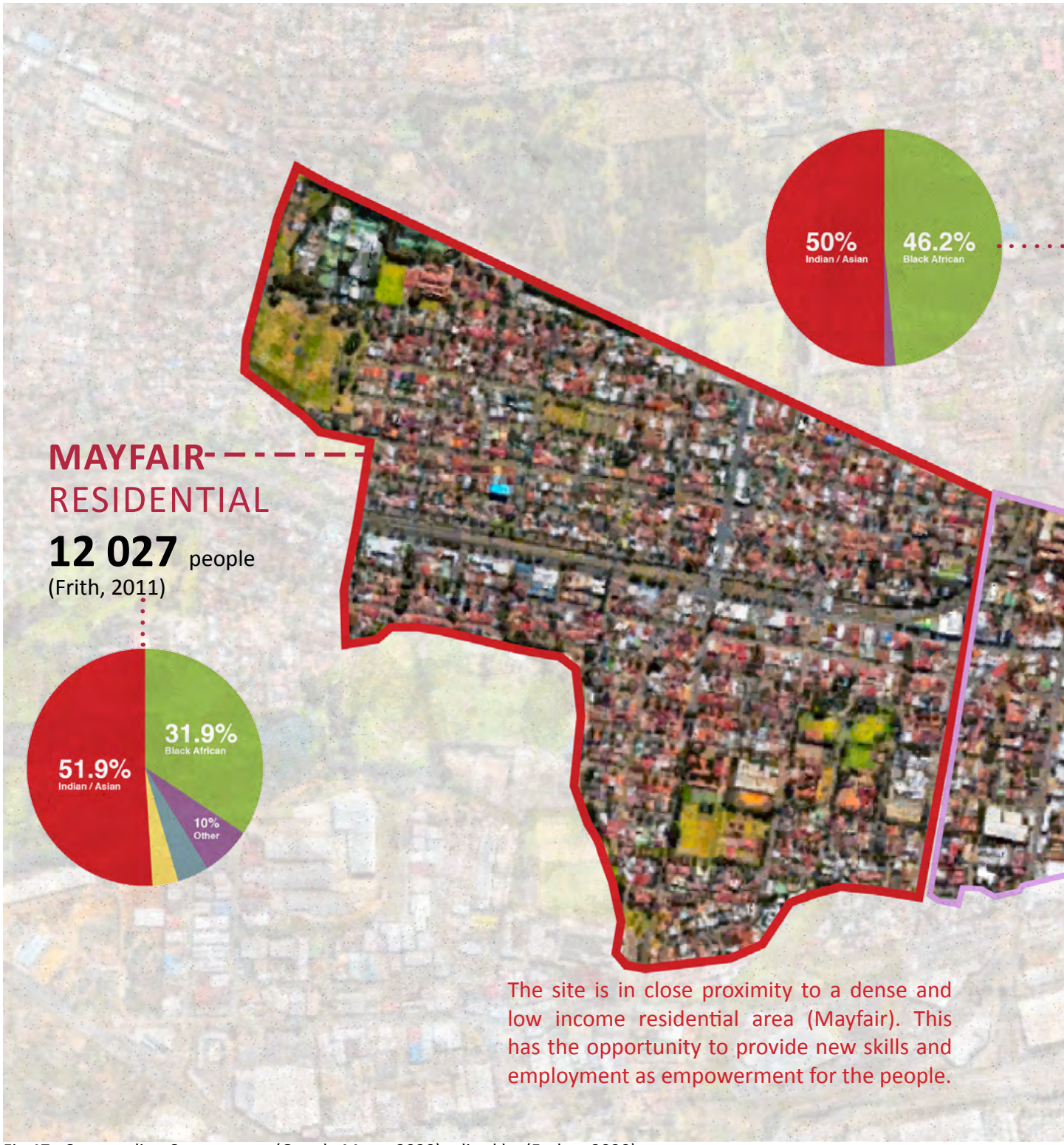


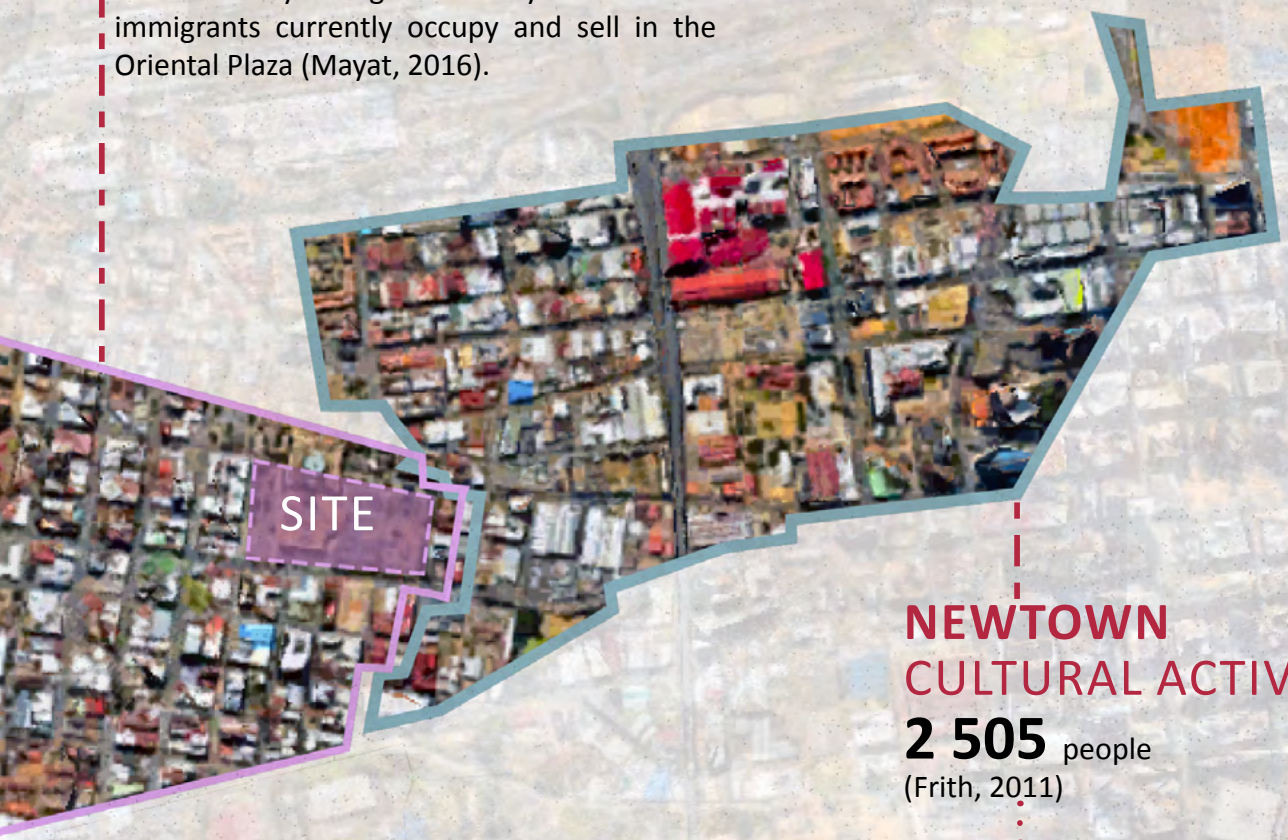
Fig 47 - Surrounding Context map (Google Maps, 2020) edited by (Forlee, 2020)

FORDSBURG
RESIDENTIAL

Fordsburg can be seen as an Indian ethnic enclave attracting many people residing from different areas within Johannesburg as well as tourists.

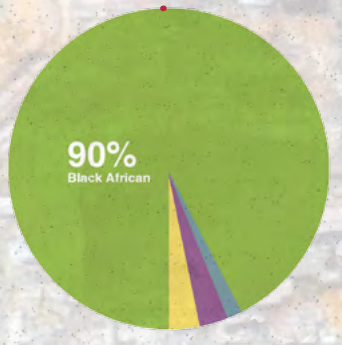
2 350 people
(Frith, 2011)

Fordsburg has been established as the starting area for many immigrants. Many of these new immigrants currently occupy and sell in the Oriental Plaza (Mayat, 2016).



NEWTOWN
CULTURAL ACTIVITIES

2 505 people
(Frith, 2011)



It is also neighbours to a culturally active area (Newtown) where many tourism also happens to understand the history of Johannesburg. This project can be an opportunity to extend tourism location, linking Newton to Fordsburg.

LANGUAGE

A range of languages are spoken in the area with the largest being English at 44% (Frith, 2011). 19% are other languages which further shows us the diversity in the area.

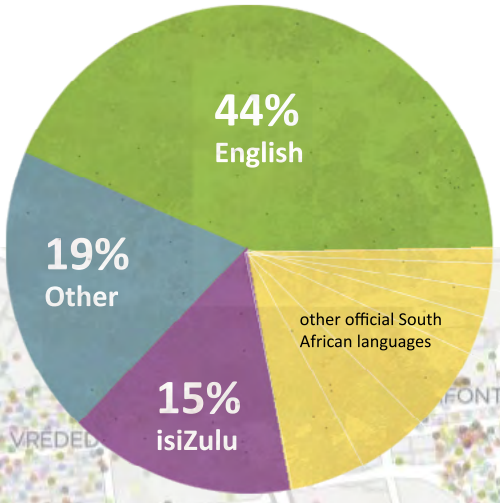


Fig 48 - Pie chart of 1st languages spoken in Fordsburg (Frith, 2011)

Fig 49 - Dot map indicating languages spoken and distribution with Fordsburg outlined (Frith, 2011) edited by (Forlee, 2020)

INCOME BRACKETS

The income brackets are shown for Ward 58. From the dot map, we can see how the income ranges are spread out fairly evenly throughout the area without any indication of segregated groups.



Fig 50 - Annual Household income of Ward 58 (Frith, 2011)

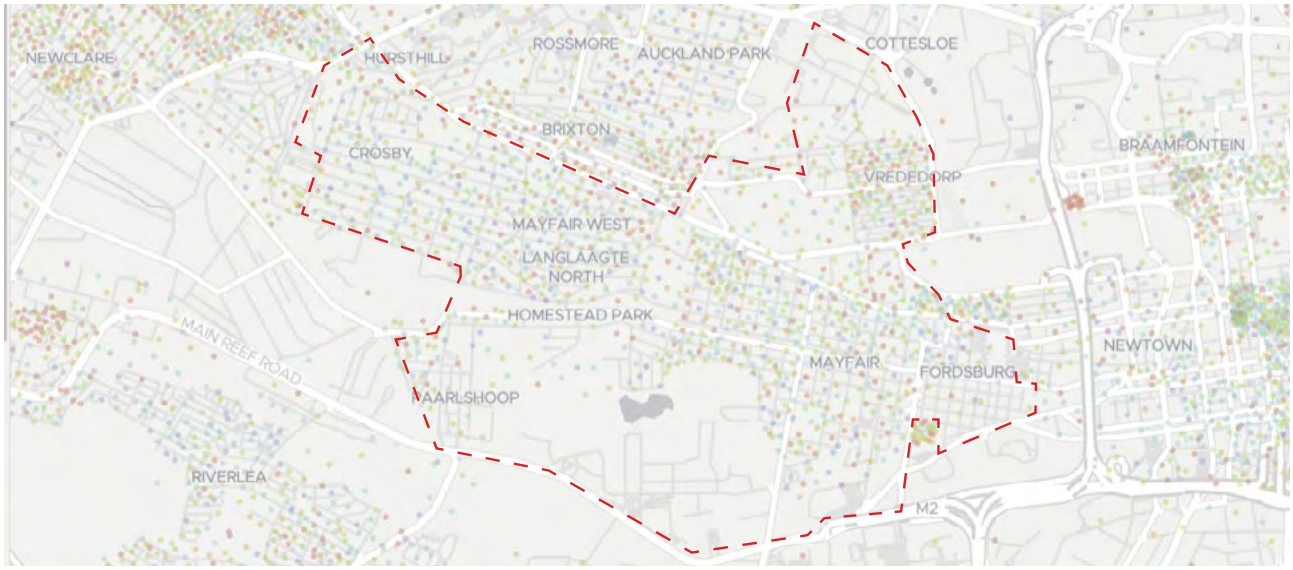


Fig 51 - Dot map indicating income brackets with Ward 58 outlines (Frith, 2011) edited by (Forlee, 2020)



Fig 52 - Map indicating open green spaces around Fordsburg (Forlee, 2020)

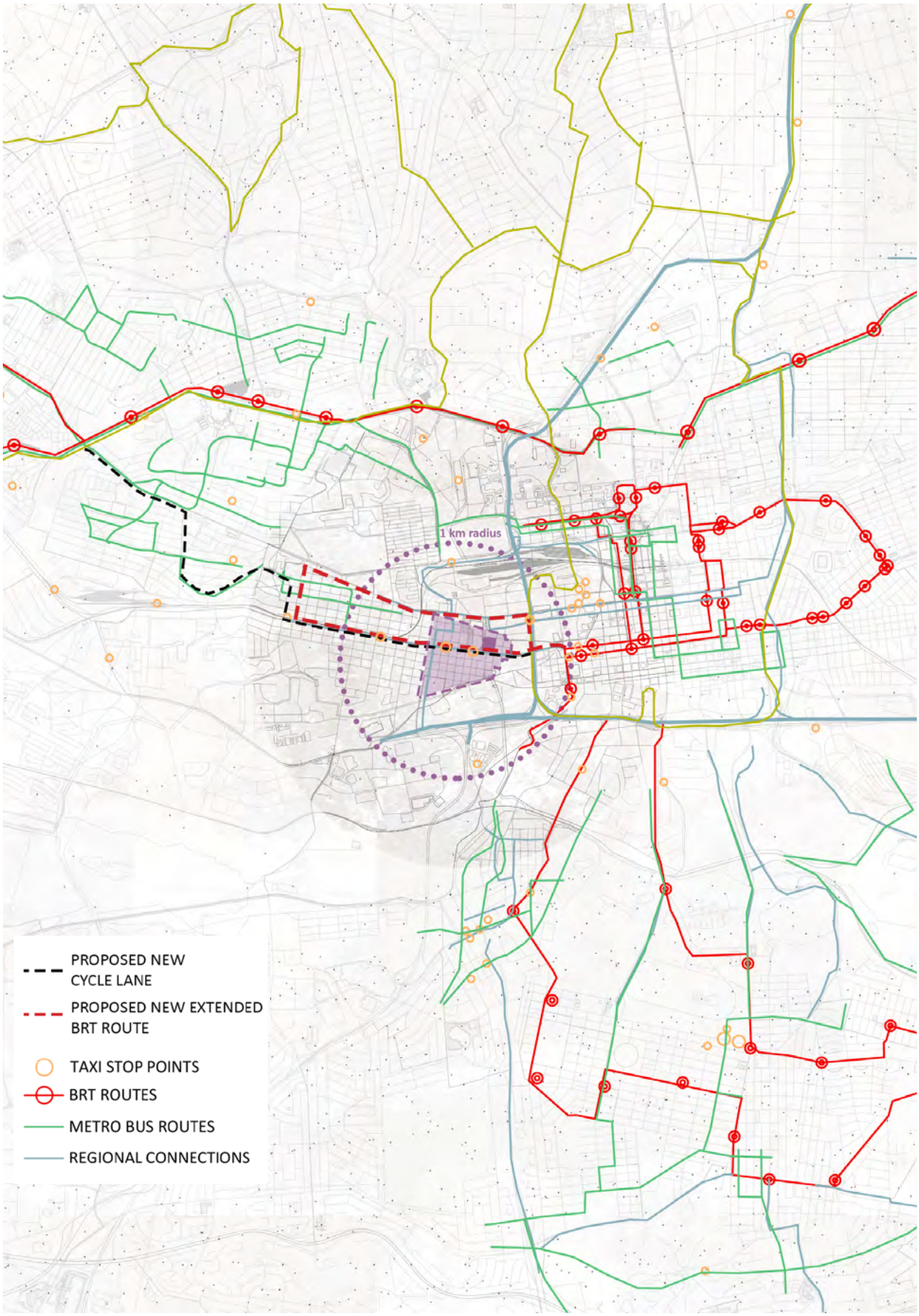


Fig 53 - Map showing different transportation routes around Fordsburg (Forlee, 2020)

TRANSPORTATION

The original town planning scheme for Fordsburg did not specify on-site parking (Toffah, 2009). 2 Taxi stop points on Albertina Sisulu Road are currently the only form of public transportation connecting Fordsburg to the neighbouring areas. It results in many visitors of Fordsburg to use private vehicles which congest the streets, especially on weekends. I propose for an extension of the BRT Route to pass through Fordsburg into Mayfair. The black line indicates the proposed route.

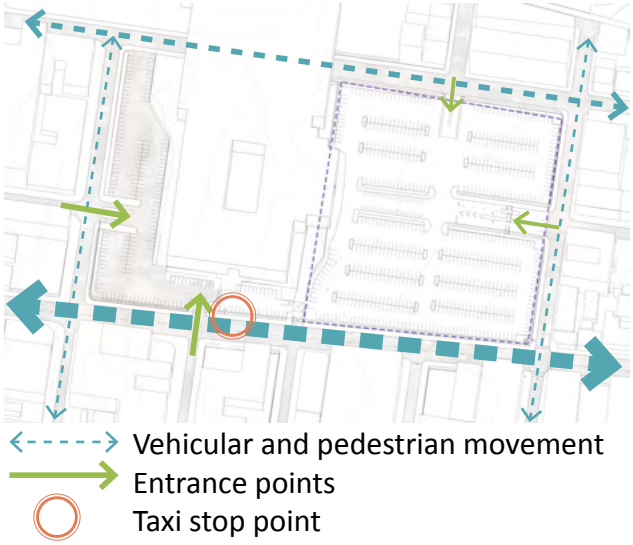


Fig. 54 - Plan diagram indicating vehicular and pedestrian movements (Forlee, 2020)

MOVEMENT

The Southern edge of the site (Albertina Sisulu Road) is the more pedestrian and vehicular active road.

The site is fenced off making pedestrian movements and access points are similar to that of vehicles

PARKING PROPOSALS

The new building design will replace the 500 parking spots of the existing parking lot in Oriental Plaza.

Proposals:

Increase pedestrian access

Johannesburg city centre is trying to densify through BRT. An extension to the existing routes (passing through Fordsburg and Mayfair) allows for a more integrated public transportation system.

Bicycle lanes

Cycling is a form of transportation can reduce an individual's transportation costs, health, and environments CO2 emissions. Bicycles require less floor are for parking compared to cars. Cycling as an alternative form of transportation is encouraged by providing a cycle route passing through the site and bicycle parking spaces.

Occupying other existing parking lots in Fordsburg

There are potential parking lots on the perimeter of the site. A contract agreement makes use of those spaces when they are unoccupied.

Unused on-site farming spaces as parking

By using containers (intensive farming method), the farm becomes mobile. When required or when harvest time has passed, the containers are stored to allow for parking.

- From 2013 statistics, 30% of the population uses bus as daily transportation. (150 parking lots)
- 10% are cyclers (50 bicycle parking provided)
- 60 parking spaces found along the perimeter.
- 60 parking spaces on site

These interventions can replace 65% of the parking spaces I have removed.

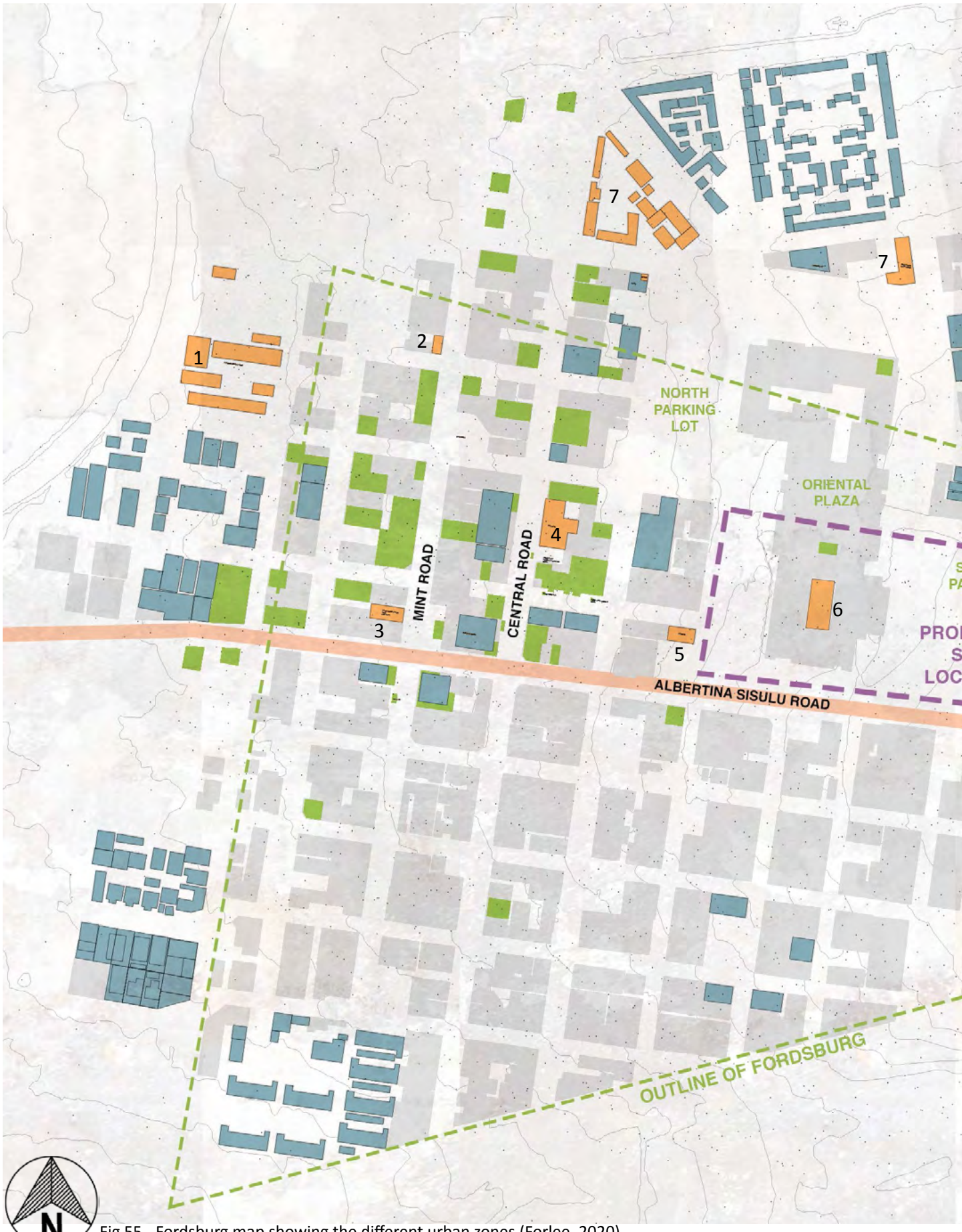
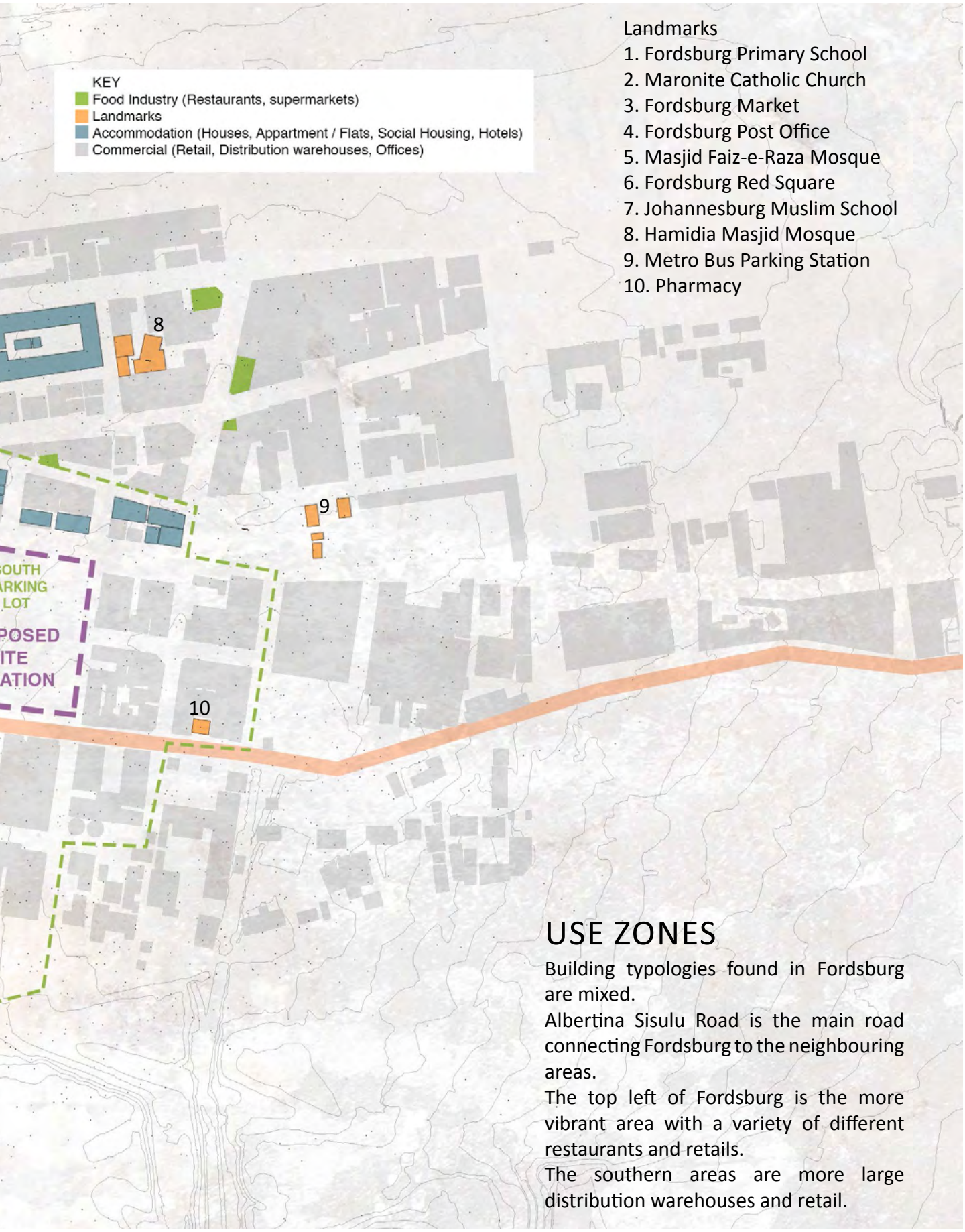


Fig 55 - Fordsburg map showing the different urban zones (Forlee, 2020)



Landmarks
1. Fordsburg Primary School
2. Maronite Catholic Church
3. Fordsburg Market
4. Fordsburg Post Office
5. Masjid Faiz-e-Raza Mosque
6. Fordsburg Red Square
7. Johannesburg Muslim School
8. Hamidia Masjid Mosque
9. Metro Bus Parking Station
10. Pharmacy

USE ZONES

Building typologies found in Fordsburg are mixed.

Albertina Sisulu Road is the main road connecting Fordsburg to the neighbouring areas.

The top left of Fordsburg is the more vibrant area with a variety of different restaurants and retails.

The southern areas are more large distribution warehouses and retail.

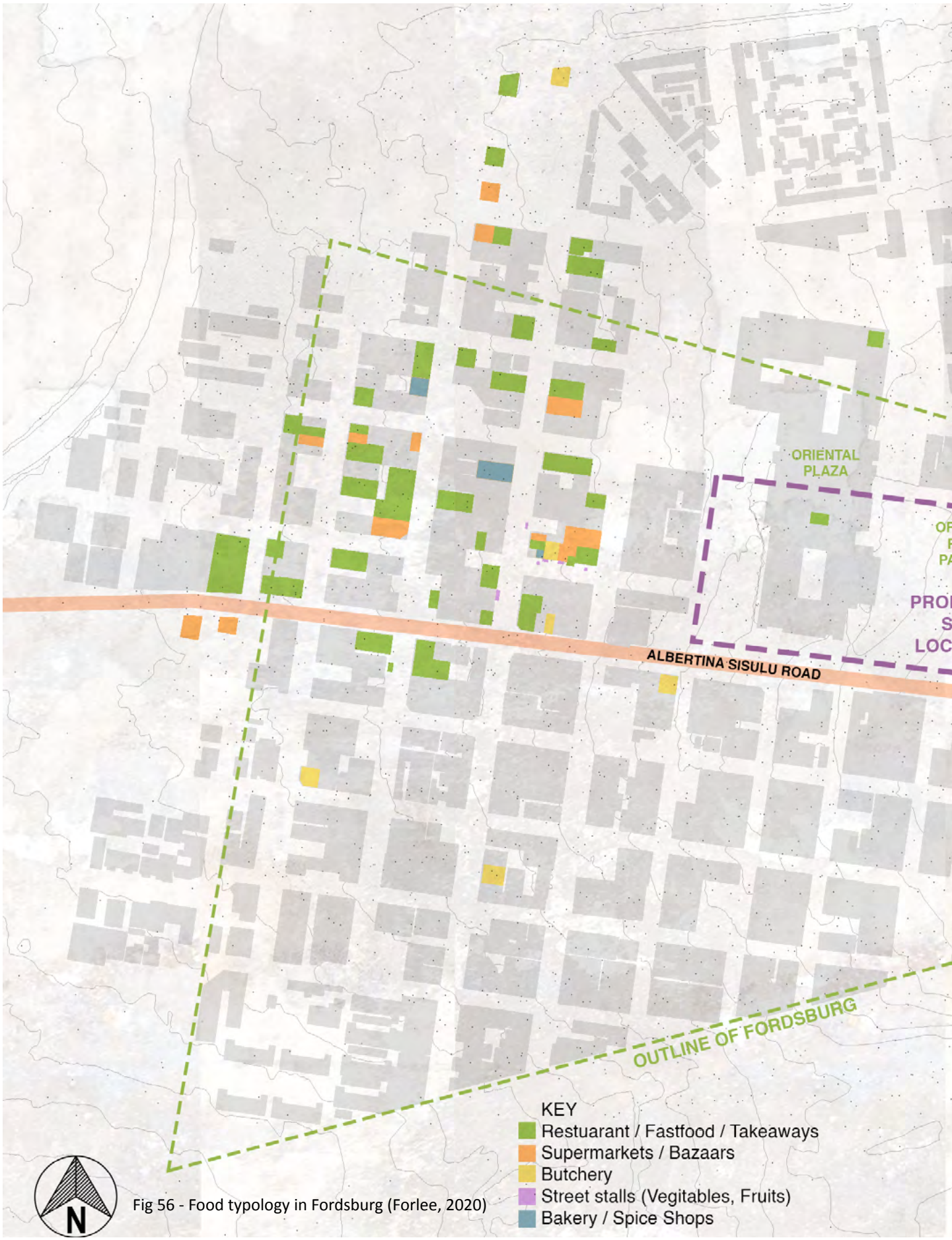


Fig 56 - Food typology in Fordsburg (Forlee, 2020)







Fig 57 - Photographs of Food Typologies in Fordsburg (Forlee, 2020)

FOOD TYPOLOGIES IN FORDSBURG

Each area in Johannesburg has its own culture regarding food. The majority have common cuisines of fast-food franchises, or commercialized restaurants and supermarkets. Looking at Fordsburg, there are around 150 food-related businesses; bazaars, restaurants, spice shops, takeaways, butcheries, and street stalls, etc., of which only 5% are franchises. The rest of the businesses, mentioned earlier, are mainly catered for the South Asian Continents with varied cuisines.

Isolating the food Industry layer, we can see that the area contains a variety of different typologies. Some cuisines are Indian and Pakistani (being the most popular), Mexican, Ethiopian, Chinese, and most fast food takeaways selling fish and chips, samoosas shwarma and so on.

SITE LOCATION

SITE: ORIENTAL PLAZA SOUTH PARKING LOT



Fig 58 - Nolli Map Indicating location of selected site (Forlee, 2020)



Immediately looking at the grain/footprint of Fordsburg, we see that the Oriental Plaza seems to be interfering and imposing in the Fordsburg context. Its scale is larger than its surrounding blocks, taking up 14 building blocks, a total area of 88500m^2.

My program required an estimated floor area of 20 000 m2. Walking around Fordsburg, I've spotted the parking lot of the Oriental Plaza was large enough for my program and had greater pedestrian traffic in its surroundings compared to other site options .

From analysis information, there were location-based issues that I could also resolve with my project. These issues include a lack of large open green spaces, the disruption of the Fordsburg grain due to the Plaza, and a lack of public transportation to connect with its surroundings. For these reasons, I've decided to implement my project on the South Parking Lot of the Oriental Plaza, Fordsburg, Johannesburg.



Fig 59 - Aerial view of Oriental Plaza (Toffah, 2009)



SITE ANALYSIS

The total area of the plaza that I will be working with is 44 000 m2, which includes half of the existing Oriental Plaza building. It would be unreasonable to demolish or ignore it as it is part of the site with significant historical value.

The new buildings will be built on the parking lot area (22 000m2), some demolition and adjustments will be done to connect the new to the existing (Oriental Plaza).

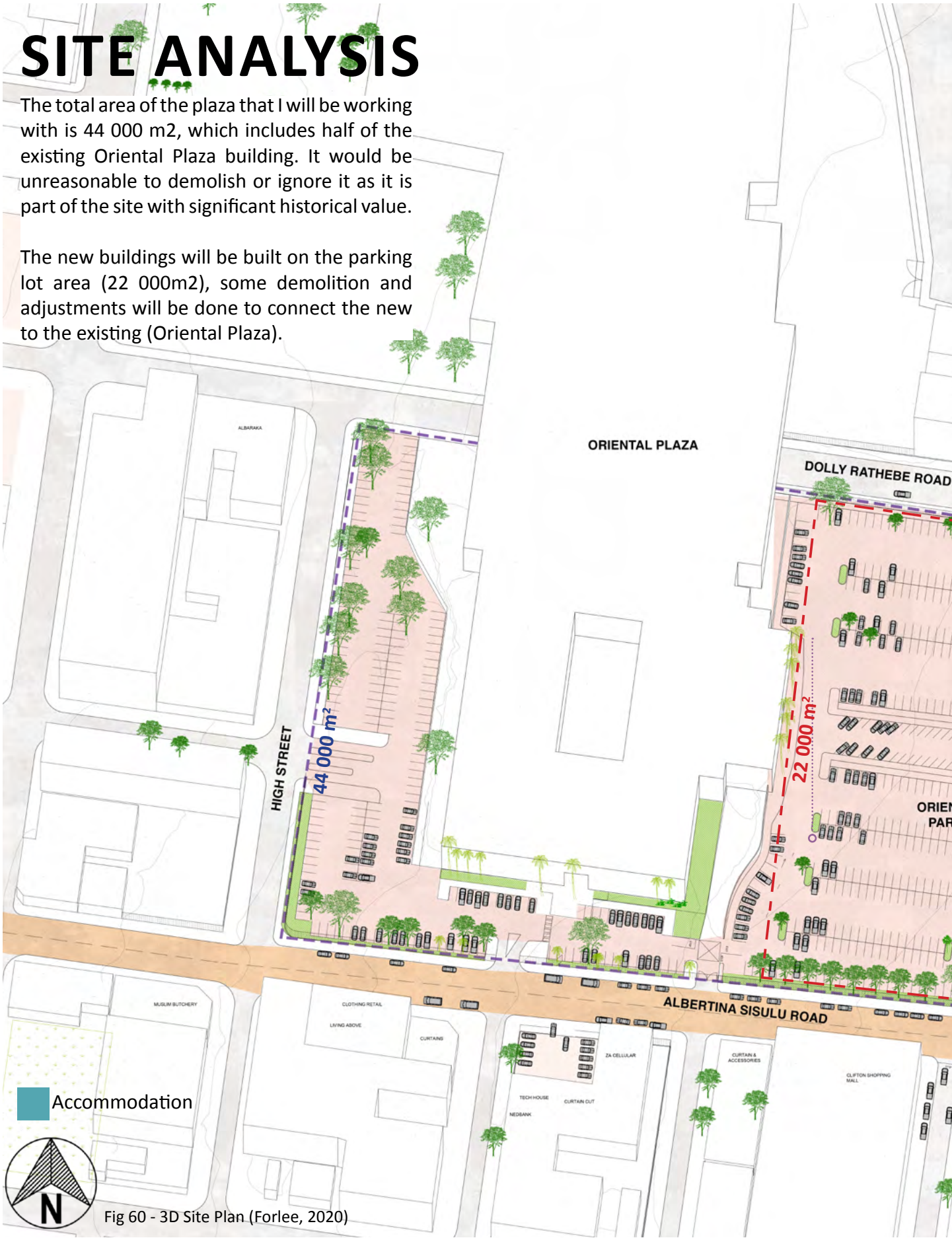


Fig 60 - 3D Site Plan (Forlee, 2020)





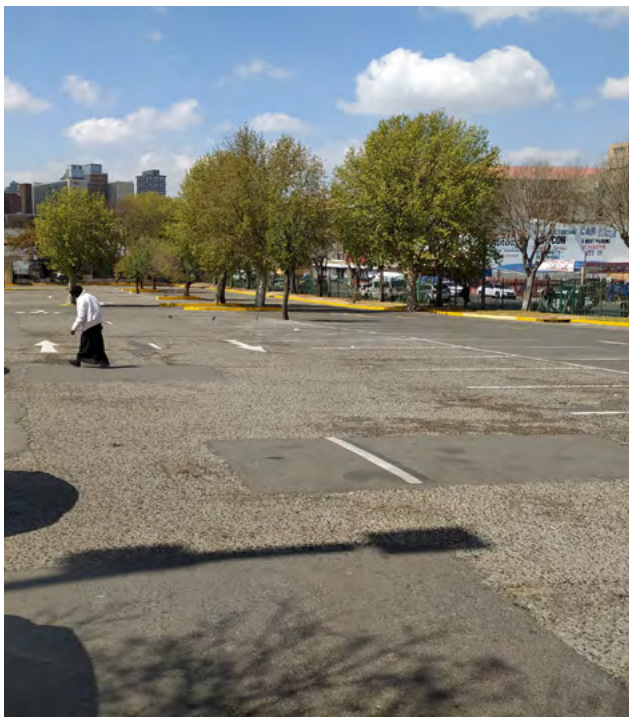


Fig 61 -Site photographs on 26 April 2020, 12pm in the afternoon. (Forlee, 2020)

The site photographs shows the minimal activity and use of the space.

HONOURING THE PAST

Just like the practice of farming has been lost in many urban South African traditions/culture, so has the history of Fordsburg been forgotten.

The south courtyard portion of the Plaza is identified as a heritage site known as the Site of Red Square. Before the implementation of the Plaza, it was an open meeting spot for political protests in the 1940-50's.



Fig 62 - Johannesburg City Heritage blue plaque (Forlee, 2020)



Fig 63 - Fordsburg Square looking south-west 1922 showing Standard Bank (Shorten, 1970)



Fig 64 - Fordsburg Red Square now (Ball, 2017)

SURROUNDING CONTEXT ANALYSIS



Elevation A-A. Albertina Sisulu Road
Fig 65a - Elevations of Fordsburg street (Google Maps, 2017) edited by (Forlee, 2020)

A series of elevations opposite my site were taken and analysed, taking note of the program and façade texture.

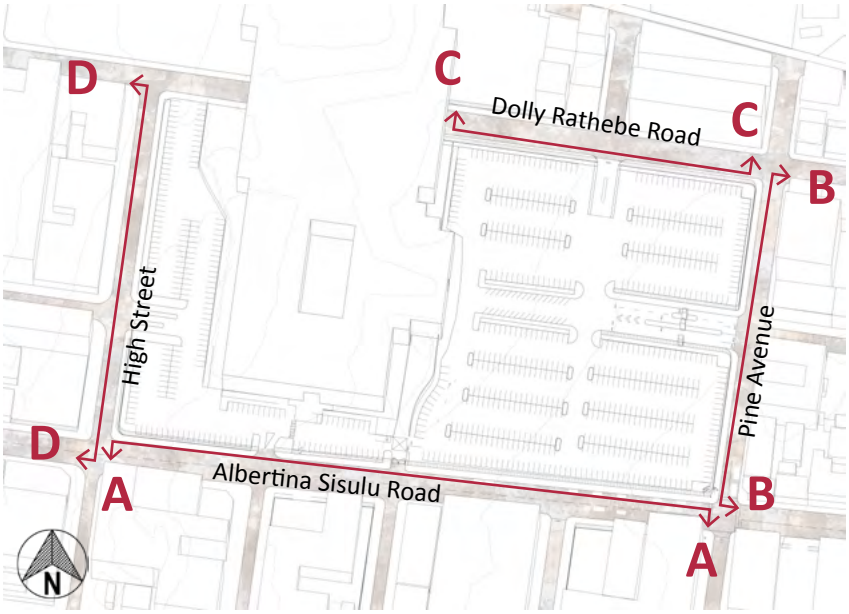


FIg.65 - Plan indicating where the elevations are located (Forlee, 2020)



Albertina Sisulu Road is a pedestrian and vehicular active road with the edges lined with retail stores. Street hawkers are found selling fruits and sweets using shopping trolleys.



Elevation B-B. Pine Avenue



Elevation C-C. Dolly Rathebe Road



Elevation D-D High Street

Fig 65b - Elevations of Fordsburg street (Google Maps, 2017) edited by (Forlee, 2020)

New Office Block
U-shaped building enclosing the center open space with stairways creating a courtyard space to allow light in

Retail

Commercial Road

Concrete

Albertina Sisulu Road



More pedestrian traffic, busy

Residential Apartment block with ground floor retail shops

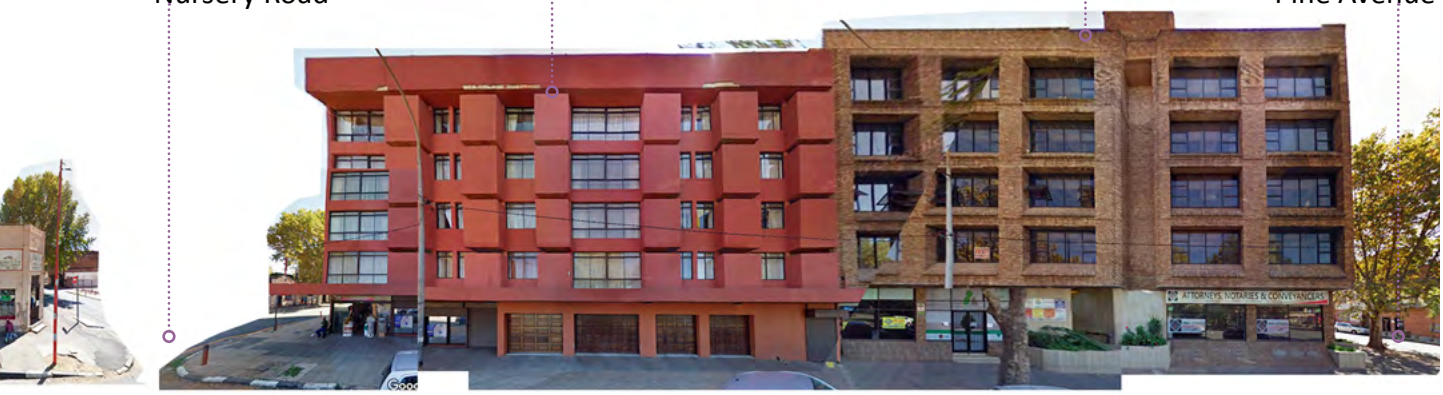
Office Block

Nursery Road

Plaster & paint

Facebrick

Pine Avenue



On Dolly Rethebe Road, the buildings are much taller compared to Albertina Sisulu Road Edge. It is also less pedestrian active.

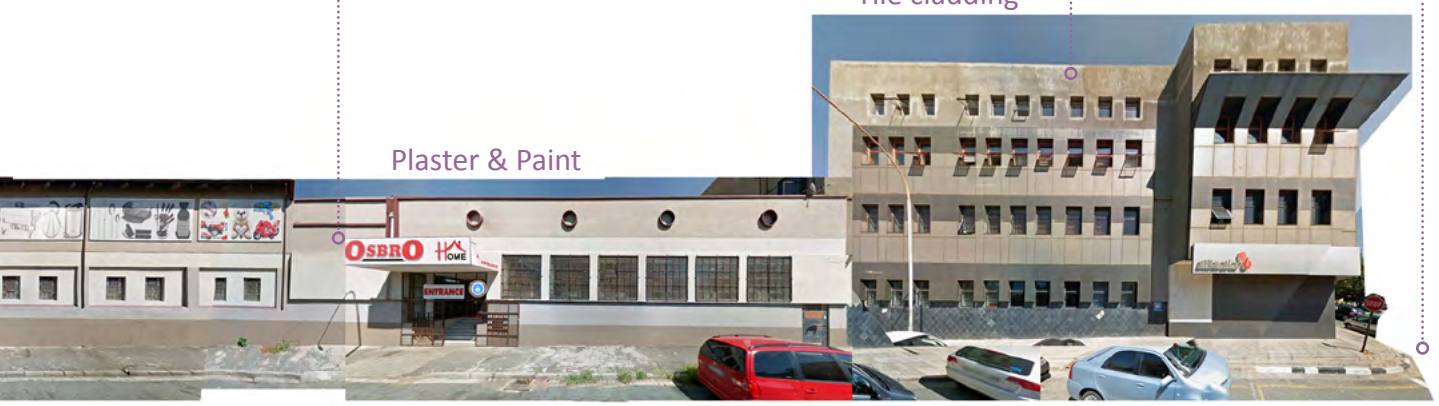
Bank

Furniture shop

Tile cladding

Dolly Rathebe Road

Plaster & Paint



High Street is the least active street compared to the other edges.
The buildings also do not have overhangs over the walkways.



Fig 66 - Fordsburg buildings (Forlee, 2020)

Through observing these street elevations, site visits and photographs take of Fordsburg, it can tell us a lot about Fordsburg building typologies, architectural language, materiality, and thresholds.

TYPOLOGY

The most seen building typology is having retail stores on the ground floor and either residential apartments or office blocks above.
Building heights range from 1 storey to 5 storeys.

ARCHITECTURAL LANGUAGE OF FORDSBURG BUILDINGS

Looking at the photographs I've taken of Fordsburg buildings (Fig 70), the architecture is very angular with minimal curved elements. The equal-sized windows and wall claddings create symmetry and repetition. New buildings seem to contrast with the old by using large glazed surfaces. This contrast tells us that Fordsburg is an area where differences can be accepted.

I like how the structure of roofs are exposed instead of hidden with ceiling boards for example. I gives a sense of the materiality of the building. The repetition of the beams and purlins also makes a space depth.

MATERIALITY

Structural materials used are mainly brick and concrete, which gives the buildings a heavy feel. Building façades finishes are either exposed brickwork, plaster and paint, or cladding with tiles/stone.

THRESHOLDS

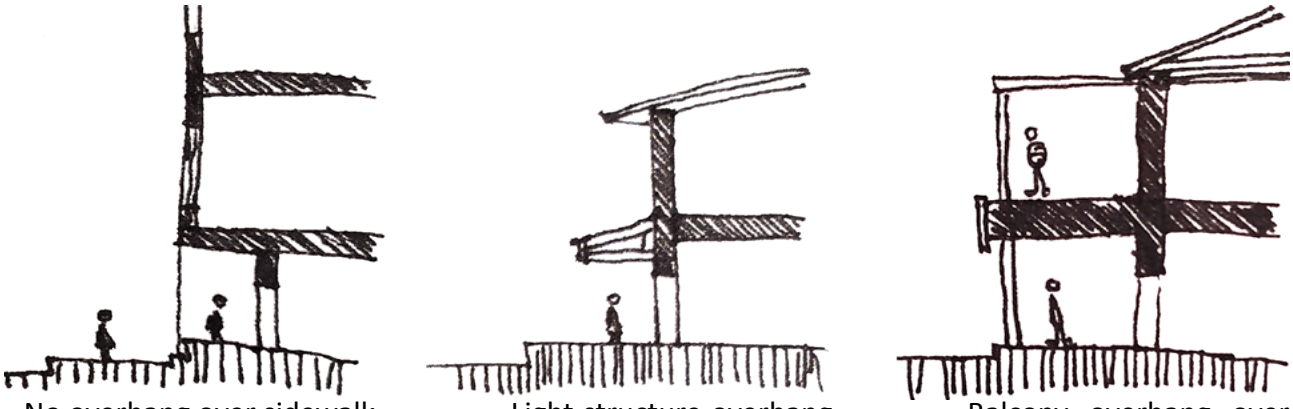
All these thresholds sketch are from looking at albertina sisulu road alone.

Fig.69 - Typical Threshold section sketches through buildings seen in Fordsburg (Forlee, 2020)



Room overhang over sidewalk

Protruded concrete slab overhang over sidewalk



No overhang over sidewalk

Light structure overhang over sidewalk

Balcony overhang over sidewalk

Fig 67 - Threshold sketches (Forlee, 2020)

ACTIVITIES

Fordsburg Square and the Oriental Plaza are the main attractions in Fordsburg. Fordsburg Square is mostly busy on the weekends and alone can attract up to 2000 people on Saturday's. The Oriental Plaza attracts an average of 900 000 people per month (Toffah, 2009).

In general, the South parking lot of the Oriental Plaza is less utilized compared to the North parking lot probably because it is a further walking distance to the restaurants/markets happening on Mint and Central Road.
During the weekends, the Northern Parking lot becomes full as people come to Fordsburg to visit the markets and restaurants.



Fig 78 - Different activities found during the different times of the day (Toffah, 2009) adjusted by (Forlee, 2020)

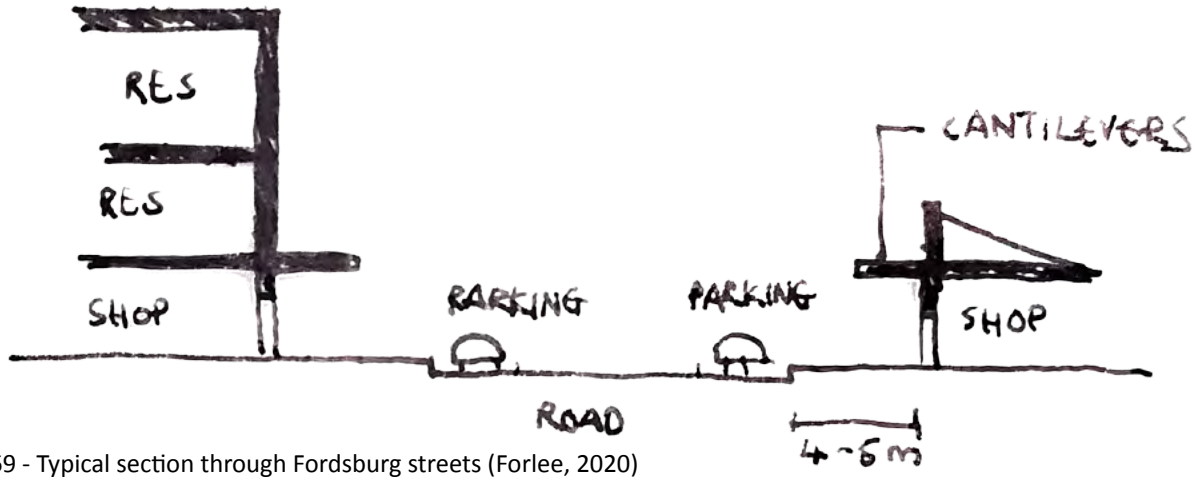


Fig 69 - Typical section through Fordsburg streets (Forlee, 2020)

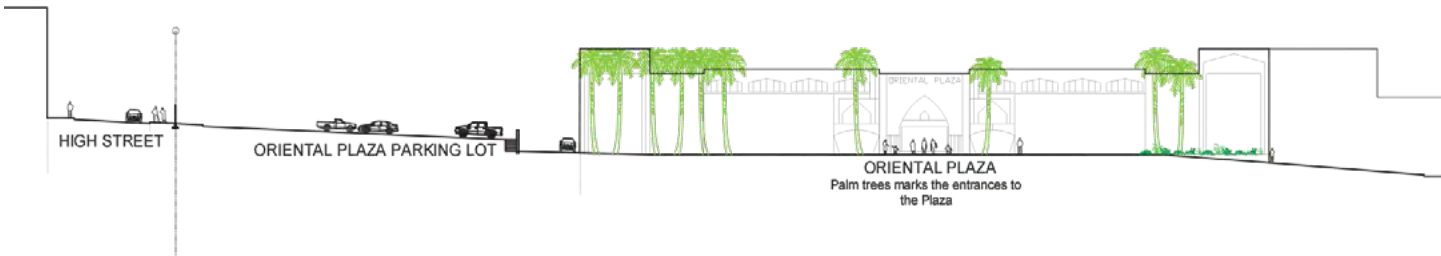


Fig 70 - Section through the Oriental Plaza (Forlee, 2020)

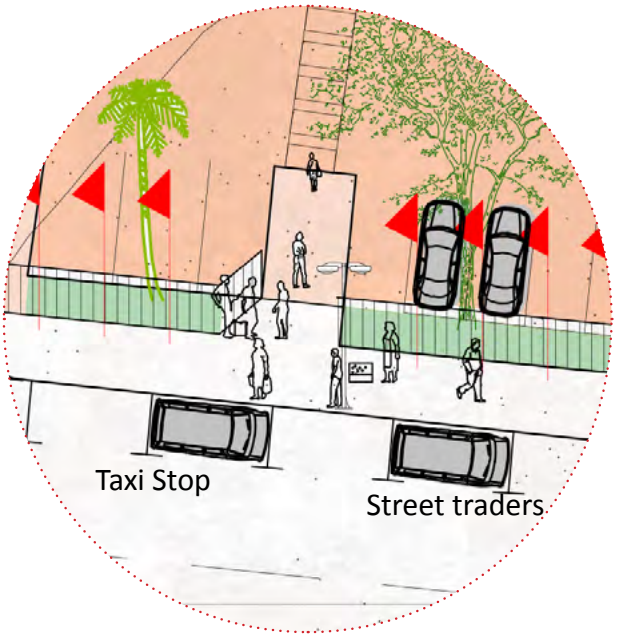
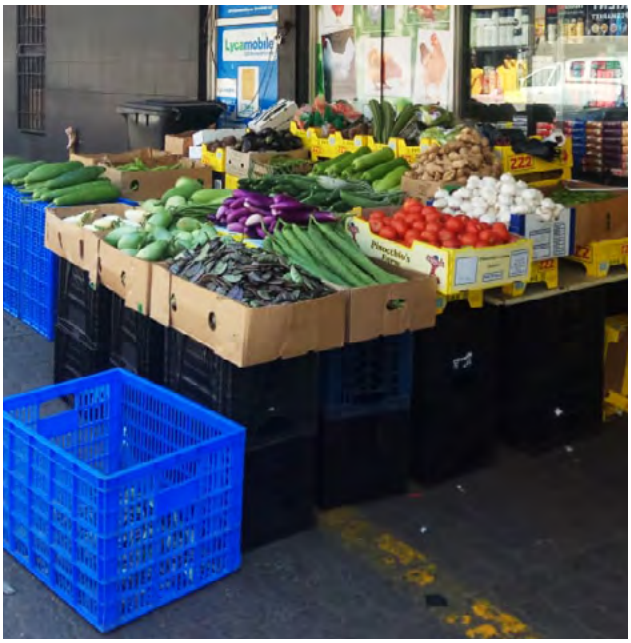


Fig 71 - Entrance activity at Oriental Plaza (Forlee, 2020)



It is common seeing many of the supermarkets displaying sell produce onto the streets instead of confining to their interior shop boundary.



Wide Pavings allows for comfortable pedestrian movement.

Fig 72 - Photographs of Fordsburg street (Forlee, 2020)



The area has many fruit and vegetable street hawkers, both fixed and mobile.

This section shows the height difference of the Oriental Plaza to its surrounding. The distance between the buildings created by the open parking lot also magnifies the Plazas importance and scale. It makes it seem more important to the rest of the context.

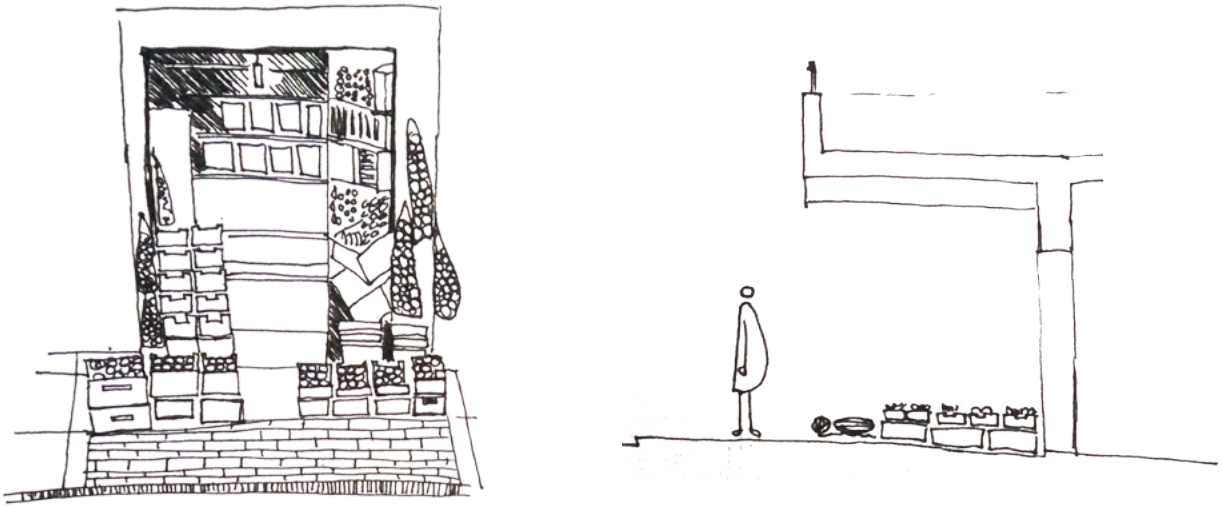




Fig 73 - Foods of Fordsburg (Forlee, 2020)



Fig 74- Restaurants prepare their food outside to attract tourists attention (Google Maps, n.d.)


Fig 75 - Sketch of front elevation looking into a Fordsburg supermarket (Forlee, 2020)

The produce that are sold are displayed outside and hung on the exterior walls to attract passing pedestrians.

FIELDWORK



Fordsburg market during weekday



Lunch at Solly's Fish and Chips



Fordsburg square on a Saturday evening







Fig 76 - Diagram of Fieldwork route taken, highlighting places, and spaces seen (Forlee, 2020)



The fieldwork journey allowed me to experience Fordsburg. It started at the North parking lot of the Oriental Plaza. This map identifies the walked route in red. Green highlighted areas are places I have explored. Some images are taken to give a sense of Fordsburg.

FORDSBURG RESTAURANT AND TAKEAWAY

COMPARING DOSA HUT AND SOLLY'S FISH AND CHIPS IN FORDSBURG

The 2 places that I had lunch at, Dosa Hut and Solly's Fish and Chips, are the 2 most popular eateries in Fordsburg.
I have sketched the plan layouts of the public areas to understand the sizes and how people use the spaces.

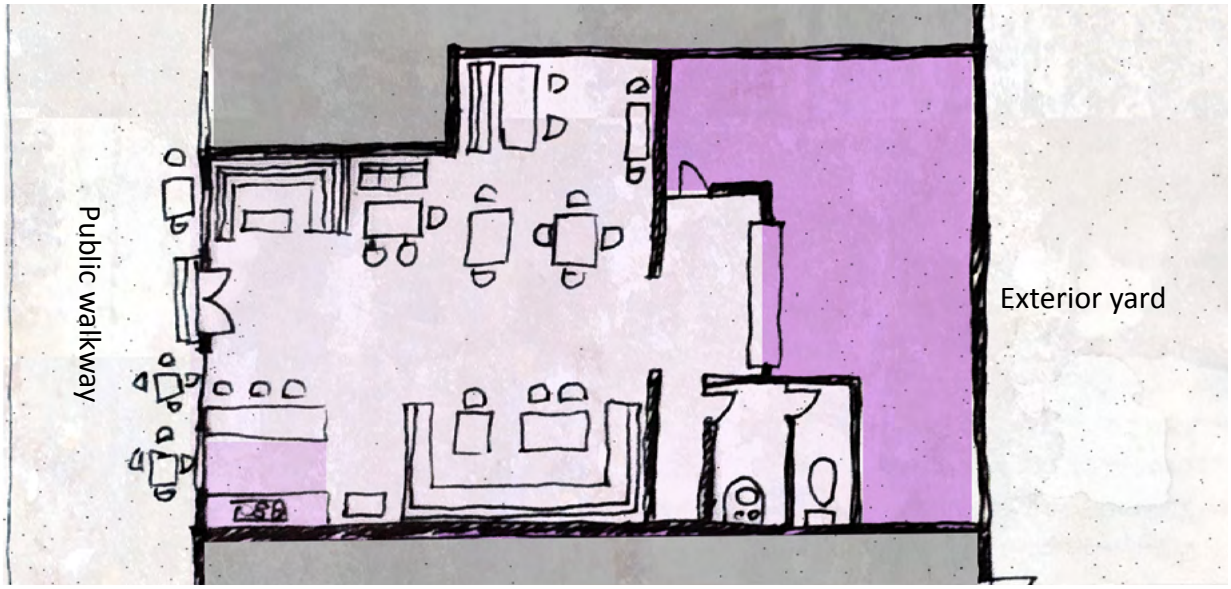


Fig 77a - Sketch plan layout of Dosa Hut (Forlee, 2020)

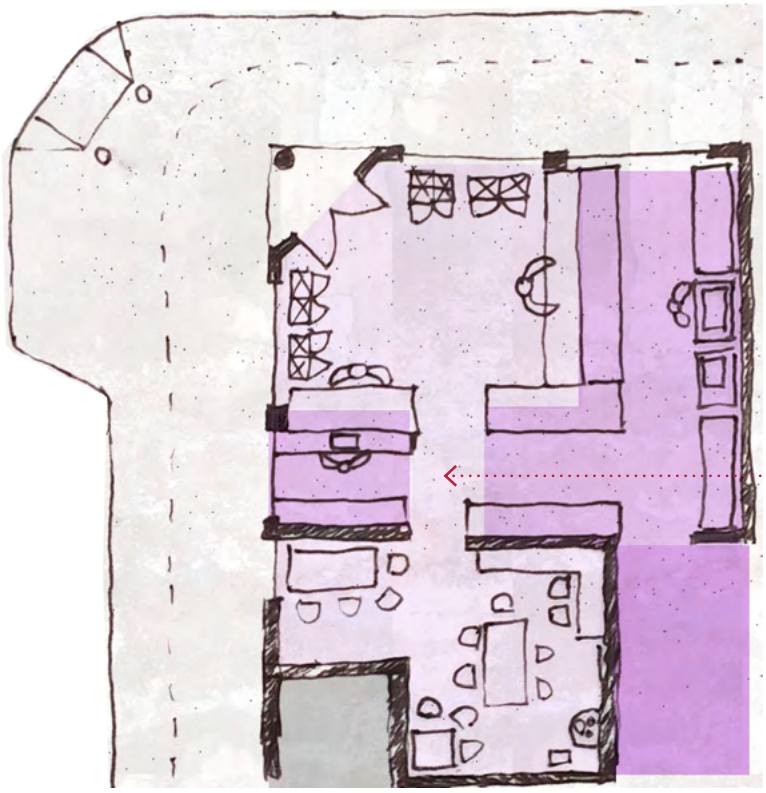


Fig 77b- Sketch plan layout of Solly's Fish and Chips (Forlee, 2020)

The space is small, a person will need to pass the counter (private area) to go to a room where they sit and eat their food.

Being in that space makes you feel like you are part of the family business and eating back of house away from customers.

Back of house

Public access seating area

0 5m



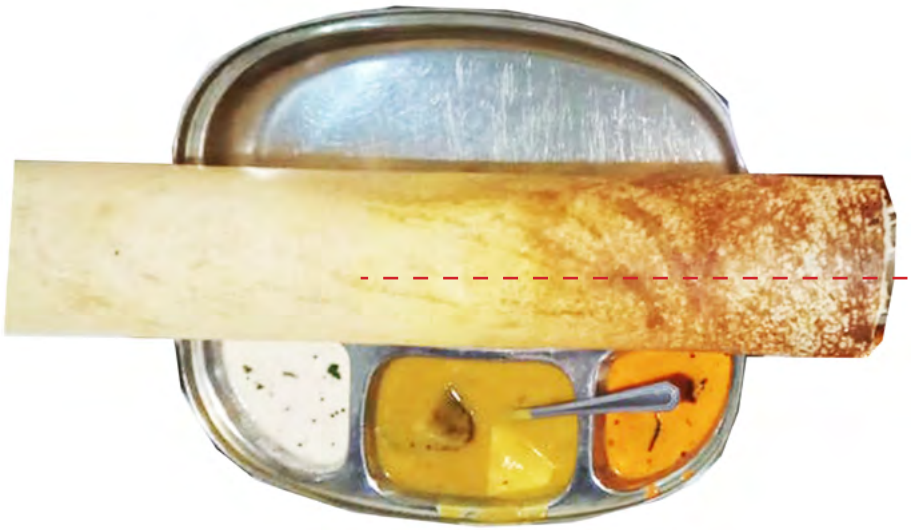
Fig 78 - Photographs inside Solly's fish and chips (Forlee, 2020)

At Solly's, walls are covered with photographs of people who have eaten at their takeaway. It gives a sense of identity and place. It keeps the history and memories of the place.

MEAL COMPARISON

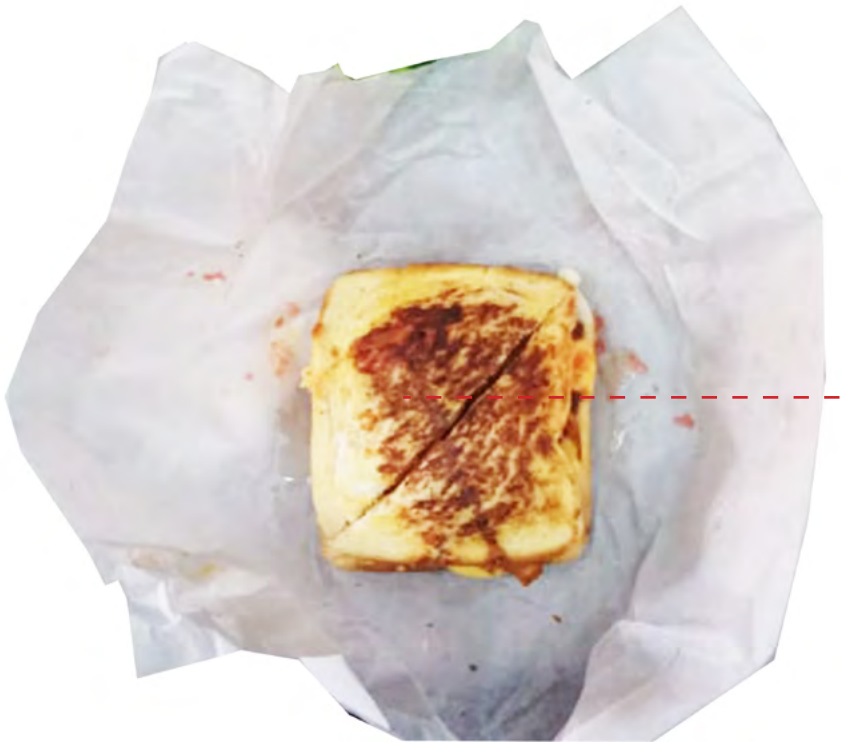
Below are details of the 2 meals I've ordered.

At Dosa Hut Restarant, an Indian/Pakistank Cuisine, I ordered the Masala Dosa which is a vegetarian dish. It costs R35 and had around 539 calories.



MASALA DOSA MEAL

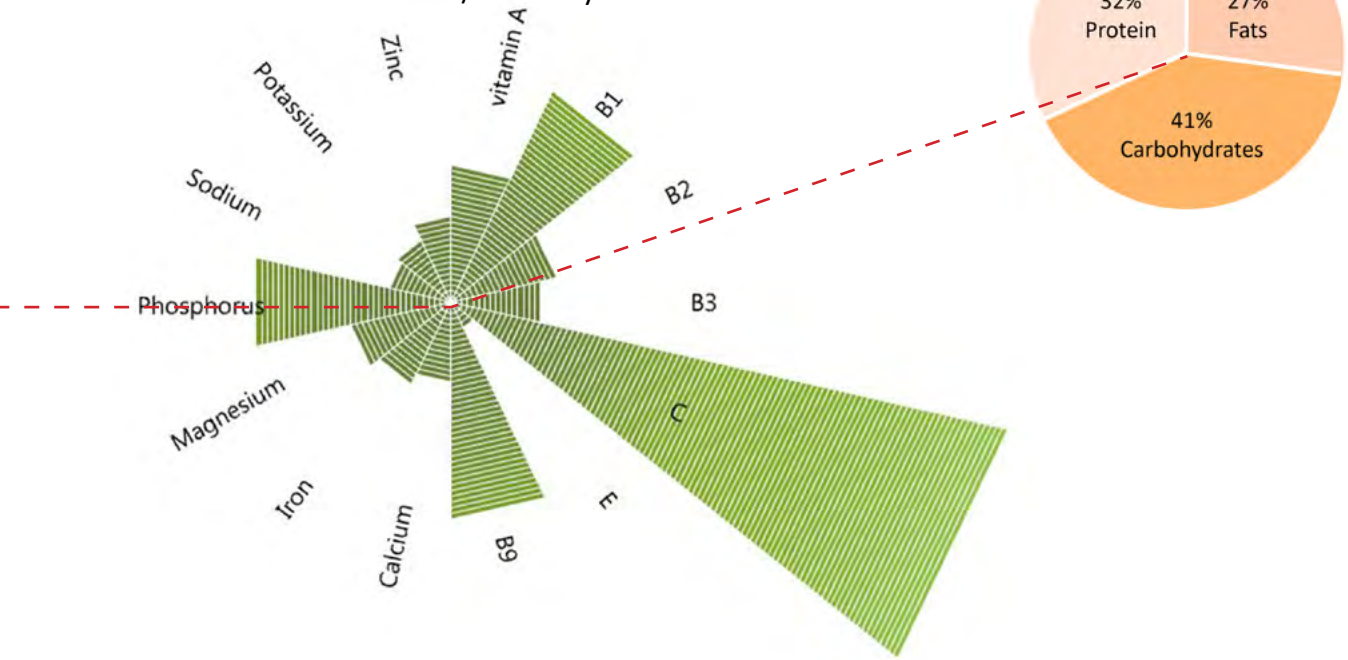
At Solly's Fish and Chips Fast food takeaway, I ordered a beef toasted sandwich at a price of R55. This contained around 850 calories around 311 more than the meal at Dosa Hut.



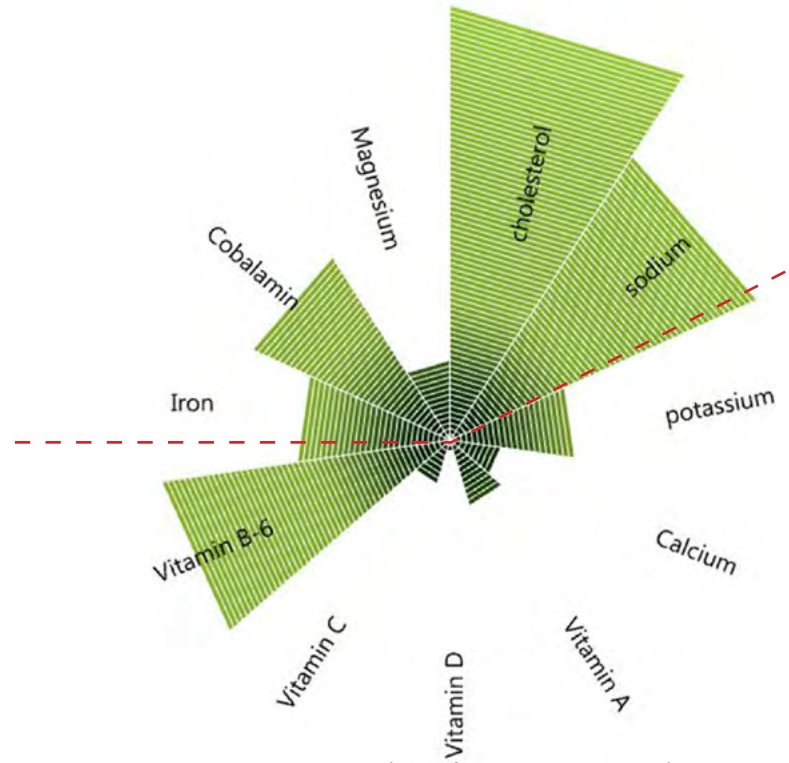
BEEF TOASTED SANDWICH

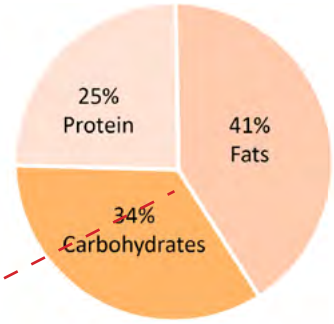
Fig 79 - Meal comparison (Forlee, 2020)

The nutritional values of each meal are based on the average calories you would generally find the meal and not the exact calories of the meals served at the restaurant/takeaway.



% Daily values in Dosa Hut's Masala Dosa (Dalal 2020)
% Daily values based on 2000 calorie diet





% Daily values in Solly's Beef Toasted Sandwich (My Fitneess Pal, n.d.)
% Daily values based on 2000 calorie diet

Fig 80 - Nutritional Values of meals comparison (Forlee, 2020)

MY EXPERIENCE

At Dosa Hut, I had ordered additional meals to share with the people I was having lunch with. The side drink is a cup of warm mocha. The variety of foods made the experience more intriguing.
A Solly's Meal is often accompanied with a soft drink. The portions were extremely large for me, and I had felt extremely stuffed and lazy after the meal.

FINDINGS

Comparing the 2, I found that the Dosa was cheaper, more nutritiously balanced and its portion is enough to feel satisfied for people who had a sedentary lifestyle. The price difference could potentially be due to the use of plant base proteins instead of from livestock such as beef.

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Throughout the analysis of Fordsburg and the site, the idea of diversity/mixed is shown throughout. It is represented in the people (immigrants, locals, different races, ages etc.), the food, and programs (restaurants, takeaways, supermarkets, spice shops). This diversity is also shown in its architecture where we see many different building styles and typologies, different colours, and different structural systems used. It enhances the idea of bringing in different plant-based foods with different nutrients.

This analysis allows me to identify some context-related issues which I would like my building to address. These include the imposing building footprint of the Oriental Plaza on the Fordsburg grid creating a broken city fabric and the lack of open, large recreational green spaces in and around the area.

CHAPTER 4
PROJECT BRIEF

This chapter gives the project overview, looking briefly at the purpose, clients, users, program, financial management, implementation strategies and concept design drivers.

PROJECT OVERVIEW

PROFESSIONAL TEAM

Funders
Clients
Johannesburg City Parks and Zoo Department
Department of Higher Education and Training
Johannesburg Development Agency
National Lotteries Commission

Client
Oriental Plaza Cooperation
Agricultural Research Council

Planning Team
Environmental Impact Consultant
Town planner

Design Team
Architect
Civil Engineer
Electrical Engineer
Mechanical engineer
Structural engineer
Fire engineer
Quantity Surveyor
Landscape Architect
Permaculture Specialist
Irrigation Specialists

Construction Team
Main Contractor
Sub-contractor
Local labour
Suppliers

The project overview looks at the professional team required to make the project possible and viable.

PURPOSE

Through statistics, it has been noted the increasing number of people who are undernourished in South Africa, which leads to many non-communicable diseases. The intention of my proposed project is to introduce a holistic and sustainable food system to the people of Johannesburg and to recreate the people's relationship with food to a more nutritious and sustainable one.

The project will be constructed on a portion of an under-utilized open parking lot of the Oriental Plaza in Fordsburg. The diverse immigrant community with its variety of food cuisines within Fordsburg can be used to influence and change trends in diet.

THE CLIENTS

The client of the project is the Oriental Plaza Cooperation and they will be in partnership with the Agricultural Research Council (ARC). The Oriental Plaza Cooperation are the owners of the land and will lease a portion of its land to the ARC through a contract agreement.

The Oriental Plaza can be seen as a shopping mall. It consists of 365 stores, mainly retail stores owned by immigrants mainly from the South Asian Continents. It attracts many outsiders and is seen as a tourist attraction. The plot provides a total of 2700 parking bays where the South Parking Lot often is left under-utilized. By densifying this site, it encourages more activities drawing more tourists to the site, benefiting the business in Oriental Plaza as well as in Fordsburg.

The ARC is mandated to do innovative and environmentally friendly research on commercial vegetables and indigenous leafy vegetables. Their aim is to enhance nutrition and food security, sustainability, wealth and provide job creation (ARC, 2016). The intention of the project is in line with their goals.

THE USERS

Different parts of the site will be used by different users. The Agricultural Research Centre, Agro-processing facility, and urban farms will be used by the ARC for conducting research. By locating such a facility close to where commercial activities happen, they can introduce new vegetables that are more nutritious and make them easily accessible to the public. The culinary school will consist of students of the school. Additional retail is provided for the constant incoming of new immigrants to Fordsburg.

The public park is mainly targeted at the residences of Fordsburg as there are no open green spaces provided in and around Fordsburg. It can benefit the children in the area.

The proposed building program consists of an Agricultural Research Centre, Agro-processing facility, Culinary School, restaurant/ takeaways, retail stores, urban farms, and an open Green Public park. The idea is that each program benefits each other creating a sustainable and supportive closed-looped system.

THE PROGRAM

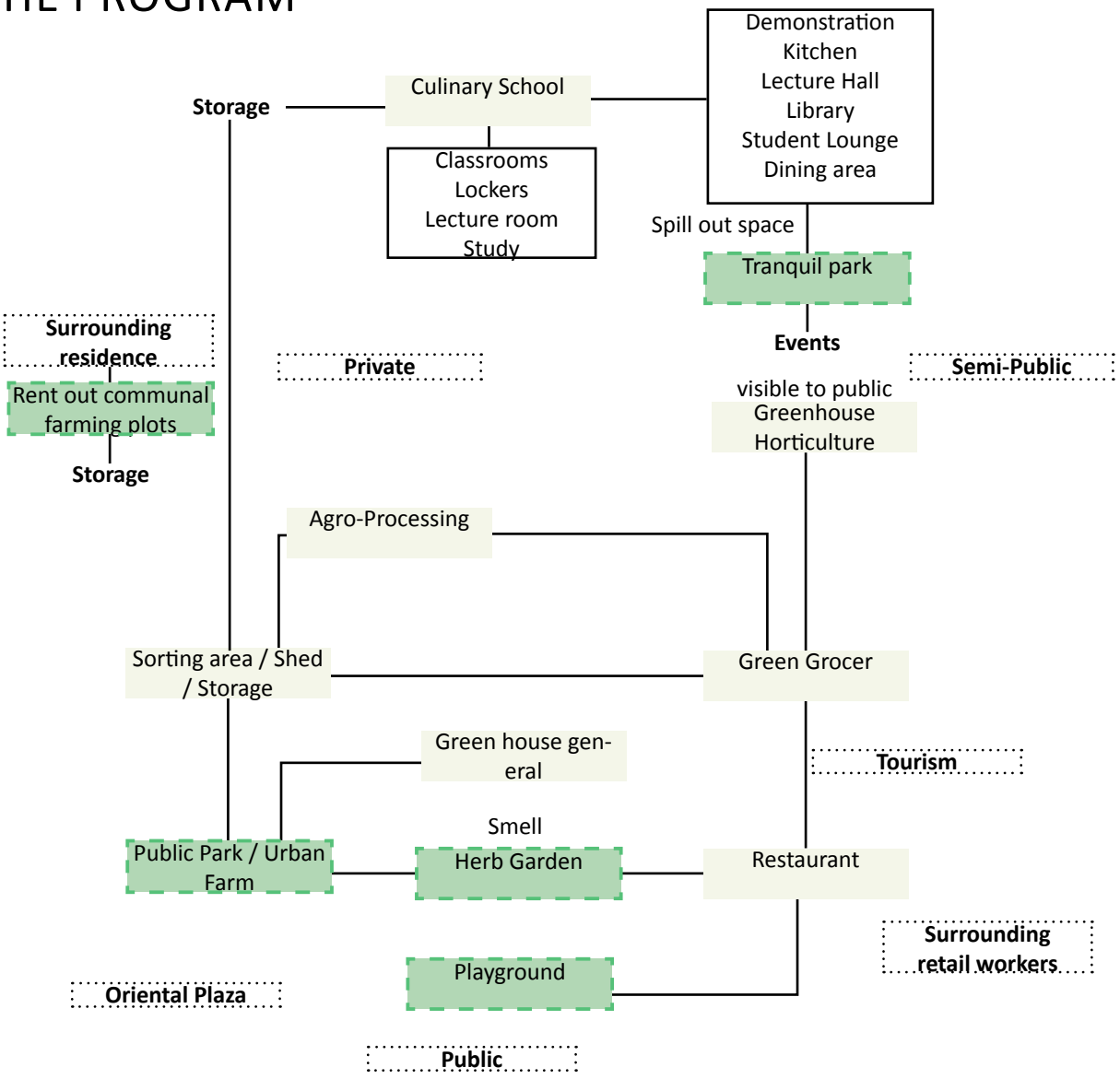


Fig 81 - Program relationship diagram (Forlee, 2020)

Program Tabulation		
Space	Area in msq GF	Total Areas
CULINARY SCHOOL		
Lobby/ Reception	100	
Demonstration Theatre/Lecture Hall	75	
Culinary Laboratories (Kitchens)		
Culinary Kitchen	80	
Pastry Kitchen	80	
Demonstration	120	
Lecture Classroom/Seminar Room (x2)	120	
Event hall	130	
Peer study room	20	
Offices x2	50	
Admin office	35	
Student Lounge	50	
Student Dining Hall	70	
Student Locker rooms	70	
Food Storage	120	
Cutlery and plates storage	150	
Housekeeping	80	
TOTAL CULINARY SCHOOL AREA	1350	**1350**
AGRICULTURAL RESEARCH CENTRE		
General Testing Lab (x3)	450	
Tissue Culture Lab	200	
Wet Lab	60	
Spectrum room Type 1	110	
Greenhouse large	900	
Lobby	150	
Reception Info centre	10	
Finance Office	20	
Admin	50	
Head Research Office	20	
Researchers (x7)	140	
Staff Kitchennette	20	
Staff Lunch room	60	
Data Analysis	50	
Semenar/meeting room	25	
Info packaging team	60	
Food Counciling and Advice office	50	
Marketing Team	80	
Testing Kitchen	70	
Staff Ablutions	20	
General Storage	50	
Equipment store	50	
Chemical Store	50	
Public Ablutions	30	
Student lounge / lunch room	150	
TOTAL AGRICULTURAL RESEARCH CENTF	2875	**2875**
SHARED EDUCATION FACILITIES		
Lecture Rooms (x3)	150	
Mini Auditorium	75	
Library/Resource Center	100	
Study rooms	30	
Multi purpose hall	150	
Storage	50	
TOTAL SHARED EDUCATIONAl FACILITIES	555	**555**
AGRO-PROCESSING		
Agro Process testing lab	60	
Agro process station	60	
Packaging station	60	
Kitchen	60	
Storage Dry	50	
Freezer/ Fridges	30	
TOTAL AGRO - PROCESSING AREA	**320**	**320**
Restaurant / takeaway	250	
Rent out retail	500	
TOTAL RENT OUT SPACE	**750**	**750**
RENT OUT OFFICE - NGO		
reception	25	
copy room	15	
office	75	
ceo office	30	
bathrooms	30	
storage files	35	
storage food	60	
Conference	30	
Small meeting	20	
Lunch room	40	
TOTAL Office area (x2)	**720**	**150**
Total BUILDING AREA	**6570**	**6000**
20%	1314	1200
TOTAL Building Area	**7884**	**7200**
Left over space for extieror activities		
Urban Farm, herb garden, compost station, potting shed		

Fig 82 - Program Tabulation (Forlee, 2020)

FINANCIAL MANAGEMENT

FUNDING

Funding will come from different sources; the client, Government institutes, and secondary funders.

CLIENT

The Oriental Plaza Corporation

The corporation will pay for the construction of the commercial component, culinary school, and alterations that will be done to the existing Oriental Plaza. They are the largest landowners in the area and will raise funds through business debenture fund-raising and participation (Mahomed, 2007).

Agricultural Research Council (ARC)

They will provide funding for the development of the Agricultural Research Centre. With the Council's existing network, they are able to provide the construction fees from multiple avenues.

GOVERNMENT

Johannesburg City Parks and Zoo Department

They will provide funding for the recreational park and public urban farm component of the project. They aim to develop open public spaces developing Johannesburg towards a liveable and sustainable future. Funding are provided for projects that (JCPZ, n.d.).

Department of Higher Education and Training (DHET)

The department will provide funding for portions of the culinary school component. Their mission is to improve quality of life in South Africa through training systems (DHET, n.d.). With people getting higher training and greater knowledge on food and nutrition, they are able to achieve this mission and assist the people around them through the knowledge they have gained.

Johannesburg Development Agency (JDA)

Interest in the development of the Fordsburg area was shown in 2003. They had agreed to contribute R300 000, however, without solid plans, the fund was not provided. With my proposal, their contribution may be made use of (Mahomed, 2007)

SECONDARY FUNDER

National Lotteries Commission

The National Lotteries Commission is open to funding educational institutions. The funding is received through application (NLC, n.d.).

IMPLEMENTATION STRATEGIES

CONTRACT TYPE

The building contract type will be a Traditional Design-led competitive tender where a complete design is proposed to the client with the help of different consultants; architect and other specialists. This method is suitable as an overall idea of what will be implemented on site is already determined.

The construction process will go through an open tender. This allows for a clear selection process that is unbiased and ensures the best selections are made for the project due to its competitive nature.

SITE MANAGEMENT

The site will be managed by the owner (Oriental Plaza Corporation) and their partnerships.

The **Oriental Plaza** will manage the new retail and restaurants.
The **ARC** will manage the Agricultural Research Centre, Farm Training Programmes, Agro-processing facility, urban food gardens, green house, and eco-tourism activities.
Johannesburg City Parks and Zoo Department will assist in maintaining the public park.
The **DHET** will manage the fees and maintenance of the Culinary School.
Some of the spaces in the culinary school, such as classrooms and auditoriums, can be used for the users of the Agricultural Research Centre. The usage of these spaces will be rented to them as a way of managing finances.

IMPACT

A skill development initiative will be authorized by the contractor. Immigrants around the area can apply and be recruited as an employee during the landscaping construction phases. Due to the nature of such construction, hired members can learn on site as they are constructing. There is potential for some of the members to be hired in future job opportunities by the contractors, or be offered a permanent job on site.

Free food baskets of the food produced on site will be given to the recruitments as an incentive for their involvement. This promotes a sense of ownership and a creation of an immigrant community.

CONSTRUCTION TEAM

The appointed contractor will manage and structure the construction team and make sure the process runs smoothly.
The building process will be implemented through phases to allow for a continuation of economic activities in hopes to reduce the temporal negative financial impacts it can have on the business owners in the Oriental Plaza and its surroundings. The urban scheme of the brief will be overlooked by the urban and town planner.

Phase 1: Oriental Plaza
The south block of the Oriental Plaza will be redeveloped; demolishing where needed, adding required plumbing, drainage, electrical connections etc.
Removal of existing asphalt of parking lot – soil testing and cleansing.
Implementation of water collection system.

Phase 2: South Portion of Site
Construction of the rent out retail and restaurant component as well as the culinary school.
Construction of Public Park
Landscaping of street thresholds.

Phase 3: Research and Landscaping
Construction of greenhouse and the Agricultural Research Centre.
Landscaping of the rest of the site.

DESIGN DRIVERS

CONCEPTS – DESIGN DRIVERS

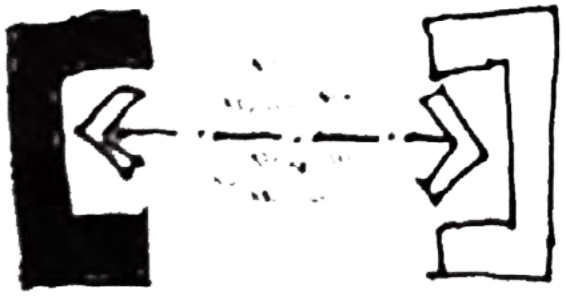
The project concept looks at the relationship between inside and outside and the relationship will be addressed throughout the different scales and forms. It also looks at context-issue driven ideas such as to restore the city fabric, creating public/green spaces, and linking the Oriental Plaza to Fordsburg.

The blurred relationship can be seen in Fordsburg activities in the streets, where products are displayed on the public sidewalks, outside from the formal shop boundaries.

It is exploring how one can bring the outside in and vice versa – making farming (which often happens outside) visible by presenting it in spaces people occupy daily, and showcasing the food production process, which is often done without the presence of the consumers. It is the relationship between built and landscape, private and public, on ground and above ground, and the hidden versus the exposed. These ideas are applied to the context, site, program, spaces, and details.

LANDSCAPE

The landscape will be the largest and most important component to the project as it is used to connect the Oriental Plaza to the new buildings and for farming. The landscape draws people onto the site.



CREATE PUBLIC/GREEN SPACES

These large open public green spaces allows the opportunity to attract different users and age groups to use the area.

Fig 83 - Concept sketches (Forlee, 2020)

THRESHOLDS

The undesirable parking lots will be turned into usable spaces for the people. These include large open green spaces to encourage children to play outside, garden spaces showcasing a variety of farming methods, and green spaces becoming thresholds between different spaces; the roads and the buildings, the Plaza and the gardens, and the ground and roofs. It also speaks of the linking of the Oriental Plaza to the rest of Fordsburg.



ENGAGING WITH THE SENSES

The food making process, from farm to table, is a process that engages with all our senses. Learning comes from making and engaging with the activity. The idea is to engage the senses through the design of different thresholds into different spaces. Each transition has its own variation, just like how there are a variety of different foods and cuisines.



CHAPTER 5
PRECEDENTS

In this section, I have looked at different precedents relating to landscape architecture and waste reuse systems. Islamic gardens are the choice of influence as Fordsburg can be seen as an Indian ethnic enclave. The landscaping looks into the idea of courtyard spaces, senses, and how it operates with restaurants.

The Oriental Plaza has a large building footprint which allows the opportunity to use the roof for rainwater collection. This decision allows incorporating alternative renewable energy systems into the building, which assists in operation costs and creates a lower carbon footprint on the environment.

LANDSCAPE ARCHITECTURE

ISLAMIC GARDENS

The exterior landscaping component of my project will draw on Islamic gardens as a layout, organisation, and spacial experience driver.

Islamic gardens are seen as an element of Creation (Ecomena, 2018).

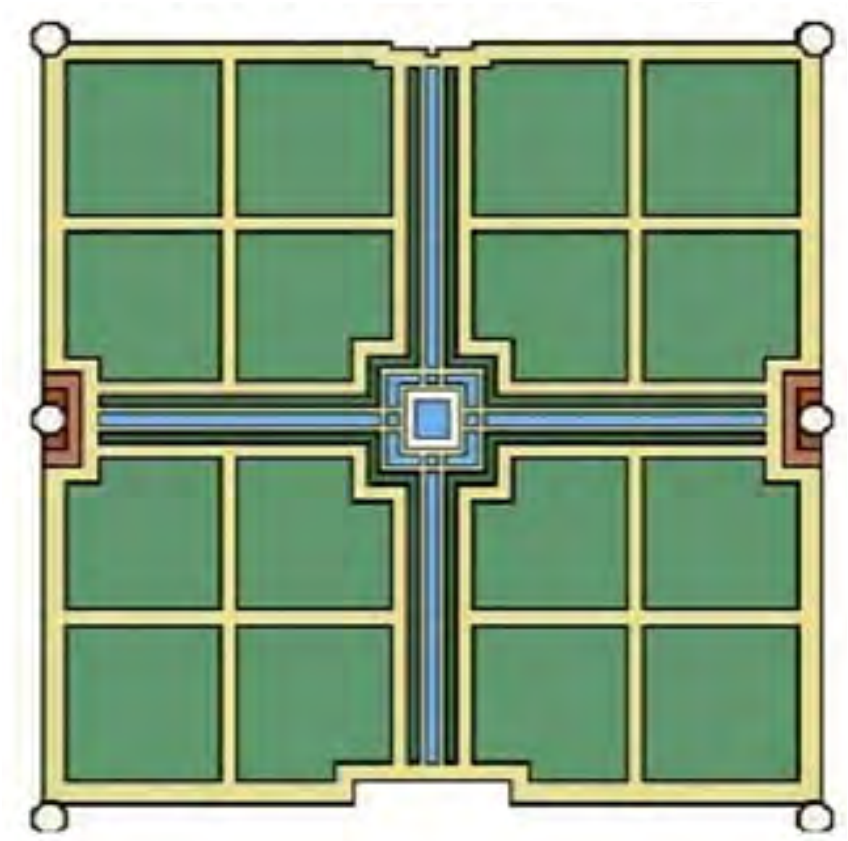


Fig 84 - Plan layout diagram of the Mumayun Tomb Paradise Gardens in Delhi, 16th century (Faraz, 2011).

beauty
mathematics
architecture
spirituality
poetry
botanic
sensibility
hydraulics
biodiversity

Life

ISLAMIC GARDENS represents

Spirits of Death

contemplation
peace
gratitude
sensuality
eternal rest



Fig 85 - Photograph of the Mumayun tomb paradise garden in Dehli, an example of the Charbagh layout built in the 16th century (My lovely India, 2012)

4 ELEMENTS which makes up an Islamic Garden

Charbagh layout

The Charbagh layout is defined as a 'garden divided into quadrants by water channels (rills) echoing the Quran, which describes paradise as a garden flowing with water, milk and wine' (Sillver, 2019).

Water

Water are featured in rock channels (rills) allowing the water to flow.
The role of water are:
- To separate the spaces of the garden
- Irrigating plants
- Create luminosity, reflecting its surroundings
- Creating pleasing sounds, and reducing noise
- Microclimate control

Scent

The sensory experience is amplified through plantations such as orange trees, herbs, and roses.

Enclosure

Enclosure of the Islamic gardens represents a safe, spiritual space away from everyday life pressures. A space for peace and relaxation, a sensory environment that allows for contemplation. This enclosure can be formed through walls, screens, or hedges (Sillver, 2019).

CAMBRIDGE CENTRAL MOSQUE

Date Completed: 2019
Architect: Marks Barfield Architects
Location: Residential area in Cambridge, UK
Client: The Cambridge Mosque Trust

The Mosque has a public restaurant component not just for Muslims.

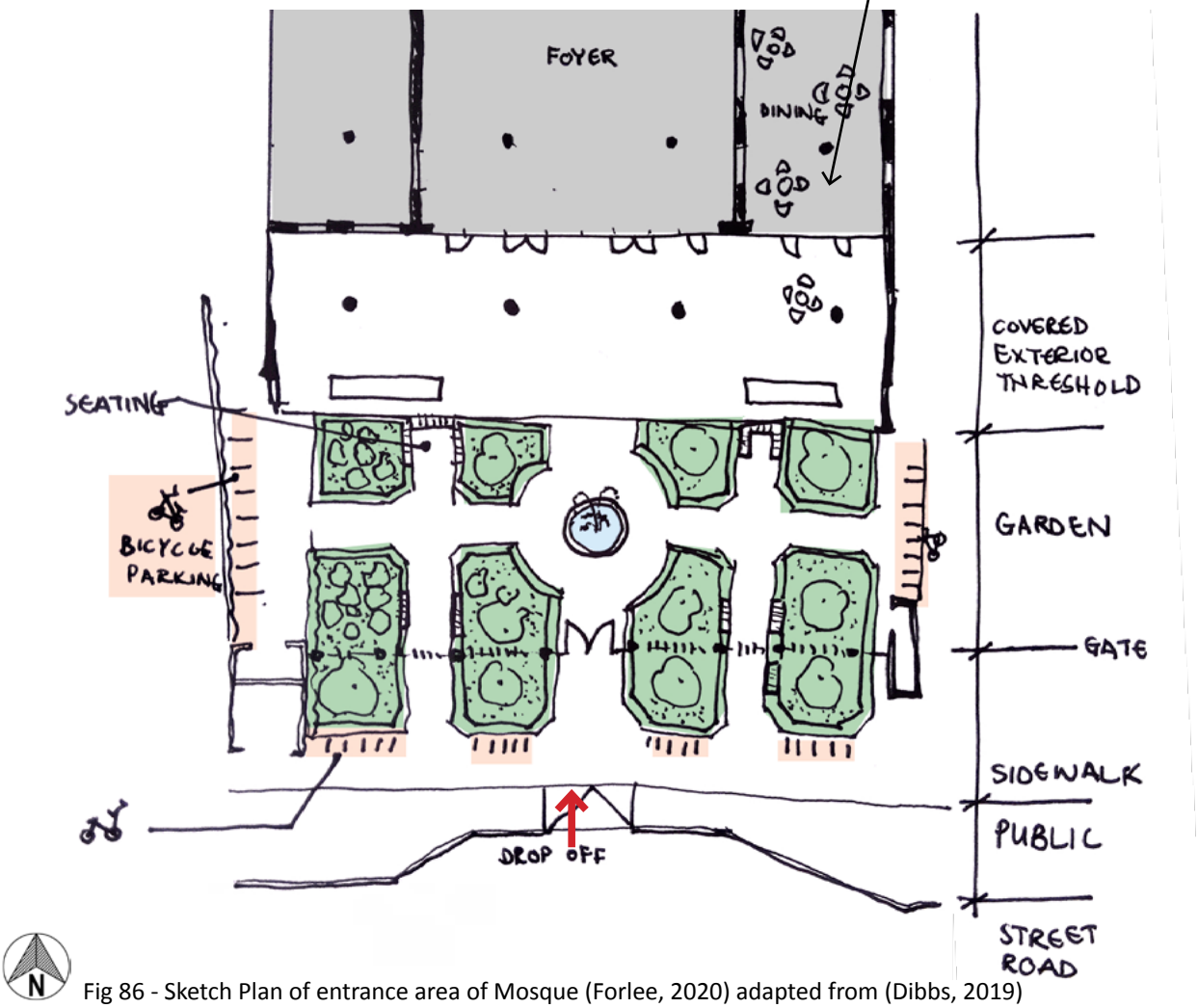


Fig 86 - Sketch Plan of entrance area of Mosque (Forlee, 2020) adapted from (Dibbs, 2019)



Fig 87 - View from entrance gate towards building (Dibbs, 2019).



Fig 88 - showing the interior dining / restaurant space (Dibbs, 2019).

What is interesting about this project is its threshold into the building, the tectonics, and how it adapts itself into the more contemporary time.

LANDSCAPING

The landscape garden design is a combination of traditional Islamic garden layout and the British planting palette. The central fountain allows for an experiential transition into the building, muffling the exterior noise. Pathways into the garden allow for children to choose where they want to roam. Seating spaces are provided all over the garden allowing for socialization and pause areas in the serene garden.

TECTONICS

The building explores new methods of construction through technology. Fabricated timber tree-like columns support the roof. The structure merges with the garden and creates serene interior spaces. (Dibbs, 2019).



Fig 89 - Aerial view of Babylonstoren (Babylonstoren, 2019)

BABYLONSTOREN

Location: Western Cape, South Africa
Area: 90 000msq

Babylonstoren is a farm established back in 1692. It is a working farm with well-preserved historical Cape Dutch style buildings from the 17th century (Babylonstoren, 2020).

PROGRAMS

The programs on Babylonstoren includes a hotel, restaurant, spa, gardens, tea, wine, and oil farm. They also offer tours and workshops on herbs and cooking. It can also be rented for special functions.

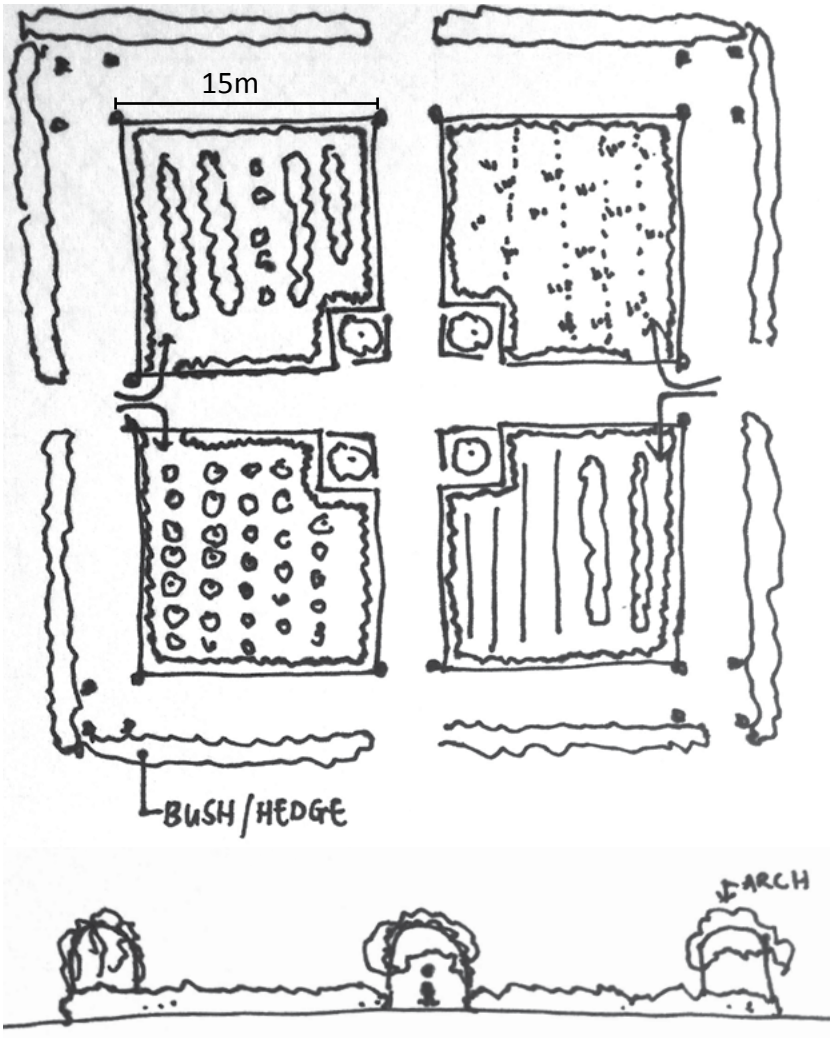


Fig 90 - Sketch plan and section of a portion of the garden (Forlee, 2020)



Fig 91 - Plan of Babylonstoren showing layout and placements of the different crops (Babylonstoren, 2020)

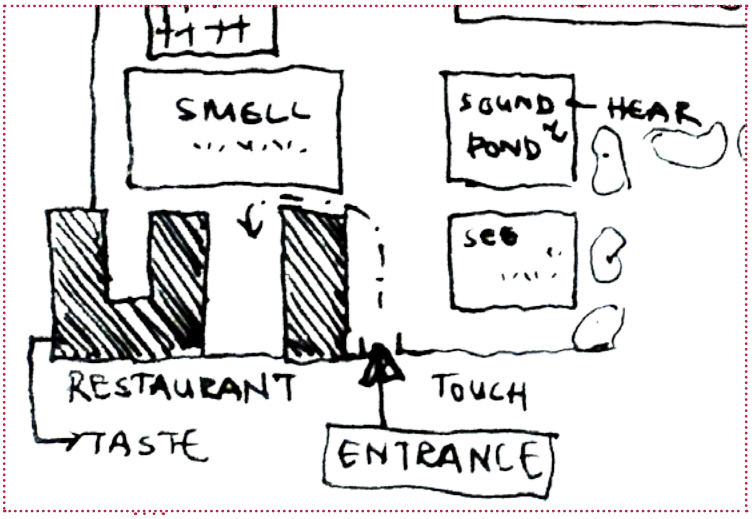


Fig 92 - Sketch plan of different zones in garden (Forlee, 2020)

GARDENS

The garden has 300 different plants ranging from orchards to vegetables, and medical herbs. Chickens, ducks, bees, and insects are also found on the farm. Each of the plants is sectioned into different courtyards, each around 15 x 15m in dimension. The courtyard walls are made of low shrubs, high hedges, vines, flower bushes, or rows of trees. These variations of courtyard content and walls give each space its own unique spatial experience.

ENGAGING WITH THE SENSES

As people enter the farm, their senses are engaged from the way they layout the spaces. Soothing water sounds from the pond, smells from the scented garden, and visual pleasure can be experienced as they walk towards the restaurant where they engage their sense of taste. It immediately welcomes the visitor.

HOLISTIC SYSTEM

The 2 restaurants on-site get all their ingredients from the garden and farms. It operates without externally supplied ingredients. This is what I intend to aim for in my project.

WASTE REUSE SYSTEMS

I've decided to incorporate systems that are sustainable and healthy for the land. Systems include rainwater harvesting and organic waste reuse.

The difficulties of waste management are in the quantities that need to be dealt with (Lyle, 1994). Water waste and organic waste are the 2 natural waste I will be focusing on as these types are produced daily by humans in all situations.

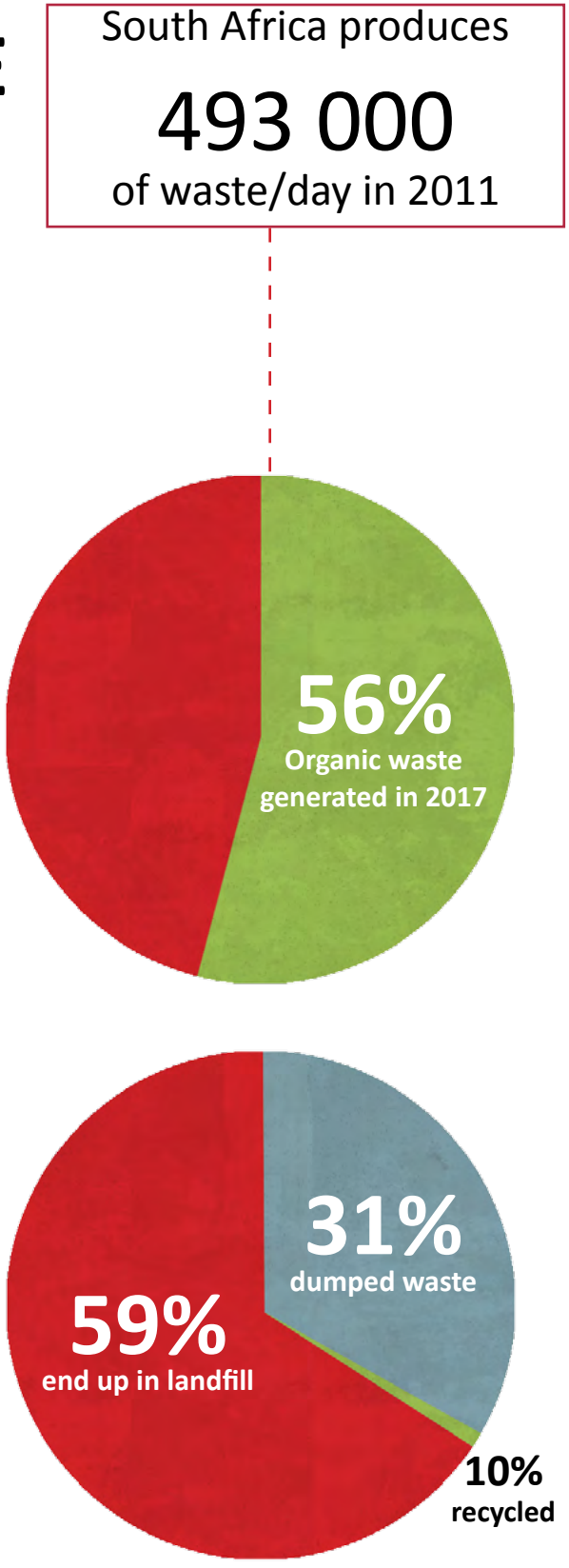


Fig 93 - Waste statistics in South Africa (Department of Environmental Affairs, 2018)

WATER SYSTEMS

Different water sources can be used effectively for different purposes.
Different water sources for different water uses (Ramachandran, 2017).
- Municipal water can be used for cooking and drinking.
- Rainwater can be collected, filtered, and used for cleaning.
- Grey water can be used for gardening and toilet flushing.
By incorporating these different water sources into the project, the demand for municipal water usage decreases, making it cheaper and more sustainable.

RAINWATER FILTRATION SYSTEM

Natural water filtering soak pits can be created using rocks, gravel, rubble, and sand. The materials are placed in a container, with the layers divided by HDPE nets or any fabric. Rain water runs through the layers, and gets filtered as it flows. The water is then pumped up for use (Ramachandran, 2017).
Rainwater harvesting on site
The Oriental Plaza covers a large area of land. Its roof can be used to collect rainwater for it to be used for crop irrigation.

Water Harvesting Calculations:
Rainwater Harvesting Potential (L) = Annual Rainfall (mm) X Roof Area (m^2) X Runoff Coefficient (0.9)
Average Annual Rainfall in Johannesburg: 713mm (Weather Atlas, 2020)
RHP = 713mm x A x 0.9

Oriental Plaza:
Roof Area: 29 565m^2
RHP = 713 x 29565 x 0.9
= 18 971 860.5 L of rainwater can be harvested

ORGANIC WASTE REUSE

Organic waste that I refer to is feacal/sewage, leaves and branches, and food waste.

COMPOSTING

Composting is a strategy of combining decay-able organic matters in a nutrient-rich fertilizer and letting it break down naturally to create compost (Hunt, 2019). This waste is placed in a container that heats up to kill insect larvae and weed seeds. Since different materials decompose at different rates, usable compost usually takes around 3 weeks to 2 months before it can be used (Lyle, 1994).

Not all natural waste is suitable for compost. Acceptable waste includes food offcuts, rotten food, leaves and branches, and human and animal waste (Lyle, 1994).

Compost is used for mainly farming and gardening. It gives back to our environment by providing nutrients to the soil. These nutrients allow plants to grow better. Taking the compost and adding greywater creates a watery mixture as fertilizers for farming.



Fig 94 - Natural composting (Lyle, 1994)

Vermiculture or worm composting is a composting method that can produce compost using worms to recycle some organic waste (Fong & Hewitt, 1996).

The worms eat the organic waste which becomes compost as it passes through the worm's body, exiting through the tail end as compost. The worms are eating nutrient-rich scraps therefore can produce high-quality compost. Foods suitable for worms to eat are fruit and vegetable scraps, crushed eggshells, and tea or coffee bags. Cooked foods, meat, milk, oranges should be avoided as these foods may be too oily, or acidic for worm consumption.
Worms are placed in containers with the waste in liveable; darkness, ventilation, moisture, and warm temperatures. Newspaper strips and leaves can be used to hold moisture and air for the worms.

BIOGAS

Biogas is a form of gas that can be used for cooking, fireplace lighting, to generate electricity, and fuel motor vehicles. It is a natural fuel with low impact on the environment.
Biogas digesters come in different forms and the one I have researched into is the fixed dome digester. Biogas can be made using organic waste, human and animal soil waste, water or urine. This is placed and mixed in the mixing pit. The slurry mixture creates biogas composed of methane and carbon dioxide gases which are trapped for use (Fagerstrom et al., 2018). Solid residue makes its way to the displacement tank and can be used as compost for farming.

Biogas is widely used in Uganda. From surveying the people who use biogas in Uganda, 40kg of inlet waste is required to produce around 5 hours of gas per day per household. These people own cattle and use the cattle dung as fuel. The people with more cattle produced more fuel and were able to sustain themselves by only using biogas fuel (Ainomugisha, 2017).

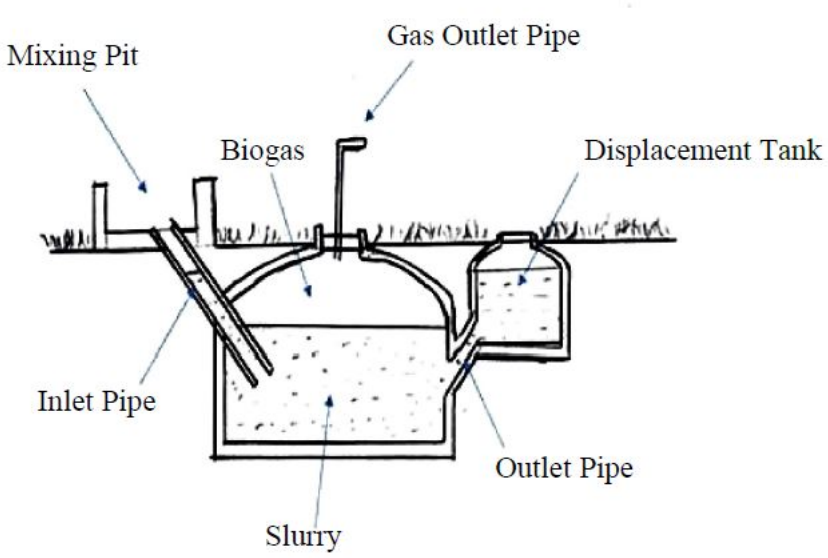


Fig 95 - Fixed Dome Biogas Digester (Ainomugisha, 2017)

CHAPTER 6
DESIGN DEVELOPMENT

This chapter is a walk-though my design progression and thoughts. This is demonstrated though various explorations.

- Design Development thought process
- Charrette

Note: all sketches made in this chapter are created by the author (Forlee, 2020) unless stated otherwise.

DESIGN DEVELOPMENT THOUGHT PROCESS

UNDERSTANDING CONTEXT AND SITE

The first step is to understand the site regarding public edges, sound, the site topography, and the surrounding activities. This will help me to layout the building in a way that relates to its surroundings.

The sketches on this page are a quick analysis of the site.

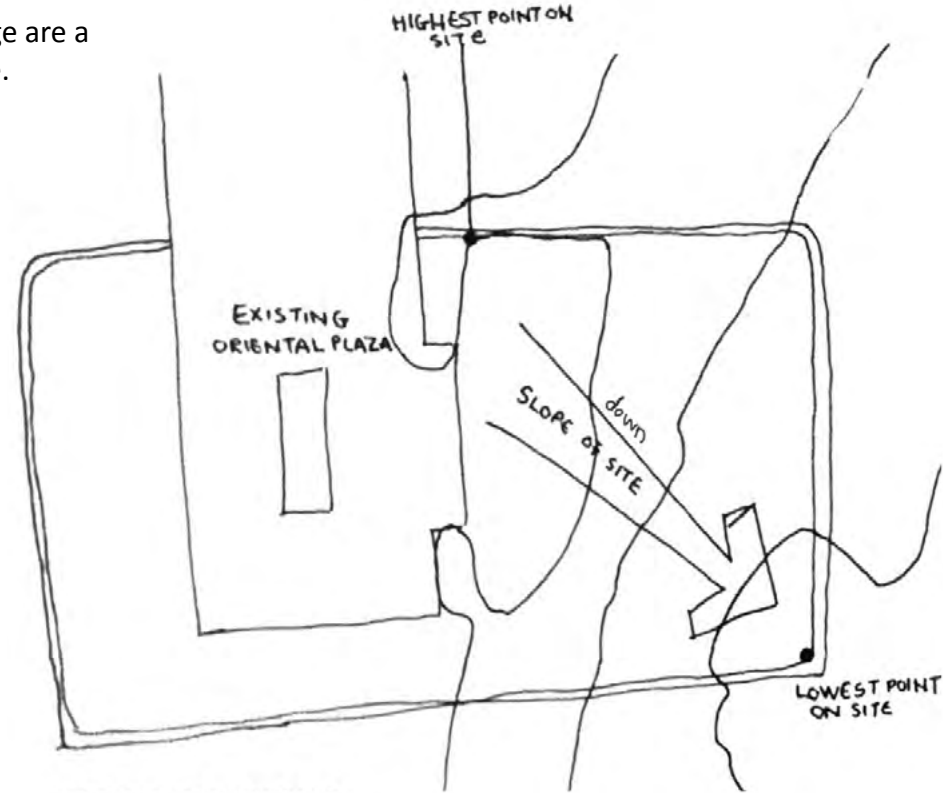
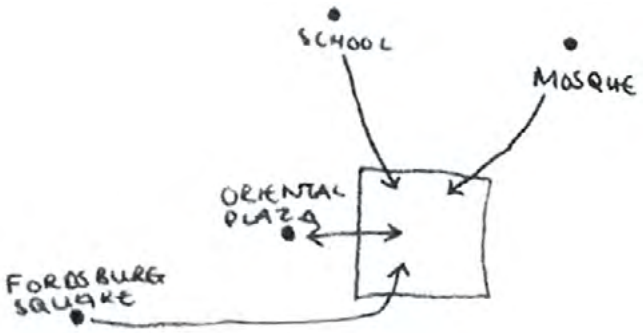
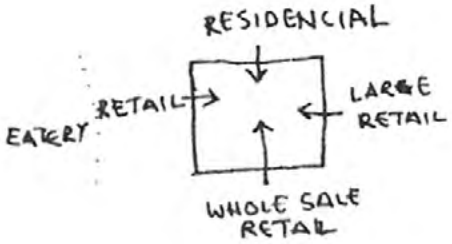


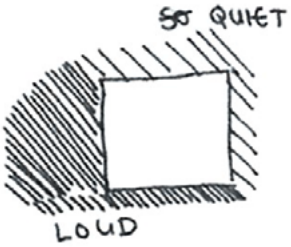
Fig 100a - Site analysis sketches (Forlee, 2020)



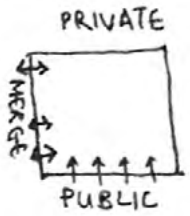
SURROUNDING SITE INFLUENCES



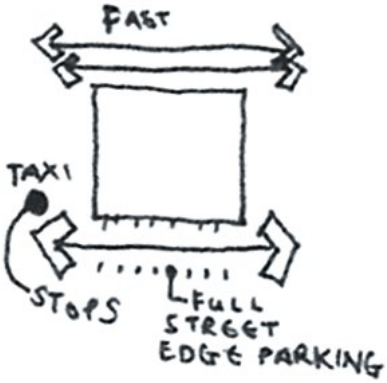
SURROUNDING ZONING

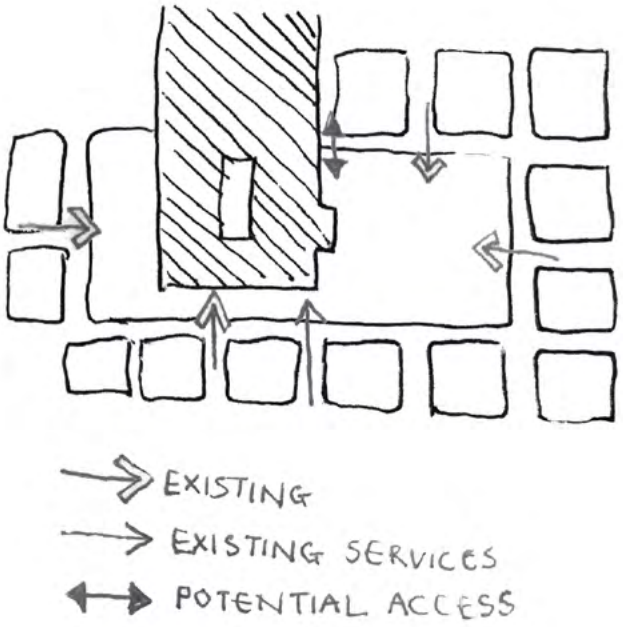


SOUND



SURROUNDING SITE INFLUENCES

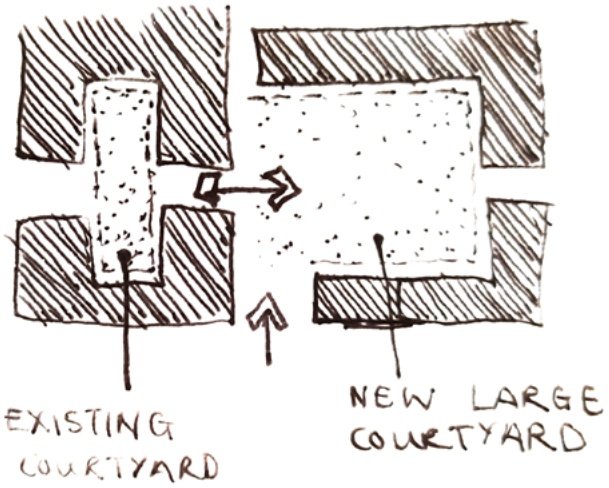




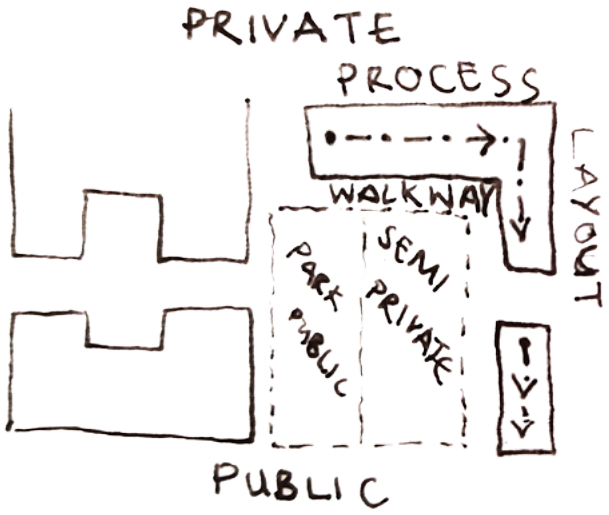
VEHCULAR ANALYSIS

Fig 100b - Site analysis sketches (Forlee, 2020)

INITIAL PLAN LAYOUT SKETCH



What I want to create is a building that related directly to the Oriental Plaza. My first idea was for my building to not overpower the Plaza, but rather be seen as an extension to the Plaza. The Plaza makes use of a central courtyard space, which I thought of taking inspiration from.



Initially, no alterations were made to the Oriental Plaza. The new buildings are arranged along the edge of the site, creating a large courtyard space in the centre.

The buildings are arranged in a way so that it follows the food making process; starting with the farms and ending with food consumption.



Fig 101a - Design development sketches (Forlee, 2020)

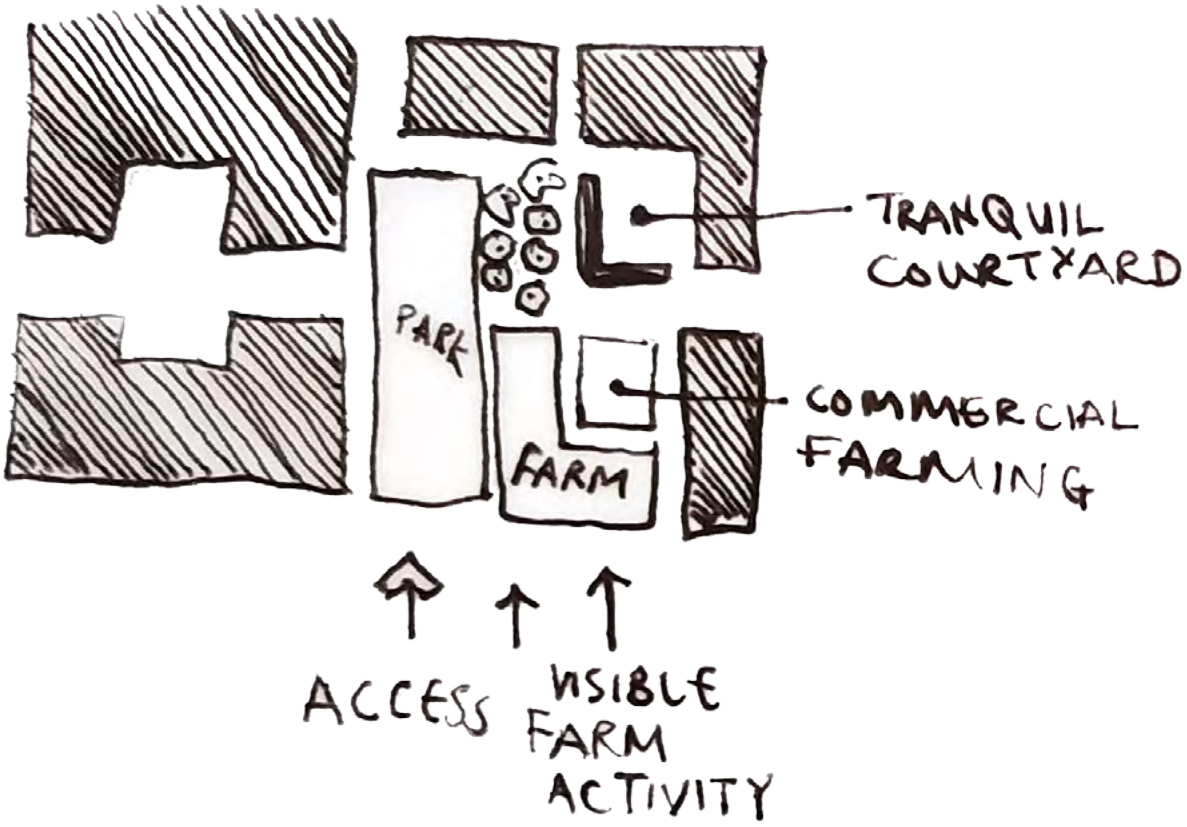


Fig 101b - Design development sketches (Forlee, 2020)

Through analysing existing courtyard landscapes and existing urban farms and food gardens, I have located different landscaping activities in the large courtyard. It related to how I imagine the public interact with the spaces. I wanted to make the farming activity visible to the public, so I've located it on the more active street edge (Albertina Sisulu Road). This edge also welcomes people into a public green park, a threshold between the existing Plaza and the new buildings.

An enclosed courtyard creates a more private exterior space for the private users of the new building. It is used for farming learning purposes or school student gathering space.

PLAN LAYOUT REVISION 1

Through the research I have done on Fordsburg, I had identified that the Oriental Plaza was interrupting the Fordsburg grid and grain, however, I decided to not alter anything regarding the Plaza for the 1st plan design. It made the new building seem separate and not integrated with the Plaza or the context.

The 2nd revision plan is to break up the site through defined roads that link to the existing and breaking up the Oriental Plaza for the grids of Fordsburg to be visible. This creates four separate spaces on the site, which allows for perhaps a more defined program separation. Each quad will have its function in the food making process.

The buildings are still placed on the edges, relating to the Fordsburg grain and allowing a spacious open courtyard feeling, similar to that seen in Islamic courtyard landscapes.

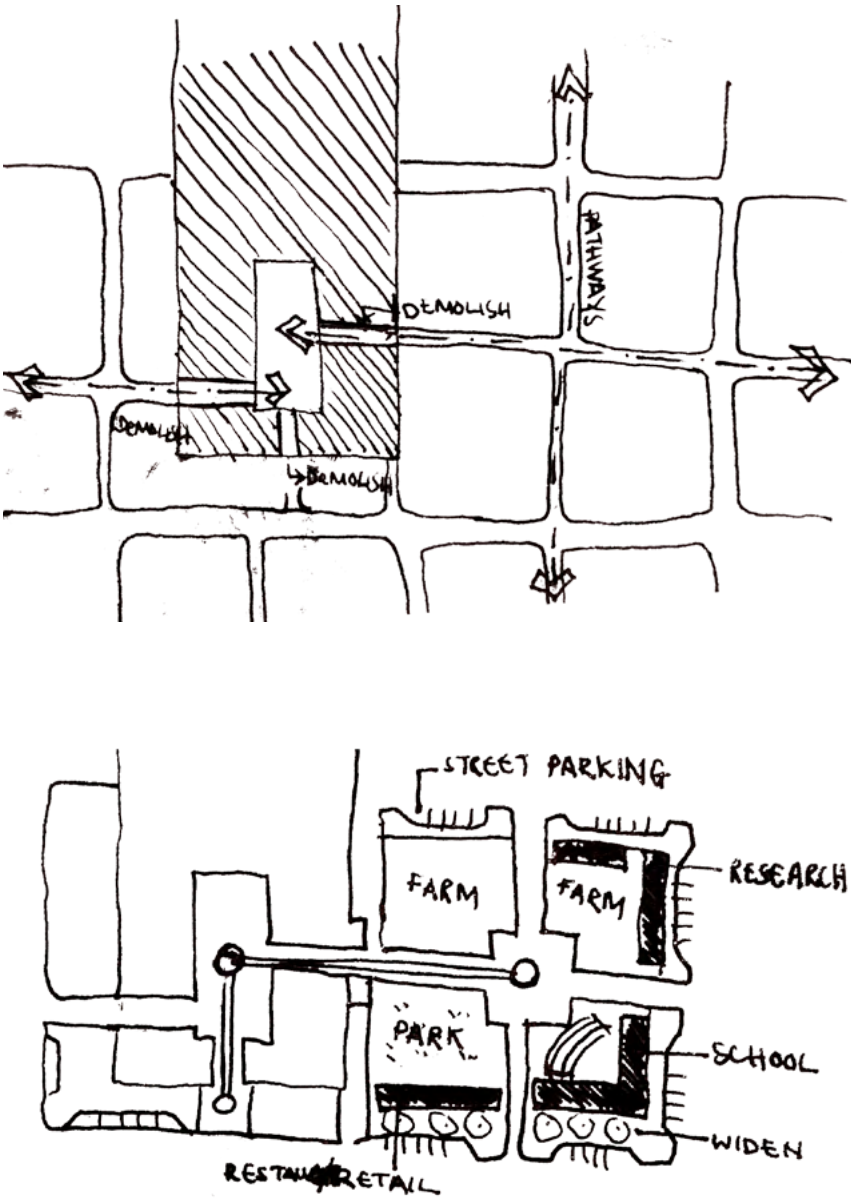
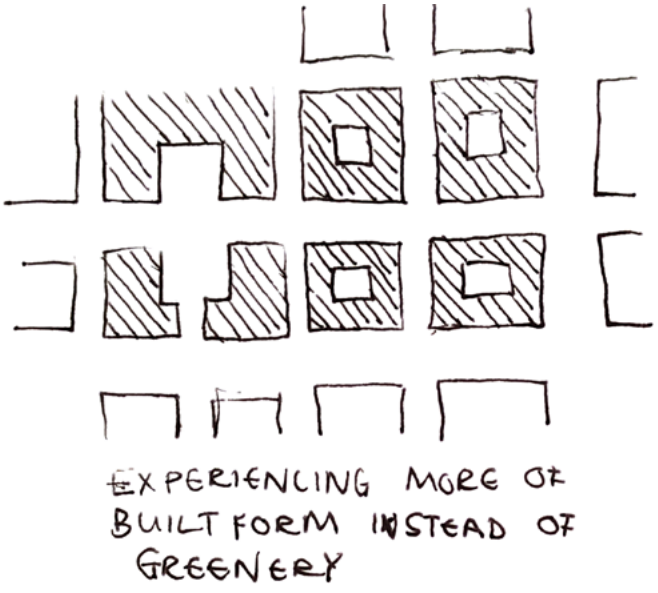


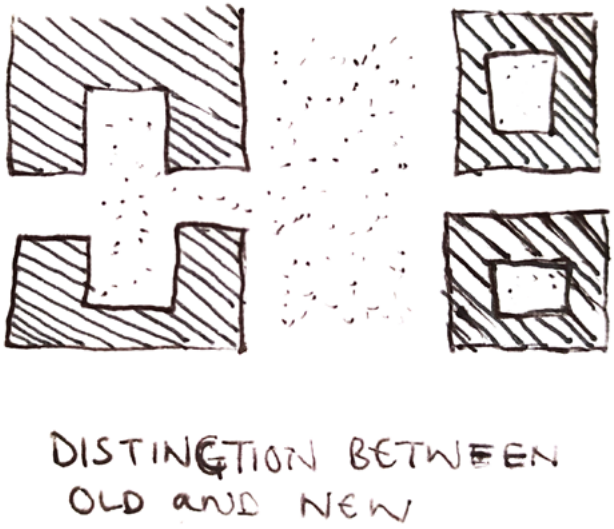
Fig 101c - Design development sketches (Forlee, 2020)

PLAN LAYOUT REVISION 2



The last revision plan resulted in a spacious exterior space with too few interior spaces to occupy all the programs I plan to add logically. I have decided to create smaller courtyards that would relate to one another.

I still wanted to keep the idea of connecting the existing and new building with landscaping. The in-between spaces is used for farming.



I have decided to add a green spine as a threshold transition between the building and the public road. These are public recreational spaces with large open parks and green gardens.

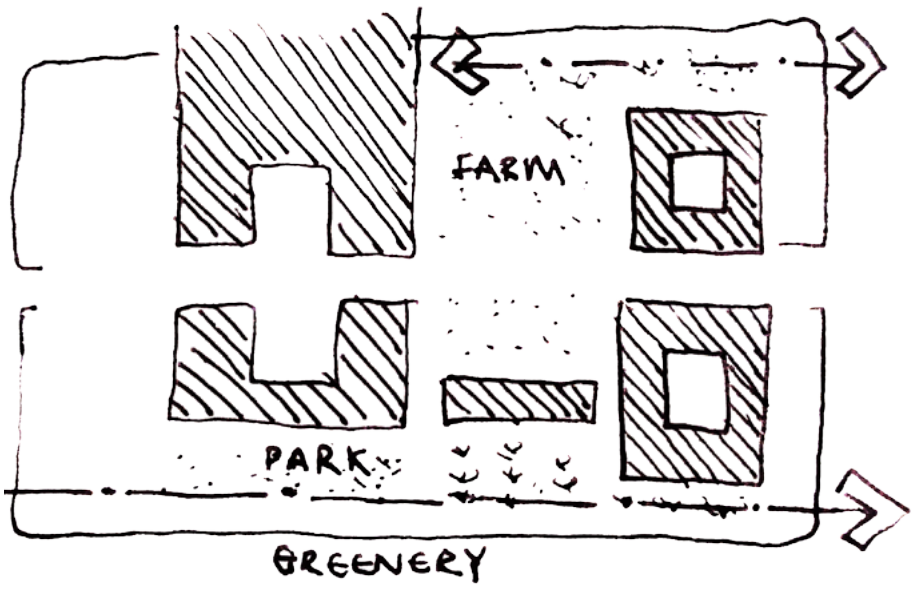
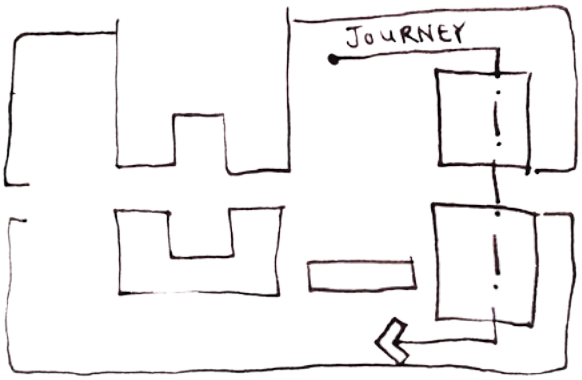


Fig 101d - Design development sketches (Forlee, 2020)

PROGRAM LAYOUT

The food processing journey is shown in this section. It starts with the Agriculture research centre, where new foods are given to the culinary school and chefs to experiment with new recipes. It is then introduced to the public through restaurants, takeaways or events. The public is then aware of these foods creating a demand for the product. The seeds are distributed to the surrounding urban farms to introduce them to different areas.



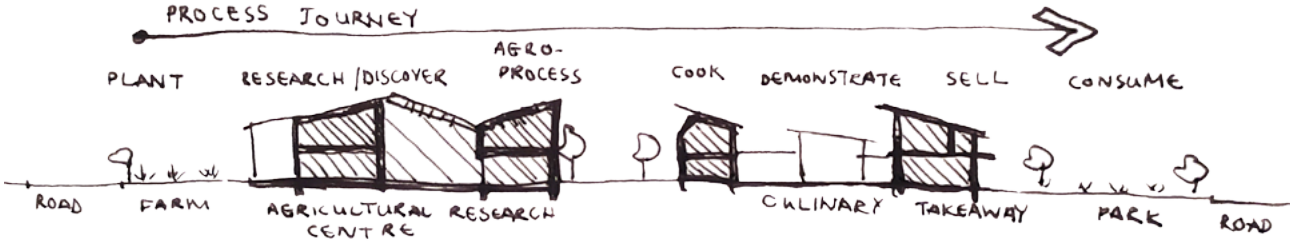
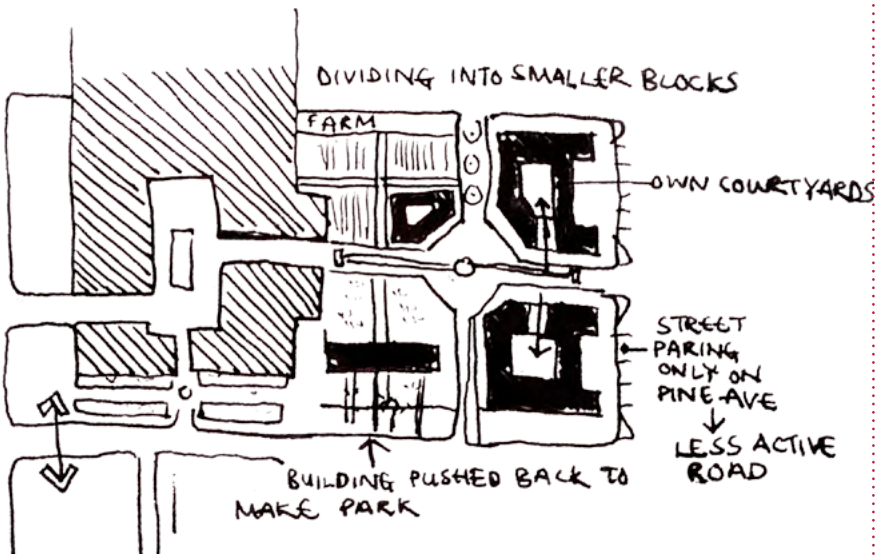


Fig 101e - Design development sketches (Forlee, 2020)

PLAN LAYOUT REFINING

From analysing existing urban farms, courtyard case studies, and urban public spaces, I have started playing around with the plan form and the location of different landscaping and different courtyard spaces.



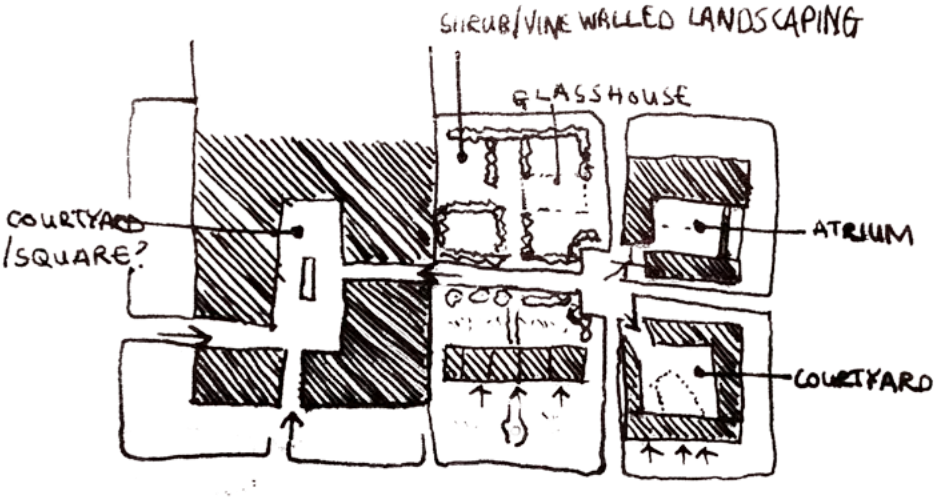
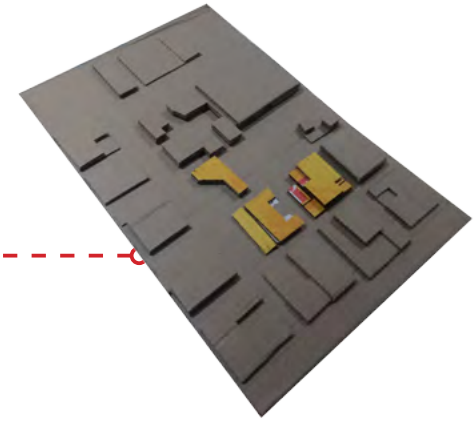


Fig 101f. Design development sketches (Forlee, 2020)

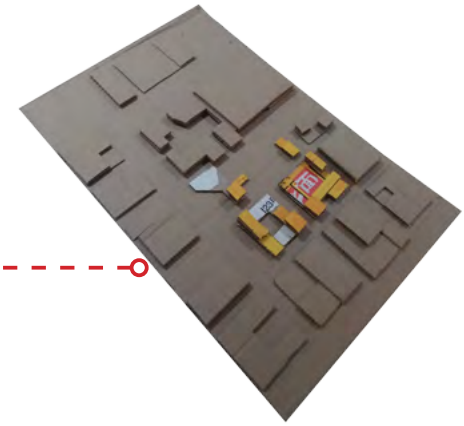
I then built a 1:10000 model to play with the building heights and playing with the forms concerning its direct context.

MODEL DEVELOPMENT - EXPLORING HEIGHT AND FORM



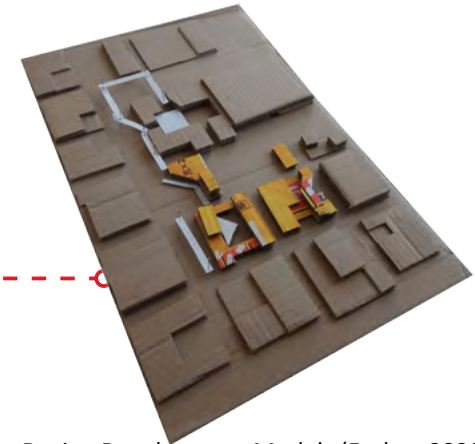


Section showing the building heights based on the direct surrounding.



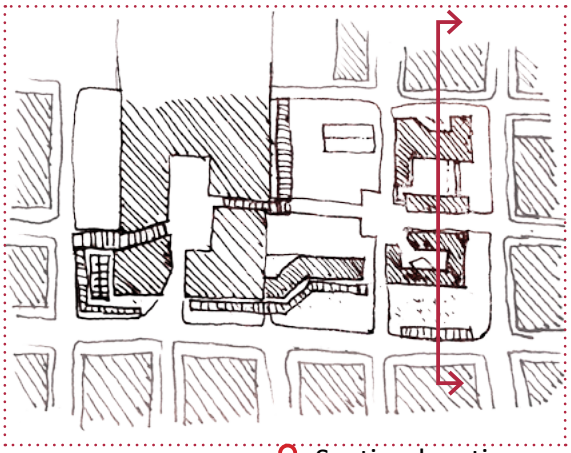


Section showing buildings being higher at the entrance points (street edges) and lower in the center.



Creating angles and adding sheltered pathways, which connects the Oriental Plaza to new buildings.

Fig 102 - Design Development Models (Forlee, 2020) Fig 103a - Design Development sketches (Forlee, 2020)



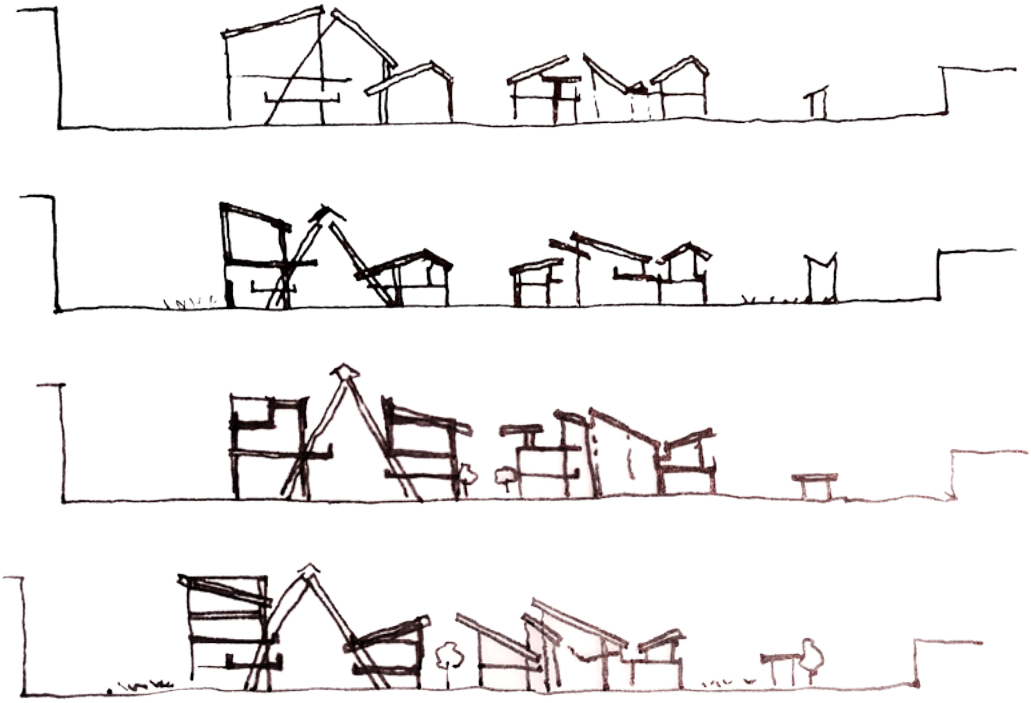
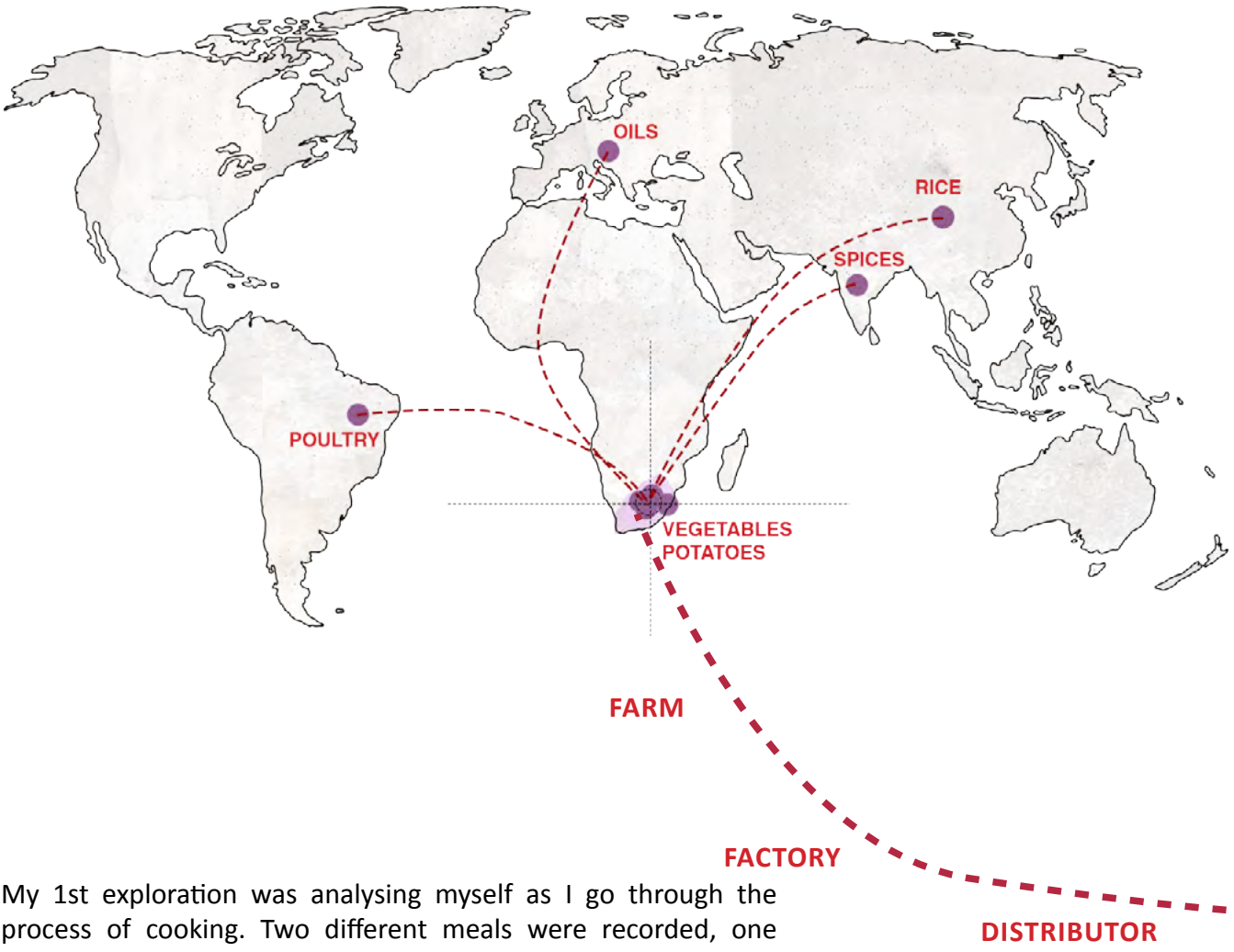


Fig 103b - Design Development sketches (Forlee, 2020)

The plan layout of the design has 45 degree angled edges and corner entry points. I want to express this as well in the section. Therefore I have played around with pitched roofs. These pitched roof angles also emphasise rainwater harvesting, which allows for solar panels and creates different internal spatial qualities.

CHARRETTE - FOOD JOURNEY



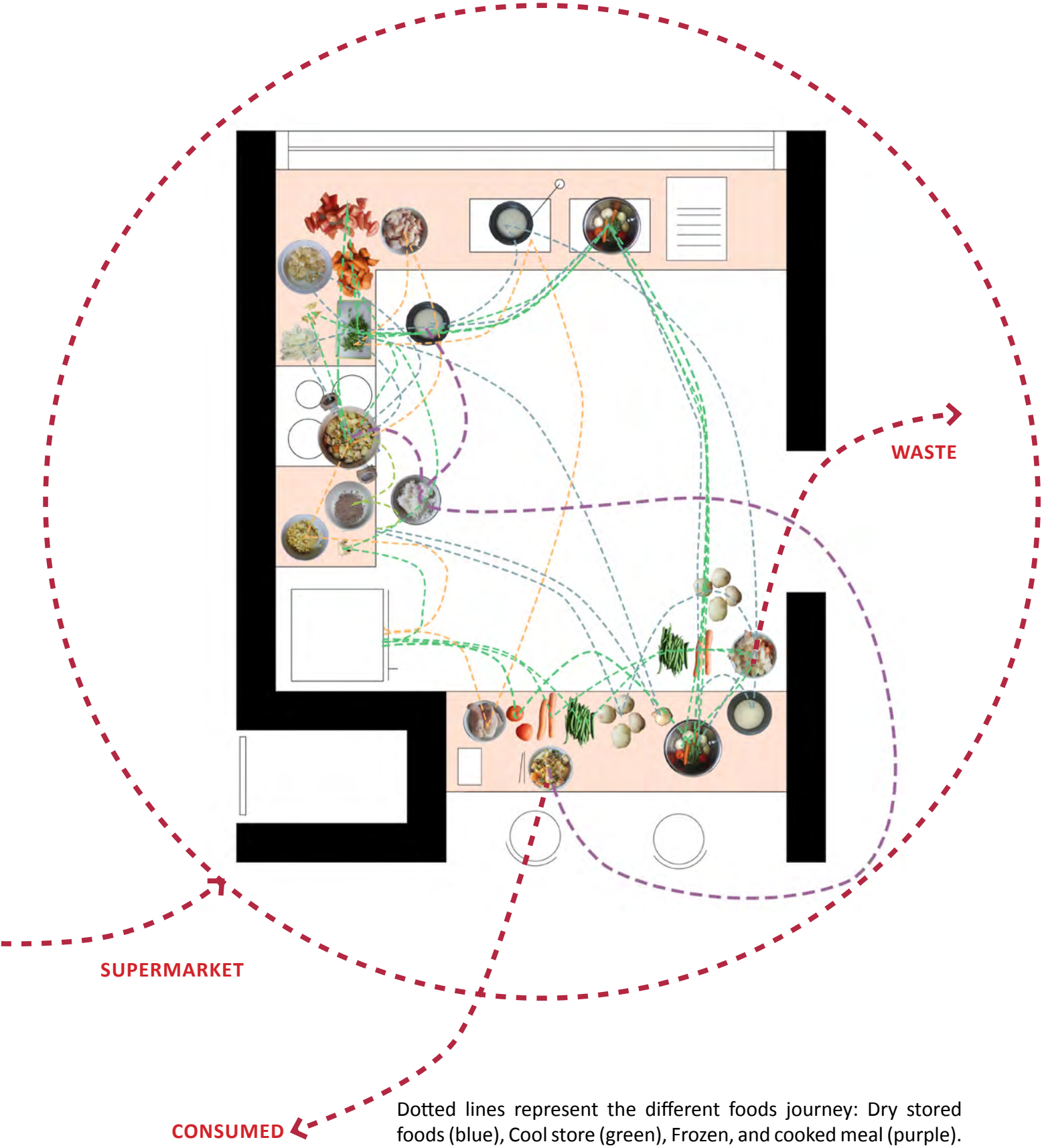
My 1st exploration was analysing myself as I go through the process of cooking. Two different meals were recorded, one edible and another not.

MEAL 1:

CHICKEN STEW

The movement and transformations of the ingredients were photographed and collaged onto a 2D plan diagram of my kitchen. This made me acknowledge the geography of where one meal comes from.

Fig 104a - Charrette (Forlee, 2020)



Dotted lines represent the different foods journey: Dry stored foods (blue), Cool store (green), Frozen, and cooked meal (purple). Each ingredient source is then linked to visually see the geography of 1 meal.

CHARRETTE - PACKAGE MEAL



FOOD PACKAGINGS

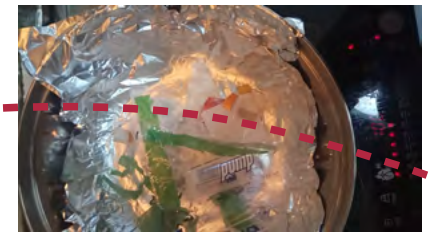
MEAL 2:

PACKAGING OF FOOD PRODUCE

I then decided to go through the same process of cooking but using the packages the different foods came in. These included a large amount and a variety of different types of plastics, cans, and cardboard. I cut these materials with knives kitchen scissors and tried grating the paper. I then threw all the materials into an aluminium covered cooking pot to imply the cooking process. It released many toxic fumes making it difficult to breathe. These fumes came out within 5 seconds of cooking and got burnt almost immediately. It formed a black lump, too hard to mould and was stuck on the aluminium foil. The burnt metal is presented on an egg carton board.

Fig 104b - Charrette (Forlee, 2020)





MELTING





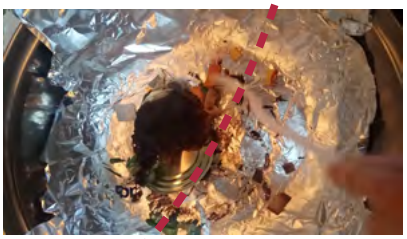
BAD FUME SMELLS



STIFF



BURNT.



TOXIC

UNHEALTHY

DAMAGING

MATERIALITY

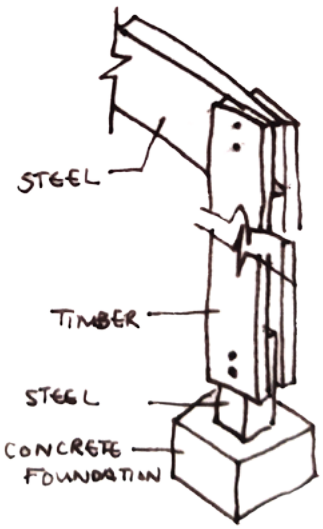


Fig 105a - Axo sketch of column in Agricultural research center (Forlee, 2020)

CHARRETTE

During the process of cooking the materials, toxic fumes filled the room making it difficult to breathe. It showed how we are using harmful materials to contain our edibles. It speaks about what we enclose ourselves may also affect our well-being. It results in deciding to avoid materials that are harmful to the environment, non-renewable or problematic for the future where possible. Instead, I tend towards materials that are sustainable with a low-carbon footprint and recyclable. These materials are like timber and steel. Another decision is to expose the structure of the building and express its materiality.

There are three structural materials I have used in the design; concrete, steel, and timber. Each of the materials has its pros and cons. They are used in different areas to maximize their properties and to be more sustainable.

CONCRETE

Concrete is a mixture of aggregates, portland cement, and water. The disadvantage of using concrete is in the production of portland cement as it releases a large amount of CO2 gas. “1 ton of portland cement releases 1 ton of CO2 gas” (Tarun, 2018), as compared to wood which absorbs 1.7 ton of CO2 gas from the environment (Kaltimber, 2017). There is also a lack of good-quality limestone, as it is a non-renewable resource required to make portland cement. Therefore minimizing the use of concrete is preferred.

Concrete, however, is extremely strong, and resilient to wet soil conditions, unlike timber or steel. Therefore it is most suitable to use as concrete foot foundations.

TIMBER VERSUS STEEL

Timber has a more interesting texture with its organic grain lines compared to the smoothness of steel. The timber grains are visible making interior spaces feel like exterior landscaping spaces.

Timber has insulation properties, therefore, reducing the need for additional insulating materials compared to steel. It is also resistant to fire. It does not catch fire immediately, instead, it becomes charred before it catches fire, and the strength property does not weaken drastically. On the other hand, steel can heat up faster and its strength of the material can weaken under high-temperature heat from fires.

Timber construction is more suited for small scale buildings (1 to 3 storeys) which constitutes most of my building area. Steel is better suited for long spans and tall buildings. It is better suited for the long roof spans d found the Agricultural Research Centre and the demonstration kitchen in the culinary school.

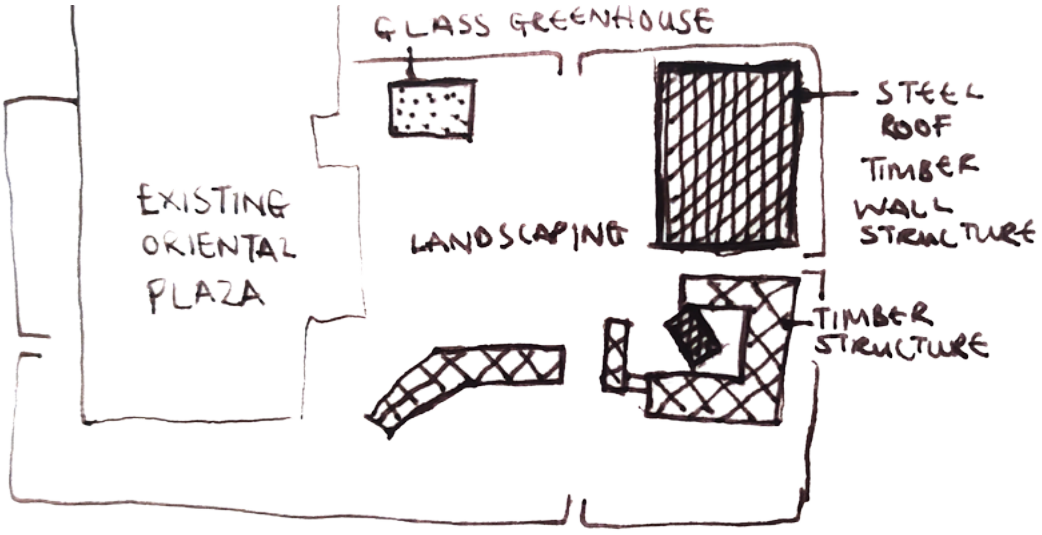


Fig 105b - Plan showing location of different structural materials (Forlee, 2020)

GLASS

Transparency elements are incorporated to play with the visibility of the cooking and making process. The light glass contrasts with the existing stone cladding on the Oriental Plaza. Glazed spaces become a showroom of the process activities in cooking and making.

SOIL

The project also includes variations of landscaping components therefore looking at soil conditions are important, especially since the site is a parking lot. Polycyclic aromatic hydrocarbon (PAH) is a chemical found in the burning of oils, petroleum, and asphalt production. They have toxic properties with the potential to cause cancer and/or able to cause mutations in human DNA (Abdel-Shafy & Mansour, 2016).
Phytoremediation is a method where plants (such as sunflower) are planted in the soil to extract contaminants and heavy metals. Once the plants are grown, they will need to be carefully disposed of so it does not get re-transferred into the soil.

SKILLS

Timber, steel and concrete construction are used in South Africa. The building does not have overly complex elements it therefore there are adequate skilled people for the construction.

The unemployed and immigrants residing in, and around, Fordsburg, Mayfair, and Newtown will be hired to construct the landscaping component of the project. Members are found through advertisements set out by the contractor. It will be specified in the Tender Documents as a requirement.
Due to the nature of the activity, the skills for the task can be done on the job and do not require long training sessions.

The charrette experiment has lead to the investigation of materials and their impact on the environment. It leads to the decision to use materials wisely to its potential to minimise its carbon footprint. Concrete is used for the buildings' foundations and not visible from the exterior. Steel, timber, and glass are used alternatively to express the structure and concepts of the building.

CHAPTER 7
PROJECT DESIGN

This section presents the final outcome of my building design. It presents diagrams, renders, plans, sections, and elevations to visually understand the building.

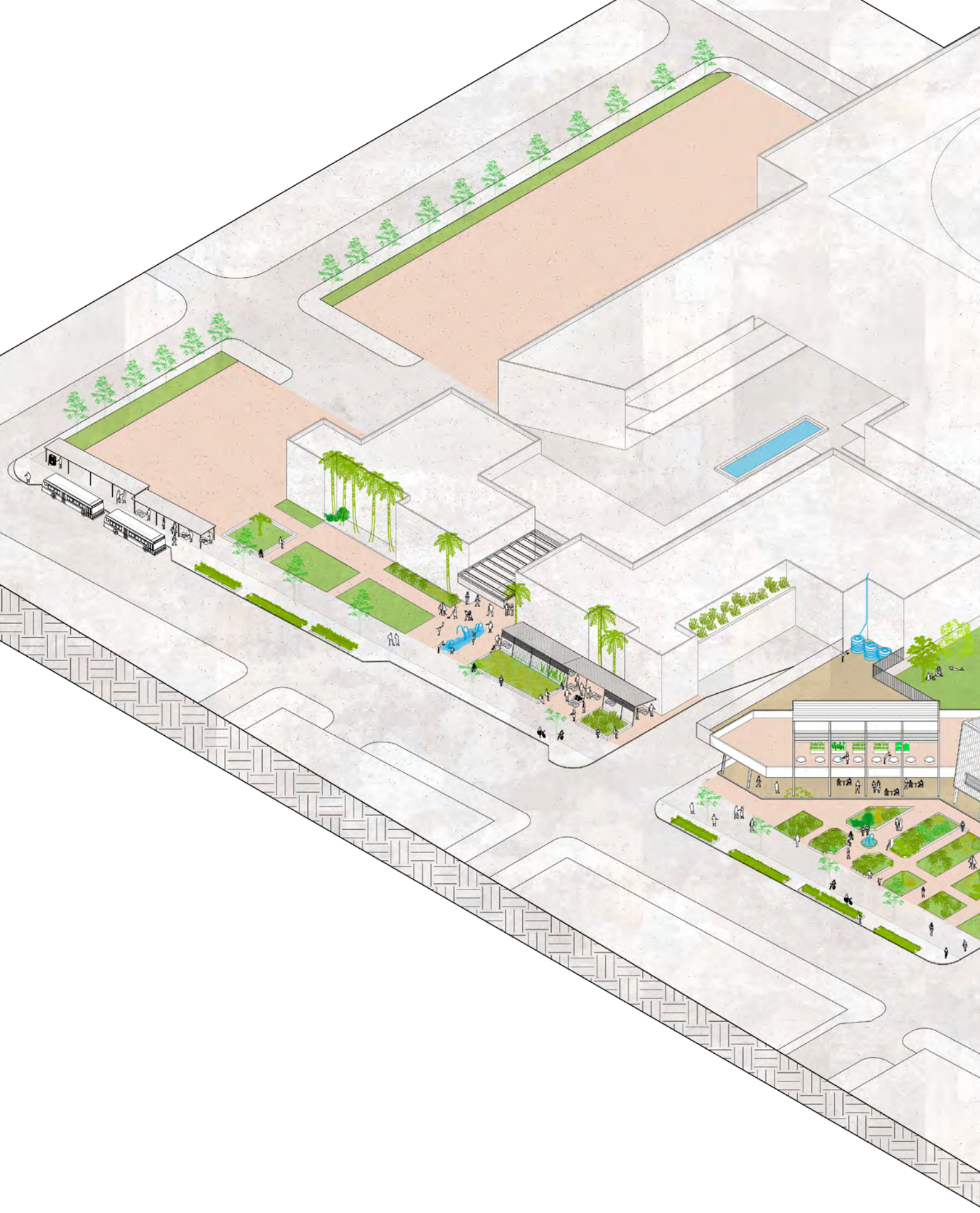


Fig 106 - Axonometric of overall design proposal. Scale 1:500 on A1 (Forlee, 2020)

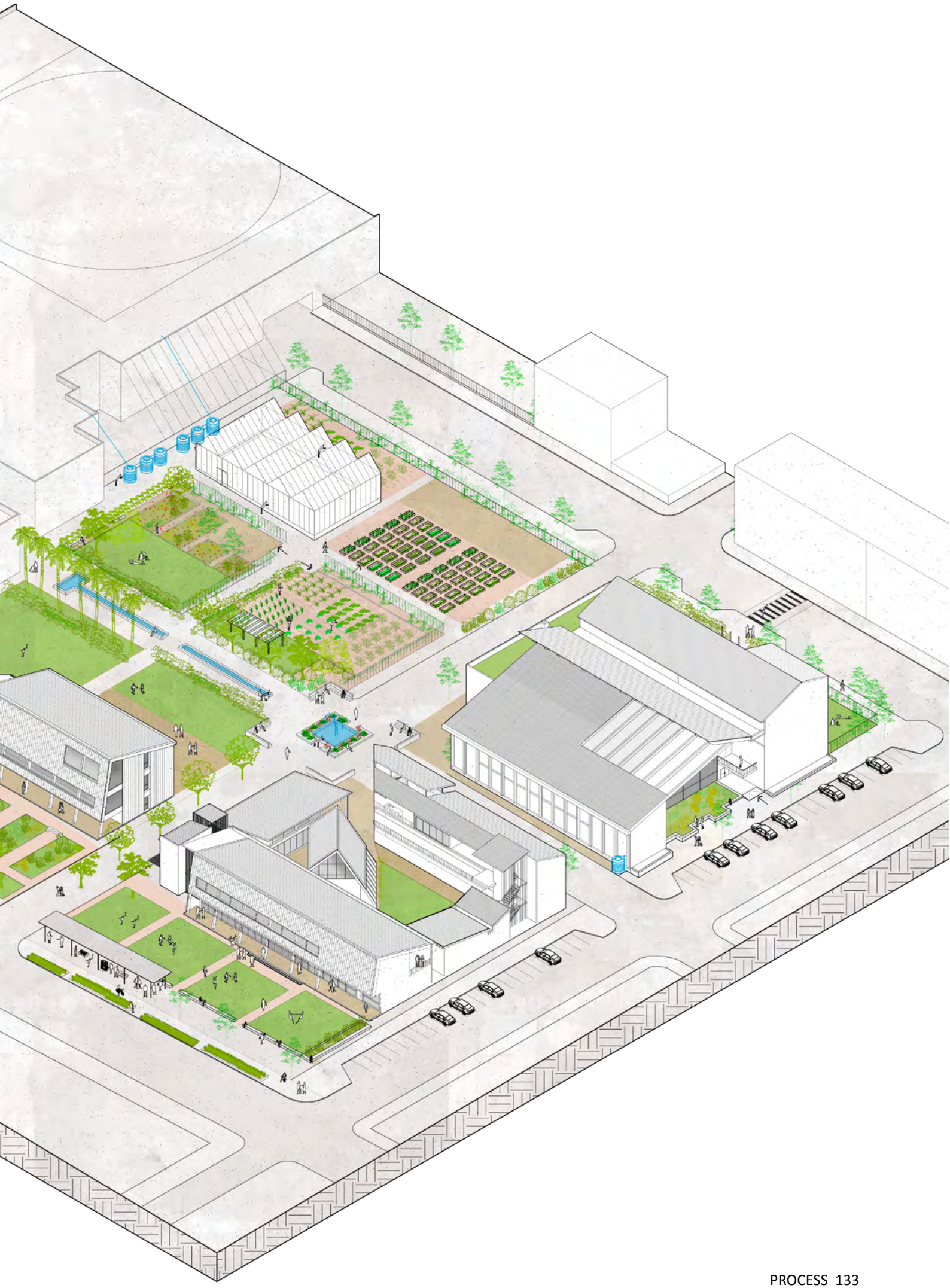




Fig 107 - 3D Context Plan. Scale 1:1000 on A1 (Forlee, 2020)


EENHOUSE
Residential apartment block
DOLLY RATHEBE ROAD
AGRICULTURAL
RESEARCH CENTRE
PINE AVENUE
CULINARY
SCHOOL
RENT OUT RETAIL
U ROAD
NGO OFFICES
PARK
etail



Fig 108 - Perspective exterior view on Albertina Sisulu Road (Forlee, 2020)

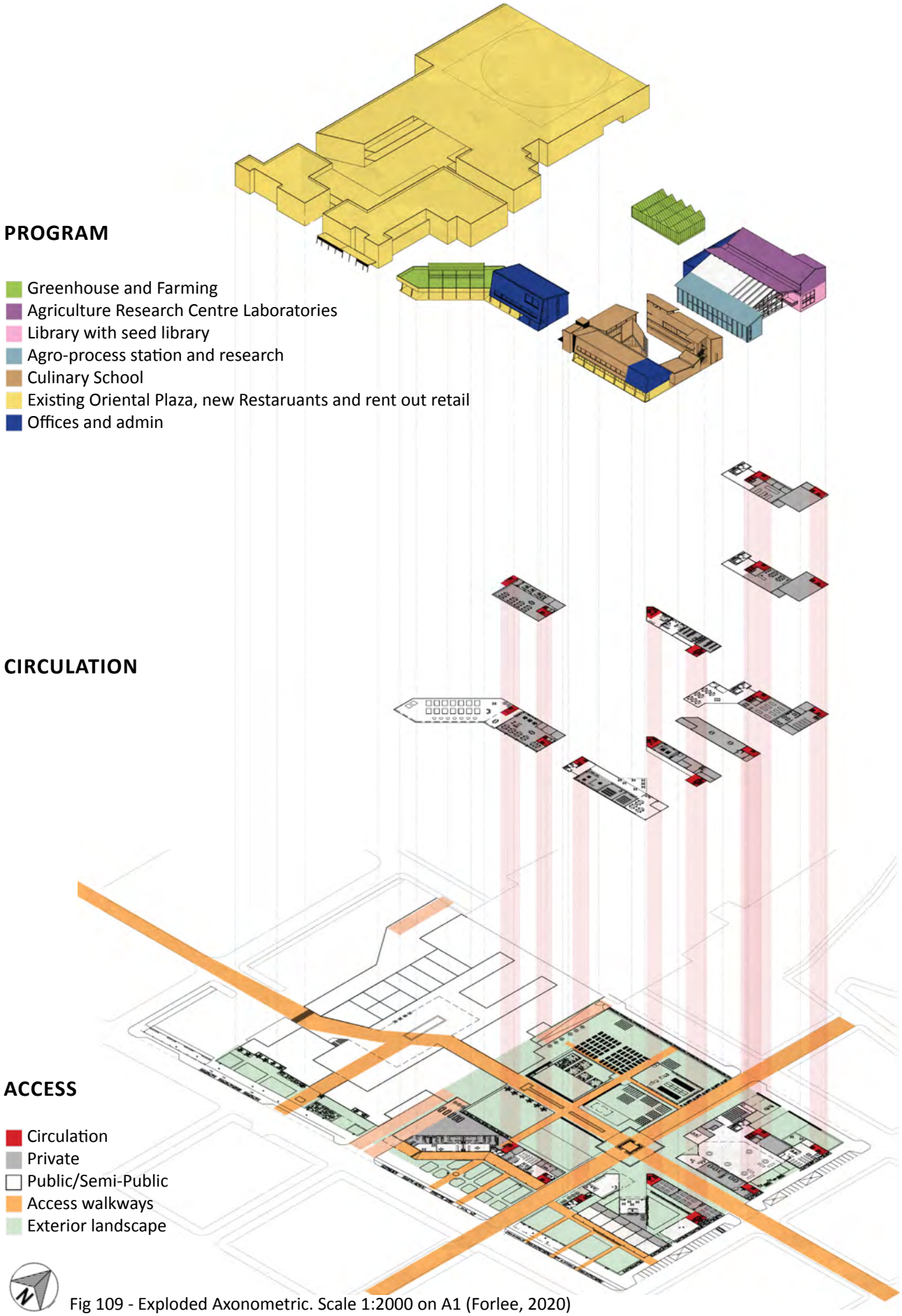
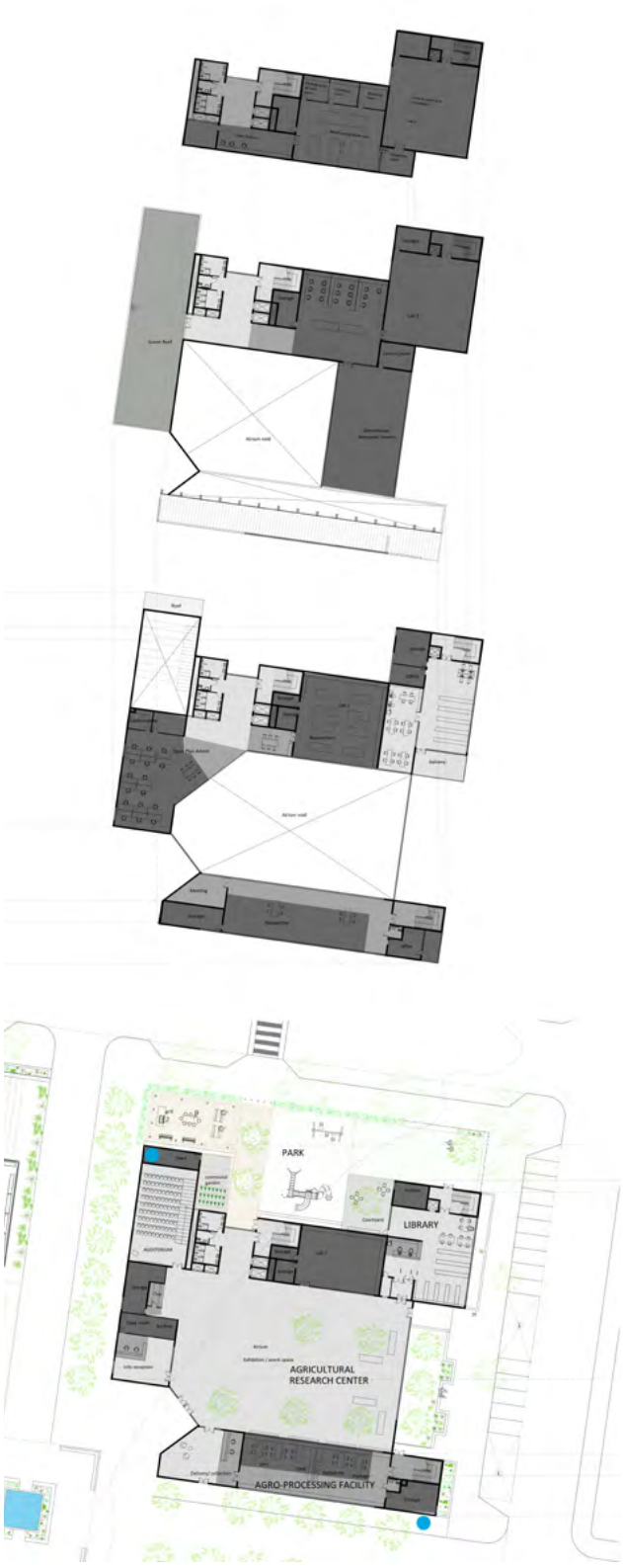


Fig 109 - Exploded Axonometric. Scale 1:2000 on A1 (Forlee, 2020)



private
semi private
semi public
public

AGRICULTURAL RESEARCH CENTRE

N

Fig 110- Public vs private spaces diagram. Scale 1:1000 on A1 (Forlee. 2020)



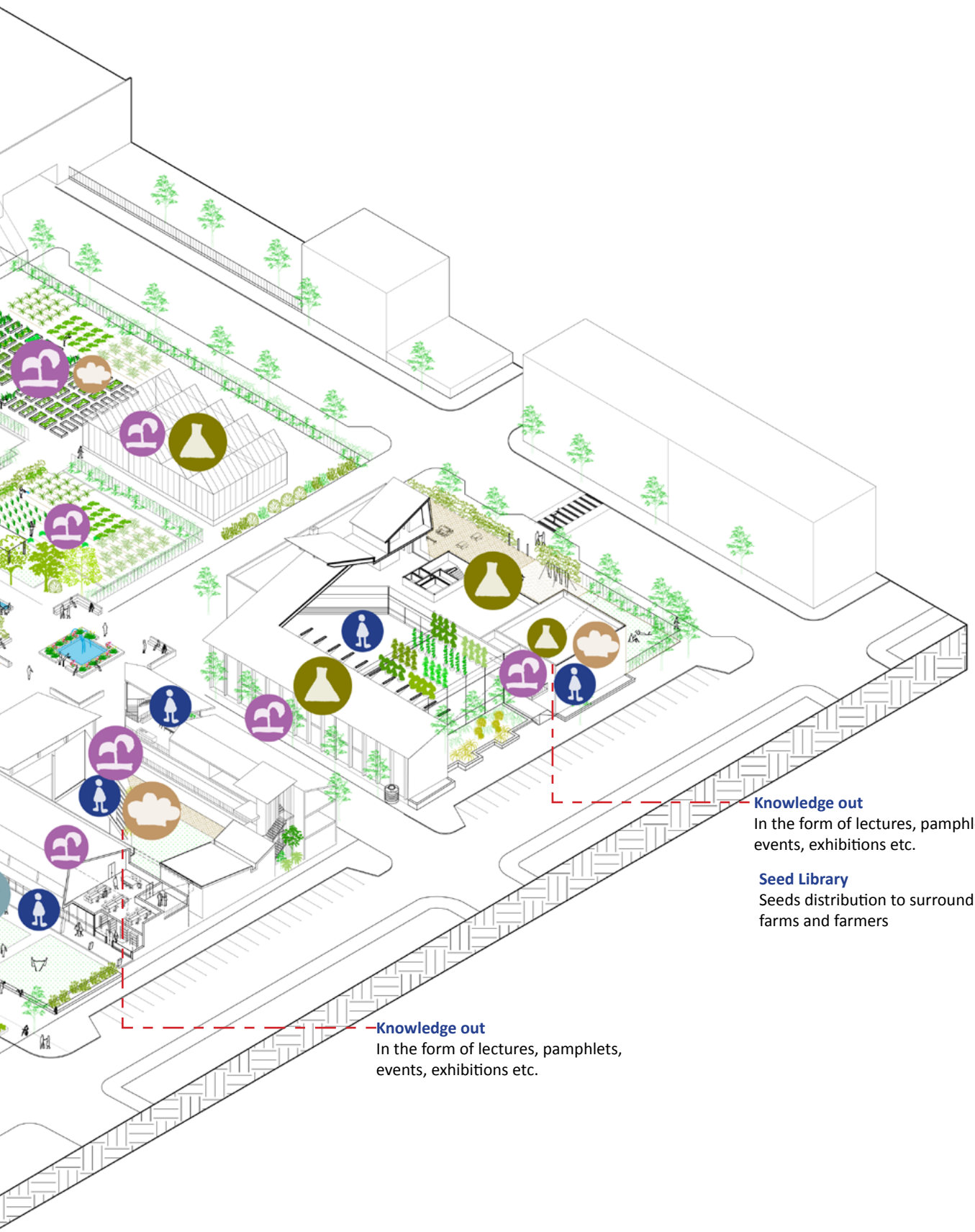


CULINARY SCHOOL

RESTAURANTS AND NGO OFFICES



Fig 111 - Users. Scale 1:500 on A1 (Forlee, 2020)



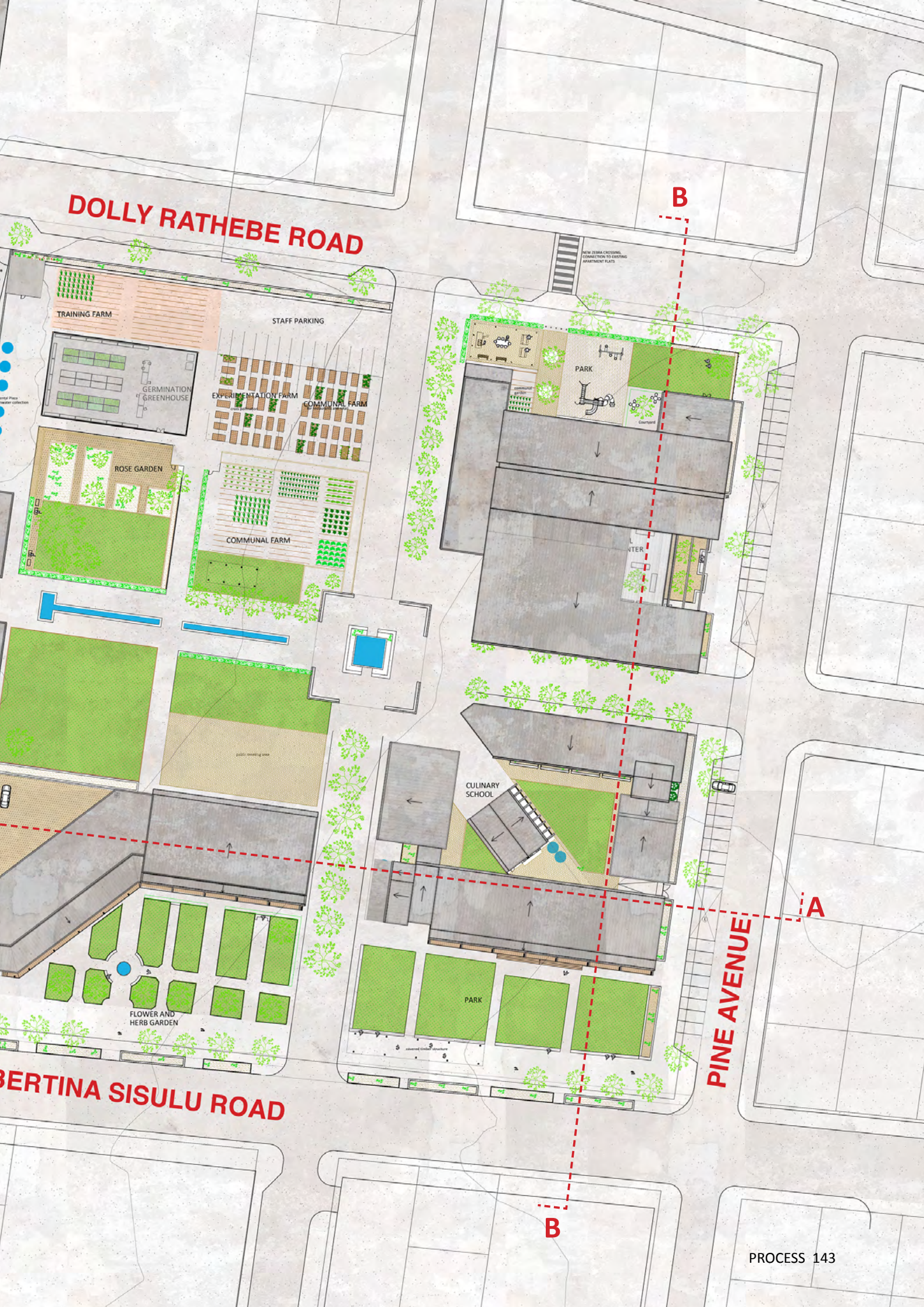
Knowledge out
In the form of lectures, pamphlets, events, exhibitions etc.

Seed Library
Seeds distribution to surrounding farms and farmers

Knowledge out
In the form of lectures, pamphlets, events, exhibitions etc.



Fig 112- Roof Plan. Scale 1:500 on A1 (Forlee, 2020)


DOLLY RATHEBE ROAD
TRAINING FARM
STAFF PARKING
GERMINATION GREENHOUSE
EXPERIMENTATION FARM
COMMUNAL FARM
ROSE GARDEN
COMMUNAL FARM
PARK
CULINARY SCHOOL
FLOWER AND HERB GARDEN
PARK
PINE AVENUE
BERTINA SISULU ROAD
A
B
B

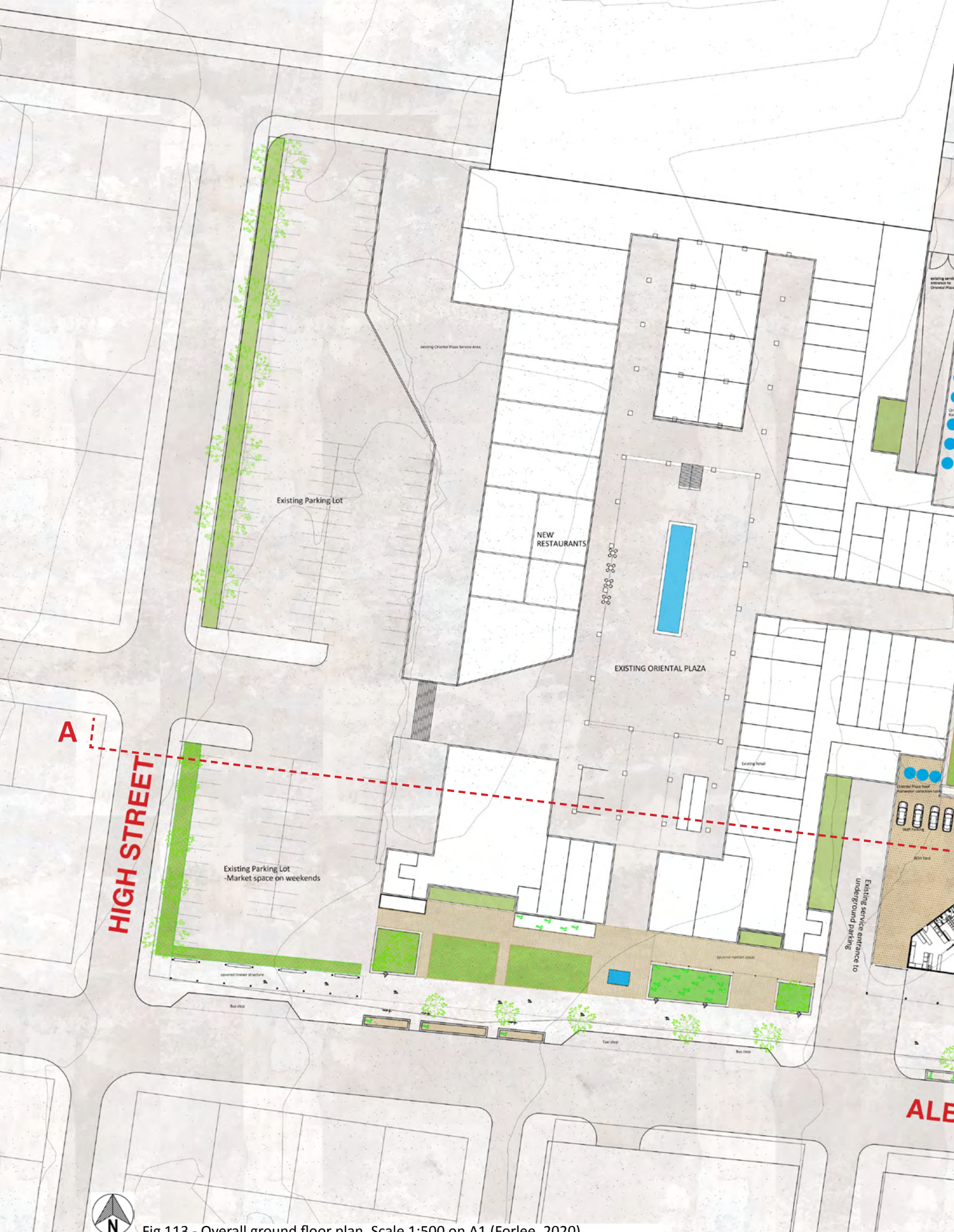
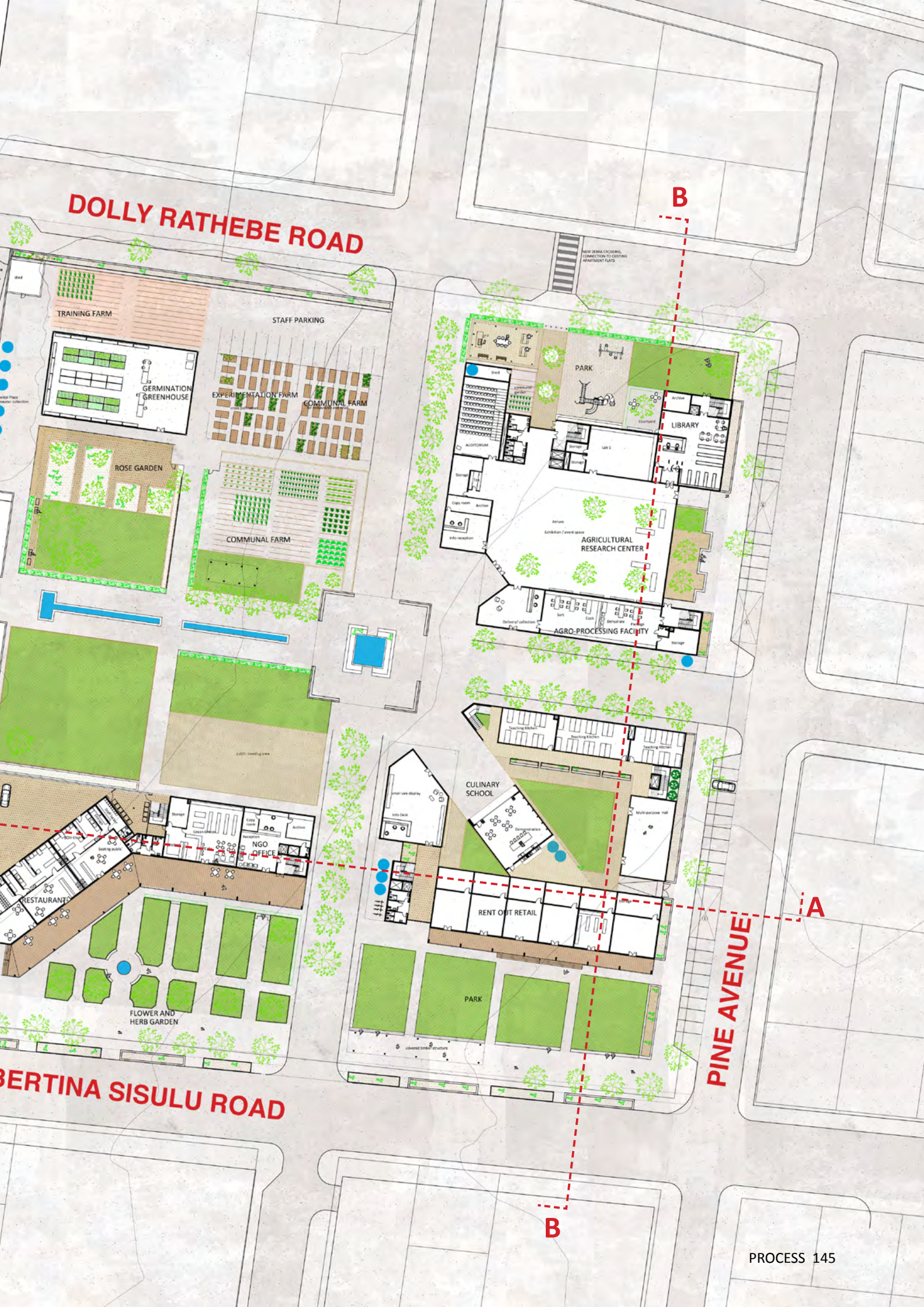


Fig 113 - Overall ground floor plan. Scale 1:500 on A1 (Forlee, 2020)


DOLLY RATHEBE ROAD
B
TRAINING FARM
STAFF PARKING
GERMINATION GREENHOUSE
EXPERIMENTATION FARM
COMMUNAL FARM
ROSE GARDEN
COMMUNAL FARM
PARK
LIBRARY
AGRICULTURAL RESEARCH CENTER
AGRO-PROCESSING FACILITY
CULINARY SCHOOL
NGO OFFICE
RESTAURANT
RENT OUT RETAIL
PARK
FLOWER AND HERB GARDEN
A
PINE AVENUE
BERTINA SISULU ROAD
B



AGRICULTURAL RESEARCH CENTRE



Fig 114 - Plans. Scale 1:200 on A1 (Forlee, 2020)

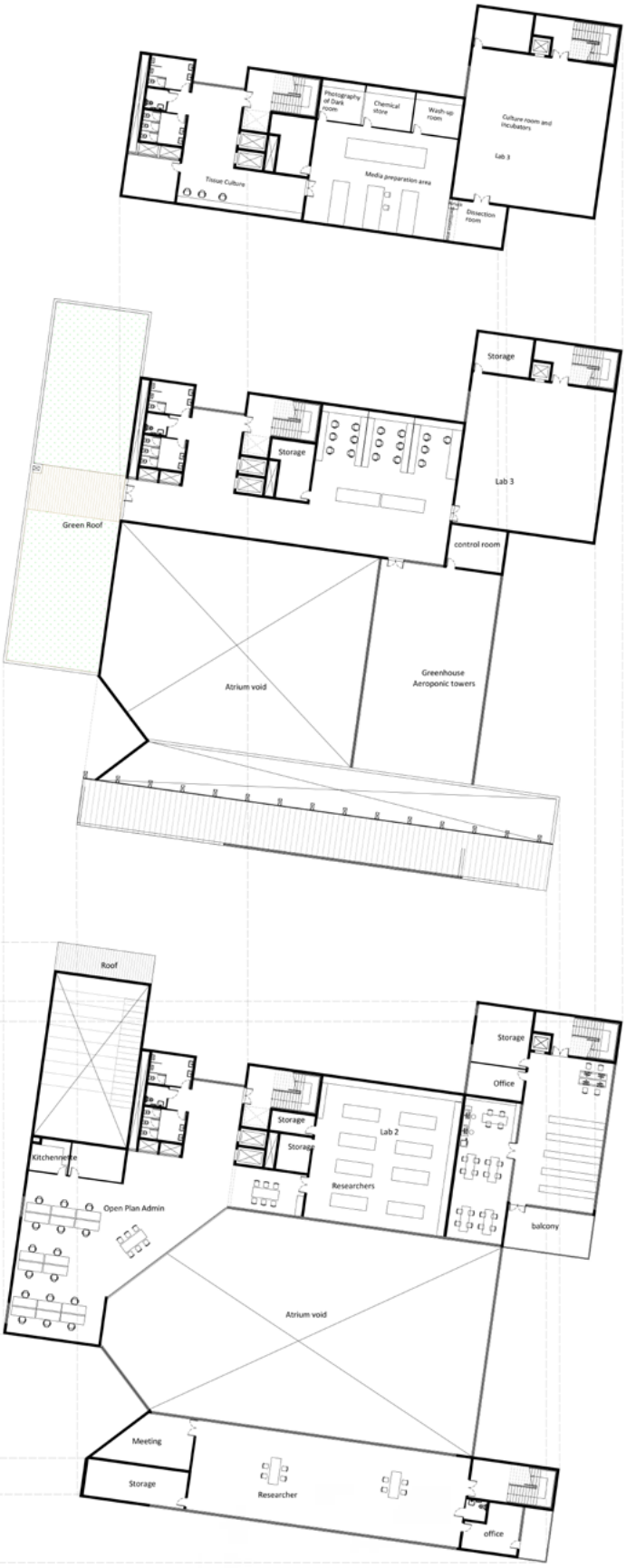

Photography of Dark room
Chemical store
Wash-up room
Culture room and incubators
Lab 3
Tissue Culture
Media preparation area
Dissection room
Storage
Storage
Lab 3
Green Roof
control room
Atrium void
Greenhouse Aeroponic towers
Roof
Storage
Office
Storage
Storage
Lab 2
Kitchenette
Researchers
Open Plan Admin
balcony
Atrium void
Meeting
Storage
Researcher
office



Fig 115 - Interior perspective view of atrium in the agricultural research centre (Forlee, 2020)





CULINARY SCHOOL



Fig 116 - Entrance perspective view of culinary school (Forlee, 2020)



Fig 117 - Plans. Scale 1:200 on A1 (Forlee, 2020)



RESTAURANTS AND NGO OFFICES

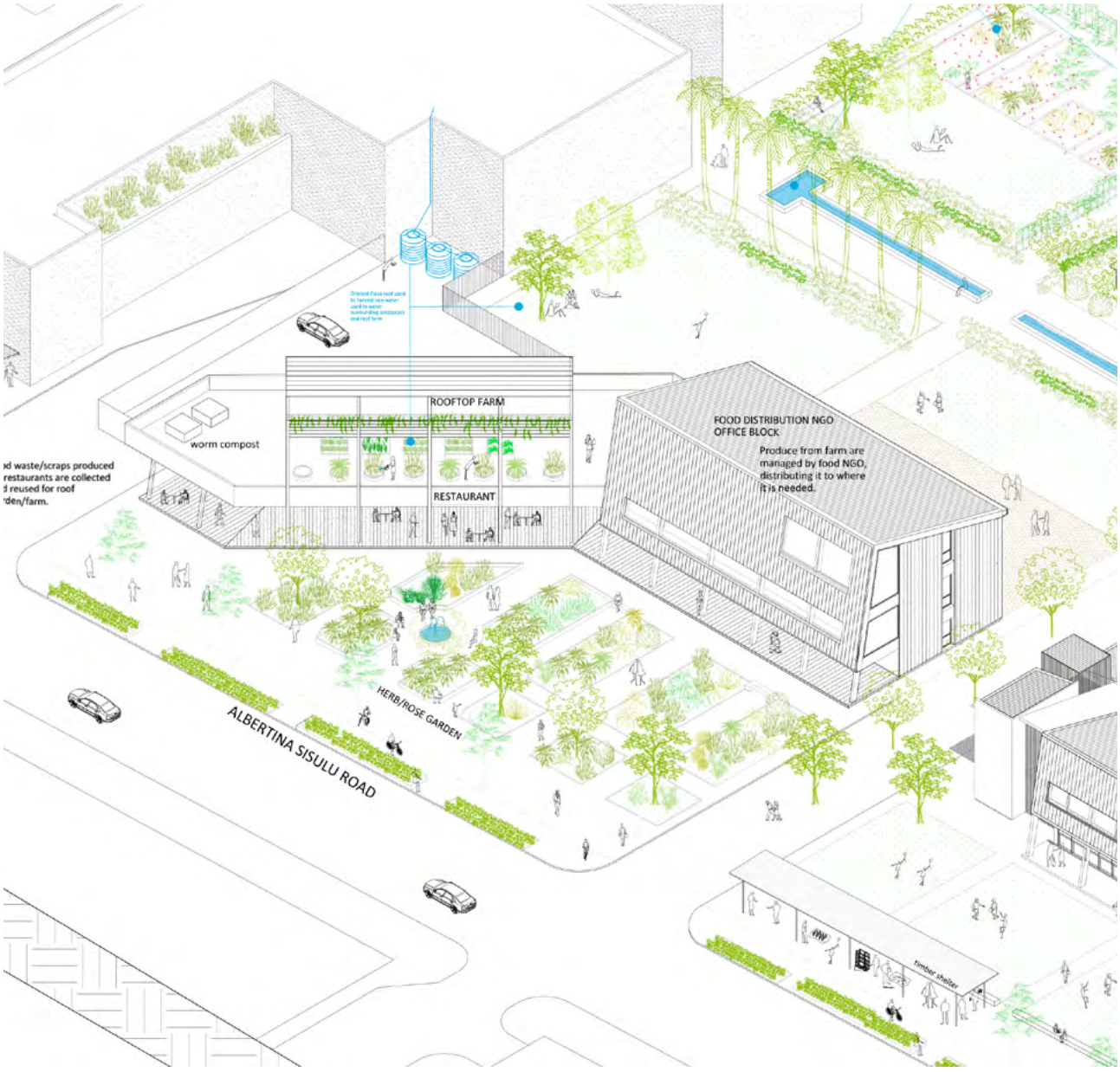
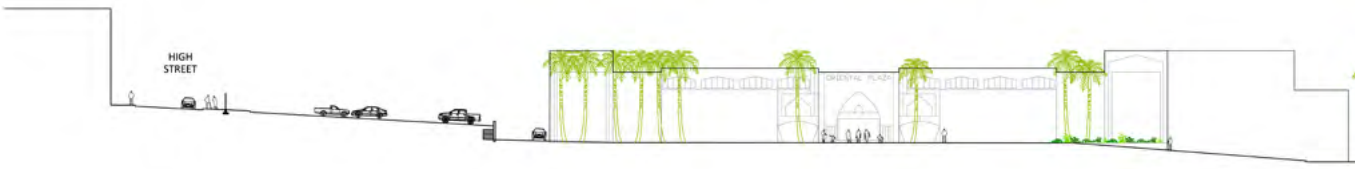


Fig 118 - Axonometric of restaurants and NGO offices building (Forlee, 2020)



Fig 119 - Plans. Scale 1:200 on A1 (Forlee, 2020)

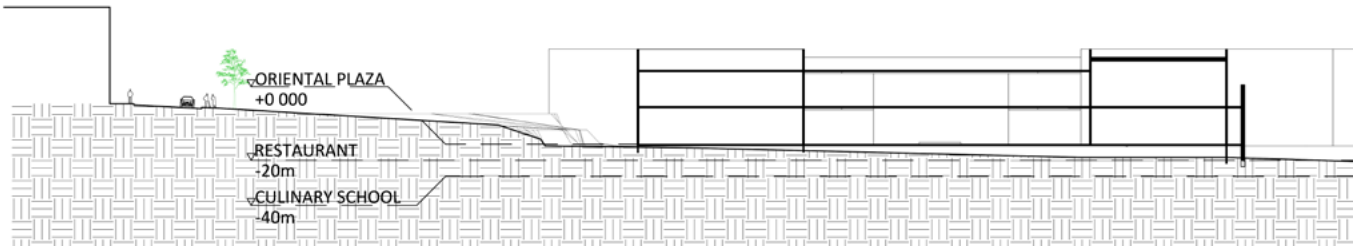




EXISTING SOUTH ELEVATION (ALBERTINA SISULU ROAD)
SCALE 1:500



PROPOSED SOUTH ELEVATION (ALBERTINA SISULU ROAD)
SCALE 1:500

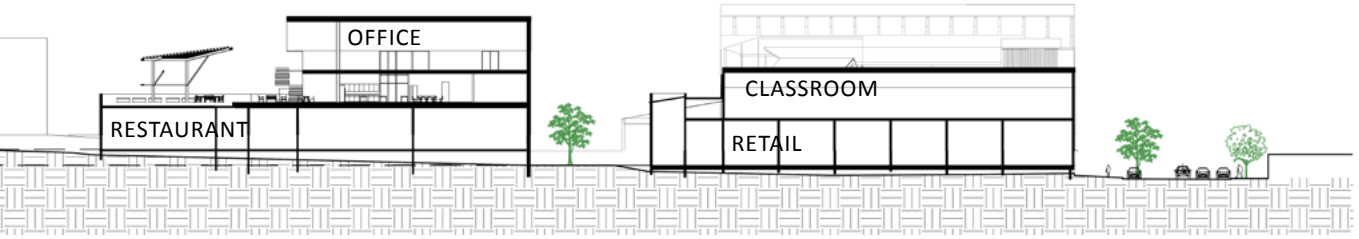


SECTION A-A
SCALE 1:500

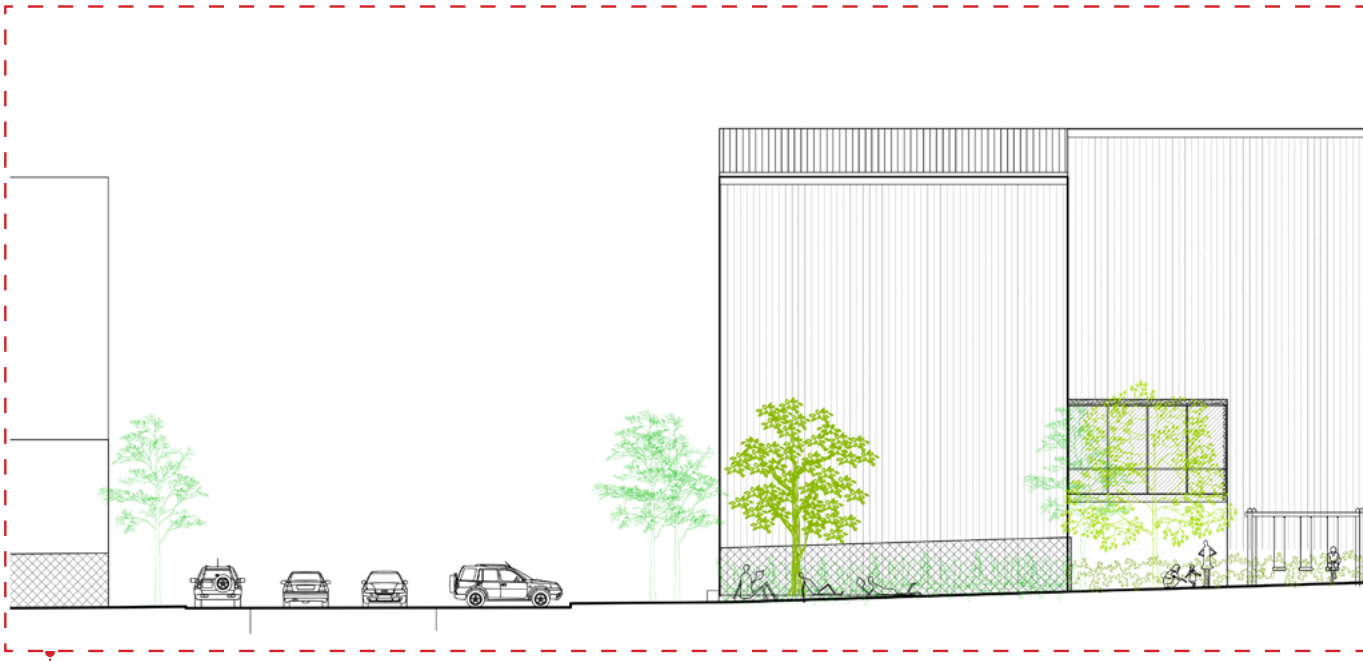
Fig 120a - Sections (Forlee, 2020)


PINE AVENUE


PINE AVENUE


OFFICE
RESTAURANT
CLASSROOM
RETAIL



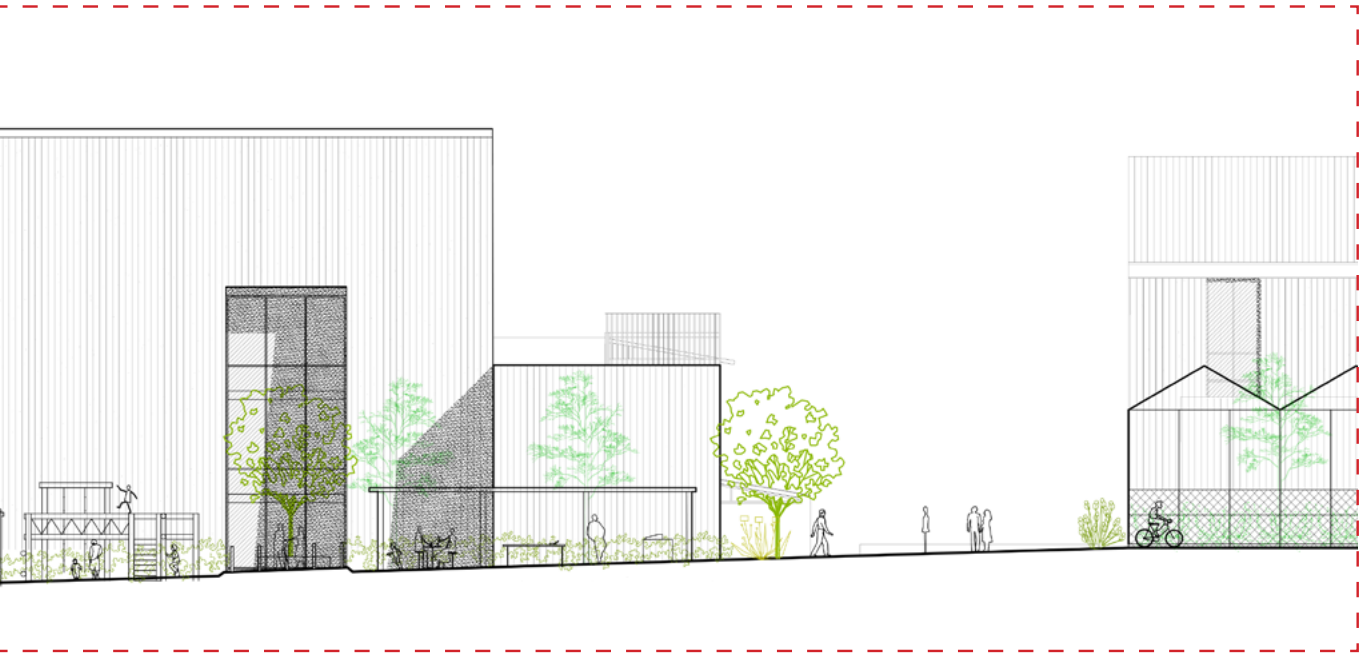


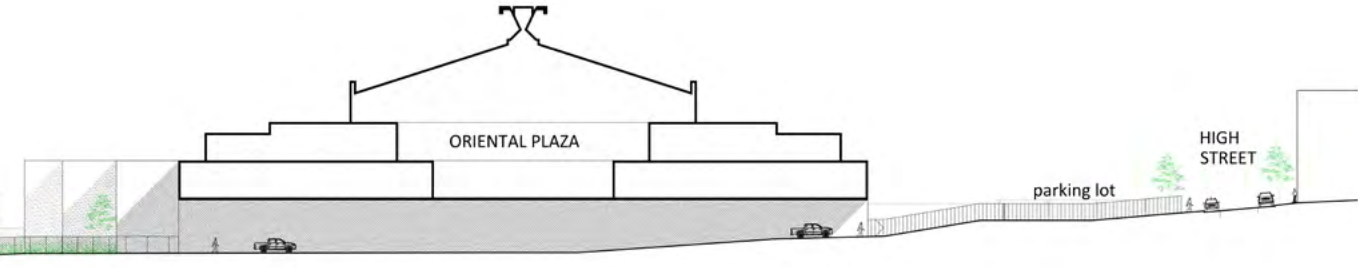
NORTH ELEVATION OF AGRICULTURAL RESEARCHE CENTRE SHOWING ACTIVITIES IN THE PARK
SCALE 1:100



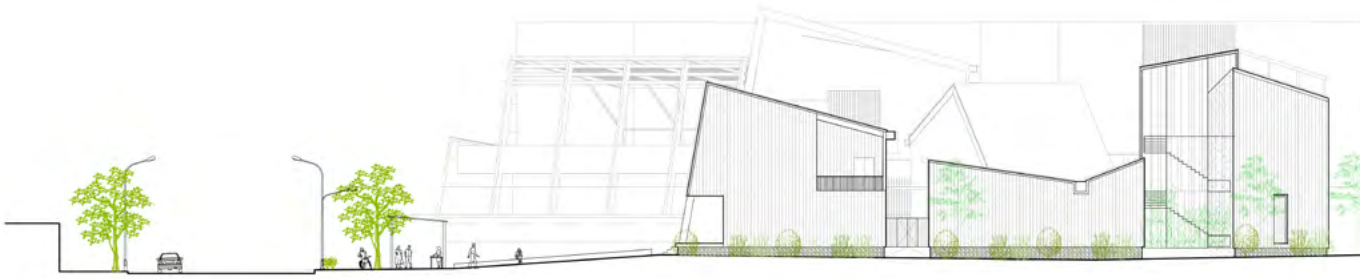
NORTH STREET ELEVATION (DOLLY RATHEBE ROAD)
SCALE 1:500

Fig 120b - Sections (Forlee, 2020)

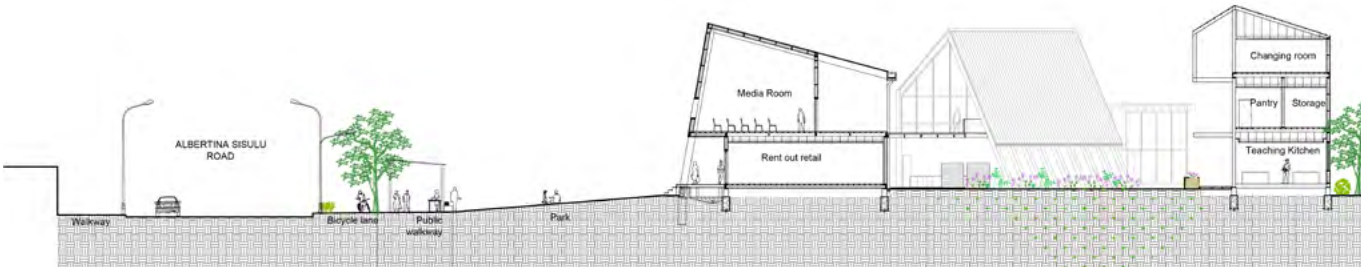



ORIENTAL PLAZA
parking lot
HIGH
STREET





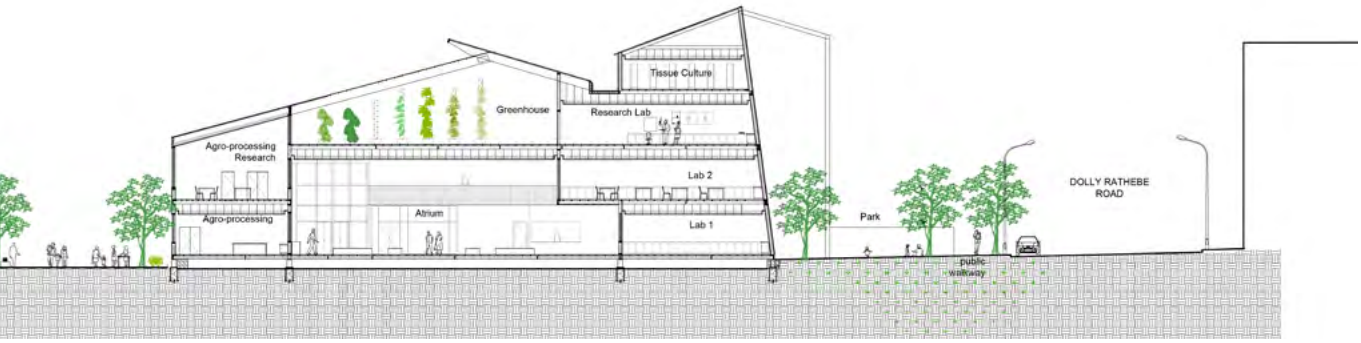
EAST ELEVATION (PINE AVENUE)
SCALE 1:200



SECTION B-B
SCALE 1:200

Fig 121- Section Elevations (Forlee, 2020)




Tissue Culture
Greenhouse
Research Lab
Agro-processing
Research
Lab 2
Agro-processing
Atrium
Lab 1
Park
DOLLY RATHEBE
ROAD
public
walkway



DETAIL

231X231mm 65° APEX FLASHING
HORIZONTAL CLOSURE

CORNICE

300X500mm MAIN STRUCTURAL RAFTERS @6000 c/c

17.5X700X1900mm CORRUGATED STEEL SHEET ROOF COVERING
8.5 S-RIBED PROFILE SHEET, 0.4mm THICKNESS ISQ550 GRADED
COATED WITH Z160 GALVANIZED ZINC FIXED ON TOP OF TIMBER
PURLINS WITH ROOFING SCREWS

10mm ALUMINIUM FOIL REINFORCED WATERPROOFING
MEMBRANE PLACED BETWEEN PURLINS AND ROOF SHEET

38X38mm TIMBER PURLINS @600 c/c

50X228mm RAFTERS @600 c/c

150mm FIBRE INSULATION

50X228mm NOGGINS @1200 c/c

15X1200X2700mm GYPSUM BOARD PANELS
FINISH WITH PRIMER AND PAINT

ME

19X19MM ALUMINIUM CHANNEL

TIMBER WINDOW FRAME

ALUMINIUM WINDOW

TILE SILL TO FALL

DPC

22X150mm WOOD COMPOSITE DECKING WITH 10mm GAPS

50X150mm JOISTS @600 c/c ON
TIMBER POST FOOTING TO CONCRETE FOUNDATION

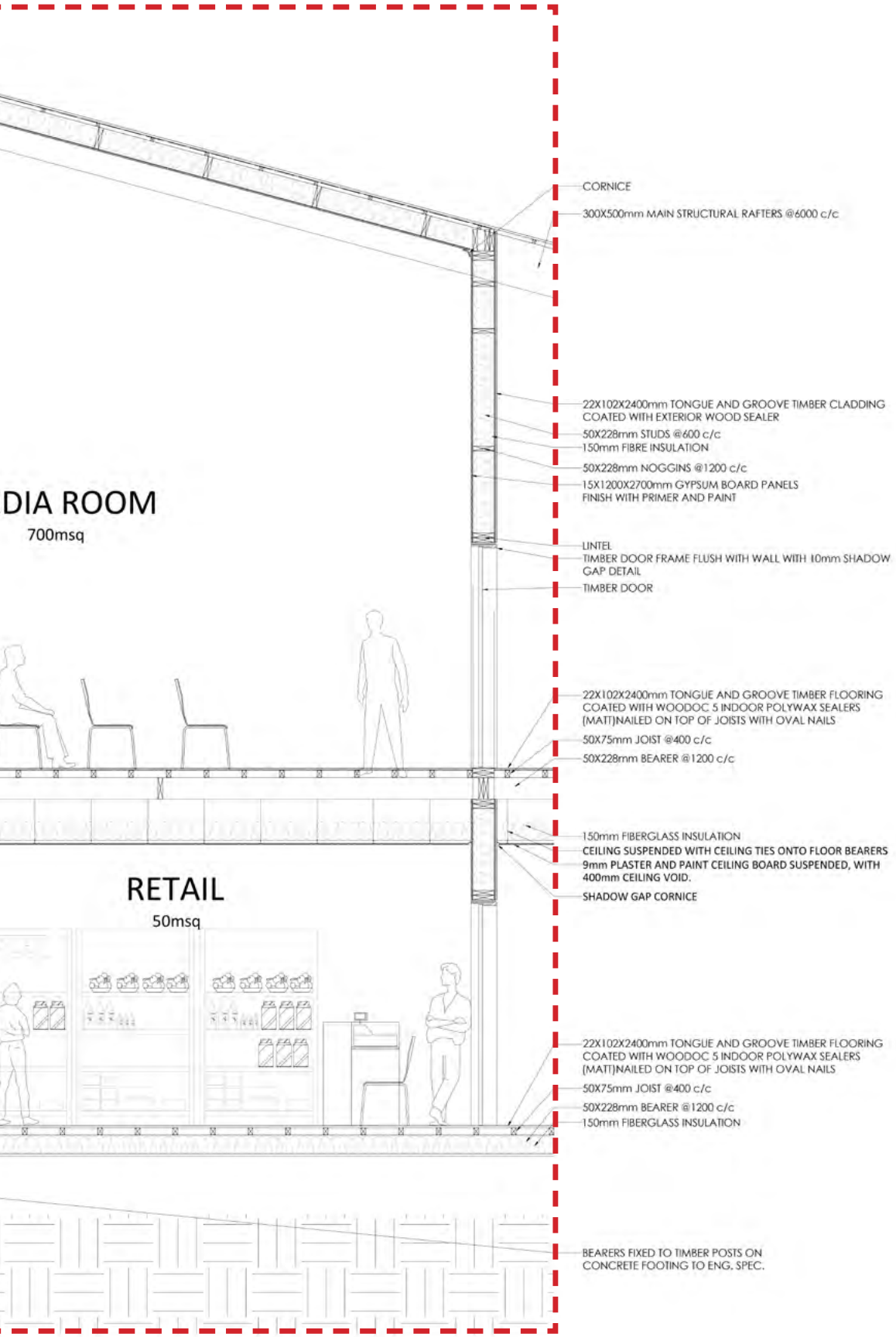
TIMBER STRUCTURE STAIRS

GABION BASKET WRAPPING ALL AROUND BUILDING EDGE

GRAVEL IN GEO-TEXTILE FABRIC, DRAIN TO SUMP

CONCRETE FOOTING TO ENG. SPEC.

Fig 122- Perimeter section detail. Scale 1:20 on A0
(Forlee, 2020)

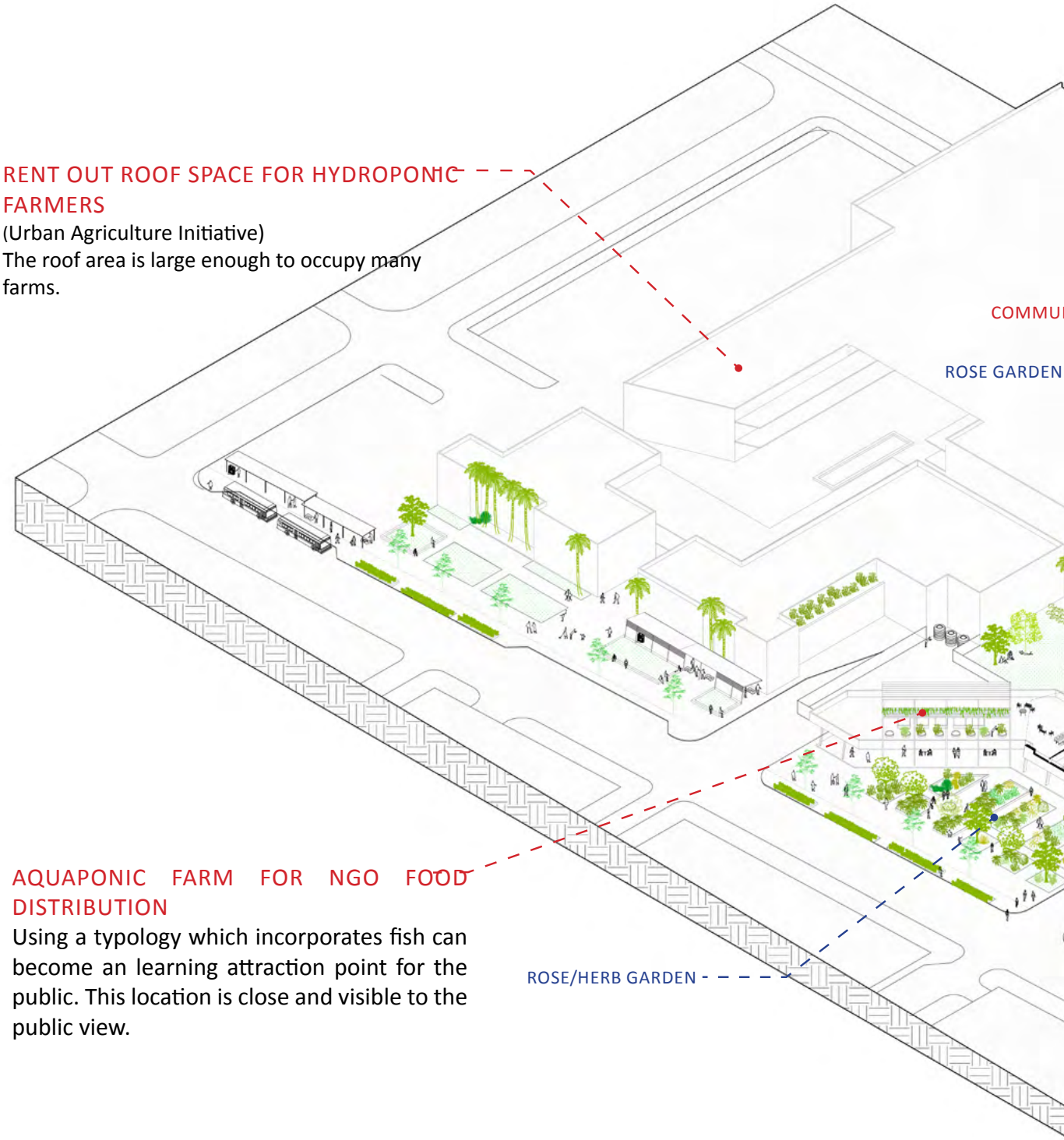

CORNICE
300X500mm MAIN STRUCTURAL RAFTERS @6000 c/c
22X102X2400mm TONGUE AND GROOVE TIMBER CLADDING
COATED WITH EXTERIOR WOOD SEALER
50X228mm STUDS @600 c/c
150mm FIBRE INSULATION
50X228mm NOGGINS @1200 c/c
15X1200X2700mm GYPSUM BOARD PANELS
FINISH WITH PRIMER AND PAINT
DIA ROOM
700msq
LINTEL
TIMBER DOOR FRAME FLUSH WITH WALL WITH 10mm SHADOW
GAP DETAIL
TIMBER DOOR
22X102X2400mm TONGUE AND GROOVE TIMBER FLOORING
COATED WITH WOODOC 5 INDOOR POLYWAX SEALERS
(MATT)NAILED ON TOP OF JOISTS WITH OVAL NAILS
50X75mm JOIST @400 c/c
50X228mm BEARER @1200 c/c
150mm FIBERGLASS INSULATION
CEILING SUSPENDED WITH CEILING TIES ONTO FLOOR BEARERS
9mm PLASTER AND PAINT CEILING BOARD SUSPENDED, WITH
400mm CEILING VOID.
SHADOW GAP CORNICE
RETAIL
50msq
22X102X2400mm TONGUE AND GROOVE TIMBER FLOORING
COATED WITH WOODOC 5 INDOOR POLYWAX SEALERS
(MATT)NAILED ON TOP OF JOISTS WITH OVAL NAILS
50X75mm JOIST @400 c/c
50X228mm BEARER @1200 c/c
150mm FIBERGLASS INSULATION
BEARERS FIXED TO TIMBER POSTS ON
CONCRETE FOOTING TO ENG. SPEC.

FARMING AND LANDSCAPING

RENT OUT ROOF SPACE FOR HYDROPONIC FARMERS

(Urban Agriculture Initiative)

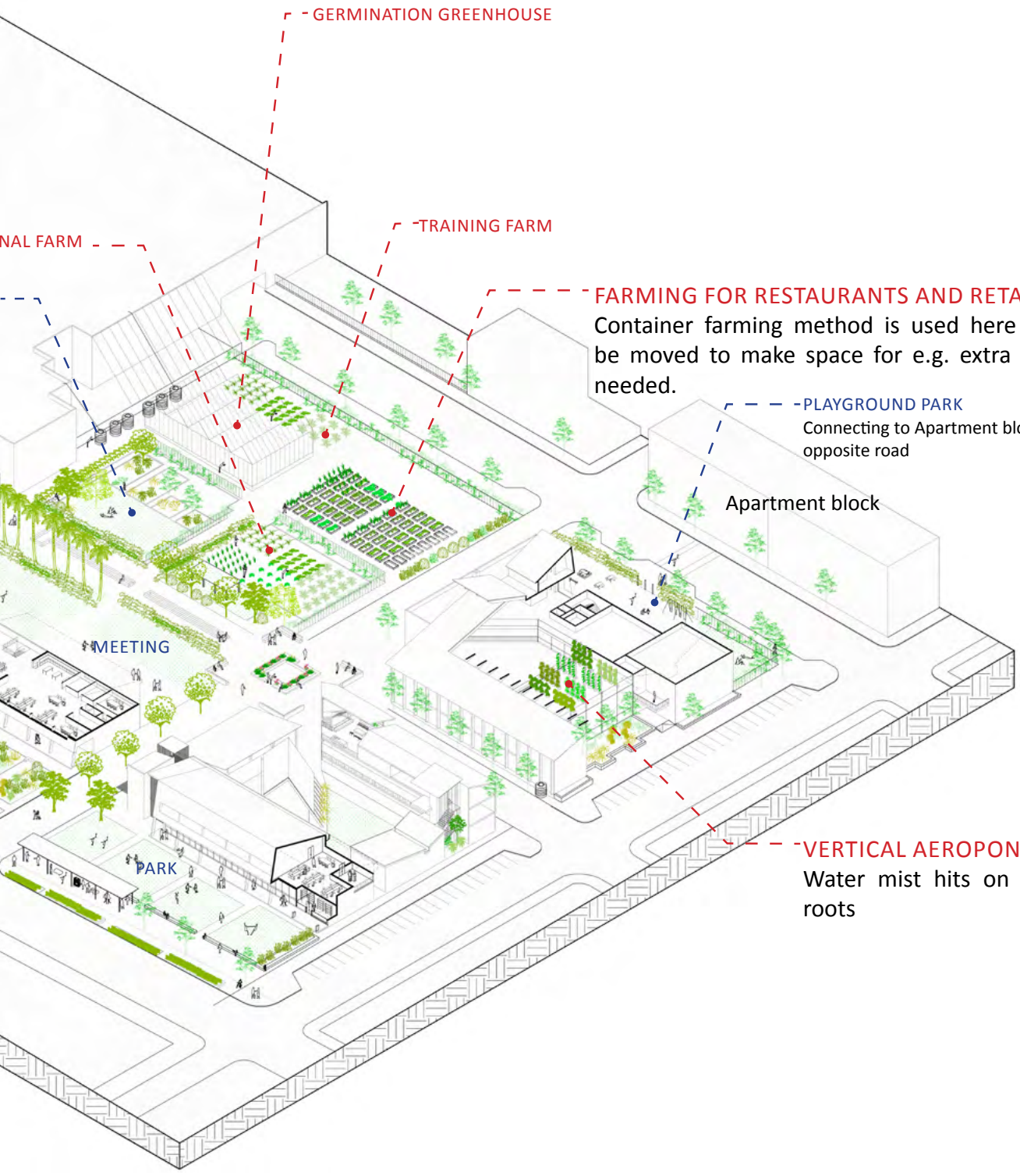
The roof area is large enough to occupy many farms.



AQUAPONIC FARM FOR NGO FOOD DISTRIBUTION

Using a typology which incorporates fish can become an learning attraction point for the public. This location is close and visible to the public view.

Fig 123- Axonometric diagram of overall design indicating different landscaping. Scale 1:500 on A1 (Forlee, 2020)



FARMING FOR RESTAURANTS AND RETAIL

Container farming method is used here as it can be moved to make space for e.g. extra parking if needed.

PLAYGROUND PARK

Connecting to Apartment blocks opposite road

Apartment block

VERTICAL AEROPONIC FARM

Water mist hits on the plant roots

CHAPTER 8
SUSTAINABILITY & TECTONICS

This section uses analysis the Agro-processing station of the design to explain the technical resolution and sustainability of the whole building .

Structure

The building will be seen as background buildings as to not impose on the land. The structure will have a light touch on the land, celebrating natural and environmentally friendly ways of constructing.

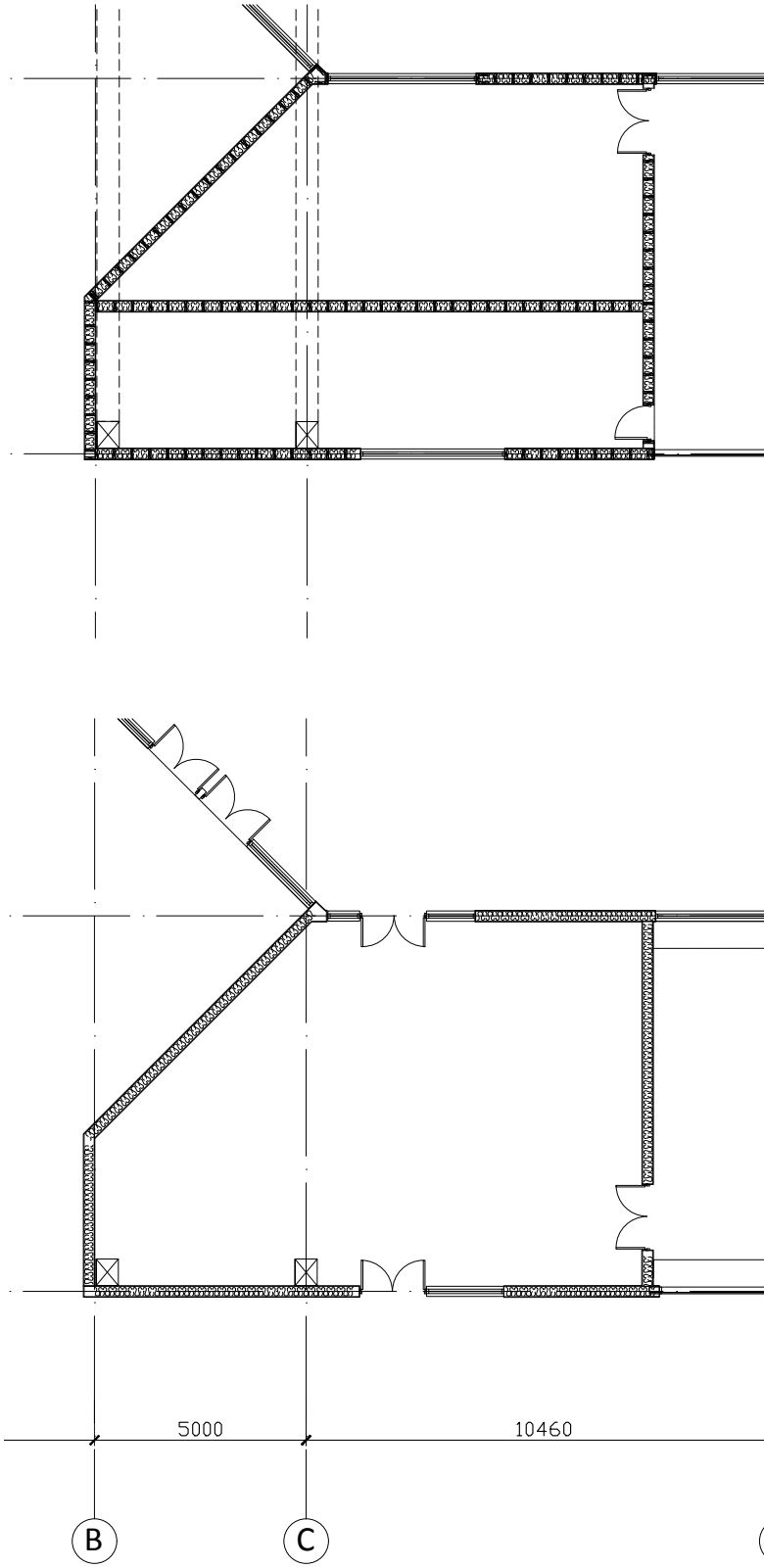
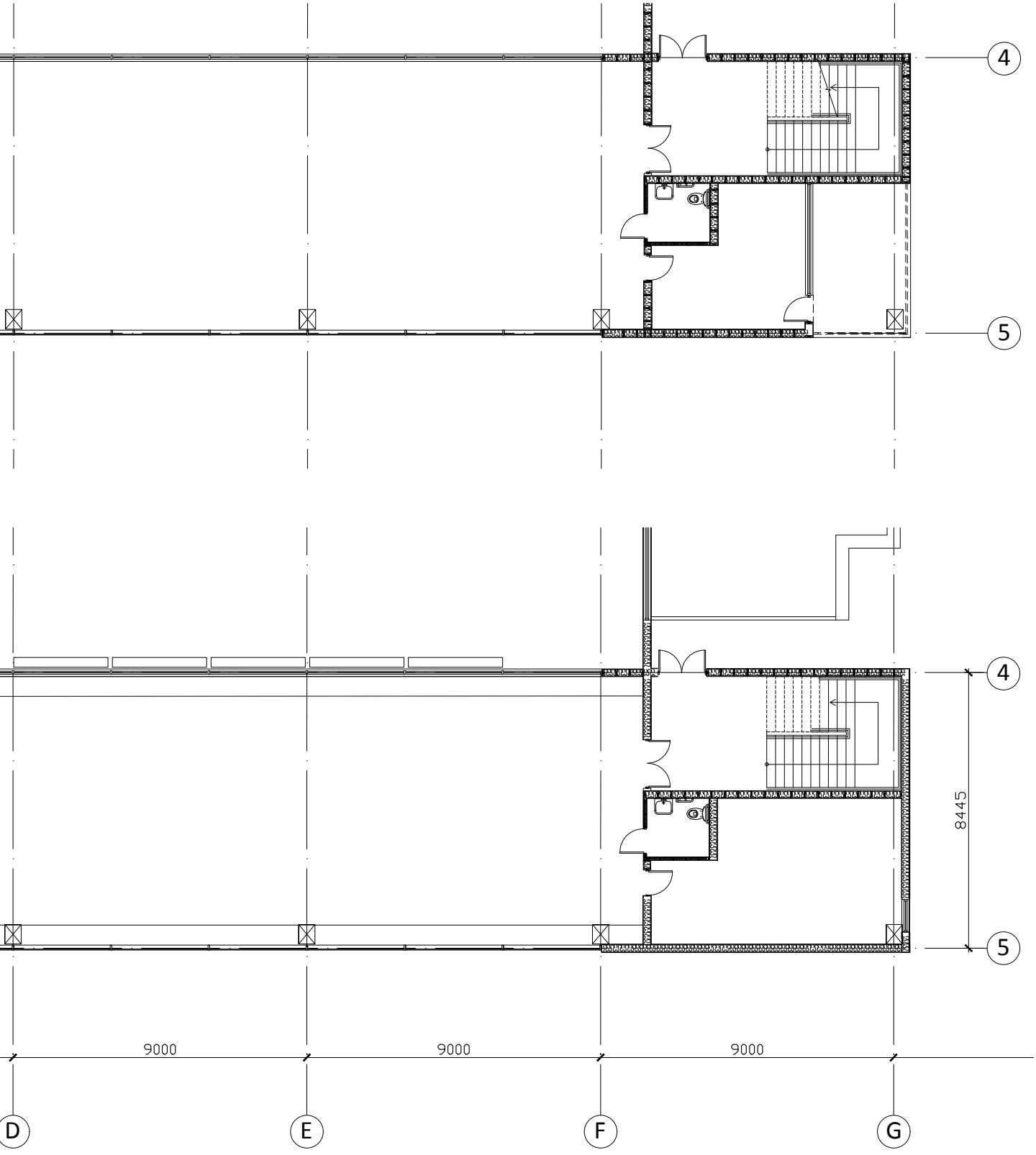
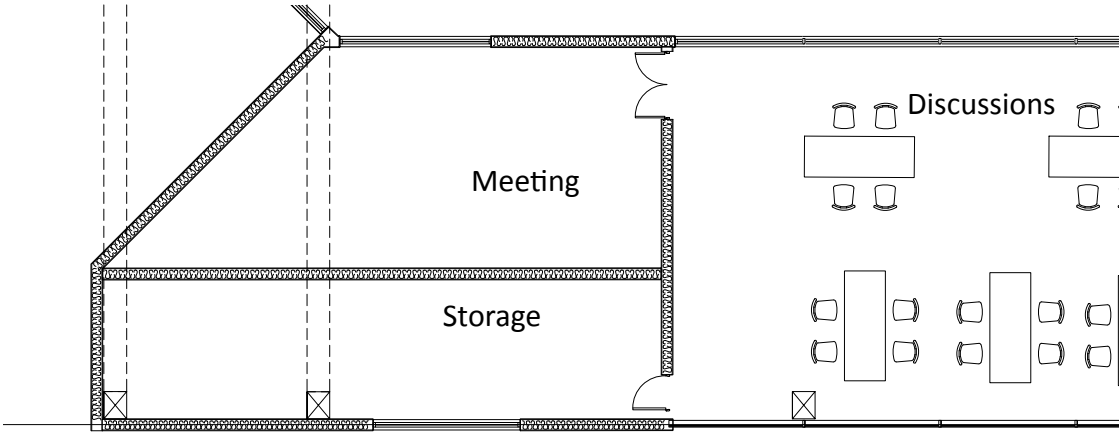
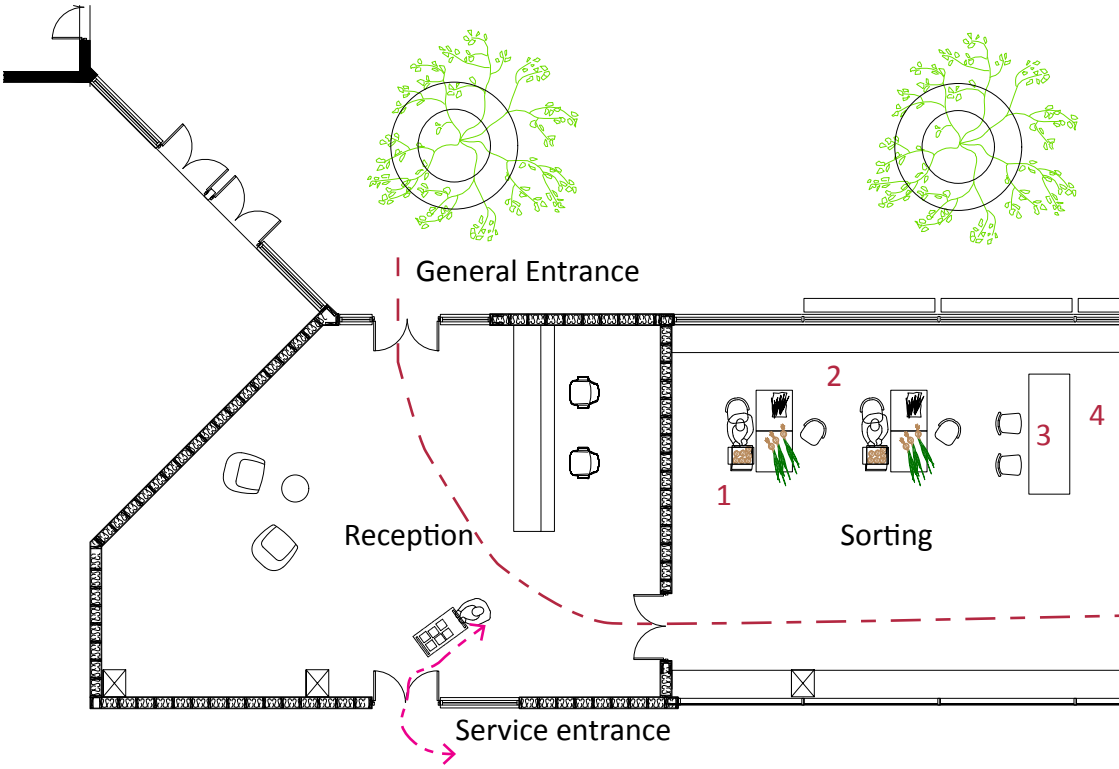


Fig 124 - Structure (Forlee, 2020)


4
5
4
5
8445
9000
9000
9000
D
E
F
G



1st Floor Plan



Ground Floor Plan

Fig 125 - Plan showing activities in the Agro-processing station(Forlee, 2020)

The dehydration process is presented through these images of drying mangos. The numbers on the image relates to where it takes place on the plan.

1



Green Mangoes ready for sorting

2



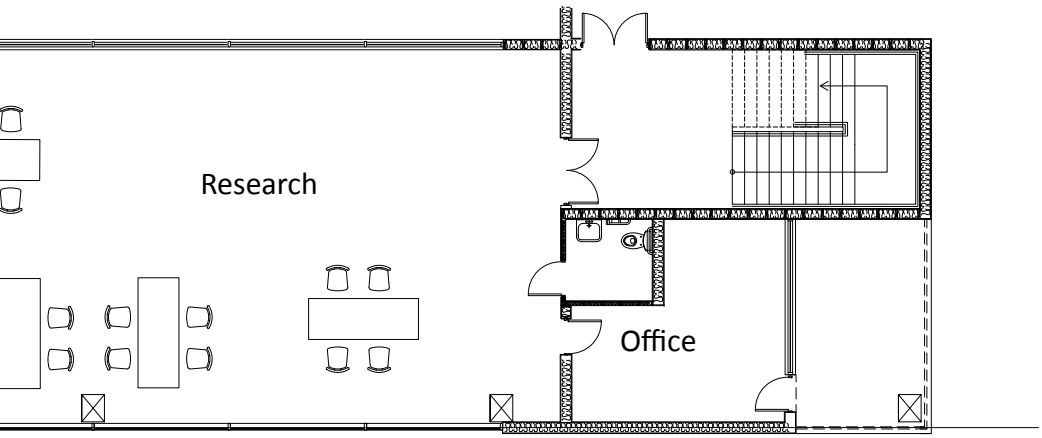
Washing of Mangoes

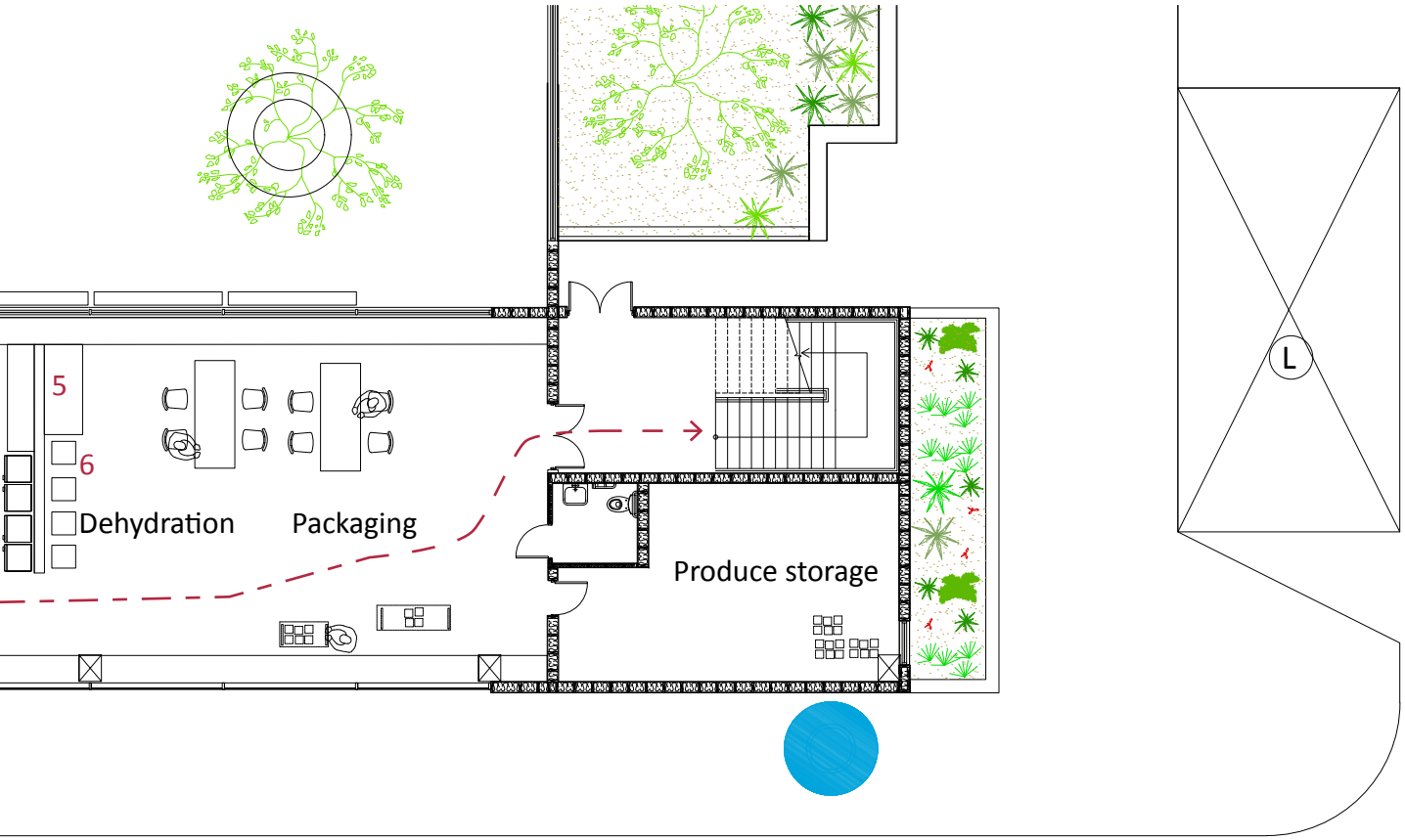
3



Peeled Mangoes

Fig 126 - Mango Dehydration process (Department of Basic Education, 2011)





4



Sliced Mangoes

5



Slices dipped into sodium solution

6



Trolley full of Mango slices

SUSTAINABILITY

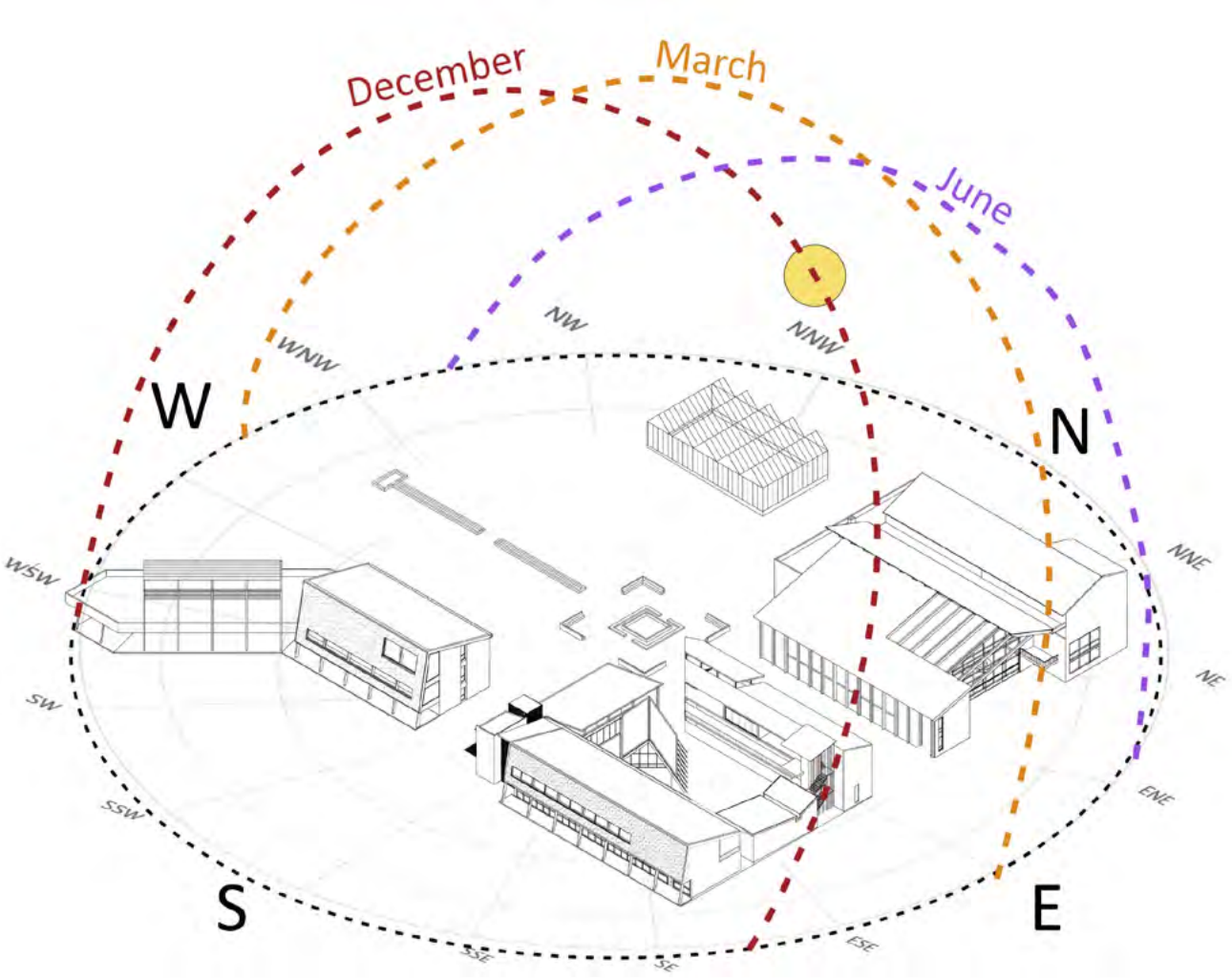


Fig 127 - Orientation of building (Forlee, 2020)

SOLAR ENERGY

Fig 128a shows the location of where solar panels are installed. These roofs are North facing with angles between 25 and 30 degrees which is suitable for Johannesburg solar exposures.

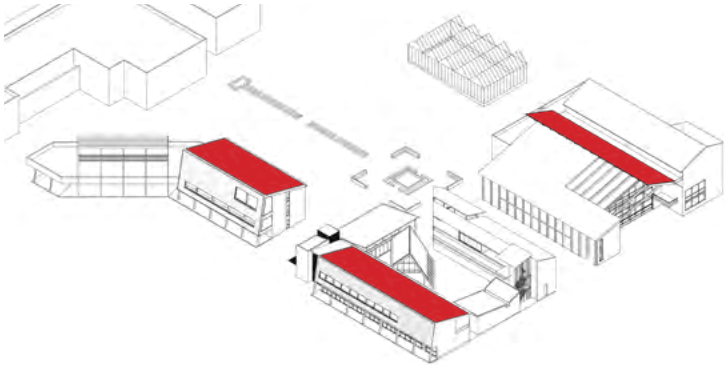


Fig 128a - Locations of Solar panels (Forlee, 2020)

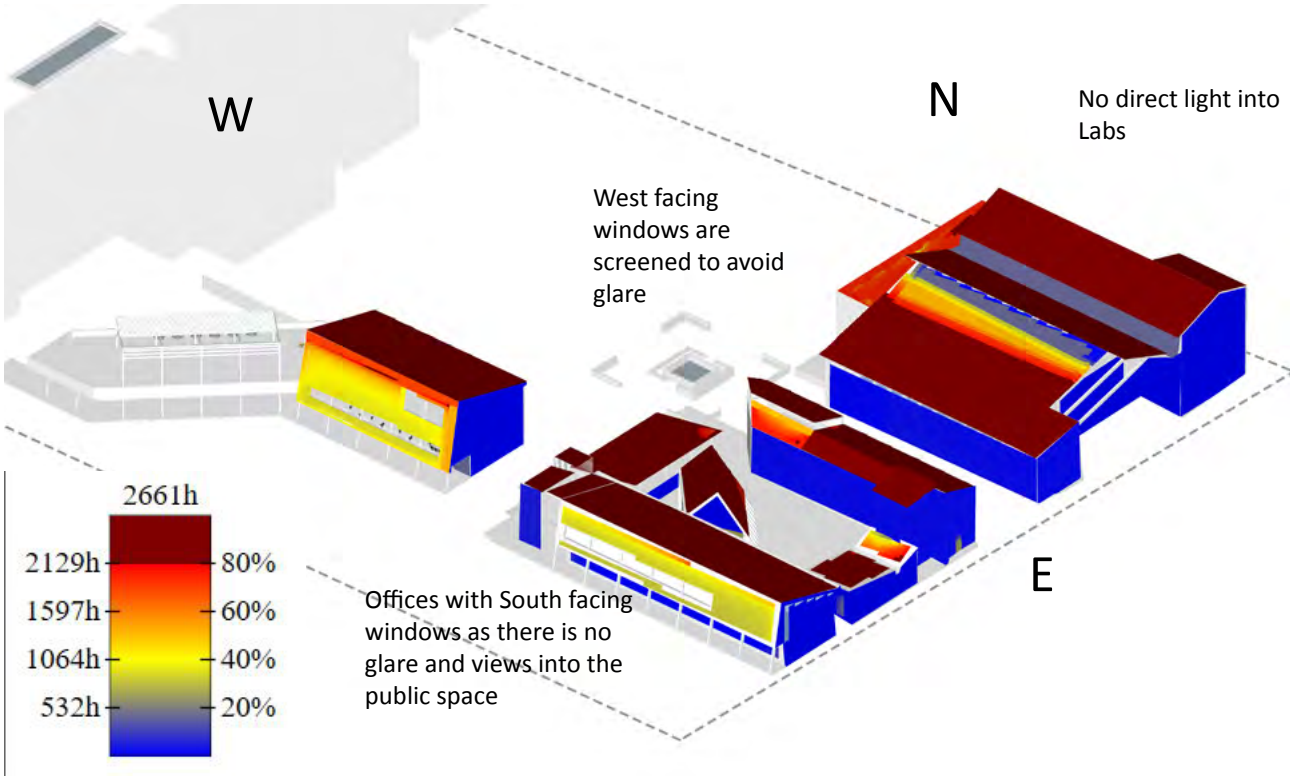


Fig 128b - solar Heat mapping (Forlee, 2020)

VENTILATION

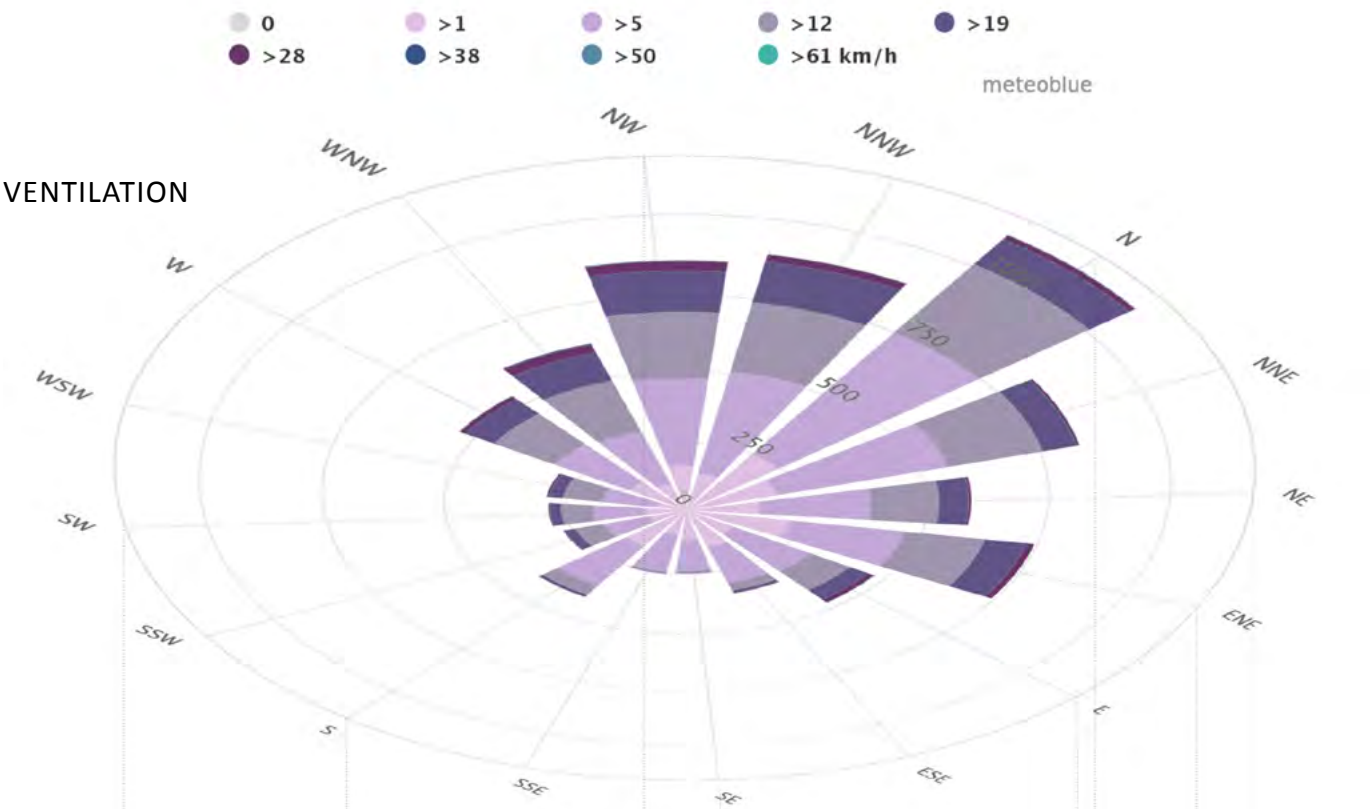


Fig 130 - Wind Rose in Johannesburg (Meteoblue, 2018)

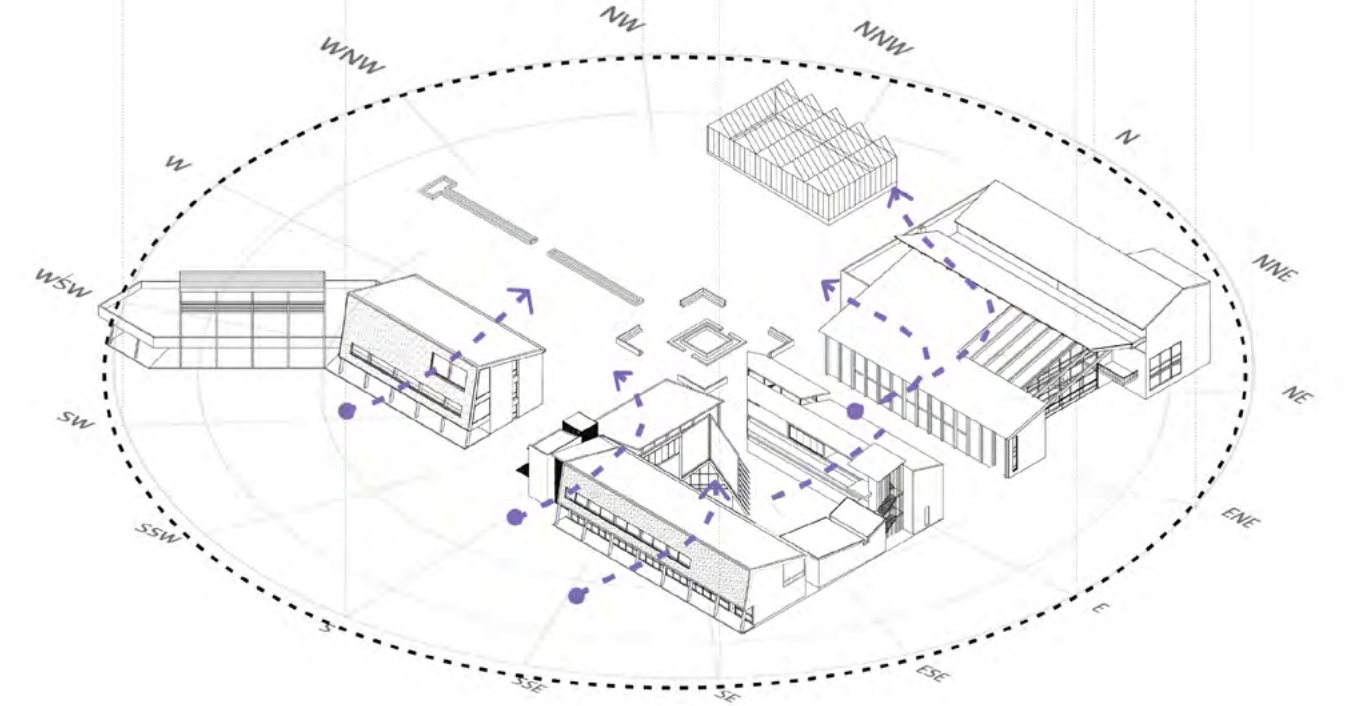
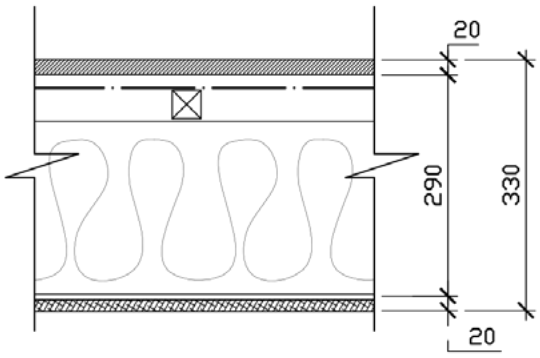


Fig 131- Ventilation direction (Forlee, 2020)

The arrows in Fig 131 indicate the wind direction and movement into the building. Johannesburg wind rose (Fig 130) tells us that wind is generally moving from South to North. It tells me to locate adjustable windows on the South and North facades. Since some North facades are where laboratories are located, they do not have windows to avoid sun exposure as these rooms need to be controlled. The Agricultural Research centre, therefore, is ventilated upwards with automatic louvres.

INSULATION



ROOF ASSEMBLY (SANS 10400-XA Required R-value) Minimum Required Total R-Value : 3.7 Heat Flow : UP	
Basic R-Value of Roof Construction	
0.3	outdoor air film (7m/s)
0.3	roof sheeting
0.2	material between metal sheeting and purlins
0.15	air space in between roof sheeting and ceiling
0.15	air space in between roof sheeting and ceiling
0.06	Ceiling
0.11	indoor air film (7m/s)
2.43	Required minimum R value for insulation

Fig 129 - Typical wall composition (Forlee, 2020)

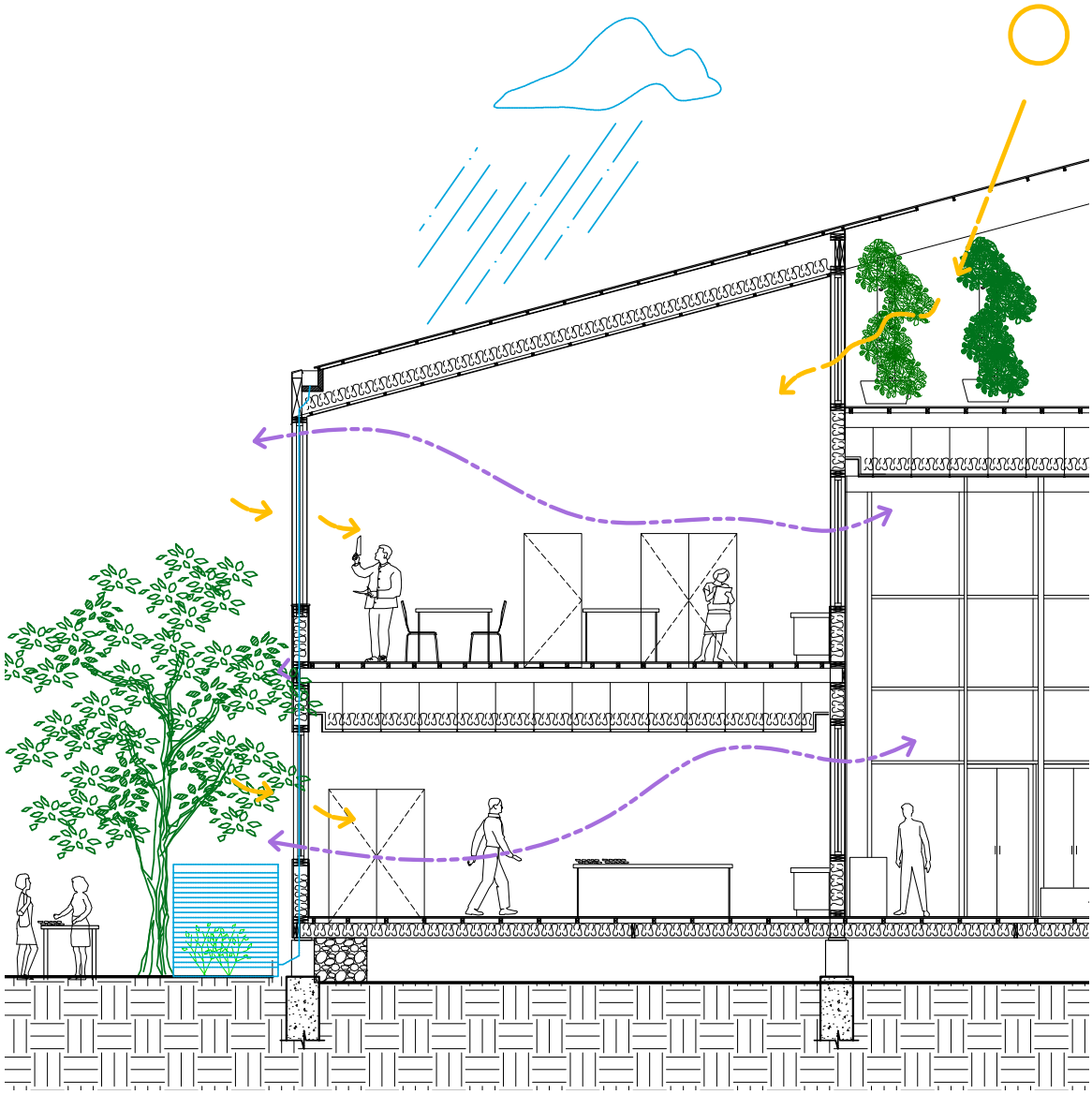


Fig 132 - Section through Agro-processing station (Forlee, 2020)

RAINWATER COLLECTION CALCULATIONS

Rainfall in Johannesburg = **790mm**
South Portion of Oriental Plaza Roof = 10 500msq
Roof Area of new building proposal = 8 572msq
Total Roof Area for rainwater collection = **19 072msq**

Potential water catchment per annum:
(L) = Roof area X Rainfall X 0.9
= 19072 x 790 x 0.9 = 13 560 192L of water can be harvested per annum

Water collection tanks on site:
16 x 15 000L capacity tanks are used and placed on ground level.
2 x 6 000m3 underground concrete water tanks will be built to store water collected from the Oriental Plaza Roof.

Landscape areas:
On average, on soil landscapes requires 800L/msq/annum.
Total on soil landscape on site = 6000msq
60 000msq x 800L = 4 800 000L of water required

13 560 192L - 4 800 000L = 8 760 192L of water left for other farming systems.
The soilless systems uses significantly less water compared to the on soil farming. This amount of water collected is able to sustain all the landscaping on site.

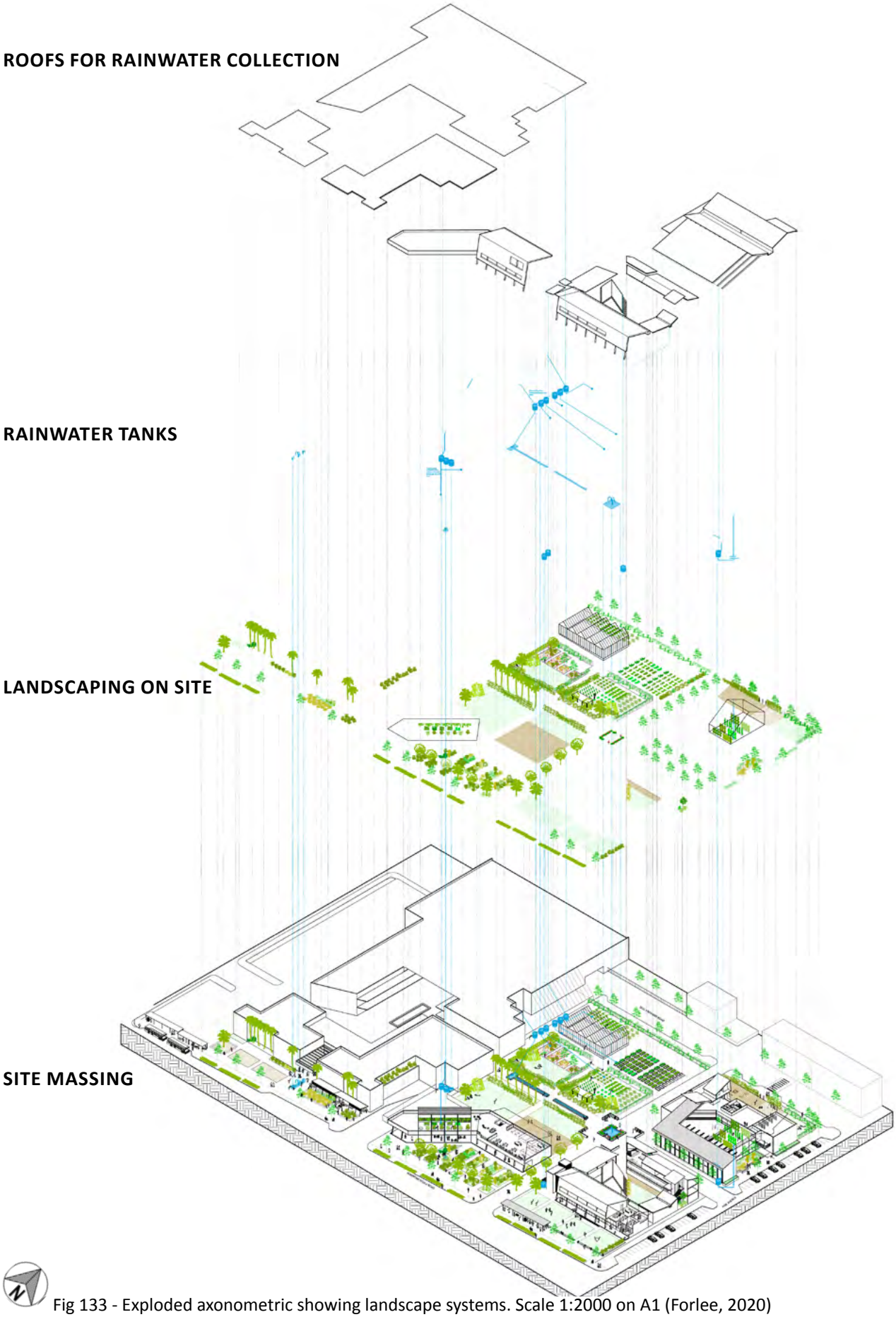


Fig 133 - Exploded axonometric showing landscape systems. Scale 1:2000 on A1 (Forlee, 2020)

CHAPTER 9
CONCLUSION

The key sustainable city challenges identified are the growing population and urbanization, the escalating costs, the impacts (carbon footprint) of mechanized food production/processing, and the escalation of food insecurity and malnutrition. The project is motivated based on an opportunity for design exploration of ways and means to address urban malnutrition and food security within Johannesburg. National and global trends in malnutrition coupled with food waste constitute the theoretical foundation of the investigation. The opportunity of revitalizing the underutilised car-parking lot of the Oriental Plaza, Fordsburg, constitutes an additional motivation.

The key approach in addressing these city challenges are through resource-sensitive urban-agriculture/farming practices and articulating the investigation across the full value chain of food.

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SCHOOL OF ARCHITECTURE AND PLANNING
HUMAN RESEARCH ETHICS COMMITTEE

CLEARANCE CERTIFICATE
PROTOCOL NUMBER: SOAP034/03/2020

PROJECT TITLE:	Process: A Holistic and sustainable food system; Restaurant in Fordsburg, Johannesburg
INVESTIGATOR/S:	Jolene Forlee (Student No: 1057367)
SCHOOL:	Architecture and Planning
DEGREE PROGRAMME:	Master of Architecture Professional (MArch Prof)
DATE CONSIDERED:	29 May 2020
EXPIRY DATE:	29 May 2021
DECISION OF THE COMMITTEE:	Approved

CHAIRPERSON
(Dr Brian Boshoff)

DATE: Signed under lockdown: 11.6.20

cc: Supervisor/s: Deborah Kirkman

DECLARATION OF INVESTIGATORS
I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to endure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee.

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