

Urban Agriculture - A Community Development Project

by Jacques Orton

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Introduction



“By the year 2025, 83 percent of the expected global population will be living in developing countries....Agriculture has to meet this challenge....Major adjustments are needed in agriculture, environmental and macro-economic policy, at both national and international levels, in developed as well as developing countries, to create conditions for sustainable agriculture and rural development.” Agenda 21 (United Nations Conference on Environment and Development, 1992)

Because food is being transported further than ever before, local crop varieties are being replaced by a few commercial types popular with supermarkets. This phenomenon of growing 'food miles' is far from sustainable and more and more poor parts of the city are becoming retail deserts. Air pollution, noise and road congestion is the by-product of this phenomenon. (Viljoen 2005:22)

There is no reason why fresh, local and seasonal food could not be promoted in the same way as the limited number of international foods that is available throughout the year. Urban agriculture will not supply all the food needs and some imported staple and special foods will still have to be imported from elsewhere, but to consume more food where it has grown will establish a sustainable and healthy balance between production and consumption. This is not only effective and practical but it will also be self-beneficial in reducing the embodied energy in contemporary food production. By reducing the energy requirements of goods and processes it will shrink the divide between those with access to abundant energy supplies and those who do not. (Viljoen 2005:29)



Urban agriculture in Africa is mainly a subsistence activity. Ordinary residents use urban space for food production under harsh economic conditions. This raises issues of legitimacy, land access, tenure and planning. There is a need to understand the concept of urban and peri-urban agriculture in Africa. Innovative policy intervention is needed to benefit local communities and the poor in terms of food security, nutrition and job-creation. Urban agriculture in Africa does not have an urban ecology and design focus like Europe. Continuous attention must be paid to the training and research that is needed to support and lead interventions for sustainable urban development. (Viljoen 2005:198)

This dissertation attempts to provide a platform where the local residents can be educated, empowered and given the opportunity to earn an income. This platform develops the community from the bottom up and could be implemented in townships across the country. The program takes form as an urban agricultural centre. The centre is located near Eerste Fabrieke Station in Mamelodi and is used as generator for other business, commercial and recreational activities. The urban agricultural centre also serves as a connection between Nellmapius and Mamelodi.

***If your vision is for a year,
plant wheat.***

***If your vision is for ten years,
plant trees.***

***If your vision is for a lifetime,
plant people.***

Old Chinese proverb

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- 001 TILMAN, H. 1997. Integration or Fragmentation: The Housing Generator Competition. NAI Publishers: Rotterdam.
- Cooke, J. 2009. Greenshops Financial Services Centre. Journal of South African Institute of Architects, January /February 2009, p.22.
- 002 GERNEKE, G. 2006. Red Location Museum of Struggle. Architecture South Africa, May / June 2006:18-23.
- 003 COOKE, J. 2009. Greenshops Financial Services Centre. Journal of South African Institute of Architects, January /February 2009, p.22.
- 004 SOUTH AFRICA. Development Action Group. 2003. Housing Report; The Masisizane Woman's Co-operative. Pretoria: Government Printer.
- 005 UNKNOWN. 2003. Nelson Mandela Pavilions. Leading Architecture, January / February 2003:46-47.
- 006 JOUBERT, O. 2009. 10 Years+100 Buildings; Architecture in a Democratic South Africa. Cape Town: Bell Roberts Publishing.

Theory

- 001 VILJOEN, A. 2005:241. Continuous Productive Urban Landscapes. Oxford: Elsevier.
- 002 VILJOEN, A. 2005:252. Continuous Productive Urban Landscapes. Oxford: Elsevier.
- 003 VILJOEN, A. 2005:116. Continuous Productive Urban Landscapes. Oxford: Elsevier.
- 004 VILJOEN, A. 2005:163. Continuous Productive Urban Landscapes. Oxford: Elsevier.
- 005 RORKE, D. 2009. So much land, so little progress. Lowvelder, April 10, 2009:8.

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Context

1.1 Project location



001 (www.samaps.co.za)
South Africa with Pretoria as indicated



002 (University of Pretoria:2009)
The study area of Mamelodi and Nellmapius.

003 (University of Pretoria:2009)
The site near Eerste Fabrieke Station

1.2 Project overview

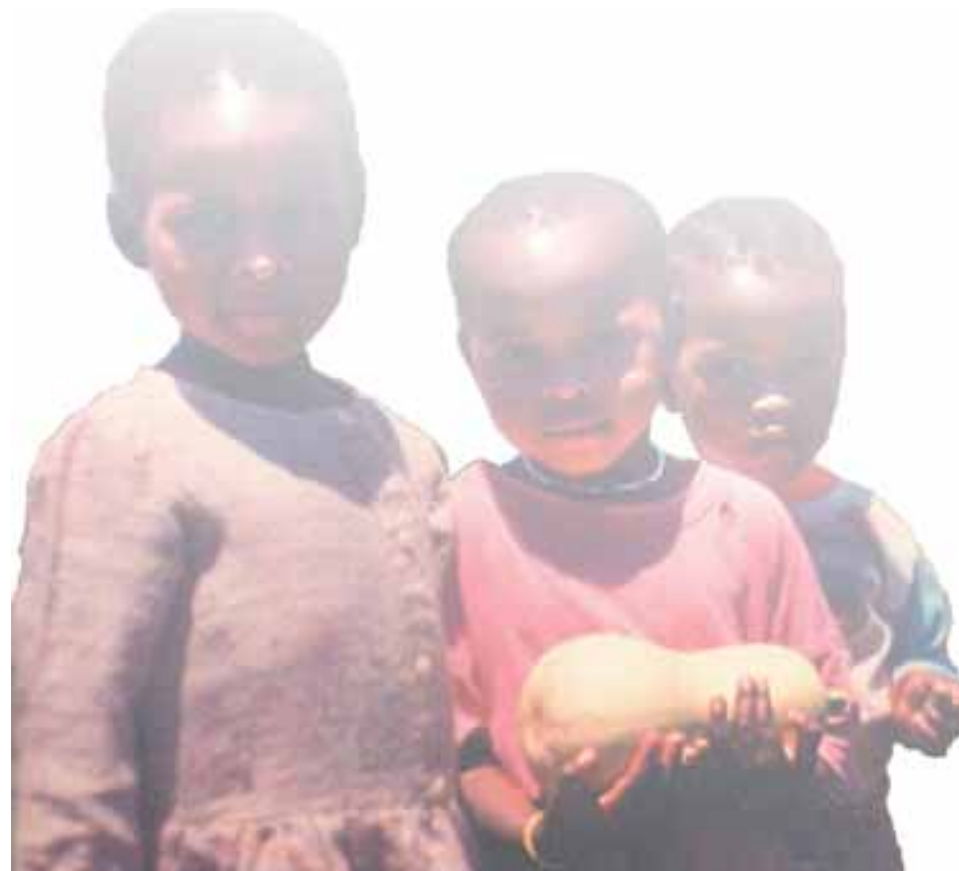
A survey by the Department of Health conducted among 1 to 9 year old children in townships like Nellmapius, revealed that their dietary intake was low in energy and poor in protein quality. These findings supported results from a study by the South African Vitamin A Consultative Group that 33% of all 6 to 71 month old children were vitamin A deficient. These children are more likely to die from infections and the condition may even cause blindness. An Integrated Nutritional Program was also implemented by the Department of Health in the early 1990's. The vision was to provide optimal nutrition and to reduce the number of vitamin A deficient children in South Africa. (Venter et al 2006:13)

Foods of animal and plant origin containing vitamin A are seldom consumed in resource-poor communities. Although foods of animal origin are the best sources of vitamin A, it is expensive and more people have to rely on orange-fleshed fruit and vegetables as sole source of vitamin A. High vitamin A rich cultivars include deep orange and dark green vegetables such as butternut, pumpkin, carrots, orange-fleshed sweet potato and spinach. (Venter et al 2006:14)

The Medical Research Council developed a home garden project during the 1990's in Ndunakazi, a rural town in Kwazulu-Natal. The focus of the project was to monitor the production and consumption of vitamin A rich fruit and vegetables. The project was successful and proved that vitamin A status of 2 to 5 year children can be improved by the necessary nutritional education and promotion. (Venter et al 2006:14)

By growing fruit and vegetables locally people will be able to see where, when and how crops are grown and awareness about food production techniques will be raised. Finally, urban food growing can also provide a basis for the amount of gentle and regular exercise that is necessary to stave off minor health problems. The people will also have direct access to fresh fruit and vegetables. (Viljoen 2005:59)

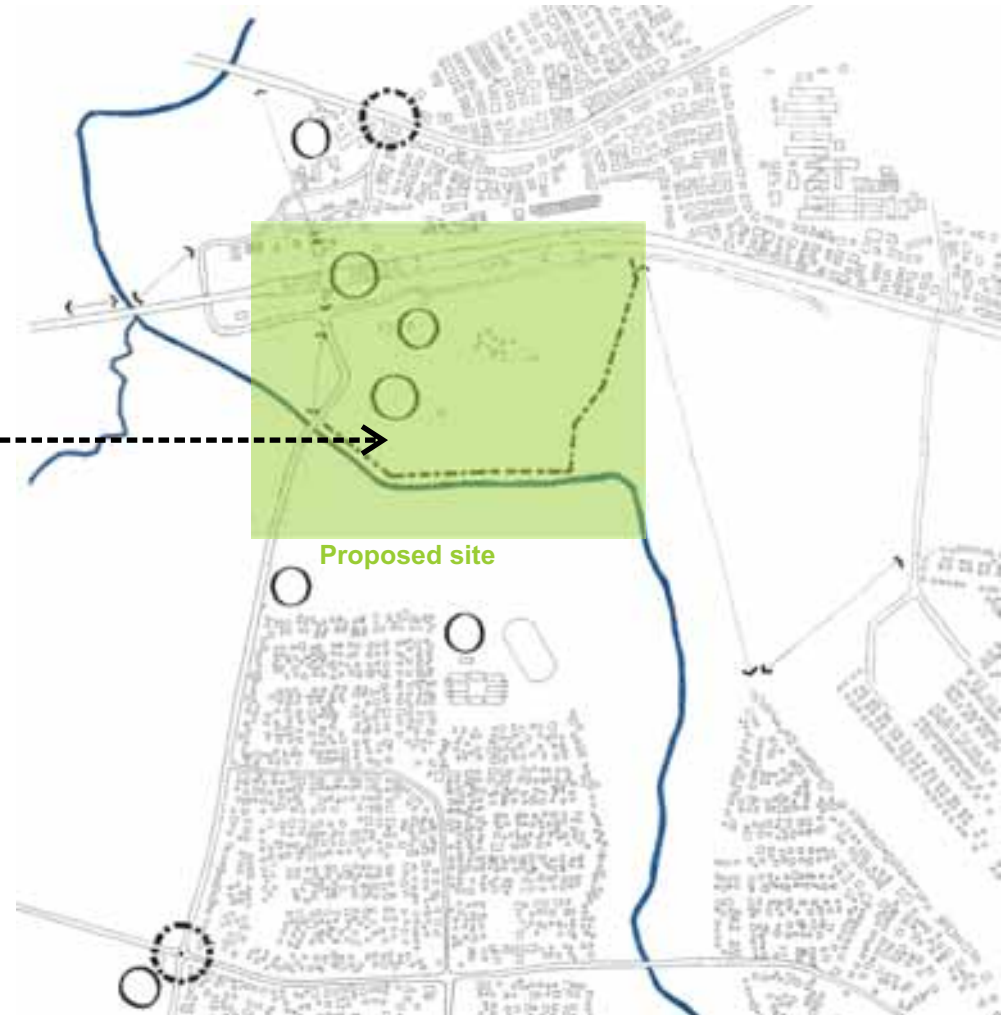
In the process, the community will be developed from the bottom up and this platform could possibly be implemented in townships across the country. The program takes the form of an urban agricultural centre. The centre is located near Eerste Fabrieken Station in Mamelodi and is used as generator for other business, commercial and recreational activities.



1.3 Analysing the site

1.3.1 Macro scale

The large pockets of open land between Mamelodi and the townships to the south act as a physical barrier. These cavities are legible in the figure ground study and could be filled with programs that support a process of generating urban fabric. The selected site and proposed program act as a catalyst for the connection process.



004 (University of Pretoria:2009)

Mamelodi and Nellmapius with the study area as indicated in light green

005 (Figure ground study by author)

Figure ground of the study area with the site as indicated in green

1.3.2 Meso scale

Barriers within the study area

Eerste Fabrieke Station is situated to the north of the proposed site and the railway line acts as a boundary, prohibiting interaction with the urban fabric of Mamelodi. The Pienaars River forms a natural boundary on the southern and western edge of the site and separate Nellmapius from Mamelodi.



006 (University of Pretoria:2009)
Barriers within the study area



007 (Photos by author)
Urban fabric of Nellmapius

Historical background of Mamelodi and Nellmapius

1881

Alois Hugo Nellmapius met Sammy Marks on a business trip to Pretoria. Nellmapius, in return for a large payment was granted the sole right to manufacture alcoholic beverages from grain and potatoes by President Paul Kruger. Nellmapius formed a syndicate with Barnett Lewis and Sammy Marks to establish a distillery to produce Whiskey and Gin.

1892

The concession for the manufacturing of alcoholic beverages is ceded and transferred to Eerste Fabrieke Hatherley Distillery Limited a public company.

1883

The Eerste Fabrieke Hatherley Distillery is opened on 6 June 1883 by President Kruger.

1896

The Pretoria Glass Works was established at the Hatherley complex.

1899

Eerste Fabrieke Hatherley Distillery won several diplomas at the Universal Exhibition in Paris. The Anglo Boer War broke out on the 11th of October 1899.

1880

1882

The construction of the buildings started. Bricks are made by hand on site whilst the machinery was imported from Germany.

1891

Eerste Fabrieke Hatherley Distillery is liquidated.

1895

The South African Fruit and Meat Preserve Works is established at Hatherley. Fruit was imported from the Cape because of better quality and lower prices.

1897

The new Liquor law prohibited the sale of Liquor to black people.

1900

1900

The British Military Forces issued a proclamation that forbids the sale and manufacture of liquor and the distillery was closed down.

1940

Mamelodi is situated on the north-eastern part of Tshwane. The main axis of Mamelodi stretches between the Magaliesberg Mountain in the north and the railway line in the south. Pretoria was founded by the Voortrekkers in 1855 and from 1860 a significant number of black people started to live within the area and settlements near the town. The earliest proof of habitation in the current Mamelodi is to a farm Vlakfontein 329JR on 4 March 1854, when the farm was inspected. In 1874 the farm was divided into three parts, with the Pienaars River separating the area into two halves. (Melsons 2008:18)

Historical background of Mamelodi and Nellmapius



1945

Mamelodi was founded on 30 October 1945 when the City Council bought part two and three of the farm Vlakfontein for the purpose of laying out a black township.

1953

Mamelodi was proclaimed as a black township by the government notice 182 Of 1953. The first black school opened.

1950

1950

The process of relocating the landowners of Lady Selbourne and the residents of Eastwood and Riverside to Vlakfontein started. Water was provided through public standpipes on every street.

1955

Electricity was supplied by local initiative. It was mainly used for lighting.

1956

First maternity home and clinic opened their doors.

1954

The infrastructure of Vlakfontein could not keep up with the booming population and by February 1954 there were about 6000 people living in the area. By June the same year the number increased to 10 000 people and by March the following year there was about 14 700 people living in the area. First old age home and Police station opened their doors. Limited telephone network was installed.

1957

First Post Office and Magistrate court in the area.

1962

Putco busses started to operate in Mamelodi.

1960

The first Community Hall was built.

1964

A cinema was opened on local initiative.

1980

Mamelodi day care hospital opens.

1975

1976

Centre for black people with disabilities opens.

1974

The start of the private taxi transport system in Mamelodi.

1987

All formal housing units were provided with electricity and sewerage systems.

1983

The S.O.S children's village was established.

1999

Nellmapius Extension 4 was established and laid out.

1993

The township of Nellmapius was established and laid out.

2000

Eerste Fabrieke Hatherley Distillery

The founder of the Eerste Fabrieke Distillery was Alois Hugo Nellmapius, who arrived in South Africa in 1873, the same year that gold was found in the Z.A.R. Nellmapius was born in Budapest, raised in Vienna and later trained as an Engineer in Holland. (BURGER 2007)

009 (photos taken by author)



Caretaker's house



House dating back to the founding of the distillery

Underground tunnels where distilled whiskey and gin was stored

Historical outbuilding dating back to the founding of the distillery

008 (University of Pretoria:2009)
Eerste Fabrieke Hatherley Distillery
Heritage site

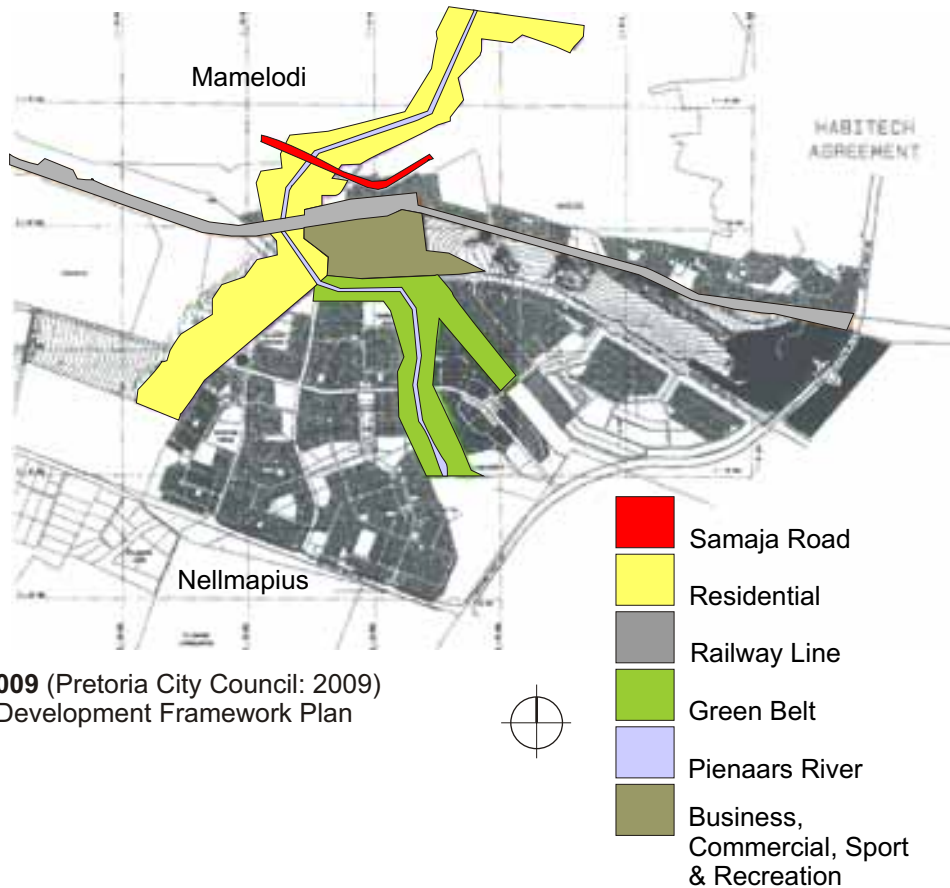


Council's Development Framework Plan

According to the Council's Development Framework the area around Eerste Fabrieke Station is classified as a Restructuring Zone. Restructuring Zones are perceived to be critical areas in the city for restructuring and integration and will receive capital grants from Government as well as institutional subsidies.

The Development Framework Plan proposes that the area south of the station be developed into business, commercial and recreational facilities. The unutilized area north of the station will be developed into low to medium density residential areas.

City Council's Development Framework Plan



Proposed urban framework of Mamelodi/Nellmapius

The Development Framework for this dissertation is a combination of the existing and proposed development in Mamelodi and Nellmapius, to form a network of much needed functions. The cavity of unutilized land between Mamelodi and Nellmapius needs sustainable development in order to weave together the strands of social, economic and legislative environments within the area. The urban agricultural centre is located between the Pienaars River and Eerste Fabrieke Station. The site is currently owned by Mr Aubrey Upton and utilized as a cattle farm. The Urban Agricultural Centre will be integrated into the larger metro area by creating activity spines across the railway line.

The transport infrastructure is adequate for the present circumstances but will have to be improved for the new development. At present the area in front of the station is transformed into a taxi-rank in the early hours of the morning and by late afternoon. Pedestrians move in and out of the area throughout the day with the train as main form of transport. The flow of pedestrians from Nellmapius across the railway line and into Mamelodi needs to be addressed by a well designed pedestrian crossing. A new bus and taxi rank north of Eerste Fabrieke Station will provide affordable and convenient modes of transport.



010 (Urban Framework: 2009)
Initial Urban Framework for study area

The Proposed urban framework by author:

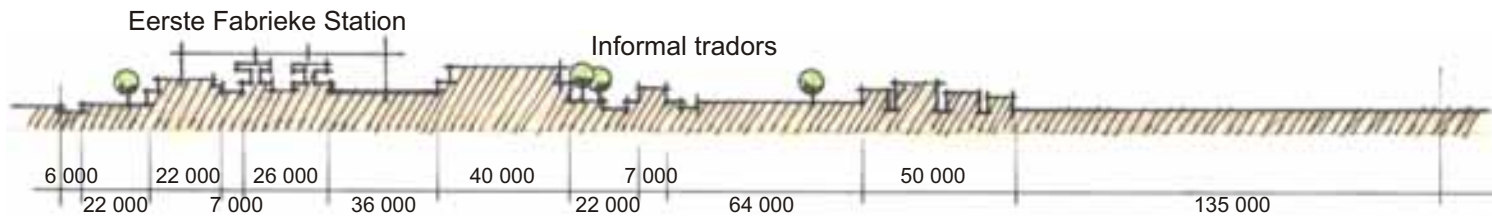


- A. Business and commercial node located at main gateway from Samaja Road.
- B. Office Park area.
- C. Recreation, Parks, Sports facilities and Eerste Fabrieke Heritage site.
- D. Main pedestrian walkway links important nodes within study area.
- E. Transport node at Eerste Fabrieke Station. (New Bus and Taxi rank)
- F. Government and Institutional Facilities. (Police Station and Court of Law)
- G Tertiary Educational Facilities. (Technical College)
- H. Areas of mixed-use. (Commercial - Ground floor, Residential - First floor)
- I. Medium to low density housing.
- J. Areas for urban agriculture.
- K. Phase 1 and 2 of urban agricultural development.
- L. Social Housing as part of Phase 3 of urban agricultural development.

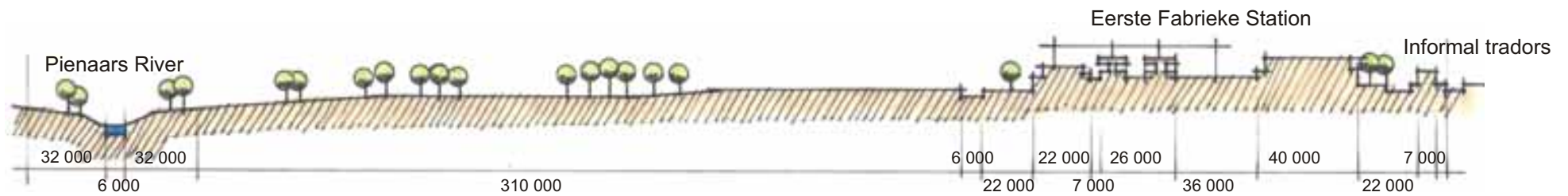


011 (Urban Framework: 2009)
Proposed Urban Framework for study area

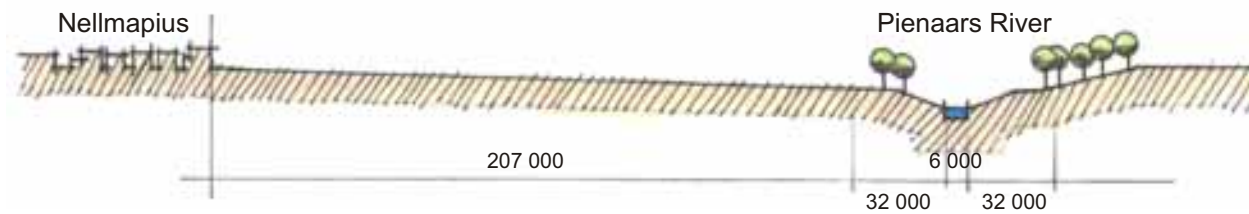
Typical sections through site



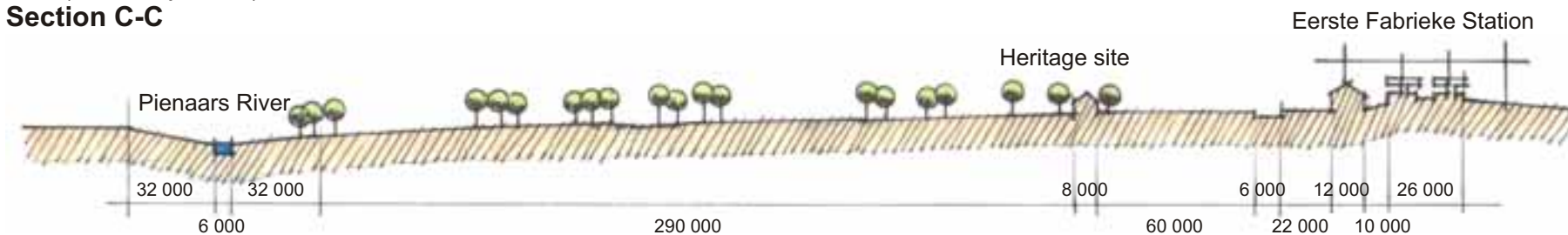
011 (Section by author)
Section A-A



012 (Section by author)
Section B-B



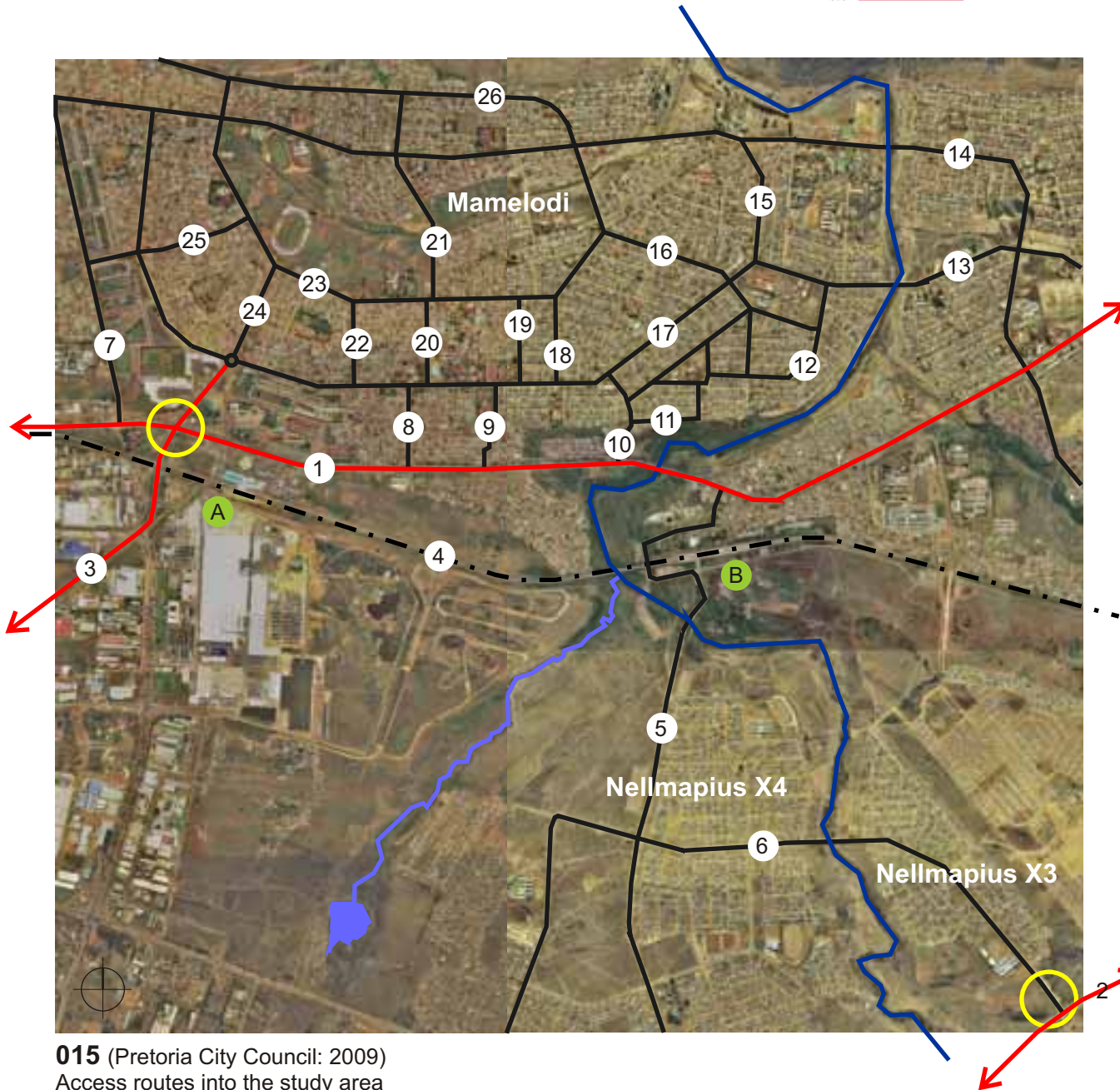
013 (Section by author)
Section C-C



014 (Section by author)
Section D-D

Infrastructural analysis

Samaja road to the north of Eerste Fabrieke Station and Hans Strydom drive acts as the main traffic arteries into the study area and is indicated with red lines. The feeder roads through the urban fabric are indicated with black lines. Denneboom Station close to the corner of Samaja and Waltloo road acts as the main gateway into Mamelodi as indicated on the aerial photo. The corner of Hans Strydom and Alwyn Road represent the gateway into Nellmapius from the south. Samaja road is also the main bus route to and through Mamelodi and acts as transitional space for all commuters. The site for the proposed Urban Agricultural Centre is situated close to Samaja road and is conveniently accessible via Eerste Fabrieke Station.



- Main roads into study area
- Feeder roads into urban fabric
- - - Railway line
- Pienaars River
- A Denneboom Station
- B Eerste Fabrieke Station
- Gateway into study area

- | | |
|-----------------------|--------------------|
| 1. Samaja road | 14. Sibande ave |
| 2. Hans Strydom drive | 15. Shabangu ave |
| 3. Waltloo road | 16. Pitje str |
| 4. Railway line | 17. Shabangu ave |
| 5. Love drive | 18. Tjale str |
| 6. Alwyn road | 19. Khumalo str |
| 7. Boundary drive | 20. Mphaki |
| 8. Dr Robeiro drive | 21. Masethe str |
| 9. Ntshabeleng drive | 22. Kekana drive |
| 10. Kgomo | 23. Kubone drive |
| 11. Motau str | 24. Maphalla drive |
| 12. Mashishi str | 25. Ntsieng drive |
| 13. Tshomo drive | |

015 (Pretoria City Council: 2009)
Access routes into the study area

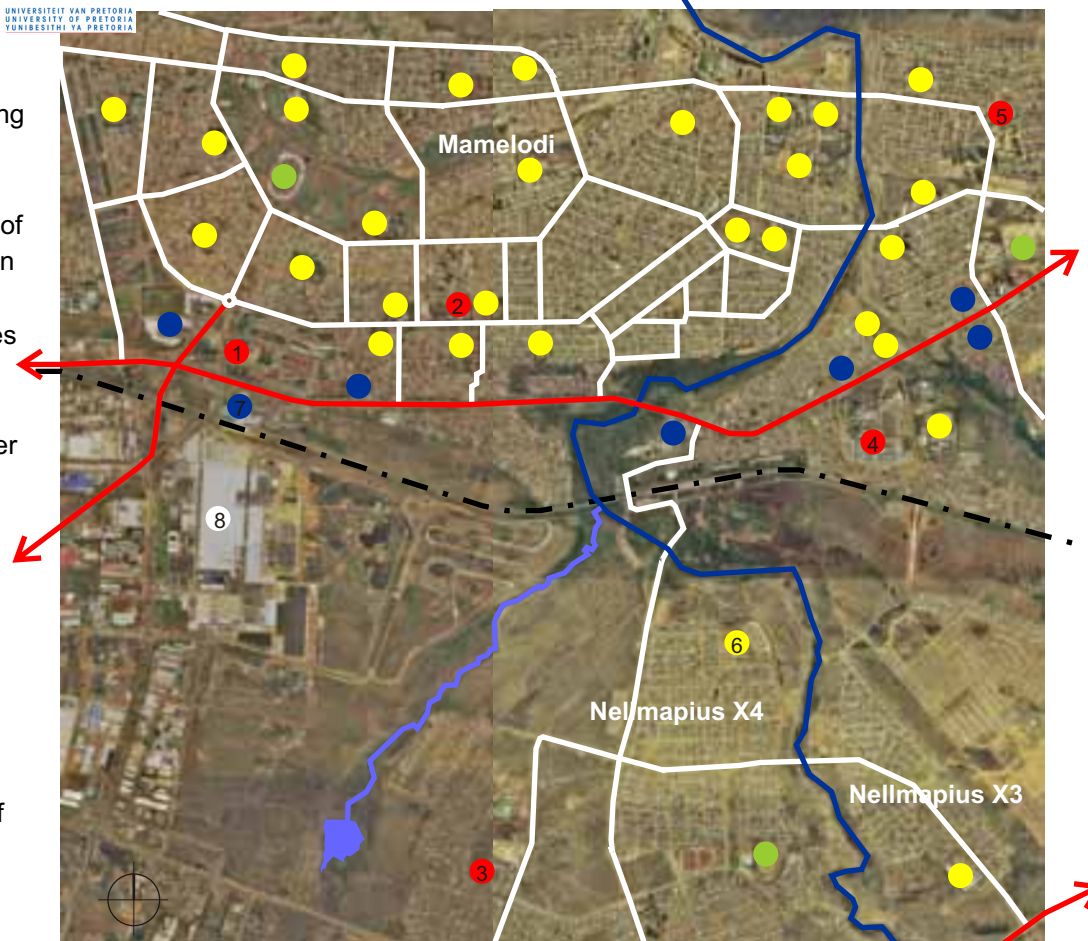
Social and economical analysis

Mamelodi is isolated from the CBD of Pretoria and comprises of low quality housing and a large component of informal settlements. Today the whole dynamic of Mamelodi exist in the form of small scale formal and informal industries and markets. The population density of Mamelodi is high with more than forty percent of the population that fit into the age categories of between 15 to 34 years. More than fifty eight percent of the people of Tshwane have no formal income and rely on other sources of income to support their families. The majority of formal employees in Mamelodi have a monthly income of less than R3 200-00 a month.

(Melsons 2008:21)

In recent years public amenities like refuse removal, toilet facilities and piped water started to cover large areas of Mamelodi, but improvement is still needed. Almost one in every four households in Mamelodi does not possess a piped water connection. Public services like health care centres, schools, post offices and places of worship are not sufficient and also not equally distributed throughout Mamelodi. The current population of Mamelodi is in the order of 250 174 people, where more than thirty percent of the people have a low monthly income of between R1-00 and R 3 200-00. Only 4.3% of the population have a middle monthly income of between R 3 200-00 and R 25 600-00. (Melsons 2008:23). The average monthly income of the 164 800 economically active people in Mamelodi is R 2 045-00. (Department of Transport 2005). Because the majority of people in the study area are employed within Pretoria, they have to travel more than 18 kilometres to go to work. Less than 0.1% of households can afford a car and the people spend more than 10% of their monthly income on transport costs. (Department of Transport 2005).

According to Mrs Kgoadi, a social worker in the area, crime, poverty and unemployment is taking its toll, and more young people are becoming dependent on alcohol and drugs. Apart from school there are almost no recreational facilities available for the youth. With an unemployment rate of over 50%, many households are dependent on social grants from government. Social grants add to the high unemployment, because the people are reluctant to look for other means of income after receiving the money. Illegal immigrants from Zimbabwe and Mozambique also flock to the area in order to find work. These people are willing to work hard for minimum wages in order to stay alive and this also adds to the dilemma of unemployment. Mrs Kgoadi believes that bad management and corruption are the main reasons why government initiatives don't work in the township. Ongoing skills and capacity training is needed to support these initiatives. (Kgoadi 2009).



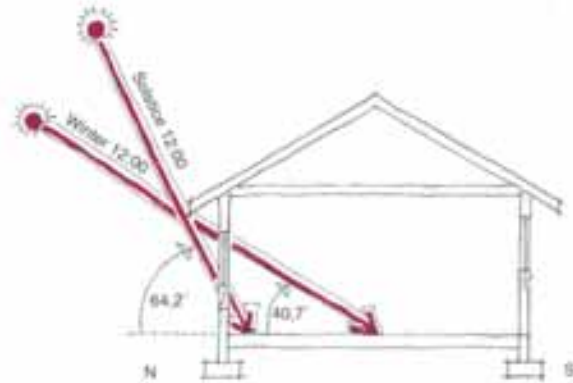
016 (University of Pretoria:2009) Social & economical analysis of study area

- Schools and Tertiary education
- Shopping / retail areas
- Hospital / clinic
- Sports ground

- | | |
|----------------------|------------------------------|
| 1. Mamelodi Hospice | 5. Mamelodi East Clinic |
| 2. Mamelodi Clinic | 6. Jonkottolo Primary School |
| 3. Nelmapius Clinic | 7. Denneboom Shopping Mall |
| 4. Mamelodi Hospital | 8. Industrial area |

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave
Maximum average monthly temperature (°C)	28,8	28	27	24,1	21,9	19,1	18,6	22,2	25,5	26,6	27,7	28	24,81
Minimum average monthly temperature (°C)	17,4	17,2	16	12,2	7,8	4,5	4,5	7,8	11,7	14,2	15,7	18,8	12,13
Average monthly amplitude (K)	11,2	10,8	11	11,9	14,1	14,6	14,1	14,4	13,8	12,4	11,4	11,2	12,68
Average monthly relative humidity (%)	58,3	59,5	60,0	59,5	56,0	53,0	50,0	46,0	45,8	49,5	54,0	56,5	53,83
Average monthly rainfall (mm)	136	79	80	31	13	7	3	8	22	71	98	119	56,17
Wspan 72	74	79	78	78	75	71	64	61	64	68	70	75	70,75
Wspan 44	45	44	41	34	31	29	28	29	35	40	43	44	36,92

017 (Holm 1996)



018 (Holm 1996)

Climate: General high temperatures and moderate humidity levels characterises the climate of Mamelodi and Nellmapius. The monthly relative humidity is in the order of 59% and not considered problematic. Thunderstorms are fairly common in this area with precipitation rates of up to 100mm per hour. Due to the high average rainfall per year, rainwater can be harvested to provide irrigation for the agricultural activities. Mamelodi is situated in a climatic zone with large temperature variations and dry and rainy seasons. Because the daily temperature swing can be high during winter time, high thermal massing for walls and floors will be advisable. Provided that the walls and floors give thermal mass, lightweight insulated roofs may be used in this area. Precipitation occurs mostly during thunderstorms and entrances should be shielded. (Holm 1996:69)

Typography: Mamelodi is situated at the foot of the Magaliesberg Mountain Range, approximately 300 meters above sea level. The Magaliesberg Mountains forms the northern and eastern boundaries of the area and reaches a height of 200 meters above the surrounding area.

Wind: During summertime the winds are predominantly east-north-easterly to east-south-easterly and accompanied by turbulent wind patterns. In the winter the winds are predominantly south-westerly with a fair amount coming from the north-east. The structure of the building should be designed in such a way to maximise cross ventilation. (Holm 1996:69)



019 (Photo collage by author)

Photo collage of existing fabric of the study area

1.3.3 Micro scale



Eerste Fabrieke Station becomes alive in the early hours of the morning when commuters start to arrive at the station. Informal traders sell fruit, vegetables and other products from small tuck shops constructed from materials gathered in the area. Survival is the one thing that many of these traders have in common with no room for financial growth. The main pedestrian movement occurs along Love drive from the informal settlement of Nellmapius towards the station. The train is the main form of transport for thousands of people working in other areas around the city and informal activities emerges all around the station. The area in front of the station is transformed into a taxi-rank during peak hours and after school when school pupils move in and out of the area.

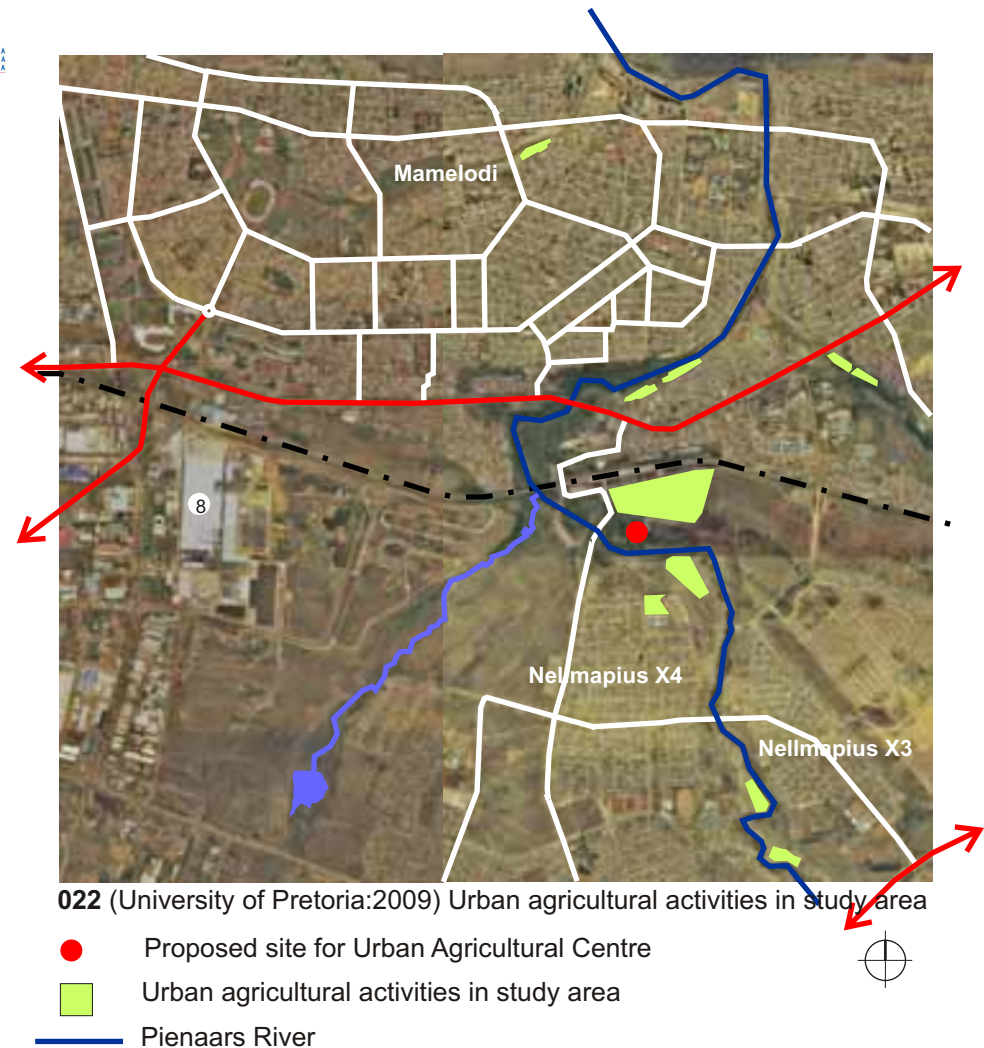
The heritage buildings from the Eerste Fabrieke Hatherley Distillery dates back to 1882 and are in a dilapidated state. This piece of land is owned by Mr Aubrey Upton and is utilized as cattle farm with cattle roaming between the station and the Pienaars River. At certain spots along the river subsistence farming are being practiced by people living in the area.

Although the people of Nellmapius are poor, the majority of houses are neatly constructed from concrete masonry blocks and corrugated iron. Small businesses like Spaza shops and hairdressers line the streets and form the main source of income for many people.

Urban agricultural analysis

The vegetable gardens are mainly for the purpose of survival and not to generate an income. Due to theft and a lack of knowledge, these small scale farmers are fighting a losing battle. Women dominate urban agriculture in South African townships, and researchers estimate that over 80 percent of these cultivators are woman. In Kenya women constitute 64 percent of Nairobi's urban cultivators. Traditionally black men play a big role in the clearing of fields and other activities like chopping down trees, while the women are more likely to be involved in soil preparation, cultivating, planting, weeding and harvesting. Only about 10 percent of urban cultivators in Mamelodi are men. (Moloto 1996:95)

Jonkotlolo Primary School in Nellmapius initiated an urban agricultural program among the children for the benefit of orphans in the area. This initiative is supported by the Heartbeat Centre for Community Development. The mission of this organisation is to alleviate the suffering of orphans and vulnerable children. Other urban agricultural activities include a Horticulture site in the east of Mamelodi. This project is government sponsored and consist of six greenhouse tunnels. Unfortunately, due to a lack of knowledge and poor the management the full potential of this initiative is not reached. The proposed urban agricultural centre will provide a platform where vegetables can be produced and harvested in a more formal and productive way to relieve poverty and unemployment.



022 (University of Pretoria:2009) Urban agricultural activities in study area

- Proposed site for Urban Agricultural Centre
- Urban agricultural activities in study area
- Pienaars River



021 (Photo collage by author)

Photo collage of urban agricultural activities at Jonkotlolo Primary School



The Problem

2. The problem

2.1 Stating the problem:

Many urban migrants end up in informal settlements because they are illiterate and unable to find work in the city. (Department of Transport 2005). In the end they have to rely on family and friends for support. Urban agriculture can be a self-empowering solution the poor can use to put food on the table. Poor people in some parts of the country spend as much as 50 percent of their income on food. It is therefore important to look for methods of implementing sustainable nutritional programmes. Nutritional deficiencies like Kwaishiorkor, Marasmus and Pellagra are also common in South African informal settlements. (Moloto 1996:3)



001 (Photo taken by author)

2.2 Sub-problems:

2.2.1 First Problem. There has been a long standing prejudice against urban agriculture among town planners and policy makers in South Africa. Urban agriculture is not considered as part of the urban informal sector and has to compete with industry for urban land. (Moloto 1996:5)

Advantages of urban agriculture

- Poverty, hunger and malnutrition can be addressed.
- It will increase economic enterprise and opportunities in the city.
- The city will become a more sustainable urban environment and will lead to a decrease in urban waste management costs.
- Urban agriculture will provide fresh produce to local residents, without the food travelling halfway around the world to reach the consumer.
- It will ensure the close proximity of services and markets.
- Today people living in townships and informal settlements are divorced from nature with rows and rows of impersonal RDP houses without a single tree in the area. By incorporating urban agriculture into urban development frameworks, people will learn to appreciate the ecosystem and how we can benefit from it. (Moloto 1996:20)
- Problems and possible solutions to urban agriculture can only be identified in practice.
- By incorporating urban agricultural programmes in local schools, children will learn from a young age how to sustain their families and to plan for the future.

Disadvantages

- Because rainfall in South Africa is often torrential, uncontrolled urban agriculture on river banks may cause soil erosion.
- Urban agriculture that includes livestock may serve as a breeding ground for flies and thus the breeding ground for the transmission of diseases. These sites provide a habitat for pathogenic bacteria. (Moloto 1996:21)

2.2.2 Second problem

Urban agriculture in South Africa is a survival strategy by the very poor who cannot afford to buy or lease plots. Because cultivation in urban areas takes place on vacant land to which the people have no title, their crops may be destroyed without consultation. It can also be expected that the lower the income of a particular household, the more likely they are to participate in urban agriculture.

Possible solutions

- Urban agriculture saves energy and conserve resources in that food is produced locally and close to the market. Transport and storage costs will be saved with no loss of quality due to handling and transportation. For this reason, incentives from government are needed to provide free or affordable land especially for cultivation purposes.
- Urban farmers should have a choice of either affordable plots which can accommodate both shelter and crops or land set aside especially for cultivation purposes. (Moloto 1996:28)
- These agricultural plots should be equally distributed throughout the area. Because the majority of urban farmers are old, it will be safer and more convenient to for these plots to be in walking distance from their homes. (Moloto 1996:71)



002 (Photo collage by author)

2.2.3 Third problem

Crop theft seems to be one of the biggest problems for urban agriculture and it seems that up to 85 percent of urban farmers are affected by it. Theft also seem to be a much bigger problem among rain fed plots, where the farmers are not able to keep an eye on their crops. Because the crops are usually not fenced off, cattle and other livestock often trample and eat the crops. Only about 19 percent of urban agricultural crops on rain fed plots are guarded and then only during harvesting time. Crop theft represents a loss in cash that could have been spent on the purchase of seeds or the renting of a tractor. (Moloto 1996:91)

Possible solutions

- The housing part of the project needs to be elevated and in close proximity to the agricultural fields for the urban farmers to keep an eye on their crops.
- Some urban farmers are guarding their crops until late at night when it's more likely for the crops to be stolen. Urban agriculture practiced on a bigger scale, would possibly allow for a guard to be appointed at night. A sense of pride and ownership will be developed by involving more people of the community in urban agricultural activities. The whole community will then be involved in protecting the crops. (Moloto 1996:91)



003 (Panoramic photo of site by author)

2.3 Hypothesis

“Food growing projects can act as a focus for the community to come together, to generate a sense of 'can-do', and also help create a sense of local distinctiveness a sense that each particular place, however ordinary, is unique and has value.” (Viljoen 2005:57)

Urban agricultural projects can be active in rehabilitation work in areas with high crime levels by offering alternatives to selling drugs and other criminal activities. Acts of vandalism have reportedly stopped in Doncaster in the United Kingdom after orchards and other community activities have been introduced. Urban agriculture can also provide excellent means of involving groups often discriminated against like ethnic minorities, woman and old people in sociable productive activities. Local or ethnic identity can also be expressed by growing cultural significant produce. (Viljoen 2005:57)

There are numerous examples in the United Kingdom where urban agricultural projects are associated with vocational training courses like basic numeracy, literacy and commercial horticulture subjects. Urban food growing activities can be incorporated into traditional school subjects like science, geography and environmental studies. A practical approach to training within the context of urban agriculture would enhance the quality of life for citizens by providing a change in environment and a heightened sensual experience. Just by observing outdoor activity and its experience, a connection with nature can be re-established. (Viljoen 2005:58)

Between 1976 and 1987, over 44 000 food retailers in the United States closed and more than 90 percent of all food sales came from only two percent of the stores. Many poor urban neighbourhoods were left without access to food outlets. One of the commercial advantages that urban food producers have over distant located producers is the ready access to markets for perishable produce that does not respond well to freezing and other conventional storage techniques. Agricultural projects within the city will also act as a springboard for new entrants into sustainable urban agriculture. (Viljoen 2005:58)

Vegetable garden projects to alleviate poverty and malnutrition should be adapted to local conditions and cultural preferences. Cultural resistance to unfamiliar technologies as well as the availability of resources like water, land and access to seeds and plant material should be taken into account. (Venter et al 2006:15)

The community should be involved in all decisions taken and regular meetings to provide feedback and to discuss relevant issues should be held. The involvement of village leaders and other prominent figures within the community will lend credibility to vegetable garden projects. (Venter et al 2006:16)

2.4 Delimitations

- Although the agricultural centre will provide ongoing training on the practical aspects of growing food in an urban environment, it is not a tertiary institution.
- The urban agricultural centre will limit its produce to local vitamin and mineral-rich vegetables which include carrots, butternuts, orange-fleshed sweet potato, cabbage, spinach and tomatoes. Other fruit and vegetables will be obtained from the Pretoria Fresh Produce Market.

2.5 Assumptions

- The proposed plans for the urban renewal of the area around Eerste Fabrieke Station form the basis for this dissertation. The brief of the urban agricultural centre will fit into the proposed upgrade of the study area.
- Eerste Fabrieke Station and the new proposed transport facilities around the station form an integral part of the urban renewal of the area.
- The Urban Development Framework and proposed urban agricultural centre will aim to incorporate the informal trading activities that are currently functioning around the station.
- Due to the urban renewal of the area, the current cattle farming activities at the Eerste Fabrieke Heritage site will be stopped. Agricultural activities will be limited to the produce of vegetables for the proposed new market area.

2.6 The Mamelodi Urban Agricultural Co-op: Client Profile

Anna Nkosi founded the Eerste Fabrieke Urban Agricultural Co-operative on the 3rd of January 2009 as part of a community development project to uplift the poor in Mamelodi and Nellmapius. A constitution was drawn up by the members of the co-operative to which everyone subscribed. In order to improve functionality, the co-operative consist of the following members:

- Director (1 person)
- Deputy Director (1 person)
- Admin Personnel (2 people)
- Agricultural Trainers (3 people)
- Agricultural Workers (30 people)
- Drivers (2 people)
- Security guards (5 people)

In total the co-operative will consist of 44 members. The project will initially be built in two phases, with a possibility of including a third phase. For the first phase of the project, a loan of R10 million was obtained from ABSA. A delivery van, delivery truck and a tractor with trailer was donated to the co-operative by the Department of Agriculture.

Phase 1 includes the construction and completion of the following:

- Training Facility.
- Offices.
- Market area.
- Cleaning and Packaging area.
- Ablution facilities.
- Agricultural outbuildings.
- Installation of drip-irrigation system.
- De-bush and plough 8.6 hectares of land.

The Second Phase of the project includes the housing facility for the co-operative members. The individual members formed a Social Housing Association to obtain housing subsidies from Government. Subsidies to the value of R 43 000-00 was granted for each member. The total amount was paid into a trust fund for the joint construction of Phase 2. After completion, each unit will be individually owned by the different members of the Association.

Institutional subsidies will be granted to individual organisations for the third and final phase of the project. The housing provided by Phase 3 will not form part of the Urban Agricultural and Social Housing Co-operative. After completion, the units will be institutionally owned and rented out to individual people.

Agricultural planning

The Eerste Fabrieke Urban Agricultural Co-operative will plant carrots, butternuts, cabbage, beetroot, sweetpotato and spinach on 8.6 hectares of land along the northern banks of the Pienaars River. This area is climatically ideal for the production of these crops and water from the Pienaars River will be used for crop irrigation. Hydraulic Ram or Gravity drive pumps will be used to pump water from the river to the storage tanks of the 10 agricultural outbuildings.

The biggest part of this area is covered by 66kva power lines. According to a report by Mr. Ernest Groenewald from Eskom and Mr. Johan Visser from the Town council, this area can not be used for anything else other than farming and present an ideal opportunity for urban agriculture. Tests were done to clarify that there will be no health risk involved for people working underneath the power lines.

The agricultural workers will be divided into groups for planting, irrigation & maintenance, harvesting and market sales. The workers will rotate on a monthly basis, depending on the amount of work to be done for the month.

A Planting and Harvesting Schedule was drawn up in collaboration with Mr. F Sephton, an Agricultural Economist, to work out the volumes of produce for planning purposes. (Sephton 2009).

Planting and harvesting schedule:

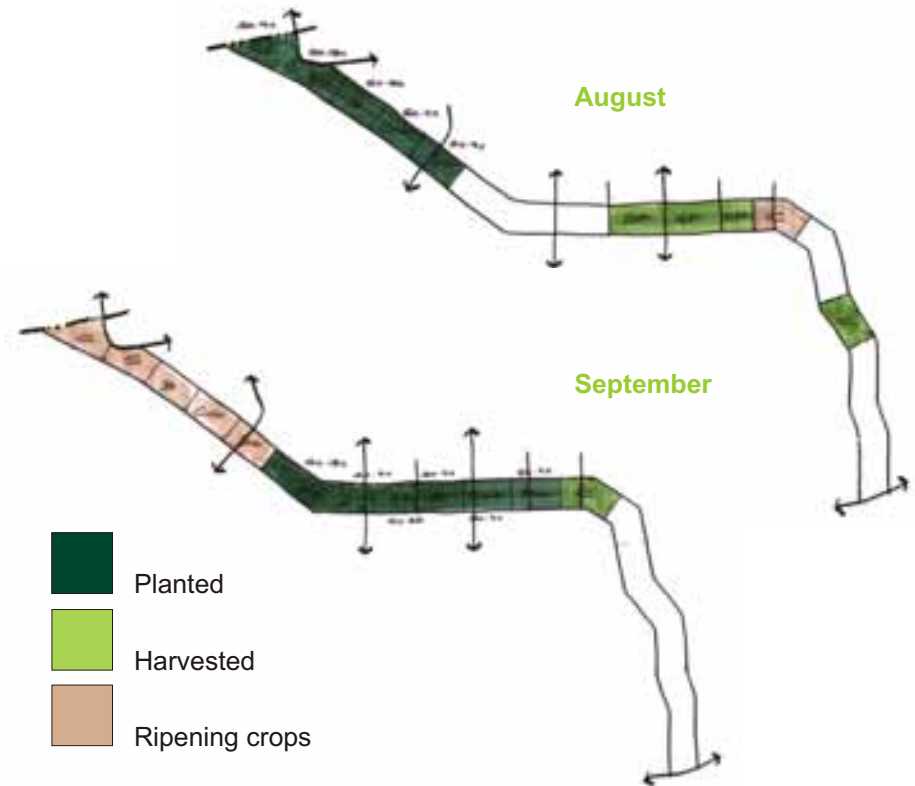
Aug				
Planted	Ha.	Seed (kg)	Fert 2:3:4 (kg)	Top dressing (kg)
Carrot	0.45	1.35kg	225	67.5
Spinach	0.45	3.6kg	225	202.5
Butternut	0.45	2.25kg	180	112.5
Cabbage	0.45	225g	225	270
Beetroot	0.45	4.5kg	180	90
			1035	742.5

Harvested	Ha.	Total (tons)	Amount
Sweet potato	1.35	40.5	R 101 250
Carrots	0.45	15.75	R 39 375
			R 140 625

Sept

Planted	Ha.	Seed (kg)	Fert 2:3:4 (kg)	Top dressing (kg)
Sweet potato	0.9	30240 cut	360	225
Carrot	0.45	1.35kg	225	67.5
Spinach	0.175	1.4kg	87.5	87.5
Butternut	0.45	2.25kg	180	112.5
Cabbage	0.45	225g	225	270
Beetroot	0.45	4.5kg	180	90
			1035	742.5

Harvested	Ha.	Total (tons)	Amount
Carrots	0.45	15.75	R 39 375



Planting and harvesting Schedule

Oct

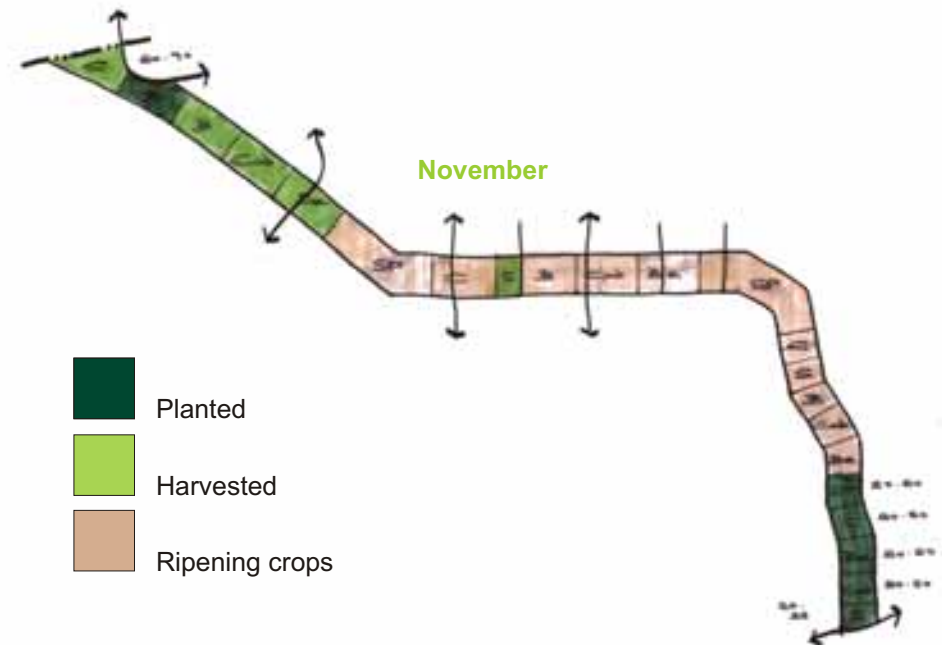
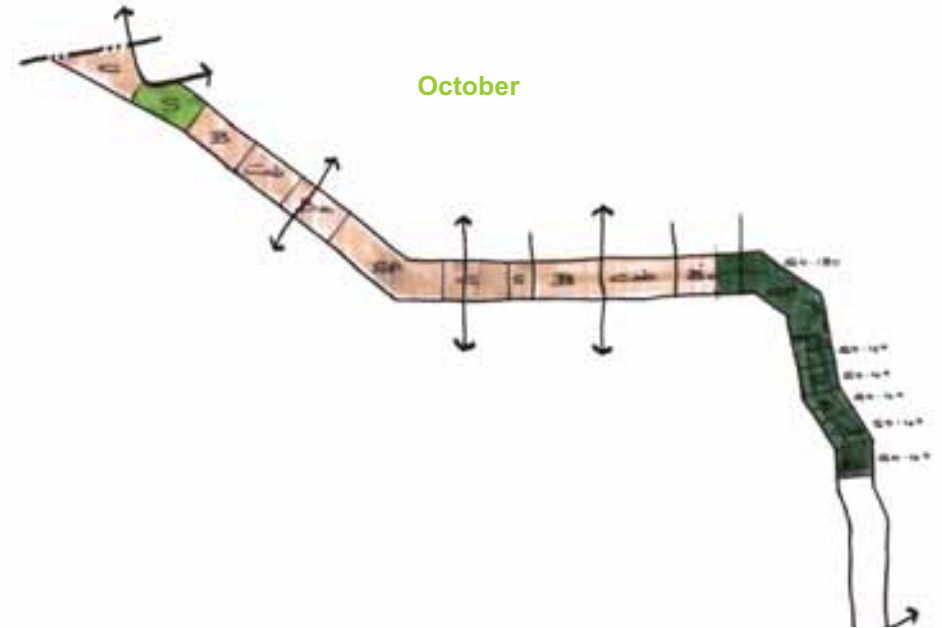
Planted	Ha.	Seed (kg)	Fert 2:3:4 (kg)	Top dressing (kg)
Sweet potato	0.9	30240 cut	360	225
Carrot	0.2	0.6kg	100	30
Spinach	0.2	1.6kg	100	100
Butternut	0.2	1kg	80	50
Cabbage	0.2	100g	100	120
Beetroot	0.2	2kg	80	40
			820	565

Harvested	Ha.	Total (tons)	Amount
Spinach	0.45	9	R 22 500

Nov

Planted	Ha.	Seed (kg)	Fert 2:3:4 (kg)	Top dressing (kg)
Butternut	0.45	2.25	180	112.5
Sweet Potato	0.25	8400 cut	100	62.5
Carrots	0.25	0.75kg	125	37.5
Beetroot	0.25	2.5kg	100	50
Cabbage	0.25	125g	125	150
Spinach	0.125	1kg	80	62.5
			692.5	475 kg

Harvested	Ha.	Total (tons)	Amount
Carrots	0.45	15.75	R 39 375
Butternut	0.45	9	R 15 750
Cabbage	0.45	27	R 67 500
Beetroot	0.45	8.1	R 20 250
Spinach	0.175	3.5	R 8 750
			R 151 625



- Planted
- Harvested
- Ripening crops

Planting and harvesting Schedule

Dec

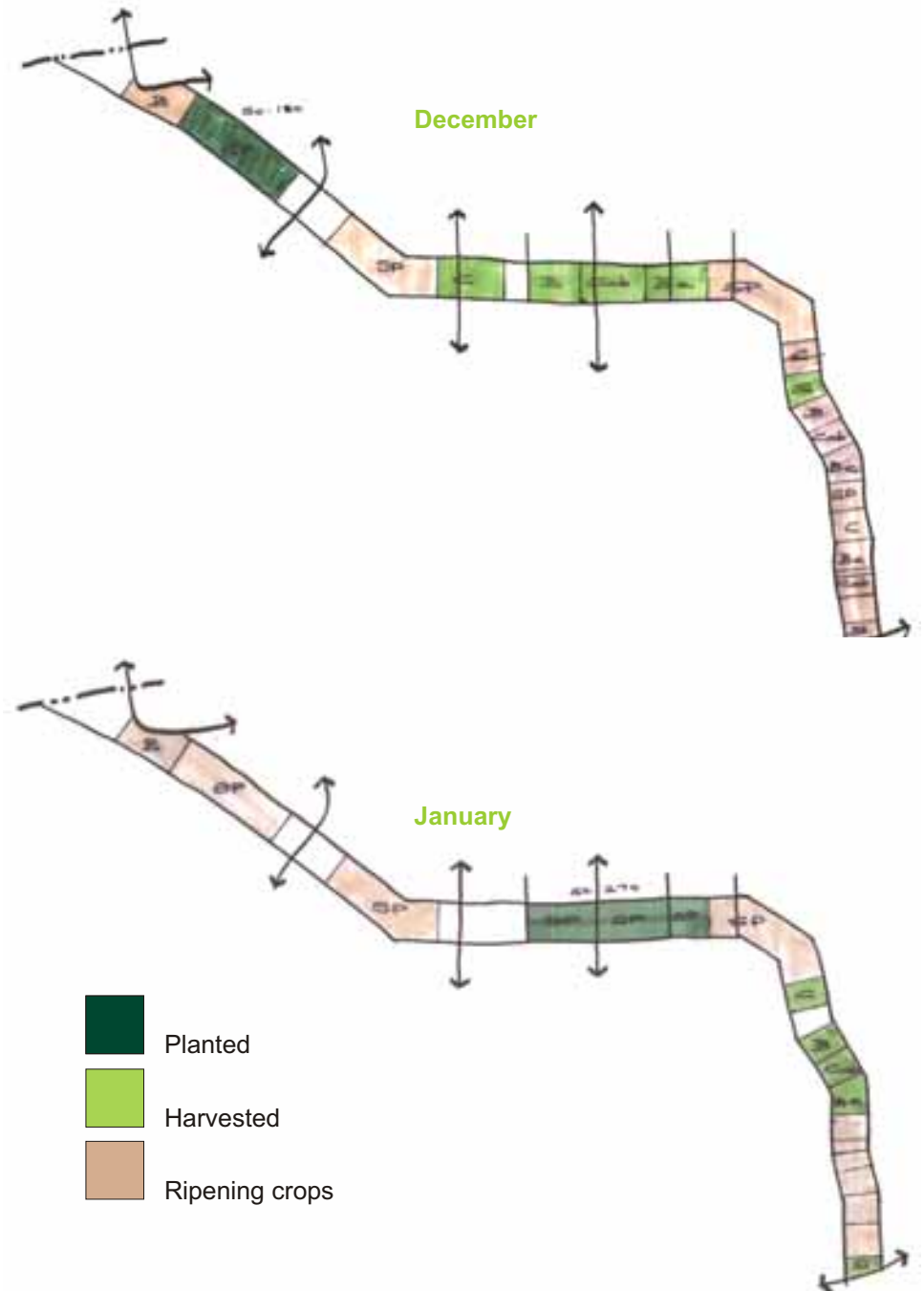
Planted	Ha.	Seed (kg)	Fert 2:3:4 (kg)	Top dressing (kg)
Sweet Potato	0.9	30240 cut	360	225

Harvested	Ha.	Total (tons)	Amount
Carrots	0.45	15.75	R 39 375
Butternut	0.45	9	R 15 750
Cabbage	0.45	27	R 67 500
Beetroot	0.45	8.1	R 20 250
Spinach	0.2	4	R100 000
			R 242 875

Jan

Planted	Ha.	Seed (kg)	Fert 2:3:4 (kg)	Top dressing (kg)
Sweet Potato	1.35	45360 cut	540	337.5

Harvested	Ha.	Total (tons)	Amount
Carrots	0.2	6	R 15 000
Butternut	0.2	4	R 7 000
Cabbage	0.2	12	R 30 000
Beetroot	0.2	3.6	R 9 000
			R 61 000



Planting and harvesting Schedule

March

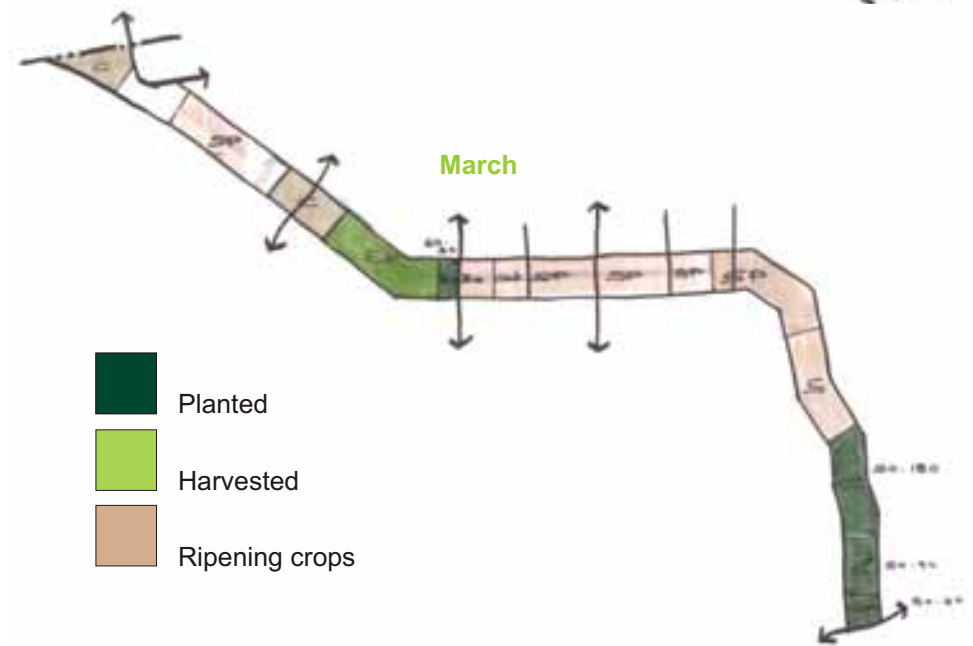
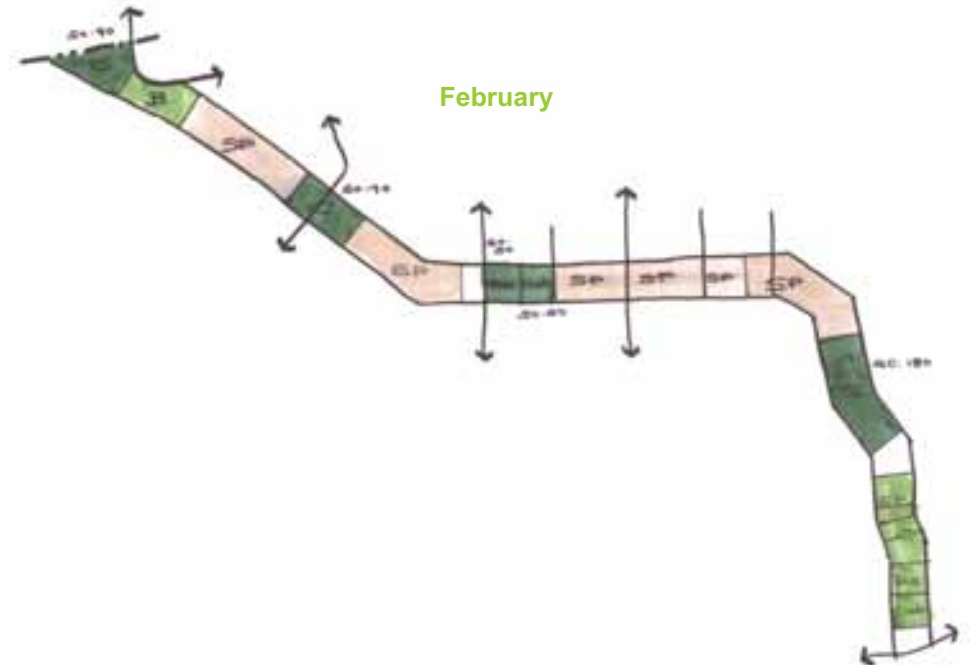
Planted	Ha.	Seed (kg)	Fert 2:3:4 (kg)	Top dressing (kg)
Beetroot	0.15	1.3kg	60	60
Carrots	0.9	2.7kg	450	135
Spinach	0.45	3.6g	225	225
Cabbage	0.2	100g	100	120
			835	540

Harvested	Ha.	Total (tons)	Amount
Sweet Potato	0.9	18	R 450 000

April

Planted	Ha.	Seed (kg)	Fert 2:3:4 (kg)	Top dressing (kg)
Carrots	0.45	1.35kg	225	67.5
Spinach	0.3	2.4kg	150	150
Cabbage	0.3	150g	150	180
Beetroot	0.3	3kg	120	60
			645kg	457.5 kg

Harvested	Ha.	Total (tons)	Amount
Sweet Potato	0.9	18	R 450 000
Spinach	0.9	18	R 450 000
			R 900 000



Planting and harvesting Schedule

May

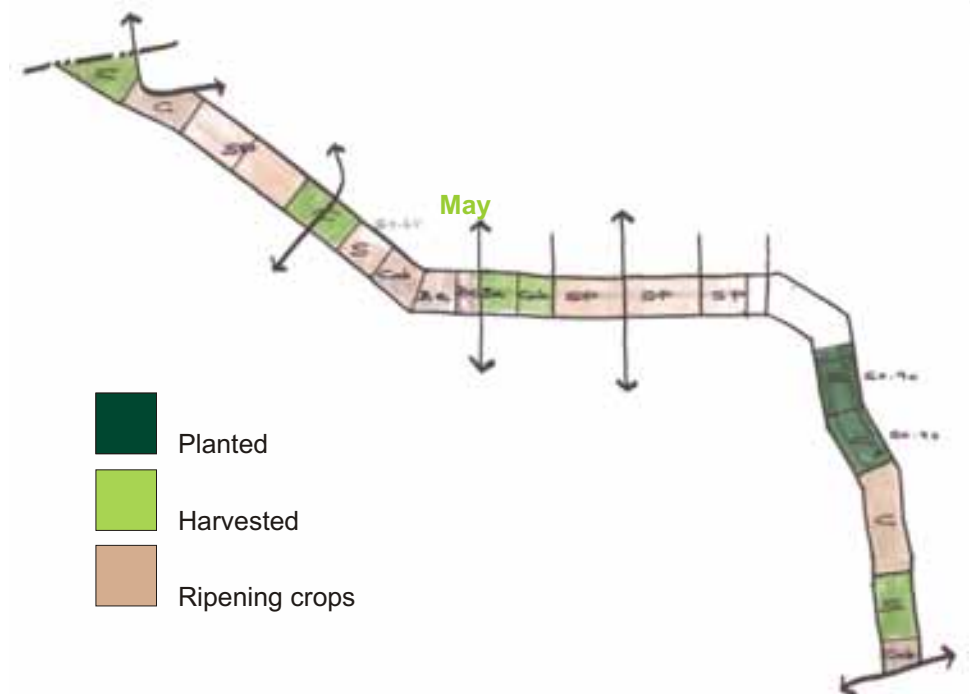
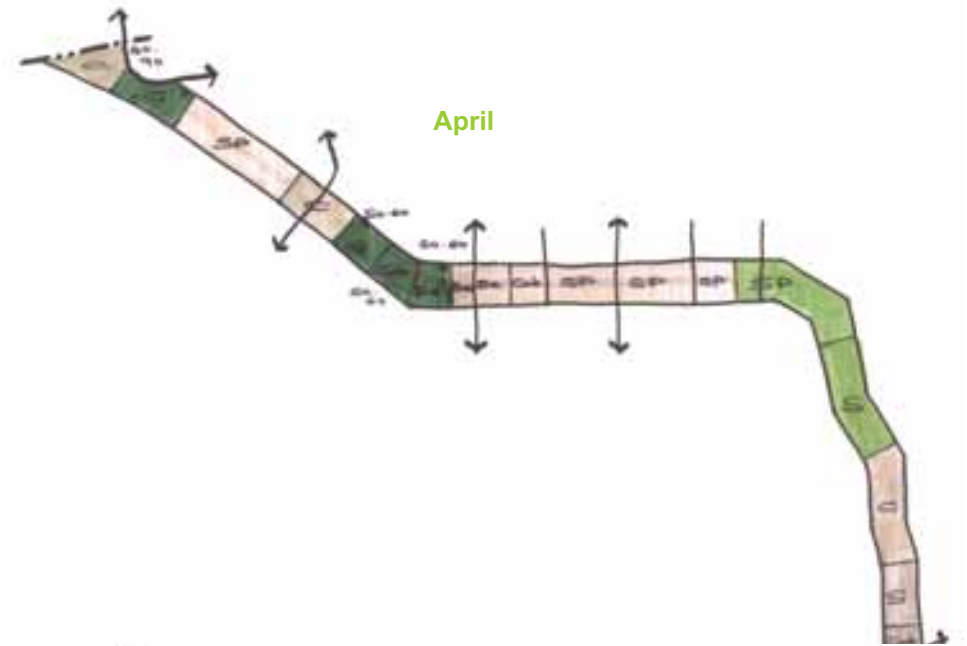
Planted	Ha.	Seed (kg)	Fert 2:3:4 (kg)	Top dressing (kg)
Spinach	0.45	3.6 kg	225	202.5
Carrots	0.45	1.35 kg	225	67.5
			450	270

Harvested	Ha.	Total (tons)	Amount
Carrots	0.9	31.5	R 78 750
Beetroot	0.25	4.5	R 11 200
Cabbage	0.25	15	R 37 500
Spinach	0.45	9	R 22 500
			R149 950

June

Planted	Ha.	Seed (kg)	Fert 2:3:4 (kg)	Top dressing (kg)
Carrots	0.45	1.35 kg	225	67.5

Harvested	Ha.	Total (tons)	Amount
Sweetpotato	0.45	9	R 22 500
Spinach	0.3	6	R 15 000
Beetroot	0.15	2.7	R 6 750
Carrots	0.9	27	R 67 500
Cabbage	0.2	12	R 30 000
			R141 750



- Planted
- Harvested
- Ripening crops

Planting and harvesting Schedule

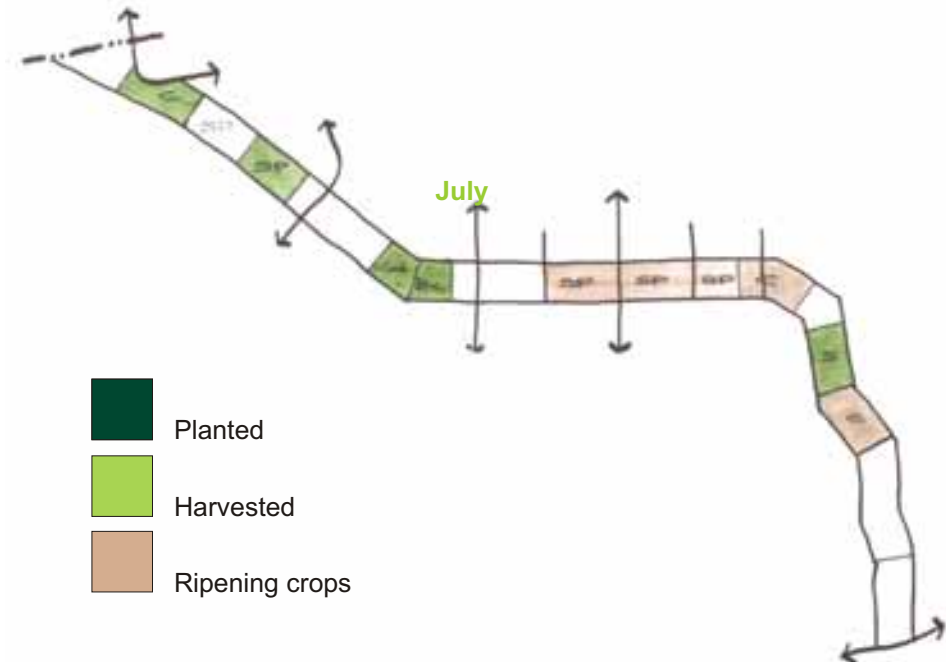
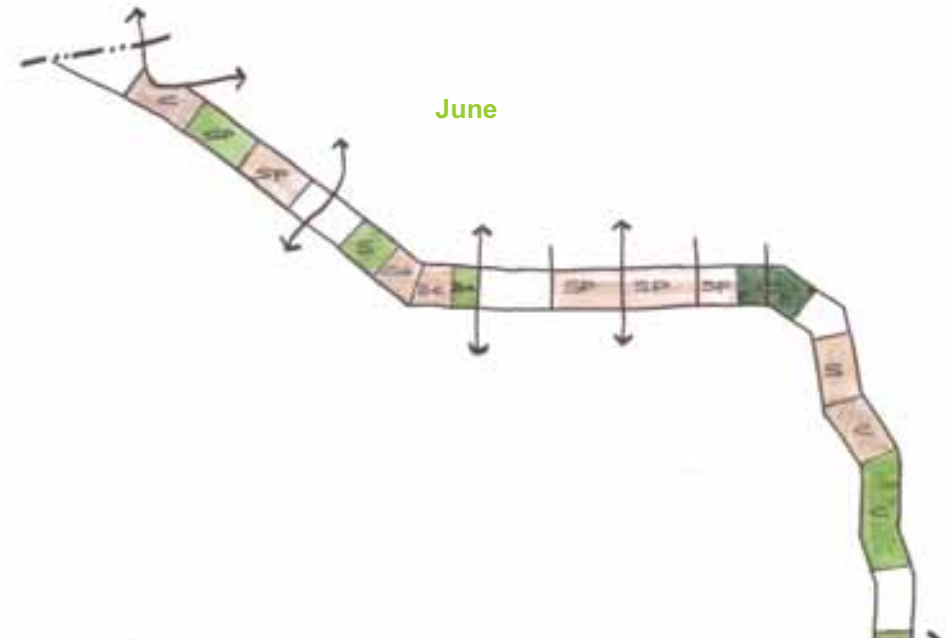
July

Harvested	Ha.	Total (tons)	Amount
Carrots	0.45	13.5	R 33 750
Sweet Potato	0.45	9	R 22 500
Cabbage	0.3	18	R 45 000
Beetroot	0.3	5.4	R 13 500
Spinach	0.45	9	R 22 500
			R137 250

Feb

Planted	Ha.	Seed (kg)	Fert 2:3:4 (kg)	Top dressing (kg)
Carrots	0.9	2.7kg	450	135
Beetroot	0.25	2.5kg	100	50
Cabbage	0.25	125g	125	150
Spinach	0.9	7.2kg	450	405
			1125	740 kg

Harvested	Ha.	Total (tons)	Amount
Sweet Potato	0.25	5	R 12 500
Carrots	0.25	7.5	R 18 750
Beetroot	0.25	4.5	R 11 250
Cabbage	0.45	27	R 37 500
			R 80 000



- Planted
- Harvested
- Ripening crops

Monthly Income and Expenditure

Aug

Income		Expenditure (Salaries excluded)	
Harvest	R 140 625	Fertilizer	R 5 589
		Top dressing	R 2 377
		Seed	R 2 322
			R 10 288

Sept

Income		Expenditure (Salaries excluded)	
Harvest	R 39 375	Fertilizer	R 6 788
		Top dressing	R 2 726
		Seed	R 2 058
			R 11 572

Oct

Income		Expenditure (Salaries excluded)	
Harvest	R 22 500	Fertilizer	R 4 428
		Top dressing	R 1 808
		Seed	R 1 032
			R 7 268

Nov

Income		Expenditure (Salaries excluded)	
Harvest	R 151 625	Fertilizer	R 3 737
		Top dressing	R 1 520
		Seed	R 2 058
			R 6 787

Dec

Income		Expenditure (Salaries excluded)	
Harvest	R 242 500	Fertilizer	R 1 944
		Top dressing	R 720
		Seed	R 1 032
			R 3 334

Jan

Income		Expenditure (Salaries excluded)	
Harvest	R 331 000	Fertilizer	R 2 916
		Top dressing	R 1 078
		Seed	R 820
			R 4 814

Feb

Income		Expenditure (Salaries excluded)	
Harvest	R 80 000	Fertilizer	R 6 075
		Top dressing	R 2 368
		Seed	R 2 205
			R 10 648

March

Income		Expenditure (Salaries excluded)	
Harvest	R 450 000	Fertilizer	R 4 509
		Top dressing	R 1 728
		Seed	R 1 626
			R 7 883

Monthly Income and Expenditure

Illustration of drip irrigation system

April

	Income	Expenditure (Salaries excluded)	
Harvest	R 900 000	Fertilizer	R 3 483
		Top dressing	R 1 462
		Seed	R 1 179
			R 6 124

May

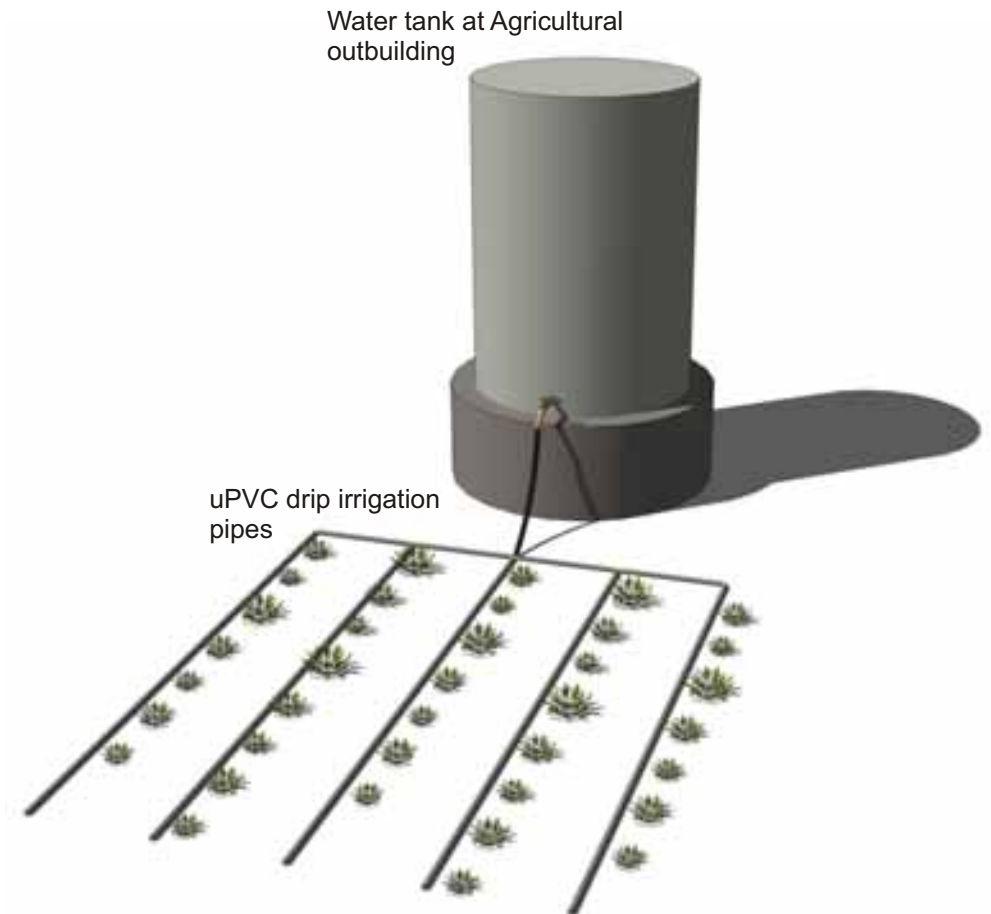
	Income	Expenditure (Salaries excluded)	
Harvest	R 149 950	Fertilizer	R 2 430
		Top dressing	R 864
		Seed	R 945
			R 4 239

June

	Income	Expenditure (Salaries excluded)	
Harvest	R 141 750	Fertilizer	R 1 215
		Top dressing	R 2 176
		Seed	R 513
			R 3 904

July

	Income	Expenditure (Salaries excluded)	
Harvest	R 137 250		



Agricultural Layout





Precedent studies

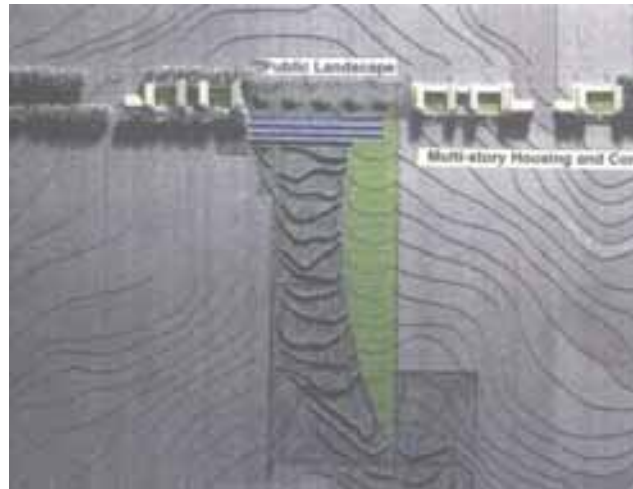
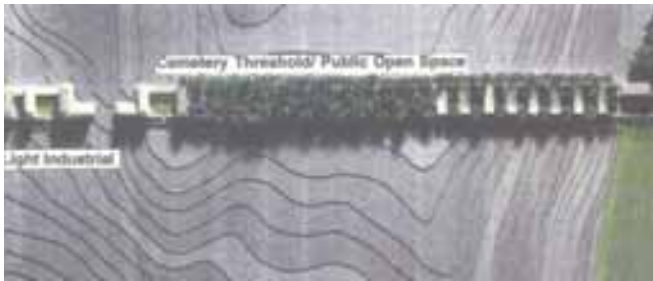
3.1 Spatial Precedents

Housing and the Productive Landscape.

Location: Wattville, about 26 kilometres east of Johannesburg.

Architects: Jo Noero, Heidrich Wolff.

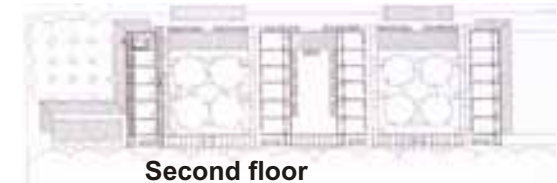
004 (Photo collage by author)



About the project:

This competition entry forms a line of convergence between Wattville and Tamboville, where residents of both area's can shop, meet each other and make use of the public facilities. The 'Cuban Work Brigade' model where residential blocks are built with skilled and unskilled labour forms the basis of the delivery system. The dwellings were kept to the smallest size and vary from 18 square metres for single apartments to 72 square metres for family dwellings. The residential buildings form half open courtyards along Mamkele Street. The public facilities and shops are also arranged to fit the traffic pattern and is accessible from the street. Public facilities are located on important corners while the shops are located close to the taxi rank and bus stop. A market building and restaurant supports the fish farm and hydroponic greenhouses at the end of the line. (TILMAN 1997:76)

The residential buildings form half open courtyards along Mamkele Street. The public facilities and shops are also arranged to fit the traffic pattern and is accessible from the street. Public facilities are located on important corners while the shops are located close to the taxi rank and bus stop. (TILMAN 1997:76)



Second floor



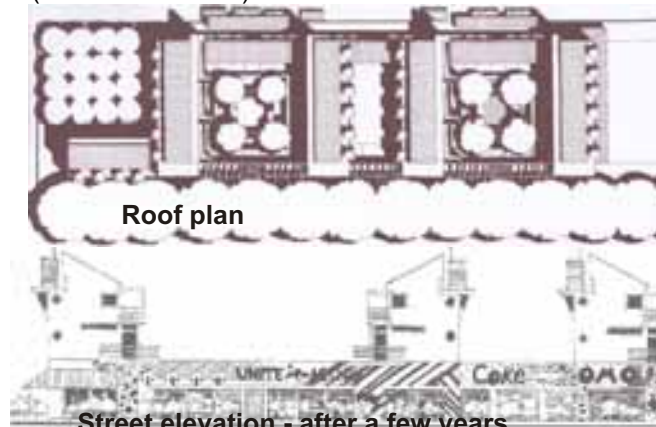
First floor



Ground floor



Street elevation - one year



Street elevation - after a few years



Street elevation - after a long time

This competition entry forms a line of convergence between Wattville and Tamboville, where residents of both area's can shop, meet each other and make use of the public facilities. The 'Cuban Work Brigade' model where residential blocks are built with skilled and unskilled labour forms the basis of the delivery system. The dwellings were kept to the smallest size and vary from 18 square metres for single apartments to 72 square metres for family dwellings. (TILMAN 1997:76)

The Red Location Museum of Struggle.

Location: Port Elizabeth.

Architect: Noero Wolf Architects in association with John Blair Architects.

Year of construction: 2005.

About the museum

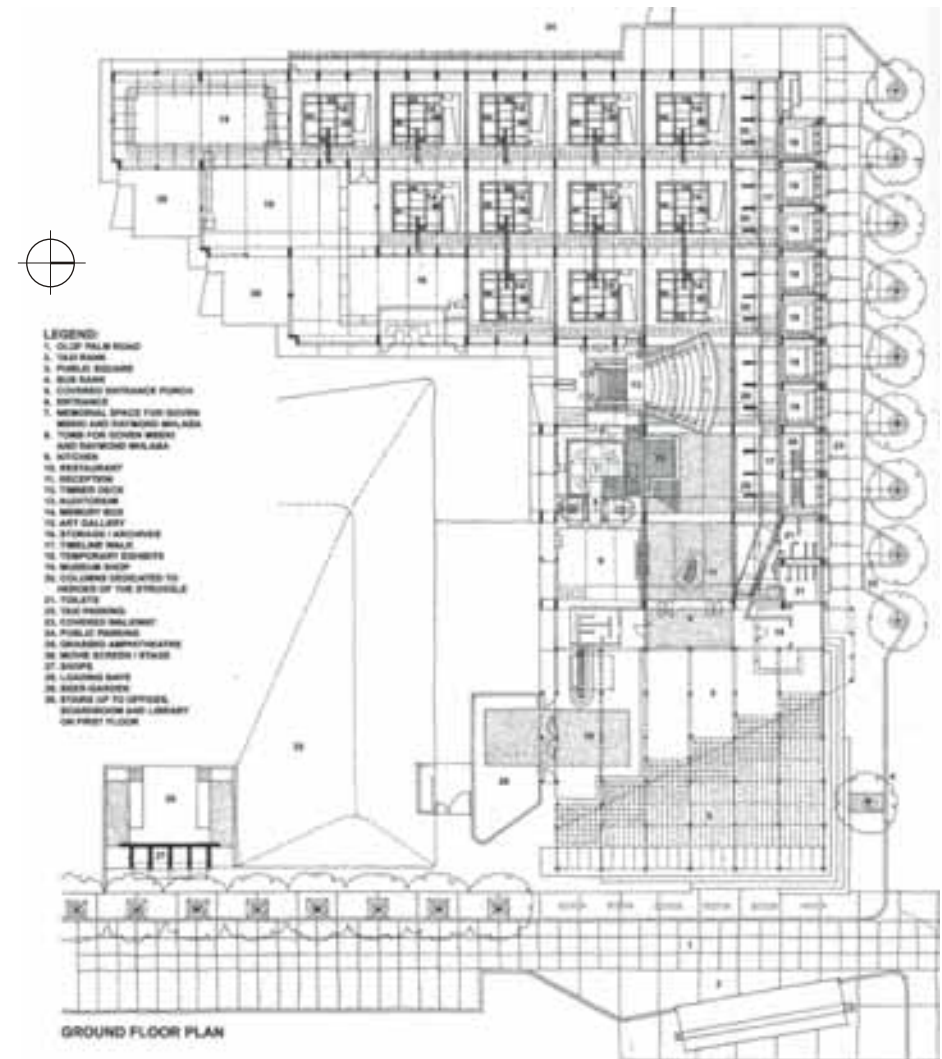
The choice for the site of the red Location Museum in Port Elizabeth is not attractive with the street pattern of the surrounding shacks barely legible. There are hardly any trees except for a row of fully grown palms. The museum is in sympathy with the harsh windswept environment and the nearby industrial area. Precious untouched objects are not exhibited in conventional glass cases, but instead visitors are challenged by an arrangement of modulated spaces. The accommodation within the museum includes an auditorium, library, art gallery, offices and a memorial space to commemorate Govan Mbeki and Raymond Mhlala. Although the museum is much bigger than the surrounding structures, it does not dominate the landscape. (GERNEKE 2006:20)

Influences and lessons learned:

The museum was built to commemorate the community of this township that was one of the first to confront apartheid. The architects wanted the building to act as a backdrop against which people can act out their lives. With this in mind, the east facade of the building forms a habitable wall with an area where children can play and space for taxi parking. The Red Location Museum is a refined, down to earth structure of great strength without being pretentious. (GERNEKE 2006:21) Buildings should not dominate the surrounding fabric. Local construction skills, methods and materials should be used to mirror the surrounding landscape.

Materials used:

- Materials include roughly built concrete blocks and corrugated iron roofs.
- Off-shutter concrete columns match the accurately placed blocks.
- A simple but elegant concrete slab portico is supported by slender round columns. The portico is linked by a rustic timber pergola where kids can play. (GERNEKE 2006:22)



003 (Photo collage by author)

3.2 Precedents of Process.

Greenshops Financial Services Centre.

Location: Centani, Eastern Cape.

Architects: Vernon Collis and Anna Cowen in association.

Year of construction: 2008.

About the centre

Centani near Butterworth in the Eastern Cape is a small hamlet where Edwardian surveyors pegged out a grid to define a little centre of administration. The centre consists of a police station, magistrates and trading store and is situated in the middle of a large area of subsistence farming. A new hall was orientated to the cardinal points and the buildings were designed to maximise passive heating and cooling. Shading devices, raised floors and variable ventilators were used to implement this. The design and building process created work, seeded small businesses and transferred skills to the local community. (COOKE 2009:22)



00 (COOKE 2009:22)

Aims and influences

Some of the local residents were trained to fell trees, to strip and boron-treat them and to cure the timber. The entire labor force, men and woman, was drawn from the community. The main aim of this project was to set in motion a process of healing to all parts of the social body by using the earth's resources and to plant an ethos of independence back into the community. (COOKE 2009:24)

Materials used

The local environment was scanned for materials and opportunities to grow them. Some materials from ruined buildings were reused. An abundance of clay and thatching grass was available on site and used to reinforce the mud walls. A combination of traditional building materials and materials found in local hardware stores were used for the construction of the centre. (Cooke 2009:24)

Other materials include:

- Bricks from ruined buildings.
- Clay.
- Thatching grass.
- Wattle and daub.
- Mud bricks.
- Timber from eucalyptus and pine trees.
- Door handles were made from the original jail bars reclaimed from the site. (COOKE 2009:24)

Lessons learned

The community should be involved in all decision taken concerning the project. Traditional building materials and construction methods should be incorporated into the construction and design process. The project was not visited by the author.

The Masisizane Woman's Co-operative

Location: Situated in ward 78, 25km from the Johannesburg CBD.

Founder: Anna Mofekeng

Year: 1990

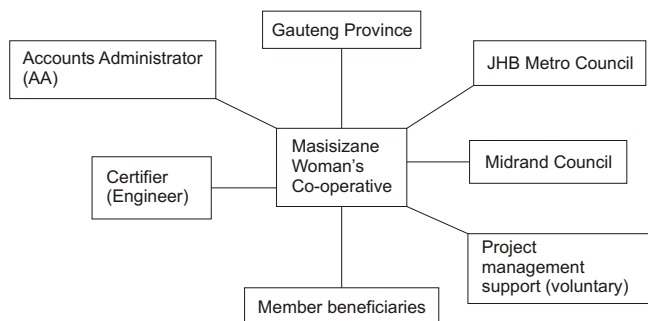
Anna Mofekeng started the project in 1990 after a child died when a local woman and her children tried to escape the rising flood waters in the township. Anna realized that despite all the promises by politicians and government officials, nothing would be done about the conditions in the township. Anna and 6 of her friends then formed a savings scheme to start building houses for the people. (Development Action Group 2003:2)

The financial vision of the project:

If a daily amount of R3-50, which was the cost of bread, could be sacrificed, a weekly sum of R20 per member could be collected. The basic material cost of a 28 square meter house was R1 400. In order to raise R1 400 per week, groups consisting of 70 beneficiaries was formed. They also established the rule that the poorest families will be helped first. Surrounding Organizations and institutions provided the necessary support and infrastructure to enable the project to operate efficiently. The Provincial Housing Department also signed an agreement with the Co-operative that appointed them as the support organization for project. The Department of Labour also provides training in brick laying, plumbing, welding and other skills. (Development Action Group 2003:2)

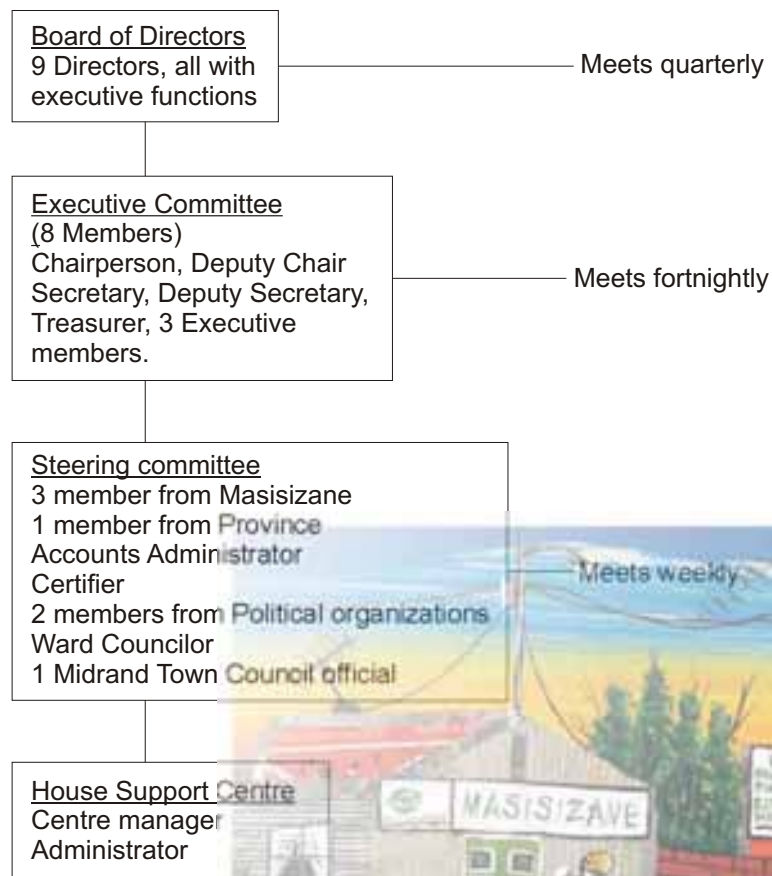
Membership to the Co-operative is on a voluntary base and the groups meet on Sundays to make their weekly payments. The chairperson of each group collects the money and beneficiaries are then paid openly and accepts responsibility for the money. The money is then paid into a FNB Savings Account that is earmarked to be used for building materials only. Group members also practice "Letsema", where the beneficiaries help each other to build the houses. The groups normally remain active after the houses have been constructed and the funds are then used to uplift the community. (Development Action Group 2003:2)

Organizational Organogram

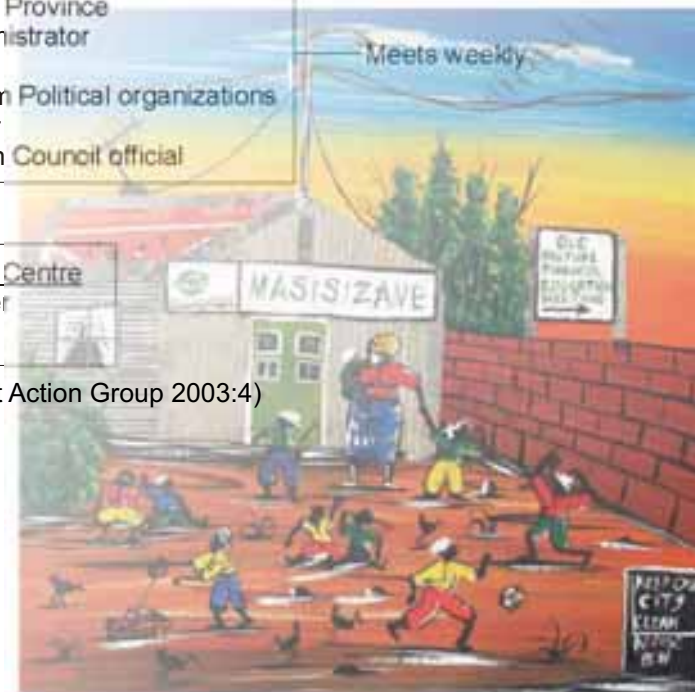


00 (Development Action Group 2003:3)

Masisizane Organogram



00 (Development Action Group 2003:4)



MASISIZANE
"Let's help each other"

3.3 Technical Precedents

Nelson Mandela Pavilions.

Location: Quno and Mvezo.

Architects: Nina Cohen, Hilton Judin.

Year of construction: 2001.

About the pavilions

The new Nelson Mandela Pavilions at Quno and Mvezo reflects an entry into a courageous new world of South African architecture. The information stand at Mvezo perches dramatically at the edge of a hill as if to face an uncertain future. These simple and powerful volumes are reflecting the prevailing mono-pitch architecture of the surrounding landscape. The 19 by 14 meter building is covered by an IBR roof and provides shelter for two concrete platforms and a small office. These concrete platforms support the photographs of Nelson Mandela. The other structure is an intended visitor centre situated at Quno, 30 kilometers away. The more industrial construction is very similar and includes a youth and heritage centre and community museum. (UNKNOWN 2003:46)

Influences

Although the local community consider housing and services to be more important, these structures celebrate this region's most famous son. The pavilions will do much to place Quno on the visitor map and will ultimately contribute to the development of the area. (UNKNOWN 2003:46)

Materials used

- The IBR roof is connected to saligna columns by industrial steel joints.
- Traditional rural materials like the stonework basis, thick rough timber floor boards and wattle lattice screens puts the construction in balance.



The Information stand at Mvezo



The Visitor Centre at Quno



The Information stand at Mvezo

Lessons learned

The Nelson Mandela Pavilions reflects the mono-pitch architecture of the surrounding informal settlement. It is very important that the project should address the needs of the community and its particular design intent.

House Sue.

Location: Twin Rivers Estate, Irene.
Architects: Derick de Bruyn.
Year of project: 2001.

About the project:

The steel farm shed can be described as off-the-shelf architecture as advertised in the Farmers Weekly and is well known to every South African farmer. The Wagon barn-house was built to last and was probably the first structure any responsible pioneer erected. More barns is sometimes added to form a farmstead of shed houses. (JOUBERT 2009:94)

Influences and materials used:

In the case of House Sue, the farmstead was emulated by combining the industrial modular supply of assembly with the on site architecture of brick and mortar. The industrial-clad steel frame walls forms a poetic assemblage that yearns for the past. The interior of the prefabricated main structure is inhabited by cellular private spaces while the carport shed becomes a pavilion for guests. The shed-like architecture of House Sue has much to offer and invites emulation and further exploration. (JOUBERT 2009:94)

Lessons learned:

The Siyotshala Urban Agricultural Centre is greatly influenced by this combination of steel clad architecture and industrial infill brick production. By emulating this built to last style of architecture, the author “acknowledges architecture of everyday domestic life, but still celebrates the potential for inventiveness within the ordinary” as Jo Noero puts it. (JOUBERT 2009:94)

Ground floor plan



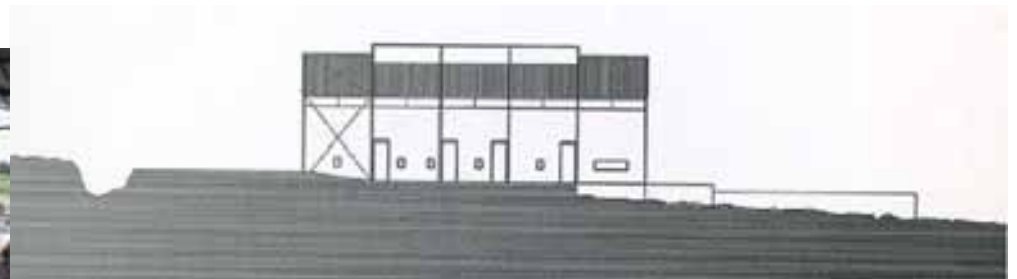
1. Living room
2. Dining room
3. Kitchen
4. Bedroom
5. Veranda
6. Pool



00 (JOUBERT 2009:95)



00 (JOUBERT 2009:95)





Theory

Continuous Productive Urban Landscapes as design generator for community upliftment

In nature, as an organism evolves it increases in complexity and it also becomes a more compact or miniaturized system. Similarly a city should function as a living system. Arcology, architecture and ecology as one integral process, is capable of demonstrating positive response to the many problems of urban civilization, population, pollution, energy and natural resource depletion, food scarcity and quality of life." (Cosanti foundation 2009)

The appearance of our cities could be forever changed by overlaying productive urban landscapes with the concept of continuous landscapes. This concept proposes a whole new urban design strategy. "Continuous Productive Urban Landscapes (CPULs) will be open landscapes productive in economical and sociological and environmental terms. They will be placed within an urban-scale landscape concept offering the host city a variety of lifestyle advantages and few, if any, unsustainable drawbacks. CPULs will be city-transversing open spaces running continuously through the built environment, thereby connecting all kinds of existing inner-city open spaces and relating to the surrounding rural area. Vegetation, air, the horizon, as well as people, will be able to flow in and out of the city. Partially, the city will become open and wild." (Viljoen 2005:11)

By existing alongside a range of urban open spaces, the productive urban landscape will compliment the space and add a new sustainable component to the city. Productive urban landscapes can offer space for leisure, recreation be the urban green lungs of the city. Most uniquely, it will provide space for urban agriculture.

The agricultural fields will range from small vegetable gardens to large multi-crop fields within or outside the productive urban landscape. In this way urban parks could become wilder and healthier by allocating parts for urban agriculture. (Viljoen 2005:12)



001 (Viljoen 2005: 241)
Carrot and the city: The concept of CPULs

Productive Urban Landscapes will need space by reclaiming or recycling land. "Urban agriculture, the proposed productive element of CPULs, could take on any shape and occupy virtually any space in the city, e.g. big, small, horizontal, sloped, vertical, rectangular, triangular, irregular, on brownfield sites, on Greenfield sites, in parks, on reclaimed roads, on spacious planes or squeezed in corners..." (Viljoen 2005:15)

“Food growing projects can act as a focus for the community to come together, generate a sense of 'can-do', and also help to create sense of local distinctiveness, a sense that each particular place, however ordinary, is unique and has value” (Garnett 1996)

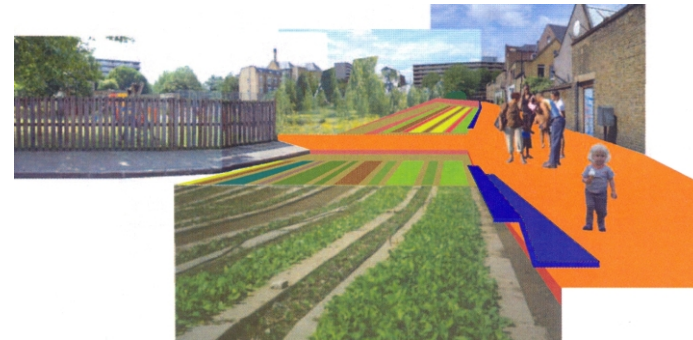
By introducing urban agriculture to our cities, abandoned and disused sites may be activated and used in more environmental productive ways. Productive urban landscapes will encourage movement, connect private and public places and create paths overlooking the horizon. The associated sounds, smells and views of urban agriculture will make the environment comprehensible and present a notion of the countryside to the city dweller. (Viljoen 2005:246)

Apart from providing the amount of exercise necessary to keep healthy, horticulture and gardening activities have always been recognised for their value in providing stress relieve and treatment to people with mental illness. In a study undertaken by the University of Florida, it is suggested that just by walking around a botanical garden, stress levels can be reduced. (Viljoen 2005:60)

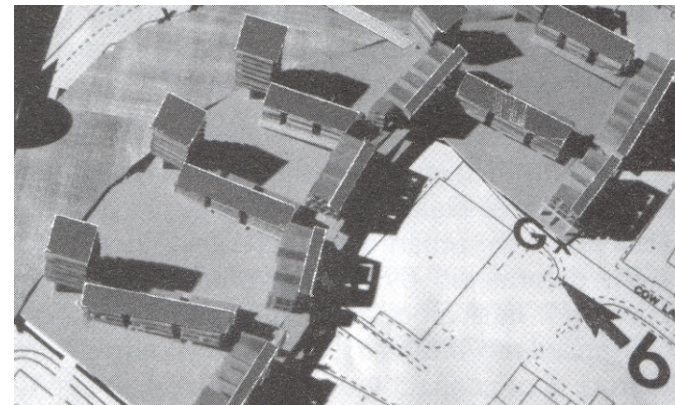
“People feel comfortable when they have access to the countryside, experience the open fields and agriculture and have access to wild plants and birds and animals. For this reason, cities must have boundaries with the countryside near every point. At the same time, a city becomes good for life only when it contains a great density of interactions among people and work, and different ways of life.” (Alexander et al 1977:22)

“Many people want to live in the country; and they also want to be close to a large city. But it is geometrically impossible to have thousands of small farms, within minutes of a major city centre. To live well in the country, you must have a reasonable piece of land of your own large enough for horses, cows, chickens, an orchard and you must have immediate access to continuous open countryside, as far as the eye can see. To have quick access to the city, you must live on a road, within a few minutes' drive from the city centres, and with a bus line outside your door.” (Alexander et al 1977:30)

Although urban agricultural activities are considered valid land-use functions, few studies have been done to examine the nature and integration of agriculture into urban land-use frameworks. Land-use policies must be studied in order to formulate lessons of good practice. Because of their higher financial return, productive urban landscapes will always face stiff competition from other land-use functions like housing, commerce and industry. Fresh research is needed in order to publicise more literature supporting the case for urban agriculture. (Viljoen 2005:62)



002 (Viljoen 2005: 252)
Urban edge buildings overlooking a productive landscape



003 (Viljoen 2005: 116)
Movement and housing with urban agriculture

“The implementation of this pattern requires new policies of three different kinds. With respect to the farmland, there must be policies encouraging the reconstruction of small farms, farms that fit the one-mile bands of country land. Second, there must be policies which contain the city’s tendency to scatter in every direction. And third, the countryside must be truly public, so that people can establish contact with even those parts of the land that are under private cultivation.” (Alexander et al 1977:24)

There is increased international attention from development organisations to make use of urban agriculture to relieve poverty and provide food security in Africa. South Africa's output in terms of urban agricultural research is likely to increase due to an increase in poverty, positive donor support and a research base in universities. Due to the collapse of many formal urban economies in Africa and the impact of economic adjustment programmes, many people had to seek alternative ways of survival. (Viljoen 2005:194)

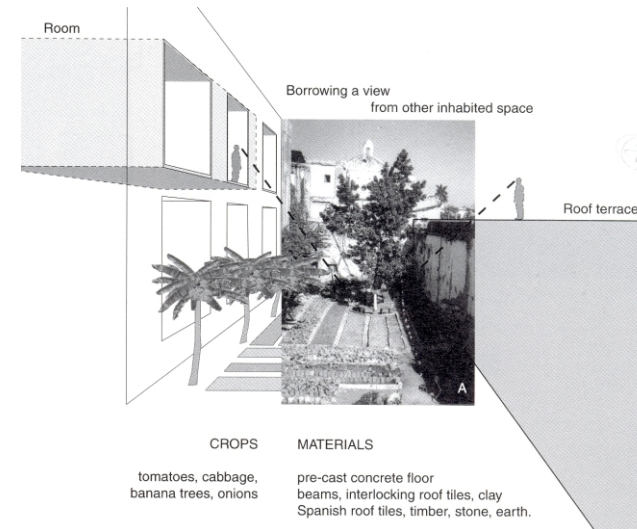
However, integration is undermined because local policy makers are still unconvinced as to the benefits that may arise. Another obstacle is the contradictory and often conflicting responses among politicians, technical professionals and local authority departments. Tension among ministries of agriculture and local government reinforce these policy dilemmas. Conflict related to urban agricultural activities versus other land uses also manifest in social tension, the destruction of property and physical confrontations. If horticultural farming in Africa is adopted on a wider scale, it would improve the productivity of the land and almost certainly diffuse some of these conflicts. (Viljoen 2005:197)

Even though the architectural design of urban agricultural plots has been part of the government manuals in the United Kingdom since 1930, urban farmers are still sculpting their own culture into the urban fabric and disrupt some of the lines laid down. Before any design principles can be applied, it is necessary to understand the part urban agriculture plays in the lives of urban farmers. (Viljoen 2005:130)

“Small, grass roots movements, unpopular at their inception, play a vital role in society. They provide a critical opposition to established ideas; their presence is a direct correlate of the right to free speech; a basic part of the self-regulation of a successful society, which will generate counter movements whenever things get off the track. Such movements need a place to manifest themselves, in a way which puts their ideas directly into the public domain.” (Alexander et al 1977:243)

Because productive urban land is often publicly owned, there is a contradiction between openness and security due to theft and vandalism. Right of access to gardening lots can often be restricted to a privileged few, who transforms the area into semi-private public spaces. In this the designer has a vital role to play in exposing the agricultural fields to the public's gaze. (Viljoen 2005:130)

“The space must be highly visible. It must be built in a way which lets the group get their ideas across, to people on the street.” (Alexander et al 1977:244)



004 (Viljoen 2005: 163)
Agricultural outdoor classroom for school children in Habana. (Cuba)

Although there is a need for caution when exposing urban agricultural activities to the architectural profession, the architect's knowledge of materials and space-use can be translated to maximise the potential of the agricultural activities. Allotments can be articulated with other built structures and space planning principles to develop its full potential. This can only be accomplished by working alongside the urban farmers and keeping them in mind. Allotments can also be integrated with playgrounds and other green spaces where children can play while the parents cultivate their crops. Some details of the design can be left open as opportunities for people to express their creativity and to create a sense of ownership among the community. (Viljoen 2005:131)

This dissertation attempts to use Continuous Productive Urban Landscapes along with the need for poverty alleviation and community upliftment as a design generator with regards to public urban space.

Unfortunately, without the necessary support from Government, these projects are more likely to fail. Ongoing support with sustainable economical systems are needed to transform our cities. These elements form the key components to upliftment initiatives and also has a vital role to play in social housing projects.

In 2007 Government invested millions of rands into agricultural projects in the Underberg area of the Lowveld. Today, almost all of these projects have been abandoned and their empty facilities tower out of the African bush. Desiree Rorke, a journalist for the 'Lowvelder' Newspaper in Nelspruit, visited some of the projects. (Rorke 2009:8)

The Department of Agriculture and Land Administration funded the Jabulani Maswati Horticulture Project with R15 million to put up structures, debush, fence and plough 250 hectares of land. Apart from acquiring new tractors and other equipment, a drip-irrigation system was also installed. Peppers, Butternuts, Watermelons, Maize and Pomegranates were planted. Sadly today, the project faces total collapse without serious intervention. The last wages was paid four months ago and only a handful of community members still come to work.

Sibongile Dlamini is one of the local women that still show up in the hope of putting in a day's work. According to Sibongile, funding for the project quickly dried up. "There are no seeds for planting or money to fix broken equipment. Electricity supply is a serious challenge, as the installed transformer doesn't have the capacity to cover the whole area." Although a pack house and a cool storage room are needed, the biggest problem seems to be the lack of a viable marketplace. Presently, the produced vegetables are sold only to community members. (Rorke 2009:8)

At the Sizolwethy Poultry Project, two state-of-the-art mass-production poultry houses were constructed without water or electricity supply. The poultry houses were constructed at a cost of R2.8 million. One house is incomplete while only a small part of the other is in use. In 2007, the community members were promised a four-ton truck which they never received. The poultry project also lacks a sufficient marketplace and currently the chickens are only sold to the community. (Rorke 2009:8)

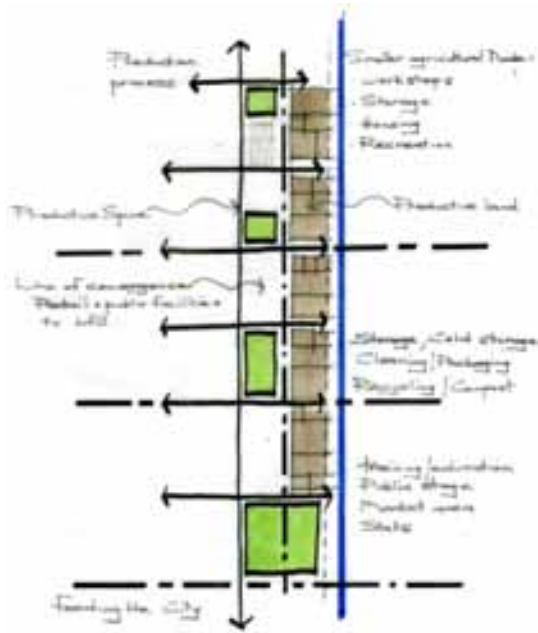
According to the farmers, there is a lack of adequate government support for these projects. Without the necessary skills training, guidance and financial aid these facilities will only stand as monuments to remind Government where it failed (Rorke 2009:8)



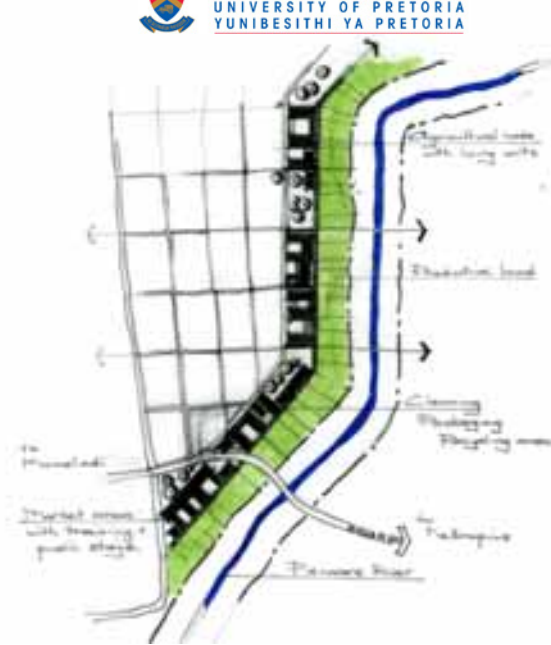
005 (Rorke 2009: 8)
The Jabulani Maswati Horticulture Project



Concept Development



001



002



001 Conceptual drawing exploring the layout and accommodation schedule within the project.

002 Placement of conceptual design on site.

003 First conceptual drawing on the placement of agricultural centre and crops on site.

004 Conceptual drawing on the placement of agricultural centre and crops on site.

005 Drawing exploring the shape and placement of agricultural centre on site.



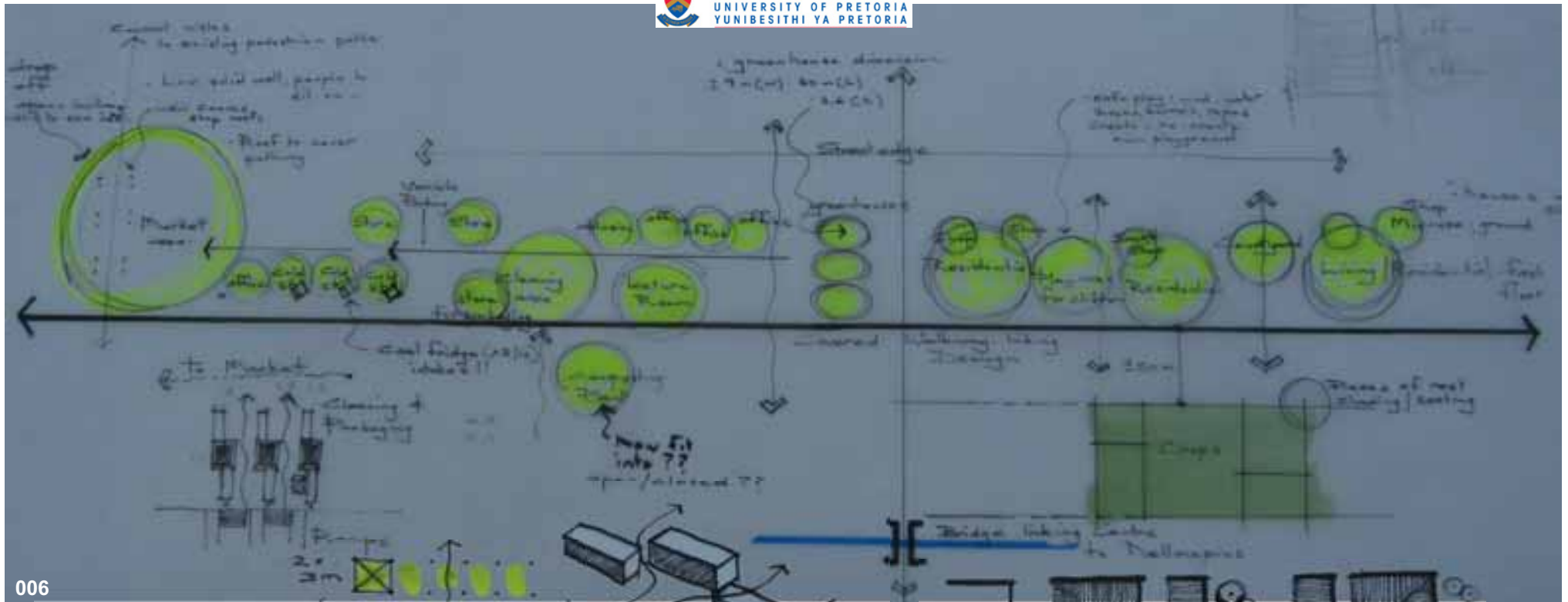
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004



005



006

007

circles wide = small delivery cars + pedestrians (2-4m)

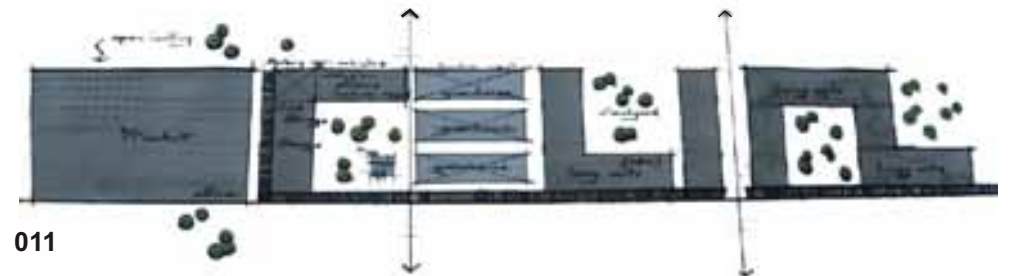
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009



010



011

006 Bubble diagram exploring the layout and accommodation of agricultural centre.

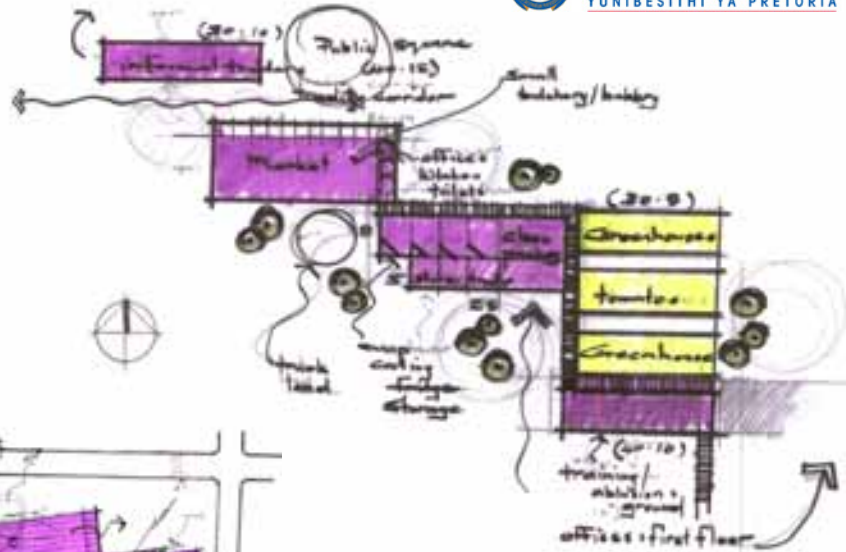
007 Drawing exploring the position of individual stalls within the market area.

008 Agricultural centre to consist of several individual units.

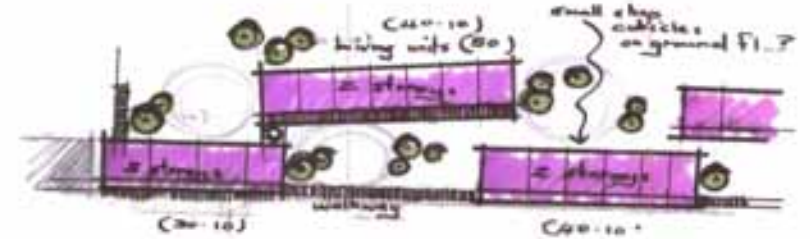
009 Individual units of agricultural centre to be linked by a walkway on the side of the building.

010 First conceptual elevation of urban agricultural centre.

011 Conceptual drawing exploring layout and shape of agricultural centre.



012



Construction Materials

- Corrugated iron/Gum pole roof
 - not local + expensive, but part of well established industry
- Concrete modular blocks
 - Crushed rock -> from granite close to (clean cladding) site - simple?
 - Heavy water - rock + modular blocks + close to site!!
- welded mesh, rocks + mortar - been part of tradi wall const for many
- external walls - sealed with silicone (base point clear-maintenance)
- side coloured screens

013



014



015

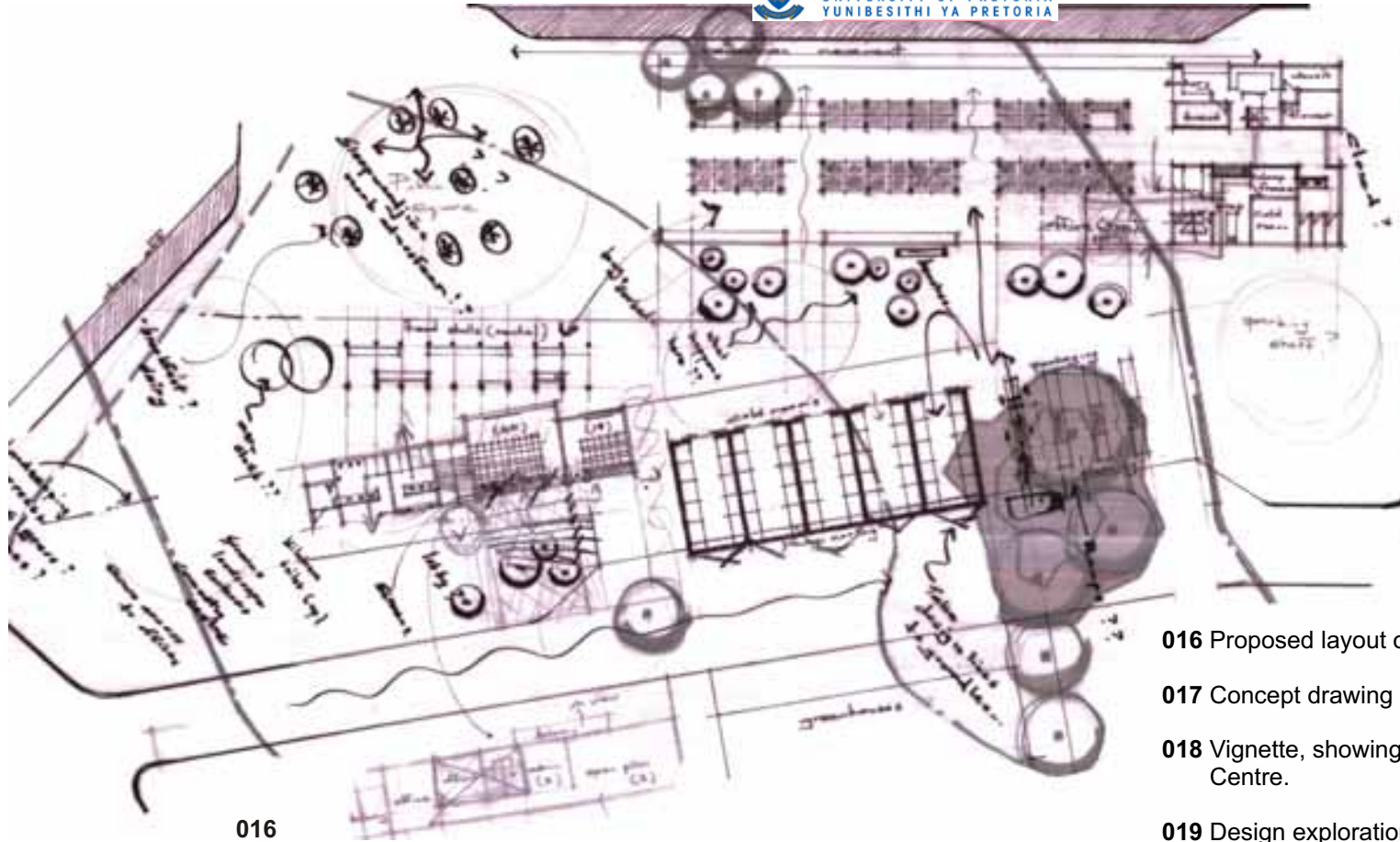
012 Conceptual layout and accommodation of the urban agricultural centre.

013 Drawing exploring the possible layout and accommodation of the housing component for co-operative members.

014 Drawing exploring the position and layout of design on site.

015 Conceptual drawing of the market area.





016

016 Proposed layout of agricultural centre

017 Concept drawing of the market building

018 Vignette, showing the basic layout of the agricultural Centre.

019 Design exploration of possible fruit and vegetable display

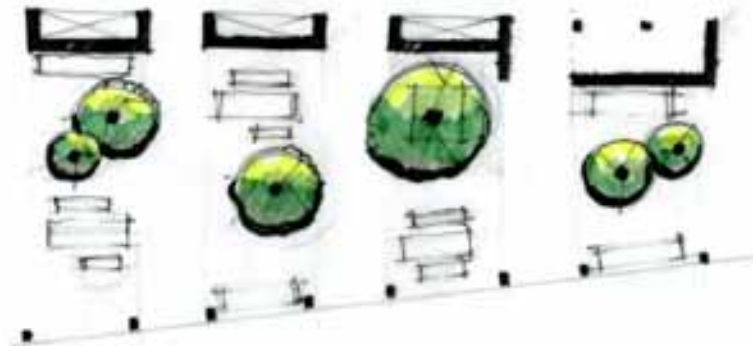


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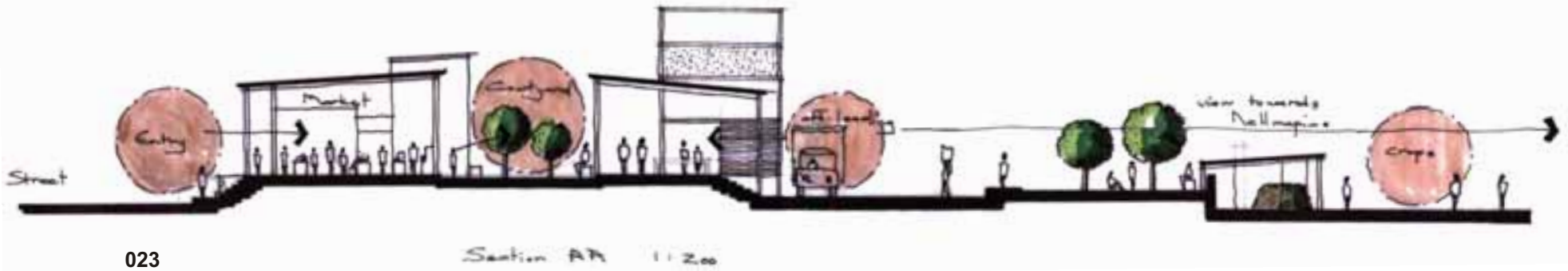


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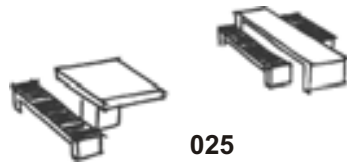
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Section AA 1:200

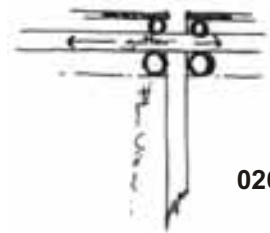


024

Section BB 1:200



025



026



027

023 Section AA; exploration of height and scale.

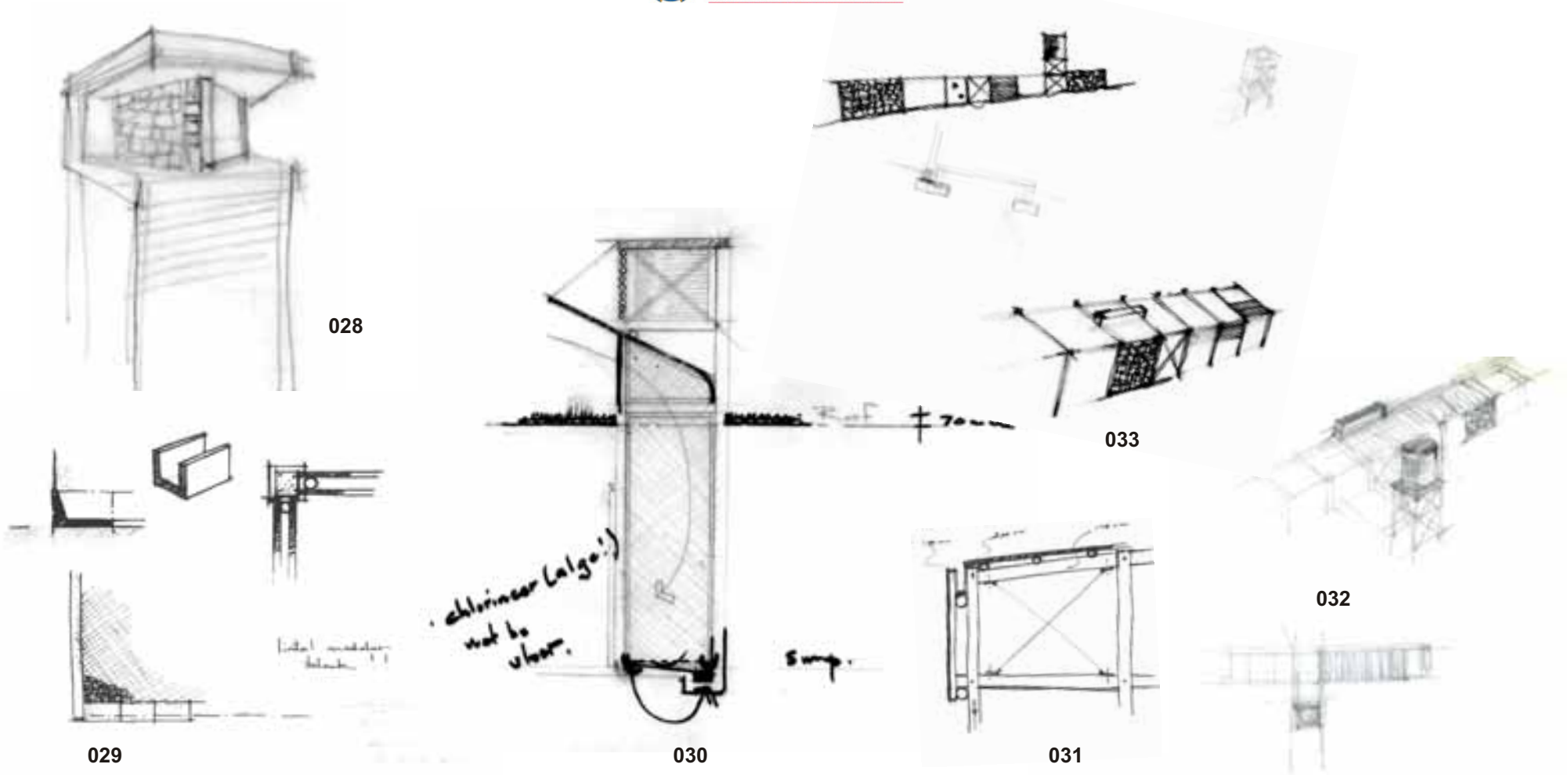
024 Section BB; exploration of height and scale.

025 Design exploration of concrete tables and seating around courtyard

026 Gum pole construction concept

027 Gum pole construction concept





028 Conceptual drawing of evaporative cooling fridges

029 Exploration into the construction of evaporative cooling fridges

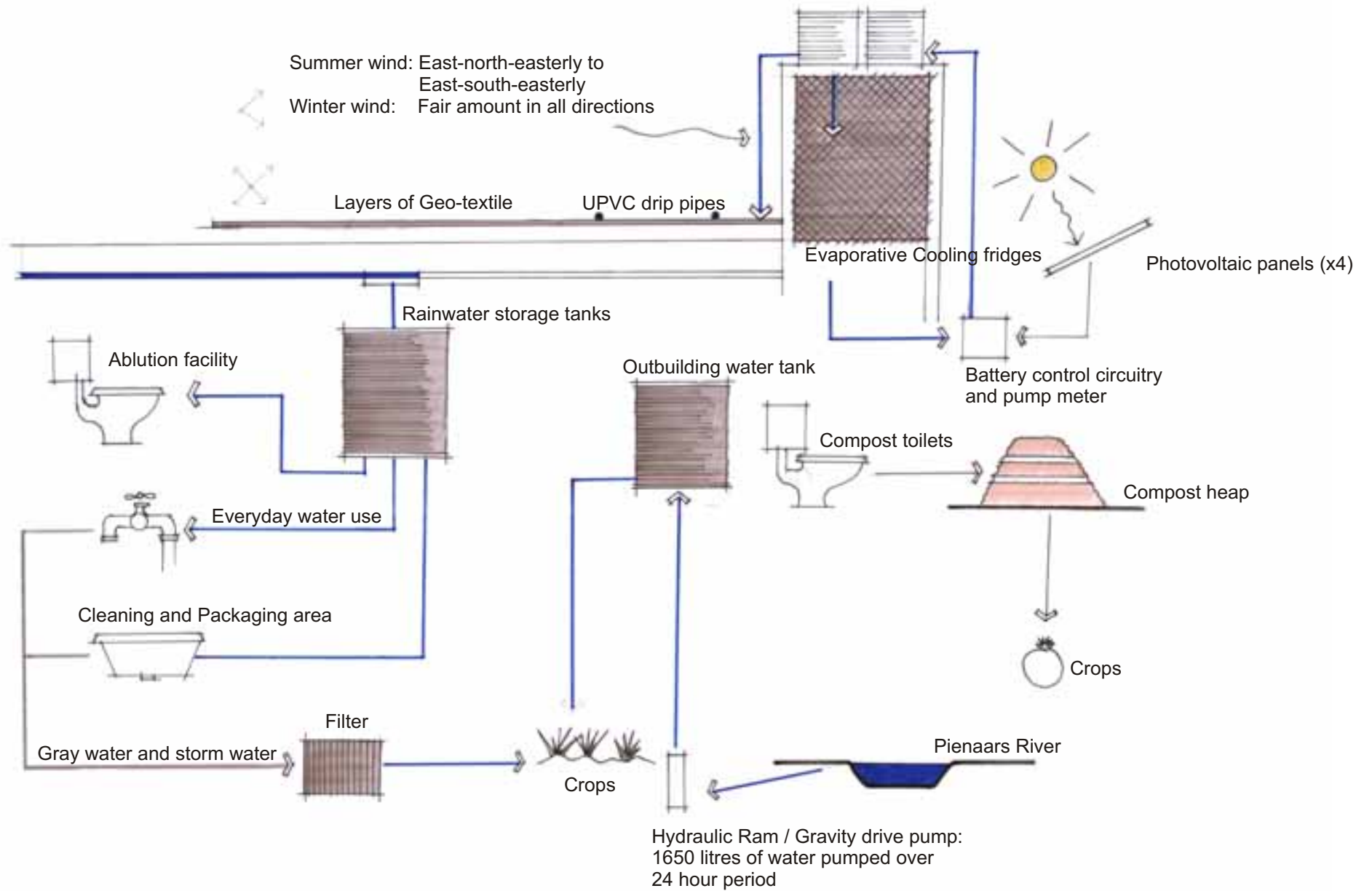
030 Conceptual drawing of evaporative cooling fridges

031 Gum pole construction concept

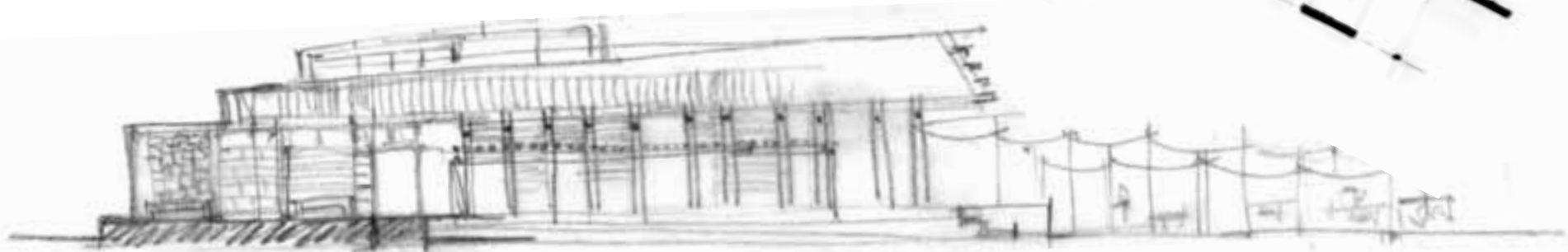
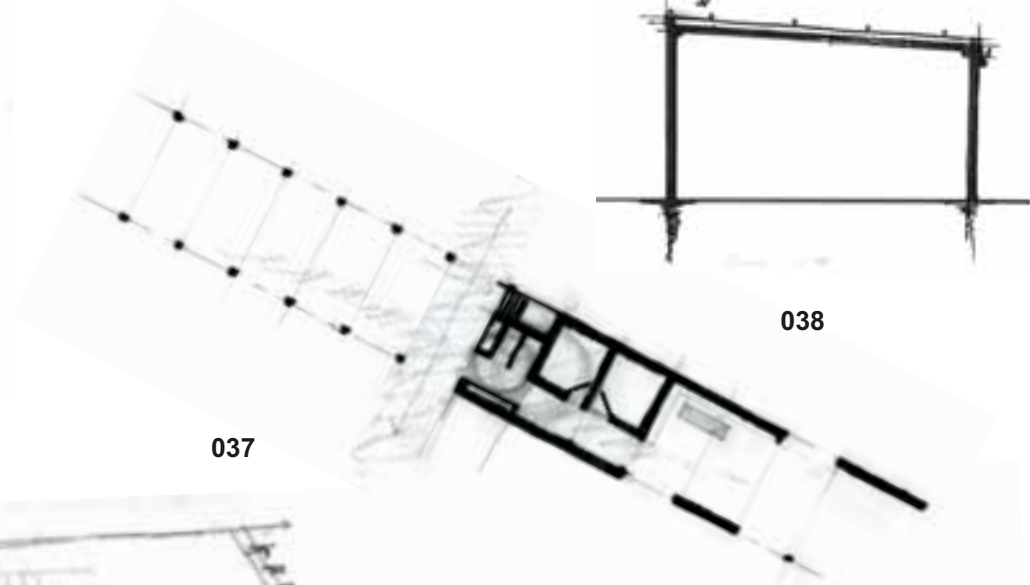
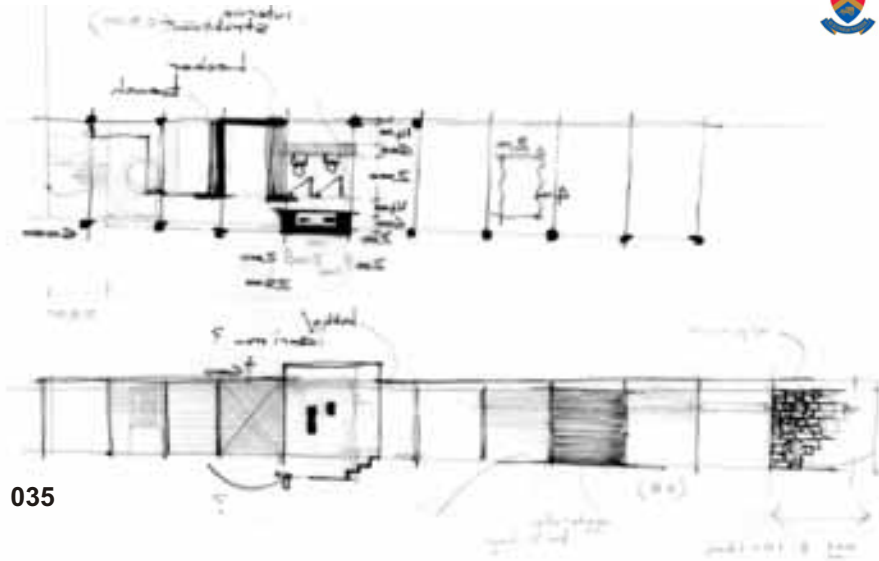
032 Design exploration of urban agricultural outbuildings

033 Design exploration of urban agricultural outbuildings





034 Drawing depicting methods of alternative energy



035 Conceptual layout and elevation of agricultural outbuilding.

036 Conceptual drawing of the market area:
street facade.

037 Proposed layout of agricultural outbuilding.

038 Gum pole construction concept.

039 Concept model of proposed urban agricultural centre.





Design clarification

6.1 About the Centre.

The word “Siyotshala” means 'we plant' in Zulu. As mentioned, the Siyotshala Urban Agricultural Centre will serve as a generator for business, commercial and recreational activity and will seek to uplift and empower the people of the area. If the 50 members of the Co-operative, all have families consisting of 5 members, then the lives of 250 people will be directly impacted. The agricultural knowledge acquired at the centre can be passed on from father to son, and will impact many more lives.

The Centre will provide the following employment opportunities:

- Employment for 50 members of the Co-operative.
- The small bakery within the centre can be rented to the public or operated by members of the Co-operative.
- The market spills out into the informal trading and food area. In this area entrepreneurs that are not in direct competition to the market can earn an income.

The Siyotshala Urban Agricultural Centre is an attempt to provide a simple structure from local materials that will be aesthetically pleasing within the newly formed urban environment. It is also an attempt to put human contact back into the marketplace, where local people can meet and do their weekly grocery shopping within a buzz of activities.

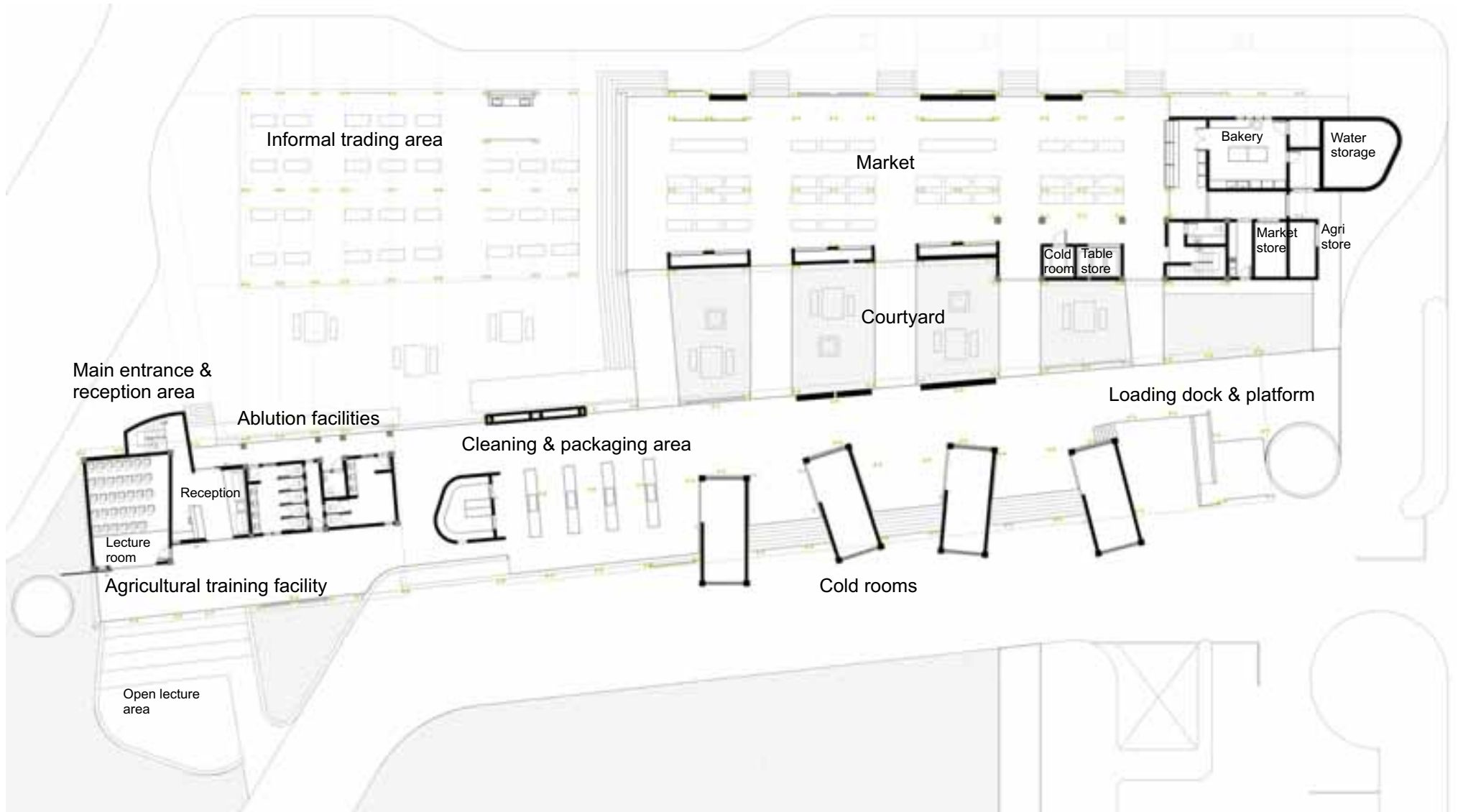
One of the main concepts behind the design is to provide a building that seems to grow out of the existing fabric of the area. The slightly off-access elements of the design open up vista's towards the surrounding agricultural fields and further emphasize the notion of “Archology”, where the city functions as a living system. We live in a world that worships celebrity and fame, and many architects design buildings to attract the attention of the world and for not much else. This dissertation attempts to provide a case for architecture that is raw and unrefined and will be constructed from simple cost effective local materials; however in the process generating a building that is fresh and that brings a sense of dignity and pride to the area. Architecture that acknowledges everyday domestic life, but still celebrates the potential for inventiveness within the ordinary as Joe Noero puts it. (NOERO 2004:16-24)



North elevation - Market



Site plan



Ground floor plan



First floor plan

6.2 Access and onsite parking

Private vehicles and taxi's access the site via Love Drive and Market Street. The newly designed public transport facilities at Eerste Fabrieke Station play a major role in the proposed urban framework of the study area. From the station people will have direct access to bus, taxi and transport by train at almost any time of day. Only a few people in this area own vehicles, and three taxi drop-off points were included in the design to promote public transport. The service road to the centre can be accessed from Love Drive. Formal parking is provided along Market Street and the parking bays at the back of the centre are reserved for co-operative members only.



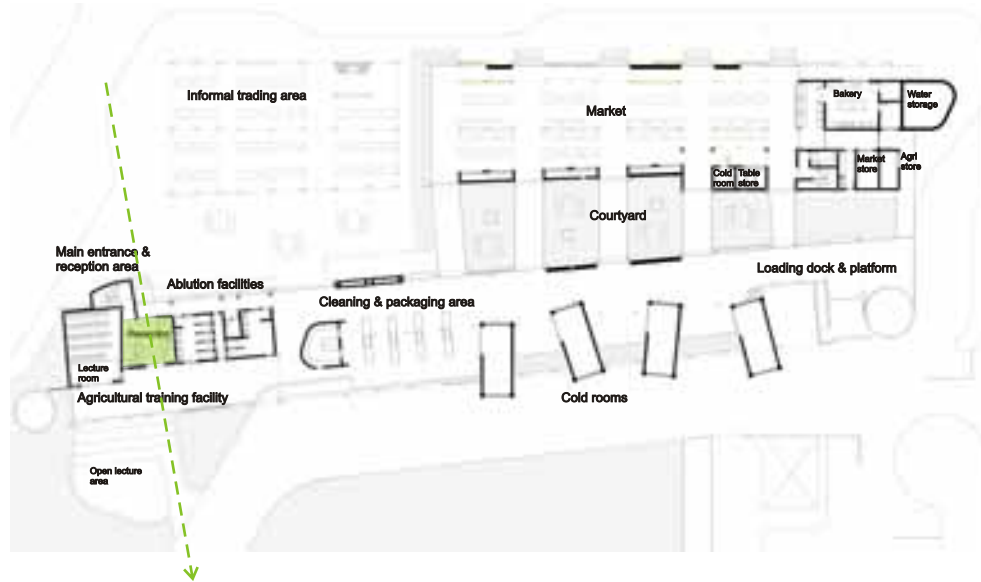
Agricultural outbuilding



Perspective view of market & informal trading area

6.3 Main entrance and reception area

The main entrance to the facility acts as a focal point upon arrival at the centre, and the visitor's eyes pass through the reception area towards the agricultural activities on the other side. From here visitors can either move to the agricultural training facility or to the office and administration area on the first floor. The reception area will be used for administration and registration purposes.

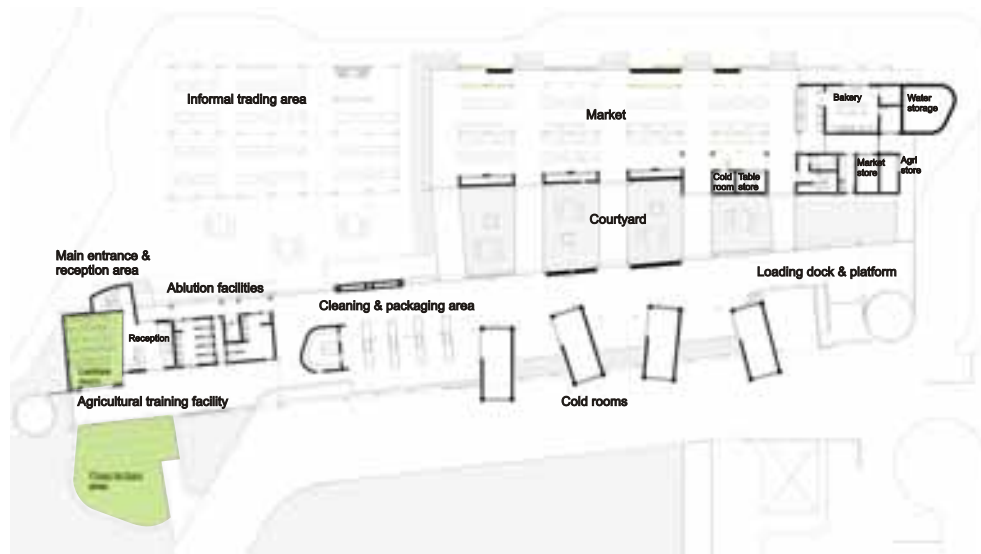


North elevation - Agricultural building

6.4 Agricultural Training Facility

Agricultural training forms the backbone of the Siyotshala Urban Agricultural Centre. The agricultural workers will be trained in all aspects related to farming, and the training will range from planting and harvesting techniques to crop irrigation. Although the training will mostly be done by hands-on practical experience in the field, two lecture areas form part of the design. The southern facade of the enclosed lecture room can slide open to expose the learners to the outside farming activities. The interior is furnished with desk chairs that can be easily removed in the event of small exhibitions and functions.

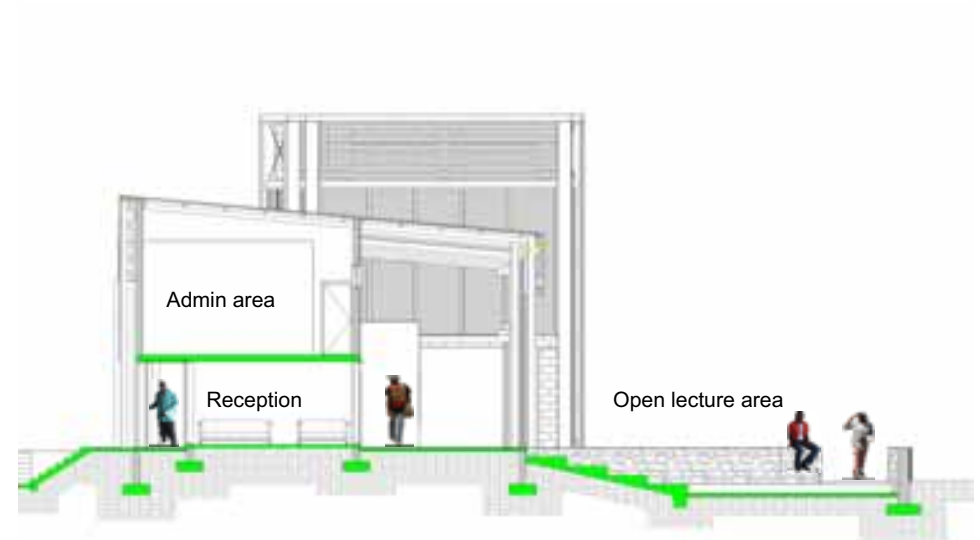
The open lecture area has a clear view towards all the agricultural activities and is located in close proximity to the crops for practical study.



Perspective view of training facility

6.5 Office and Administration area

The office and administration area of the Siyotshala Urban Agricultural Centre is located on the first floor of the agricultural building. This area contains offices for the directors, agricultural trainers and administrative personnel and will have a bird's eye view over activities around the centre.



Section through office and administration area



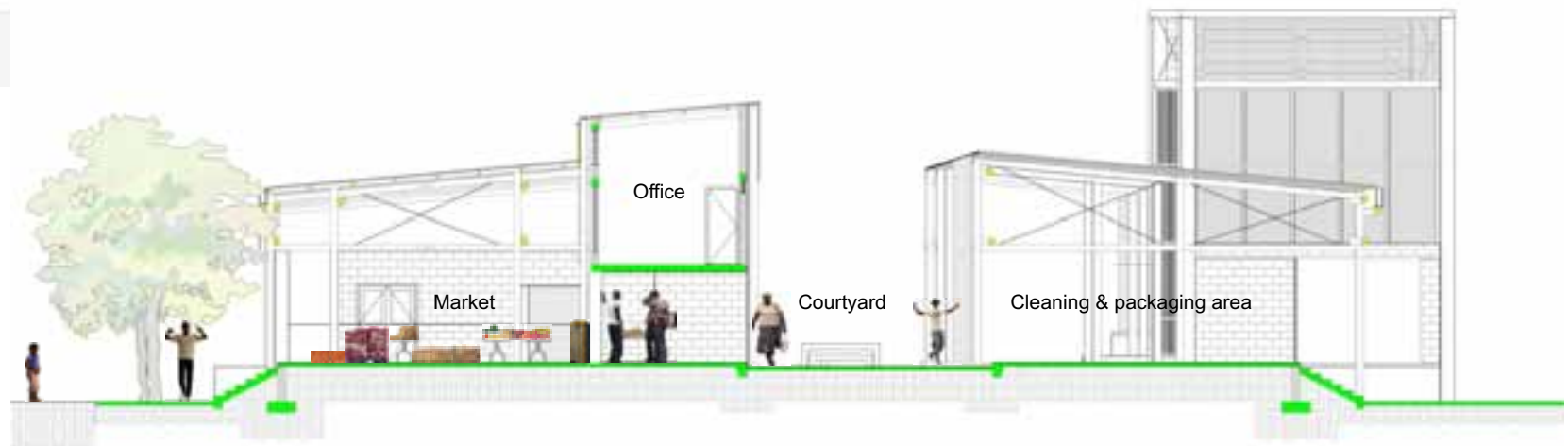
South elevation - Agricultural building

6.6 Cleaning and Packaging area

After harvesting, the vegetables will be taken to the cleaning and packaging area to be washed. From there the vegetables can be directly carried to the market, loading platform or cold rooms for storage. All the necessary packaging equipment and containers will be stored next to the packaging area. On the northern side, the cleaning and packaging area is screened off from the informal trading area by means of a concrete masonry wall.



Perspective view of cleaning & packaging area



Section through market & agricultural building

6.7 Cold rooms

The cold rooms make use of evaporative cooling, and can reduce the internal temperature by up to 7 degrees Celsius during summer months. Although this temperature reduction will be sufficient for most produce, other fruit and vegetables like tomatoes, cabbage, lettuce and grapes need to be stored at optimum temperatures between 1 and 10 degrees Celsius. These products will be stored in cold rooms inside the market area.

The evaporative cooling cold rooms act as wind scoops and wind is directed through wire mesh skins that contain coal. Water is constantly dripped onto the coal to enable evaporative cooling to take place. Fresh produce will be stored in purpose-made designed wall crates that can be stacked on top of each other. The roof structure of the main agricultural building is overlaid with a few layers of geo-textile. Water is constantly dripped onto these layers to cool the roof underneath the protruding cold rooms.

Because fruit and vegetables are mostly composed of water, it is not surprising that the final product is relatively expensive. Water loss also equates to a loss of saleable weight and a direct loss in marketing. For this reason measures to minimise water loss after harvest must be taken. Evaporative cooling will enhance the moisture content on the inside of the cold rooms and inevitably also enhance the shelf life of the stored produce.



Volume of cold storage required

December (biggest harvest)

Harvested	Volume	Storage per ton	Total
Carrots	15.75 t	1.5 m3	23,63 m3
Butternut	9 t	1.6 m3	14.4 m3
Cabbage	27 t	1.6 m3	43.2 m3
Beetroot	8.1 t	1.8 m3	14.58 m3
Spinach	4 t	1.5 m3	6 m3
	63.85 t		101.8 m3

First week = 31.93 t (harvested)

Second week = 31.93 t (harvested)

Total = 63.86 t

Cold storage required (harvested produce for 1 week) = $101.8 / 2$
= 50.9 m3

Cold storage provided: 15.88 m3 per cold room (x4)
= 64 m3

Available storage (everyday) for produce obtained from fresh produce market:
 $64 - 50.9 = 13.1$ m3

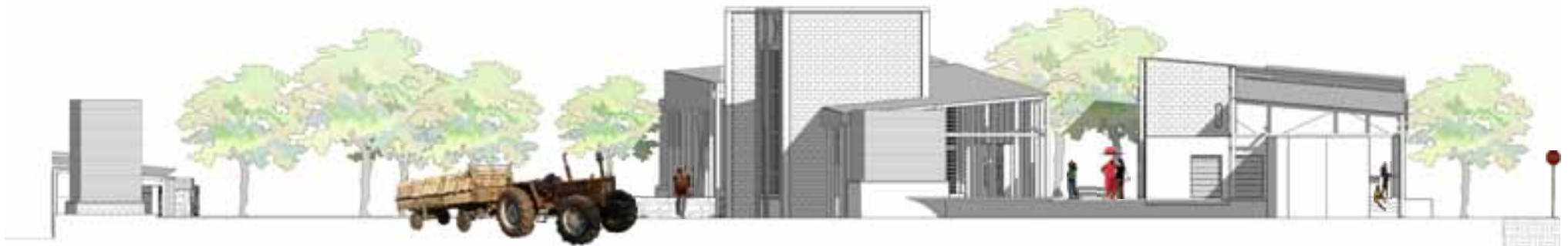
6.8 Loading dock and platform

Vegetables planted at Siyotshala will be limited to sweet potatoes, carrots, cabbage, butternut, beetroot and spinach. The biggest part of the harvest from Siyotshala will be sold to the Pretoria Fresh produce Market on a monthly basis. The centre will also purchase other fruit and vegetables from the Fresh Produce Market on a daily basis.

Delivery trucks will be able to reverse into the loading dock or offload at the platform, should the truck only open from the side. From this area the produce can be distributed to consumers throughout the city.



Perspective view of courtyard



East elevation - Urban agricultural centre

6.9 Market

During daytime the market becomes a vibrant trading area where fruit and vegetables are displayed in storage crates on fold up steel tables.

The main idea behind the design of the market area is to create a multi-functional space that may be used for other activities besides the selling of produce. After trading hours, the centre can be turned into a community centre where kids can do their homework and play volleyball. It can also function as a venue for conferences, weddings and even church services. The floor of the market is designed with the necessary surface drainage slopes and area drains and can easily be hosed-down and cleaned.

Five Concrete walkways link the market to the cleaning, packaging and cold room area for the produce to be moved from one area to the other.



Interior view of market area



South elevation - Market & informal trading area

6.10 Informal trading Area

Fold-up steel tables and allocated space for trading can be rented by informal traders for a minimal amount. From underneath the overhead roof structure, traders can personalize their area of trading by fixing canvas screens to the cables that span from the gumpole structure. This way, many smaller stalls will be created under a common roof to humanize the whole experience.

6.11 Courtyard

The elongated courtyard area is located between the market and the main agricultural building. From here visitors will be able to see how the vegetables are being processed while enjoying a meal from the informal trading area. This grass filled area contains concrete tables with seating and will be filled with the flavour of food being prepared.



Perspective view of informal trading area

6.12 Ablution facilities

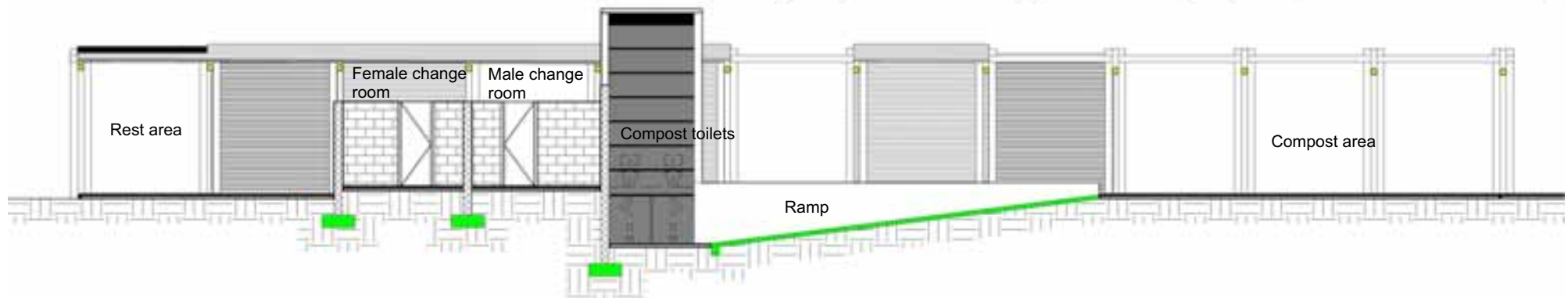
The ablution facilities for the centre are designed in accordance to the National Building Regulations for buildings with a low risk commercial service and are located next to the Agricultural Training Facility. These facilities can be accessed from the Informal Trading and Agricultural Training Area. The water closet toilets of the ablution facilities are connected to the municipal sewer.

6.13 Agricultural Outbuildings

The 10 agricultural Outbuildings are located at regular intervals along the 8.6 hectares of agricultural land. These outbuildings will contain a resting area, change rooms, compost toilets and an area for compost production. The composting toilets consist of a double pour flush system and enables alternative use of the two pits. When one of the pits is full, it can be closed and left for pathogen destruction to take place. After this period the decomposed content can be safely removed and mixed into the organic plant material waste.

6.14 Security

All agricultural workers will be trained in security matters and will perform security work on a rotation basis.



Section through agricultural outbuilding

6.15 Applied alternative energy

Although mainstream electricity will still be necessary, alternative methods of energy are being used to reduce the carbon footprint of the building and to make the centre more self-sustainable. These methods include the following: Evaporative cooling cold rooms, composting toilets, the reuse of gray water, hydraulic ram water supply and rain water harvesting for reuse. Photovoltaic panels will also be installed on the roof of the main agricultural building. These panels will be used to pump the evaporative cooled water back to the storage tanks on top.

10 Hydraulic Ram pumps will be installed at 2 meter working fall intervals. This implies that the gravity pump will be able to pump 165 litres of water to a vertical height of 10 metres at a rate of 24 hours / per. litre / per. Minute. The Pienaars River has a flow capacity of 10 litres per minute.

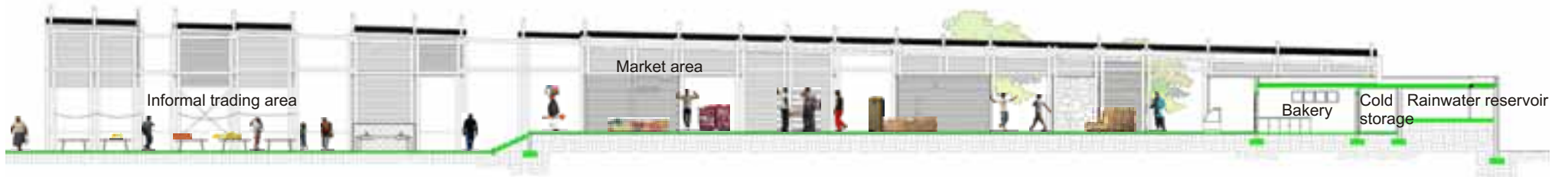
Calculation: $10 \times 165 = 1650$ litres. Thus, each of the installed gravity pumps will be able to pump 1650 litres of water over a period of 24 hours.



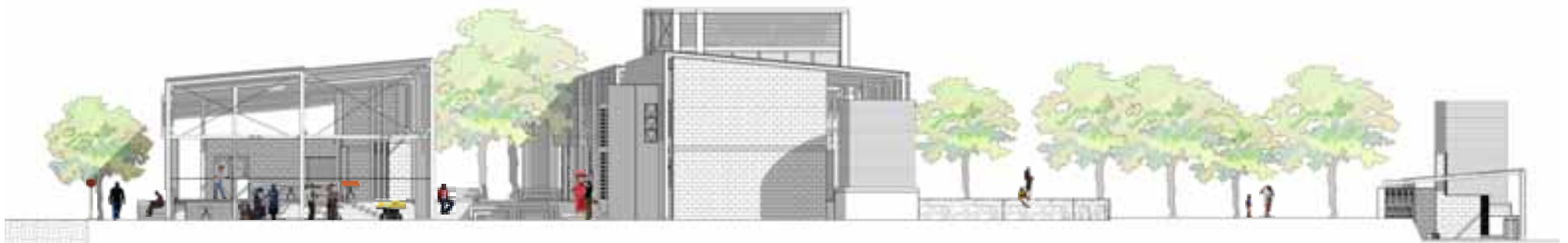
Perspective view of agricultural outbuilding



South elevation - Agricultural outbuilding



Section through market & informal trading area



West elevation - Urban agricultural centre

Harvested rainwater storage

Month	Rain(mm)	Roof area A	Roof area B	Roof area C	Accumulation: A	Accumulation: B	Accumulation: C	Tank size A	Tank size B	Tank size C
Jan	136	262 m2	555 m2	610 m2	39 (kl)	75.5	83	Max required: 39 kl	Max required: 75,5 kl	Max required 83 kl
Feb	75				21.5	41.6	45.8			
March	82				23.5	45.5	50			
April	51				14.6	28.3	31.1	Diam: 3.6 m	Diam: 5 m	l / h: 5m
May	13				3.7	7.2	7.9	Height: 4	Height: 4	Height: 3
Jun	7				2	3.9	4.3			
Jul	3				0.8	1.6	1.8	(0.7854 d2h)	(0.7854 d2h)	(l x w x h)
Aug	6				1.7	3.3	3.7	= 40.72 m3	= 78.54 m3	= 75 m3
Sept	22				6.3	12.2	13.42	= 40 720 L	= 78 540 L	= 75 000 L
Oct	71				20.3	39.4	43,3	= 40.72 kl	= 78.54 kl	= 75 kl
Nov	98				28.1	54.4	60			
Dec	110				31.6	61	67.1			
					January = 39 kl	75.5 kl	83 kl			

Attainable evaporative cooling

Month	Wet bulb	Dry bulb	Rel humidity	Attainable cooling	Area	Av. wind speed (m/s)	Factoring	Wind speed (m/s)	Volume of air flow (m3/s)
Jan	18.83	22.6	58 (%)	3.02 (deg C)	(50 m2)	1.9277	(0.5)	0.964	48.2
Feb	18.56	24.7	59.5	4.9		1.8837		0.942	47.1
March	16.9	21.6	60	3.76		1.78		0.89	44.5
April	13.26	18.76	59.5	4.4		1.7063		0.853	42.65
May	11.9	16.26	55	3.5		1.728		0.864	43.2
Jun	8.9	13.56	53	3.73		1.787		0.894	44.7
Jul	7.9	13.26	50	4.3		1.915		0.958	47.9
Aug	10.27	18.5	46	6.6		2.0603		1.030	51.5
Sept	12.47	22.3	45	7.9		2.2177		1.109	55.45
Oct	14.6	23.6	49.5	7.2		2.32		1.16	58
Nov	17.2	23.76	54	5.3		3.1241		1.062	53.1
Dec	17.8	25.16	56.5	5.9		1.99		0.995	49.75

6.16 Selected construction material

The Siyotshala Urban Agricultural Centre will be constructed from materials like concrete masonry blocks, gumpoles, Megaspan roof sheeting and Quartzite rock from the area. These cost effective materials are commonly used by the local community to construct houses in Nellmapius and refer to local building traditions in a very clear way.

Concrete masonry blocks will be purchased from Frans Tswai. This local entrepreneur from Nellmapius manufactures concrete masonry blocks and stock bricks, and is located a kilometre from the centre on the outskirts of Nellmapius.

The treated gum poles and laths will be obtained from Northern Poles, which is located about 12 kilometres west on Lavender road in Pretoria North.

Megaspan Composite Insulated Roof Panels from Sagex is used for the roof construction. These metal roof sheets are bonded to a core of expanded polystyrene and finished with a Chromadek steel ceiling board for maximum span and insulation.

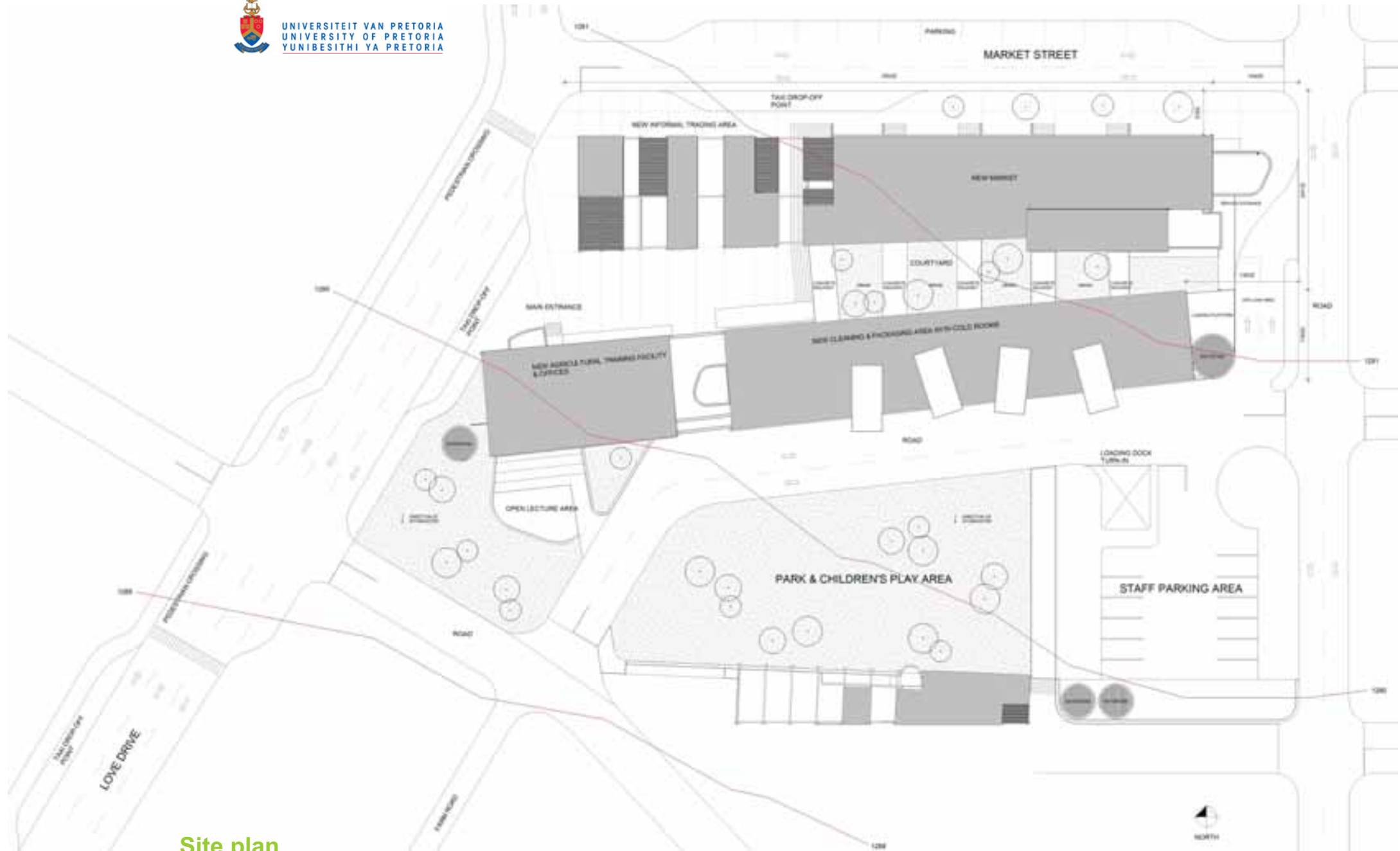
Quartzite rock will be purchased from Willow Quarries at a cost of R120 per ton. The quarry is situated 14 kilometres south on Lynwood road in Zwavelpoort and transport cost amounts to R31-25 per ton.



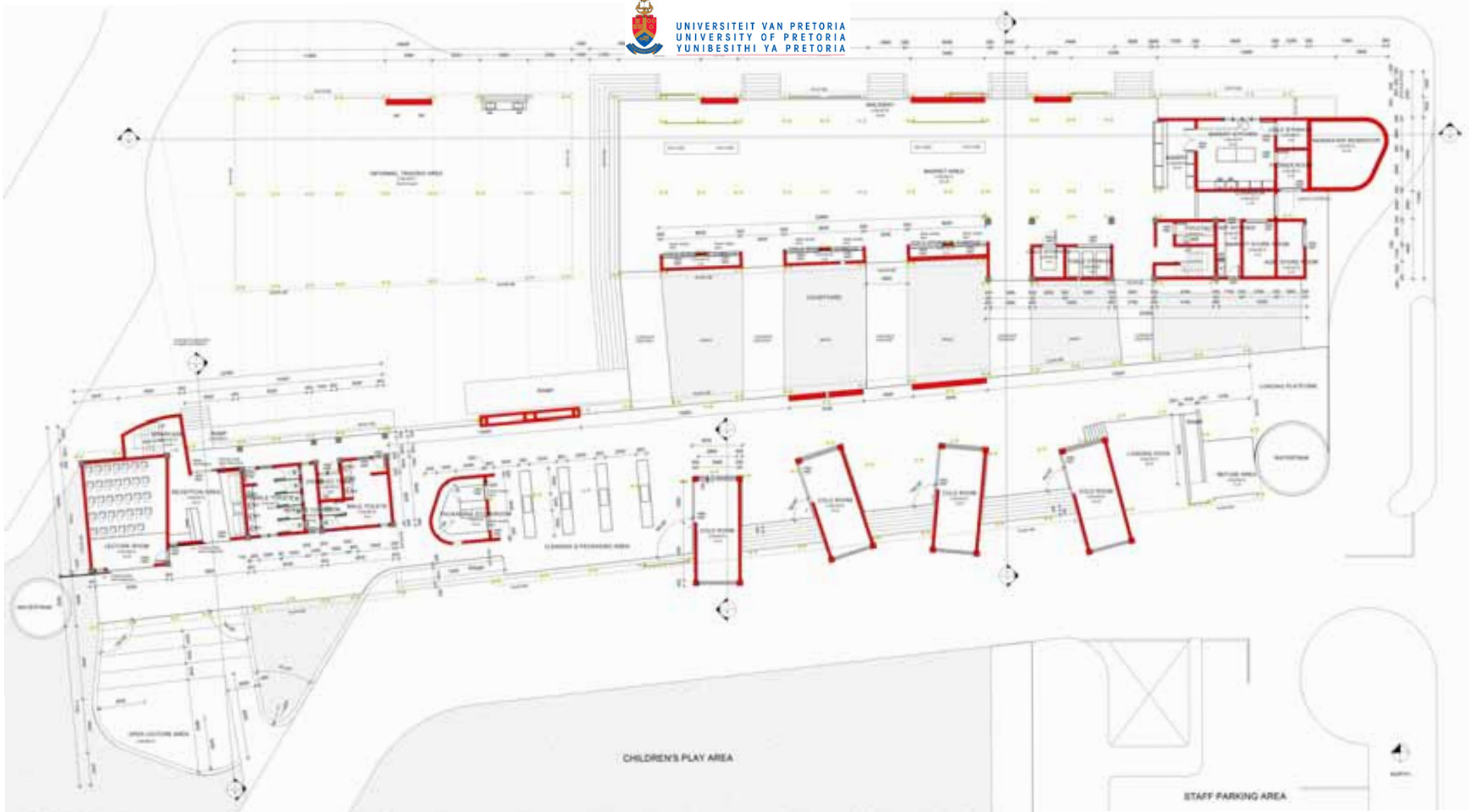
001 (Photo collage by author)
Photo collage of selected construction material



Technical documentation



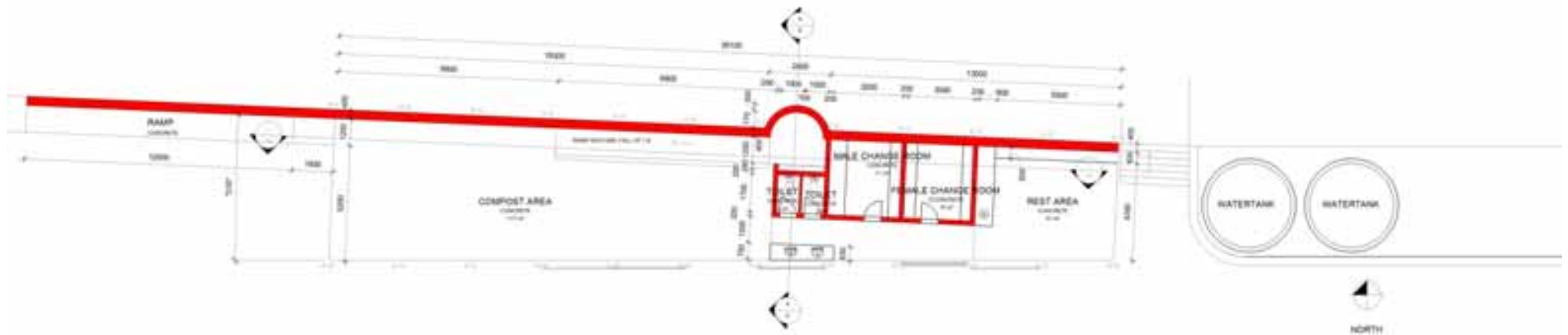
Site plan



Ground floor plan



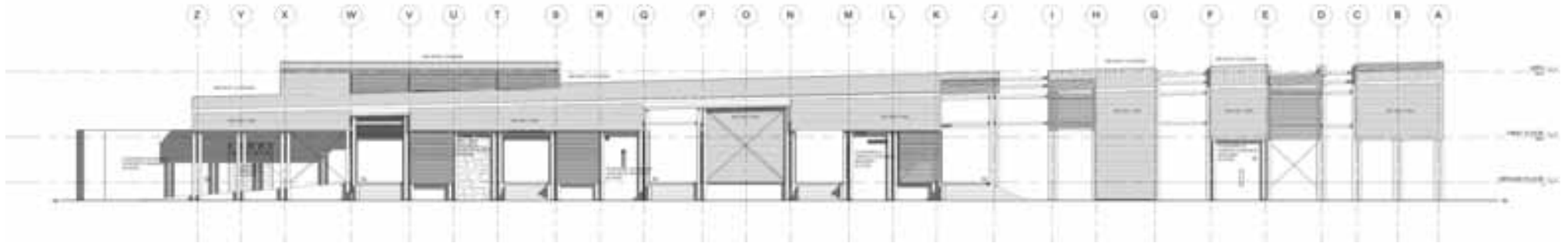
First floor plan



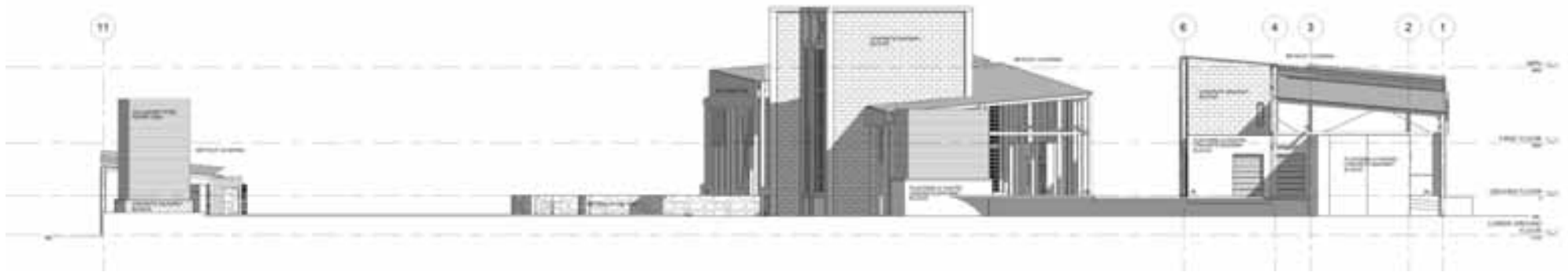
Floor plan - agricultural outbuilding



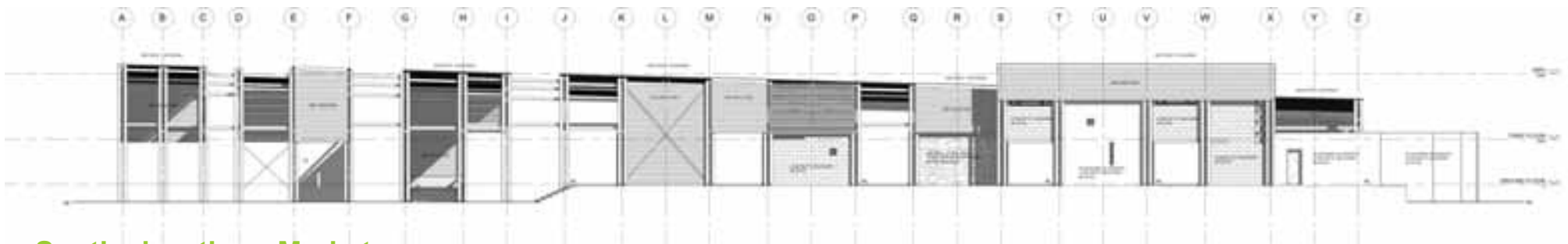
Gridlines - Agricultural outbuilding



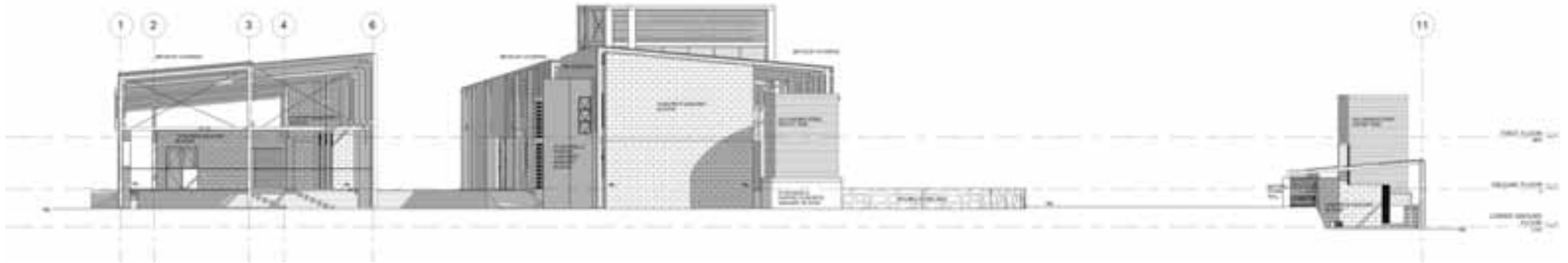
North elevation - Market



East elevation



South elevation - Market



West elevation



North elevation - Agricultural building



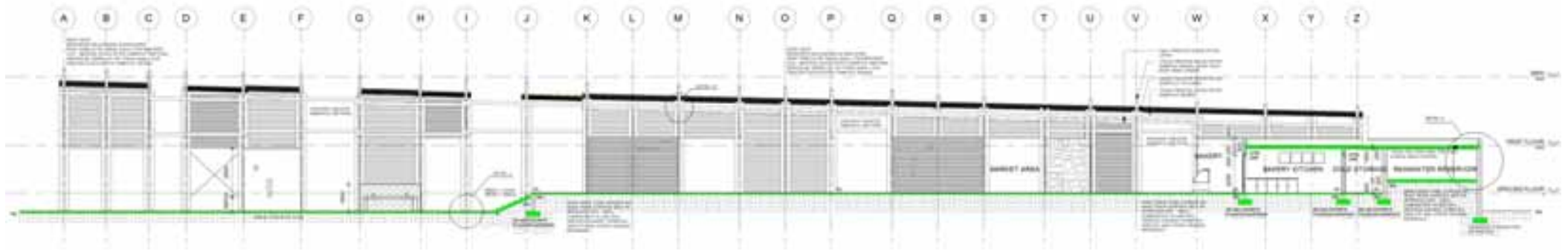
South elevation - Agricultural building



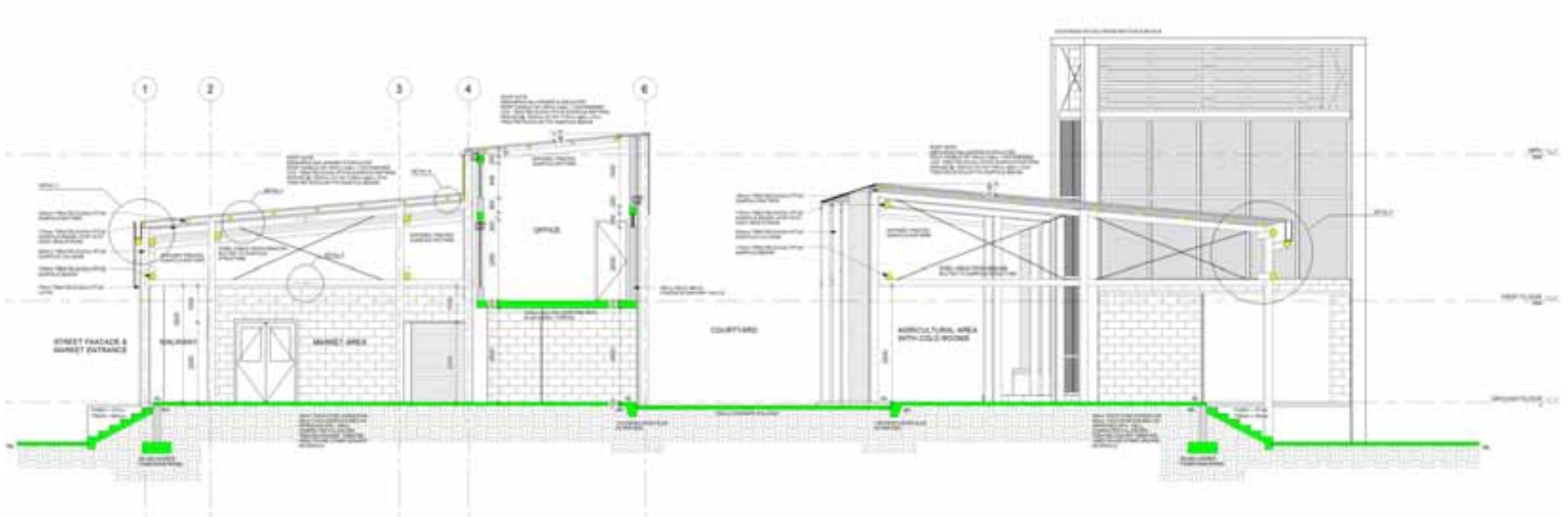
South elevation - Agricultural outbuilding



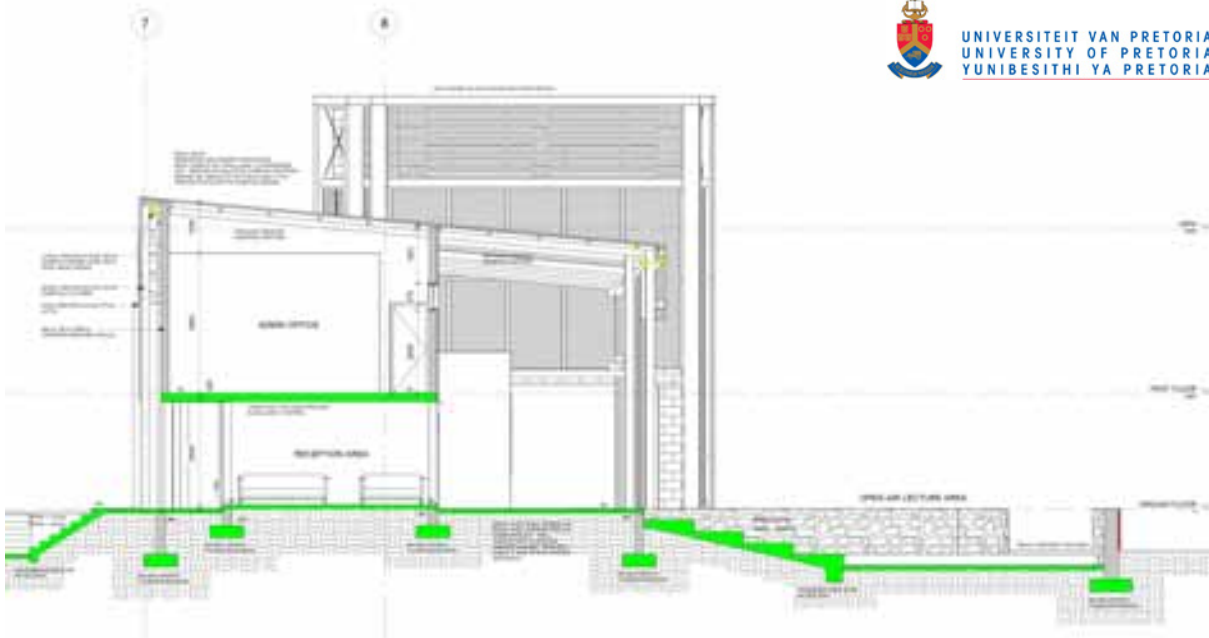
Section F F



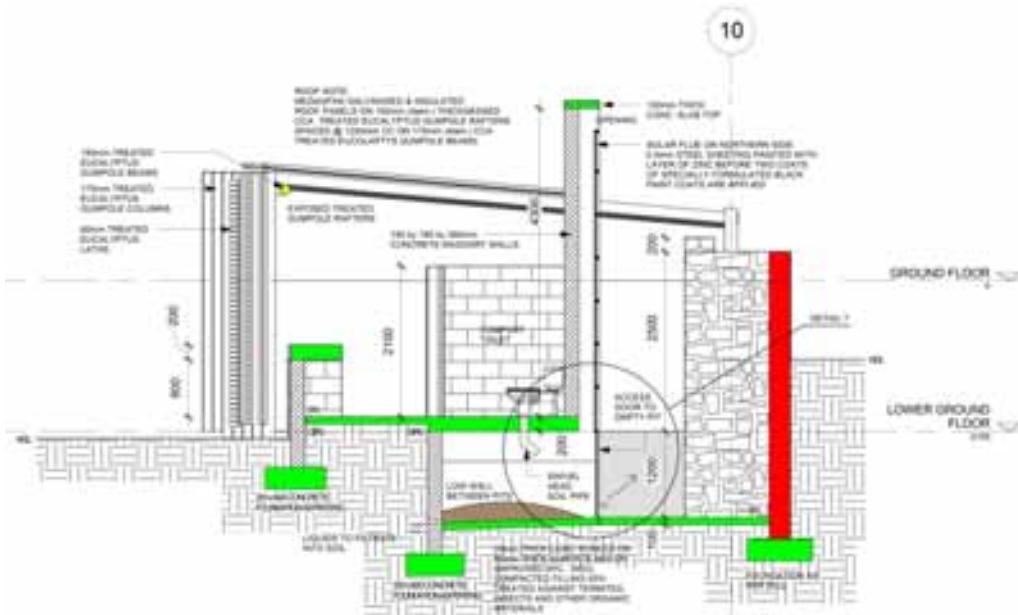
Section A A



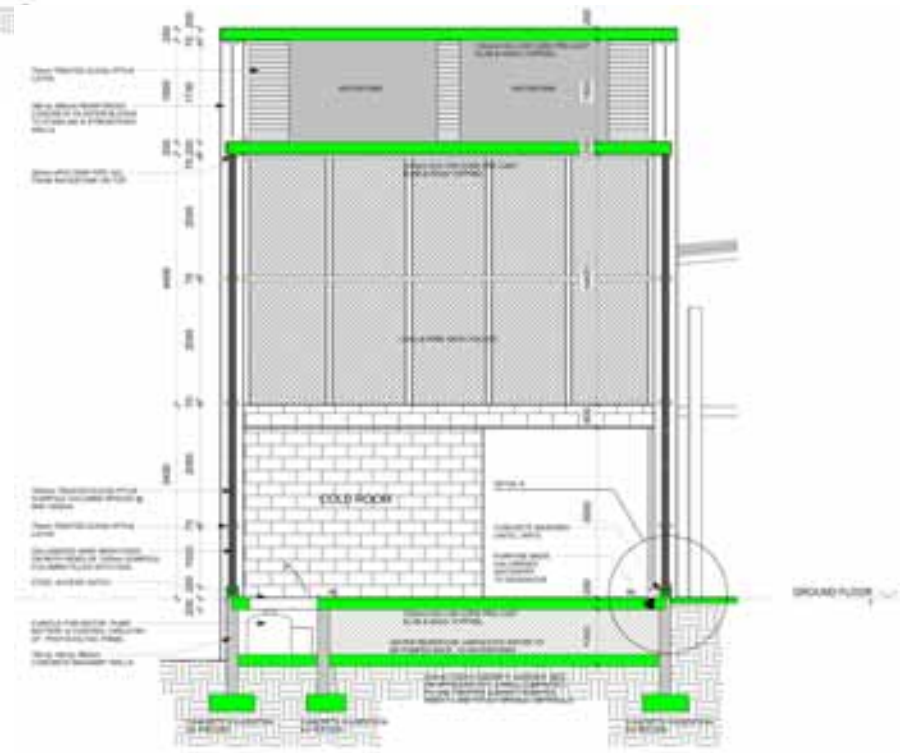
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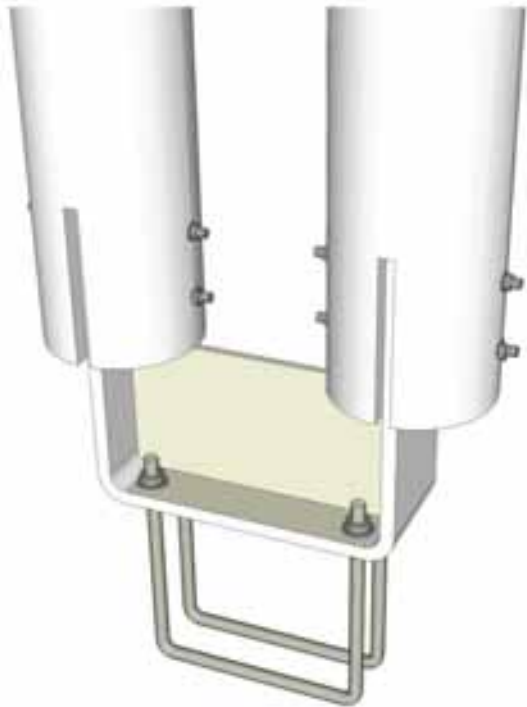
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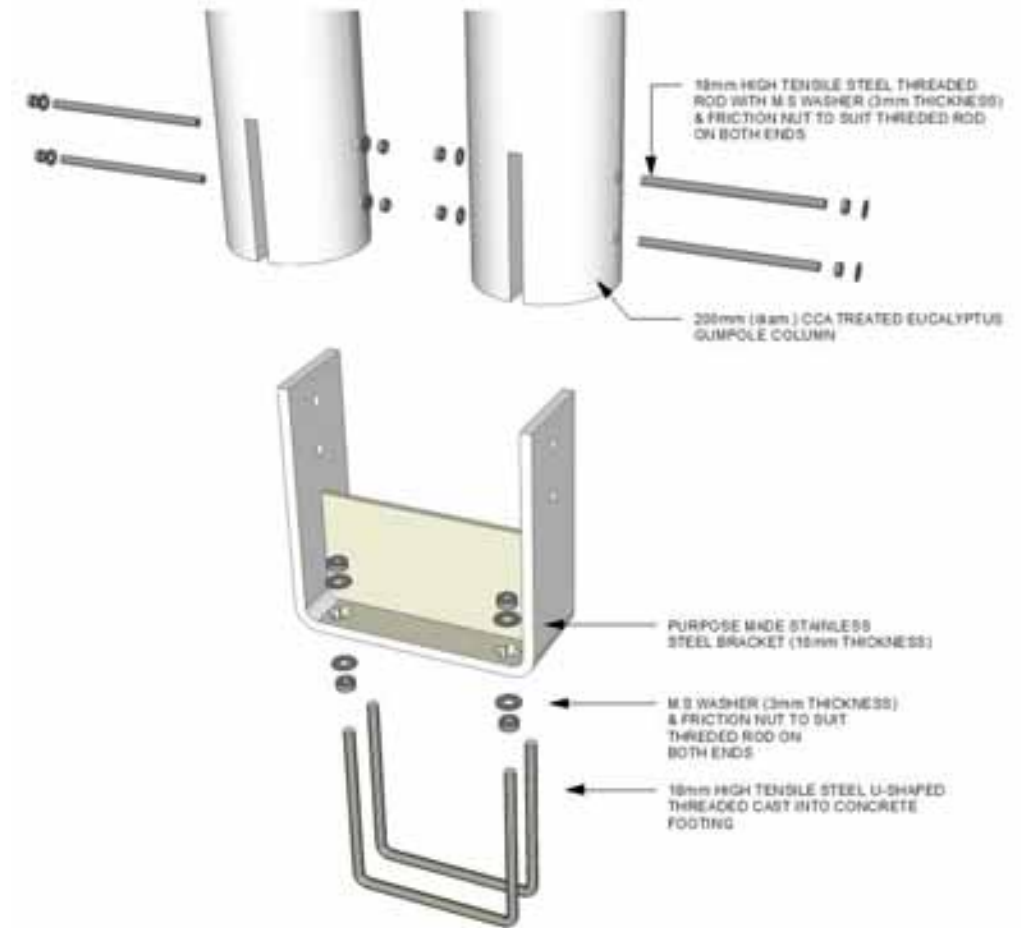
Section D D



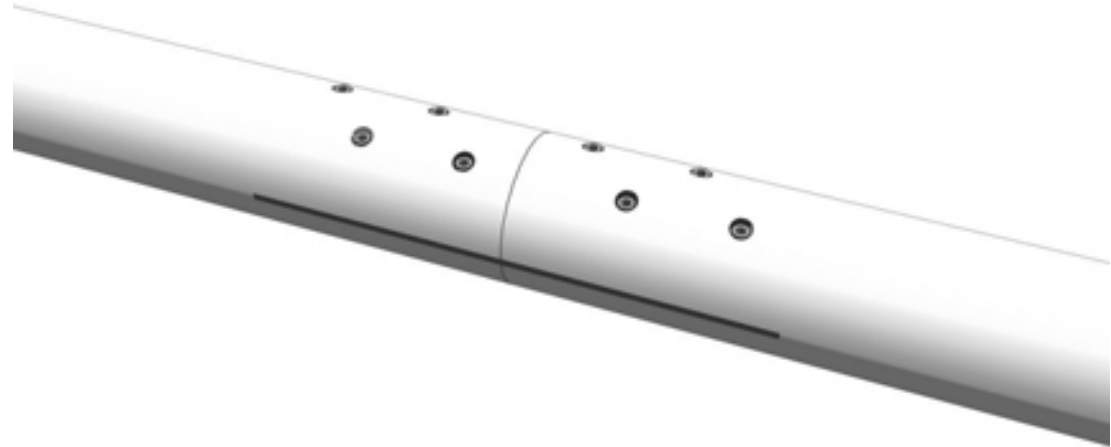
Section E E



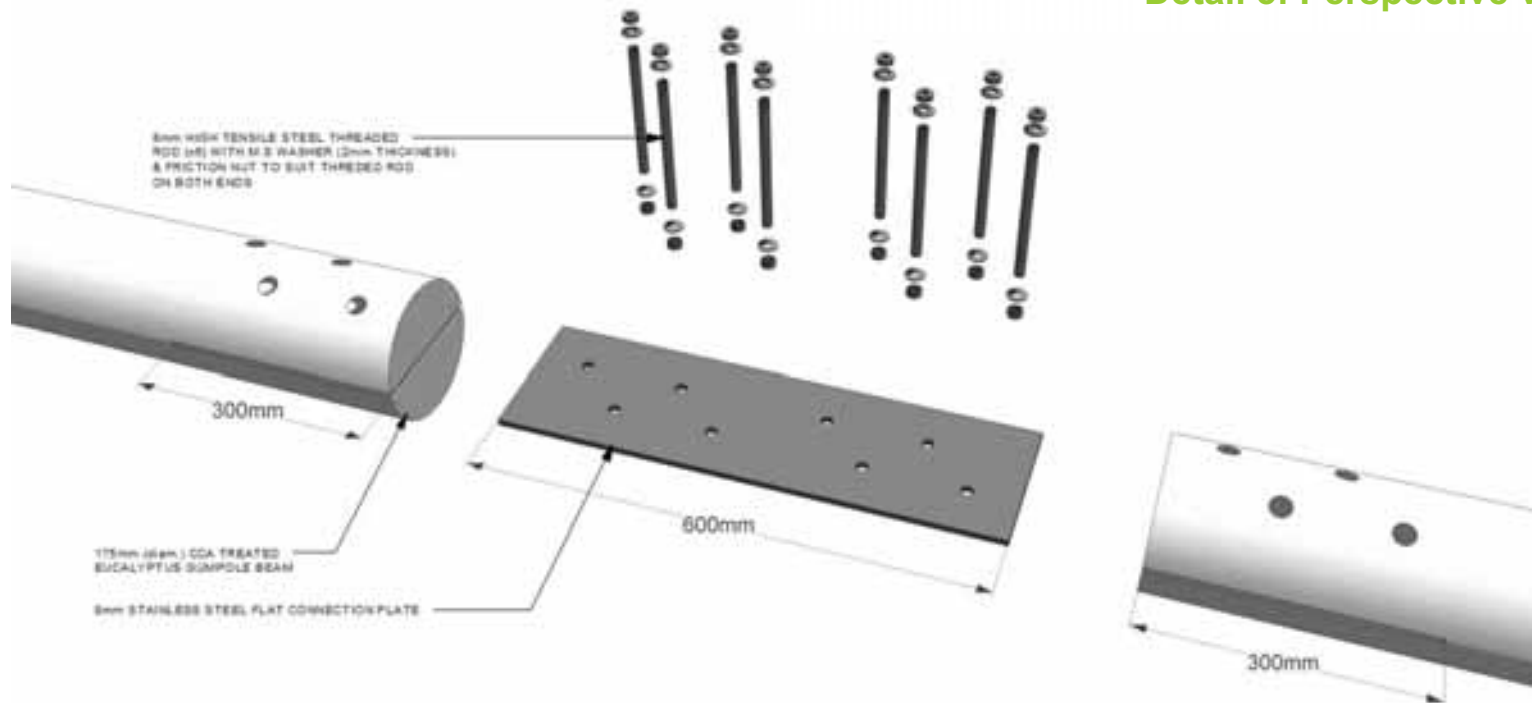
Detail 1: Perspective view



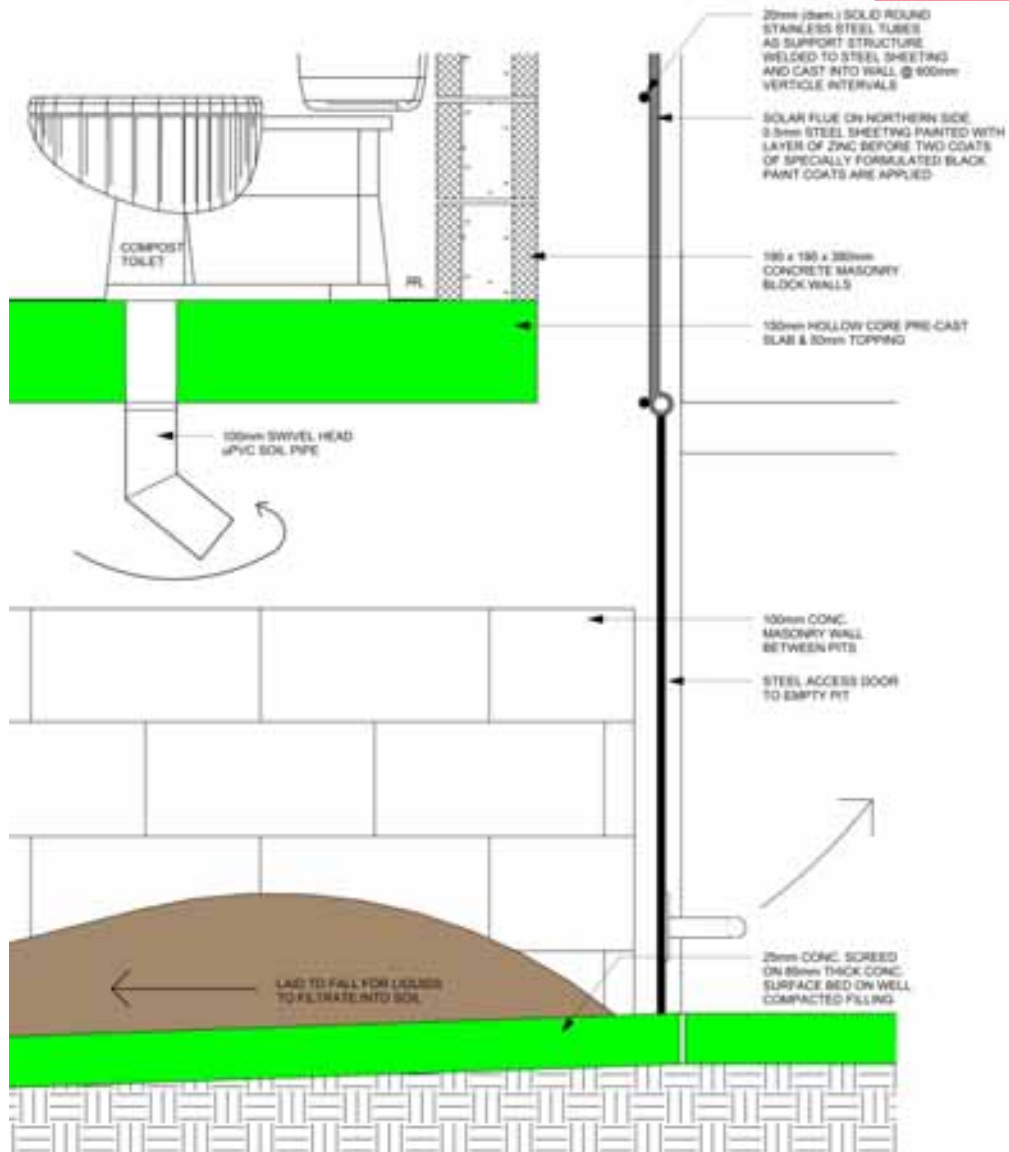
Detail 1: Exploded view



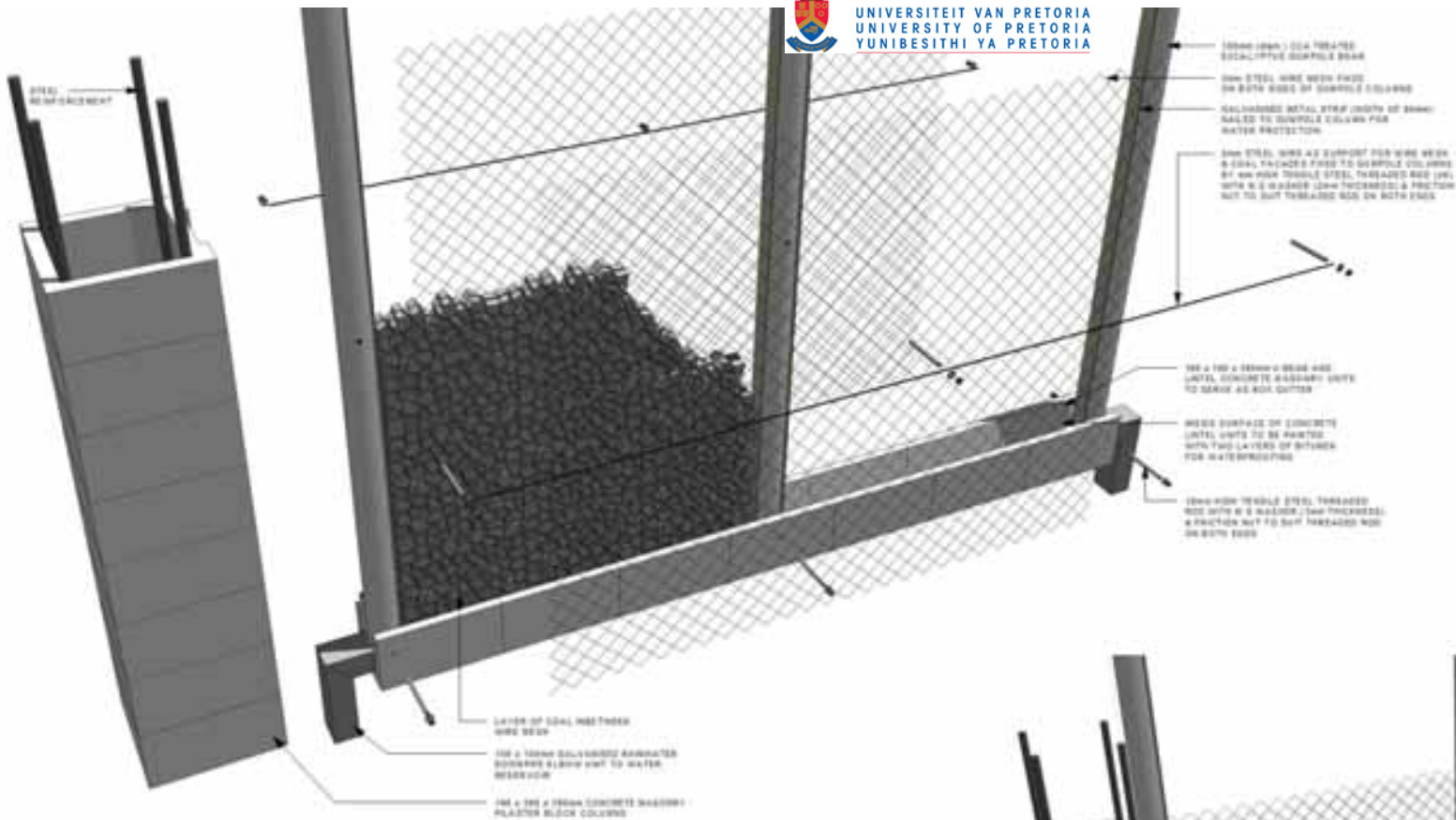
Detail 5: Perspective view



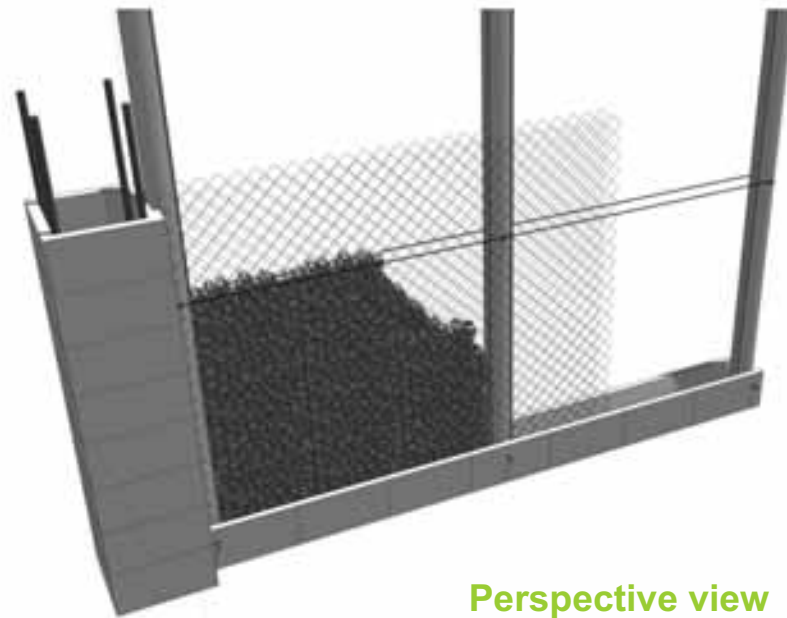
Detail 5: Exploded view



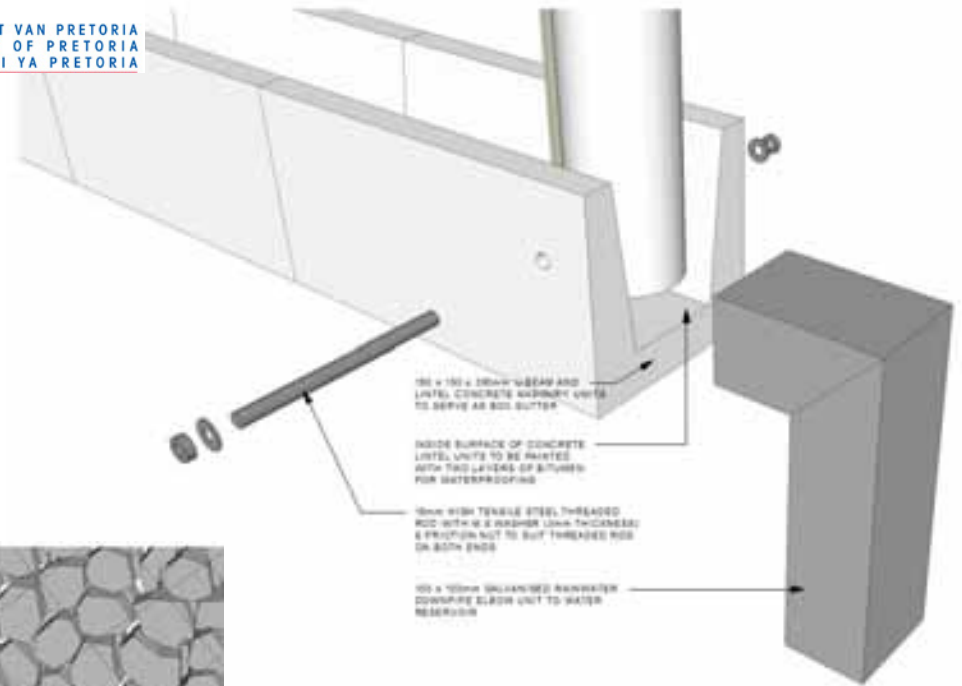
Detail 7



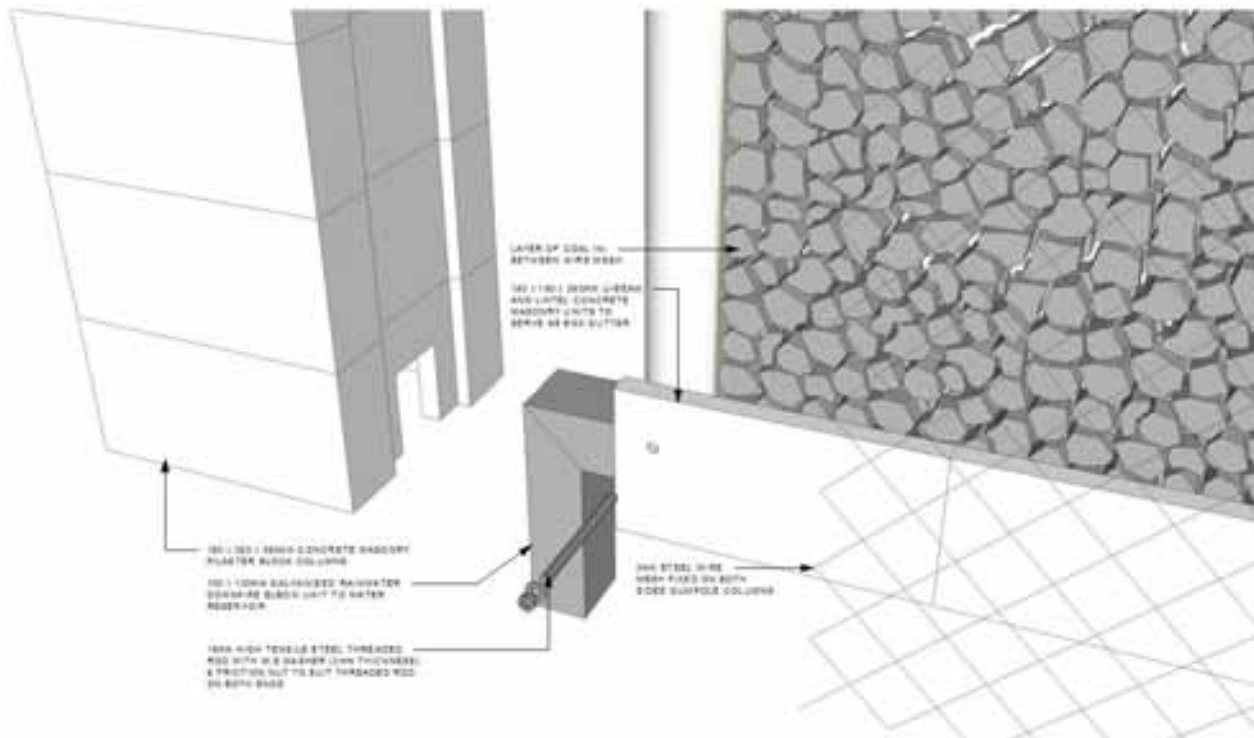
Detail 8: Exploded view of wire mesh & coal facade



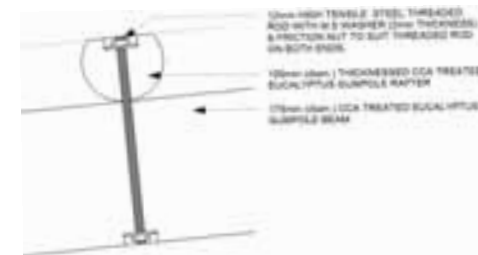
Perspective view



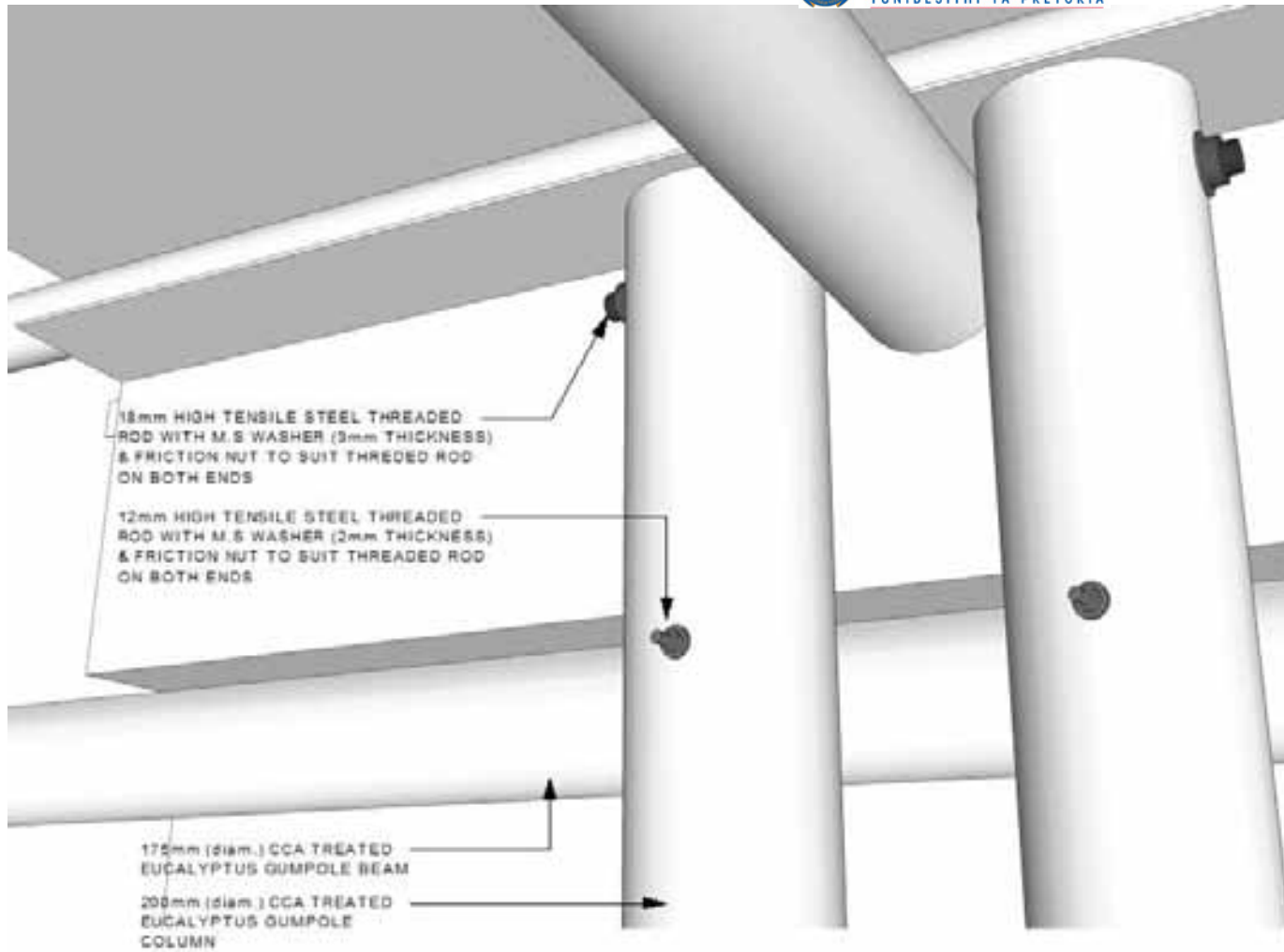
Detail 8: Exploded view of concrete lintel unit, downpipe & column fixture



Detail 8: Exploded view of wire mesh & coal facade



Detail 9



Detail 10

Conclusion

In conclusion, this dissertation proposes that urban agricultural activities can be shaped to emerge as an economic and design generator. The applied design principles aim to establish a sense of order to subsistence farming activities in Africa and creates an awareness of the technique and process involved.

In a sense, the Siyotshala Urban Agricultural Centre serves as a stage on which informal activities will be allowed to perform, and in doing so, develop the skills, self confidence and entrepreneurship of the man in the township.

Today, more than ever, sustainable economical systems are needed to transform South Africa. We need to teach people how to uplift themselves through the necessary skills training, guidance and financial aid from Government.

The architecture was shaped by considering the ordinary activities and domestic rituals of everyday life in Mamelodi and Nellmapius. This condition is described by Henri Lefebvre's concept of the everyday when he wrote: "...while the everyday is the object of philosophy, it is inherently non-philosophical; while conveying an image of stability and immutability, it is transitory and uncertain; while governed by the repetitive march of nature's cyclical time; while unbearable in its monotony, it is restful and playful and festive; and while controlled by technocratic rationalism and capitalism, it stands outside of them. Everyday life embodies at once the dire experiences of oppression and transformation. However inhuman it reveals the human that still lies within us." (Lefebvre 1971:32)

In the end, no attempt was made to respond to typology. Instead, the site, program and technology shaped the form of the centre. Only in this way can architecture break out of the place where architects escape in order not to address the real challenges laid before them.



List of sources

Books

- VILJOEN, A. 2005. Continuous Productive Urban Landscapes. Oxford: Elsevier.
- TILMAN, H. 1997. Integration or Fragmentation: The Housing Generator Competition. NAI Publishers: Rotterdam.
- VENTER, S., LAURIE, S., FABER, M. 2006. Home-gardens to address vitamin A deficiency in South Africa: A food-based approach. CPD Printers: Pretoria.
- ALEXANDER, C., ISHIKAWA, S., SILVERSTEIN, M. 1977. A Pattern Language. Oxford University Press: New York.
- JOUBERT, O. 2009. 10 Years+100 Buildings; Architecture in a democratic South Africa. Cape Town: Bell Roberts Publishing.
- LEFEBVRE, H. 1971. Everyday Life in the Modern World. New York: Harper and Row.

Journals

- HOLM, D. 1996. Manual for energy conscious design. Department minerals and energy: Directorate energy for development. Pretoria.
- COOKE, J. 2009. Greenshops Financial Services Centre. Journal of South African Institute of Architects, January / February 2009:22
- UNKNOWN. 2003. Nelson Mandela Pavilions. Leading Architecture, January / February 2003:46-47.
- GERNEKE, G. 2006. Red Location Museum of Struggle. Architecture South Africa, May / June 2006:18-23.
- NOERO, J. 2004. The Good, the Bad and the Ugly. Architecture South Africa, Nov / Dec 2006: 16-24.

Newspaper articles

- RORKE, D. 2009. So much land, so little progress. Lowvelder, April 10, 2009:8.

Student research

- MELSONS, S. 2008. Formulating an Architectural design Paradigm for the quality improvement of formal settlements. University of Pretoria.
- BURGER, M. 2007. Industrial Archaeology as part of a Research Project; Irene Industrial Landscape. University of Pretoria.

Academic dissertations

- MOLOTO, P.P. 1996. Mamelodi as case study of urban agriculture in South Africa. University of Pretoria.

Government and International publications

- SOUTH AFRICA. Department of Transport. City of Tshwane integrated transport plan for 2004 up to 2009. 2005. Pretoria: Government Printer.
- UNITED NATIONS. United Nations Conference on Environment and Development. 1992. Earth Summit '92: Regency Press Corporation.
- SOUTH AFRICA. Development Action Group. 2003. Housing Report; The Masisizane Woman's Co-operative. Pretoria: Government Printer.

Recorded interviews

- KGOADI, B. Social Worker. FAMSA. 2009. Interview with Jacques Orton to discuss the crime, poverty and unemployment in Mamelodi and Nellmapius. 25 March 2009.
- SEPHTON, F. Agricultural economist. B.Sc. Agric (LEk) 1997. Interview with Jacques Orton to work out a Planting and Harvesting Schedule for the proposed site.

Internet

- Cosanti foundation. "Archology theory"
[Http://www.arcosanti.org/theory/archology/intro.html](http://www.arcosanti.org/theory/archology/intro.html) (25 May 2009)